$2.00

ENTERIC FEVER

ITS

PREVALENCE AND MODIFICATIONS; ÆTIOLOGY;

PATHOLOGY AND TREATMENT;

AS

ILLUSTRATED BY ARMY DATA AT HOME AND ABROAD.

BY

FRANCIS H. WELCH, F.R.C.S.

SURGEON-MAJOR A.M.D.

(Alexander Prize Essay, December 1881—Modified)

PHILADELPHIA
PRESLEY BLAKISTON, SON & CO., 1012 WALNUT-ST.
1883

PREFACE.

In the accompanying pages I have endeavoured to show the relation of the Enteric Fever of England to that in the world at large, as illustrated by Army data; and how far these support the school teaching as to its nature and clinical features, or the asserted potency of climate, or this combined with youth and recency of arrival in the tropics. It has always seemed to me that deductions from army life are valuable to a degree often wanting in civil life, from the comparatively more accurately known conditions under which our soldiers are placed.

TABLE OF CONTENTS.

Pathology.

ENTERIC FEVER.

Its Prevalence and Modifications.

In the official nomenclature, Enteric Fever is placed under "General Diseases, Section A." This section "comprehends those disorders which appear to involve a morbid condition of the blood, and which present for the most part, but not all of them, the following characters. They run a definite course, are attended with fever, and frequently with eruptions on the skin, are more or less readily communicable from person to person, and possess the singular and important property of generally protecting those who suffer them from a second attack." It is defined as:—"a continued fever characterised by the presence of rose-coloured spots, chiefly on the abdomen, and a tendency to diarrhœa, with specific lesion of the bowels." This terse definition we may expand by adding that the disease has "an incubation period of about two weeks;" that the eruption appears "generally from the seventh to the fourteenth day, occurring in crops, each spot continuing visible about three days and vanishing on pressure;" that the diarrhœa is "early, spontaneous, and increases, the discharges being for the most part liquid, copious, of a bright yellow colour, and alkaline;" that "the average duration of the illness is about twenty-three days, death in the majority of fatal cases occurring towards the end of the third week;" that "there are special symptoms sometimes associated with the characteristic lesion of this fever—fulness, resonance, and tenderness of the abdomen, more or less tympanites, gurgling in the iliac fossæ, and increased splenic dulness;" and that the specific lesions are:—"enlargement of the spleen and the mesenteric glands, with enlargement, ulceration, or sloughing of the glands of Peyer and the minute solitary glands of the small, and sometimes also of the large, intestine." (Aitken).

The current theories are:—

(*a*) That the disease is specific, one case necessitating a former case; the virus or germ being transferred from the diseased body, and mainly by the intestinal discharges, to the healthy through contamination of a medium (air, water, food) or by personal contact; or through the use of the flesh of a diseased animal as food.

(*b*) That it is spontaneous in origin, caused by filth decomposition, by putrescent fæcal elements gaining access to the body through air, water or food; as such not requiring a pre-existent case, but capable of arising whenever and wherever these ascribed factors exist.

(*c*) That the disease is produced through air rendered foul by decomposition of nuisances going on especially "*under cover.*" "The production by emanations from the soil is partly admitted. The doctrine of a specific virus seems to be placed in the background, and the conclusion finally is that the single continuous thread of probability leads uniformly to the decomposition of organised (and chiefly vegetable) substances as the cause" (Parkes—*State Board of Health, Massachussetts*).

Such, briefly detailed, is the malady which "is the most common of the specific diseases in Europe and America, and probably in India." (Parkes).

If we turn from this general view to the statistics of the army to ascertain its prevalence as shown by a period of years among our troops, we find that prior to 1859 the disease was amassed with other forms under the generic heading of "continued fevers;" in 1859 onwards most of the stations of the army return it as "typhoid," but it is absent in the returns from India until 1861, from Bermuda until 1866, and from the West Indies until 1867; from 1869 it is returned as "enteric." The following table embraces the station returns at home and abroad.

Summary of Enteric Fever between 1860 *and* 1878 *inclusive.*

Station.	Average Annual Strength.	Average Annual Admissions.	Average Annual Deaths.	Ratio of Admissions per 1000 of strength.	Ratio of Deaths per 1000 of strength.	Mortality ratio per 1000 of cases.
Home . . .	77929	57·5	15·6	·73	·20	272
Gibraltar . .	4551	12·5	3·4	2·61	·75	324
Malta . , .	5253	25·2	8·8	4·79	1·66	335
Ionian Islands (from 1860-64 inclusive)	4013	12·5	3·25	3·11	·80	260
Nova Scotia (from 1862-68) . .	3205	6·4	1·1	2·00	·35	177
Canada (from 1862-68)	9965	5·55	2·42	·55	·24	435
Canadian Dominion (from 1869-78) .	2789	1·4	·20	·50	·07	142
Bermuda (from 1866-78) . .	1779	18·3	4·0	10·28	2·24	218
Windward to Leeward Island (1867-73) .	761	·55	·14	·75	·18	250
Jamaica (1867-73) .	590	·85	·42	1·45	·42	500
West Indies (1874-78)	1254	6·4	3·2	5·25	2·62	500
Cape . . .	3678	9·4	2·7	2.57	·74	288
Mauritius . .	1087	1·5	·8	1·45	·77	533
Ceylon . . .	931	1·5	1·0	1·67	1·06	642
Straits Settlements (1868-1878) .	722	·81	·27	1·13	·37	333
China . . .	1931	1·6	·8	·87	·46	548
Japan (1864-71) .	692	8·37	·75	12·08	1·08	89
Bengal . . .	36837	95·0	40·5	2·57	1·10	426
Madras . . .	11335	28·6	9·2	2·52	·81	322
Bombay . .	10866	19·0	10·1	1·75	·92	584
All India . .	59594	142·6	59·3	2·41	1·01	421
Australia (1860-69) .	956	·7	·1	·73	·10	142
New Zealand (1860-9)	4576	6·4	1·7	1·39	·37	265

From 1859 to 1878 our white troops suffered from the disease at home and in every foreign quarter they have been called upon to serve except in Newfoundland, British Columbia, West Coast of Africa and Fiji Islands; one case only has been returned from St. Helena during the period—in 1874. Among native troops, the Malta Fencibles, Negro troops in the West Indies (with one case returned among them on the West Coast of Africa—Gold Coast Station in

1867), the Sepoys in Ceylon, China, India, and Straits Settlements, have suffered from it, but in a much less ratio.

In the majority of our foreign stations, during this period, the disease has been a constant though variable yearly factor of the sickness and mortality, but in some, as the Canadian Dominions, West Indies, Cape, Mauritius, Ceylon, Australia, China, Japan, and Straits Settlements, there are years of intermittence in the period when no disease was returned among the troops; and these facts are strongly antagonistic to climate as cause or any peculiar condition of station, soil or country.

Taking the admission ratios only, Canada gives the lowest prevalence, followed closely by Home Stations, Australia and China, and at a longer interval in progressive advance by the Straits Settlements, New Zealand, Mauritius, Ceylon, Bombay, Nova Scotia, Madras, Cape* and Bengal, Gibraltar, West Indies, Ionian Islands, Malta, Bermuda, Japan, Cyprus.

Taking the severity of the disease as indicated in the proportionate mortality to admissions, we get the stations arranged in progressive sequence, commencing with the mildest form, as follows:—Japan, Canada and Australia, Nova Scotia, Bermuda, Ionian Islands, Home, New Zealand, Cape, Madras, Gibraltar, Straits Settlements, Malta, Bengal, West Indies, Mauritius, China, Bombay, Ceylon.

It is clear that some of our foreign stations are more favourably placed than the troops at home, both as to amount and also character of disease. These

* Did the statistics, however, include the year 1880, the Cape would be placed in a more unfavourable position.

more favoured stations approximate our own in climate, or are colder, but this alone cannot explain the point for the advanced position in the list of China and the Straits Settlements (tropical climate "par excellence"), and the less satisfactory position of Nova Scotia, Cape, Japan, require some other factor than climate to explain the prevalent phenomena. Looking to the severity of disease, no less than six foreign stations return a ratio less than the home troops; but not the less well marked is the association of climate approximating the soldier's native one with improved chances of recovery (whether from diminished severity of disease or augmented vital stamina), and on the other hand, the high ratio mortality in the tropics.

If we arrange the stations in groups in conformity to climate, or regional features, the following is the result.

Groups.	Stations.	Admissions for period per 1000 of strength.	Deaths per 1000 of strength.	Proportion of mortality to Admissions per 1000 of cases.
Countries approximating native climate.	Home. Canada and Nova Scotia. Australia. New Zealand. Japan.	·81	·20	257
Mediterranean. Sub-tropical.	Gibraltar. Malta. Ionian Islands. Cyprus.	3·75	1·14	309
Western tropical Isles.	Bermuda. West Indies.	7·20	1·85	257
Eastern topical Isles.	Ceylon. Mauritius.	1·54	·90	586
India.	Sea coast, plains, table lands, hill stations.	2·41	1·01	421

The grouping tends to corroborate the deductions from individual stations, that the conditions under which our soldiers are placed in the countries temperate or approaching temperate in character are less favourable to the production of enteric fever than tropical or approaching tropical stations, and that the disease when present is relatively not so severe, or if as severe then the chances of recovery for the individual are greater. As regards the less amount of the disease (assuming the potency of the ascribed causation) we have an explanation in the less favouring climatic conditions for disease diffusion, in less potency of insanitary conditions in the quarters or surroundings of the troops (assuming that the insanitary conditions are equal in amount in all climates, but which would probably be given in favour of the temperate stations), and in less chances of contracting the disease (assuming that the disease is less prevalent in the civil population on the above bases) ; but on the one hand we know from Japan, Nova Scotia, and some of our home stations, that special defects have annulled the advantages which the stations as a group possess, and on the other, from some of our tropical stations, it is clear that climatic conditions are not paramount. As regards the less proportionate mortality, we have an explanation in the reduced severity of the disease as compared to the tropics, owing (on the assumption that it is contracted from the civil population) to its being contracted (with the exception of Japan) * not from

* Not necessarily an exception, because Japan is chiefly made up of one large outbreak, and the history reads like an initial introductory case with diffusion from foul latrines, and on this

an alien race with all that this entails in proportionate increased severity of disease of any kind, but from their own, and in the increased chances of recovery from the body stamina of the individuals being supported by the health-giving properties of the climate.

In the Mediterranean these are conditions very favourable for the development and diffusion of the disease as compared to the temperate group; these are partly climatic, but probably more dependent on the unsatisfactory state of the barracks and their surroundings, many of them in close contact with a thick native population in whom enteric fever is endemic, and on soils contaminated by the location on them of generations of human beings—unreformed old civilized cities. That these latter are the more powerful is shown by the comparison of barracks and quarters exposed to their influence with those more recently built and removed from them. The proportionate mortality of this group is great, and probably mainly due to the severity of the contracted disease, for the chances against recovery from climatic causes or prior disease are not so great as in tropical stations generally. The western tropical islands lead the list so far as disease prevalence is concerned. The moist warm climate of these isles must assist in the diffusion of such a disease, but from the disproportionate prevalence in Bermuda and Jamaica (and here Newcastle in the hills as compared to the plain stations), it is apparent that other causes are more potent than climate. That these are to be found as a rule in or around the localizations of the troops, with a sur-

assumption the main mass derived the cause modified by having passed through the body of one of their own race.

rounding dirty coloured population, is, I think, apparent from the details which will follow. The disease when originated is not more fatal than in the temperate climes, although probably contracted from an alien race, owing apparently to its inherent mildness among the Bermuda Islands' inhabitants; but in this Jamaica is on a par with the tropics generally, the proportionate mortality there reaching 500 per 1000.*

In the Eastern tropical Isles the admission list is intermediate between the temperate countries and India, the ratio of mortality is the highest, but there are special reasons for considering the Ceylon figures as unreliable.

The mainland of India gives a ratio of disease considerably in excess of the temperate climes but below that of the Mediterranean and Western tropical Islands, the inference being that the conditions favouring its diffusion in India are intermediate in degree, and the actual facts are apparently in accord with the figures. Seasonal features are undoubted adjuvants to its dissemination, the occupied portions of the country are the equal, or probably in advance, of the Mediterranean countries in this,—that they abound in the insanitary consequences of long occupation by close packed populations with utter absence of hygiene, while there are advantages over most other foreign stations in the character of barracks, and comparative removal from the native population. The excellent housing of troops in India, and all that it embraces, undoubtedly powerfully counteracts the influences of

* If, however, we bring to bear on this the acknowledged extent of the outbreak in 1874, with numerous mild cases not returned as enteric, the proportionate mortality will be considerably reduced, and probably to much the same ratio as Bermuda.

climate and surrounding native population, and reduces this disease as a producer of sickness and death in the European force to a ratio considerably below that of more favoured climates. Again, as regards the ratio of mortality to cases, India is close to the top of the list and in advance of the Mediterranean, Western Isles, and home stations, and here the results are in accord with what might *à priori* be inferred. The disease when contracted is probably not less severe in India, and the chances against recovery from prior debilitating climatic and disease influences, and from the combined influence of virus and heat when on the sick bed, are undoubtedly greater than in any other country we occupy with less intense tropical heat and moisture and less prevalence of undermining health agencies.

The relative importance of enteric fever in the sum total of sickness and mortality is shown in the following table.

Countries.	No. of years.	Proportion of Admissions from Enteric Fever to Total Admissions represented by 100.	Proportion of deaths from Enteric Fever to total mortality represented by 100.
Home	19	·083	2·2
Gibraltar	17	·37	9·6
Malta	18	·57	13·9
Ionian Islands	4	·39	8·2
Bermuda	13	1·46	10·6
Nova Scotia	7	·33	3·7
Canadian Dominion	10	·08	·82
West Indies	5	·24	11·3
Cape	19	·27	6·7
Mauritius	19	·10	5·5
Ceylon	15	·13	5·2
Australia & New Zealand	10	·04	2·08
China	19	·05	1·4
Japan	8	·78	5·4
Straits Settlements	11	·08	2·3
Bengal Presidency	18	·16	4·3
Madras "	17	·11	3·8
Bombay "	17	·11	4·6

This is calculated by taking the average annual admissions and deaths from all causes for as many years as the figures will allow, and the same from enteric fever, and bringing the results out as a proportion to 100.

As an element in the yearly sickness enteric fever has not taken a high proportion anywhere except in Bermuda where it has formed about $\frac{1}{70}$ part of the total admissions from 1866 to 1878; next is Japan with about $\frac{1}{140}$ part for a period of 8 years, and Malta about $\frac{1}{170}$ for 18 years. The small importance however which this disease obtains in the admission list is more than counterbalanced by the mortality list; in Malta, West Indies, and Bermuda constituting over $\frac{1}{10}$ of the total deaths, in Canada, China, Australia, Home and Straits Settlements about $\frac{1}{45}$ and in India about $\frac{1}{25}$. These figures show, coupled with those already given, that this disease assumes a maximum importance, in proportion to number of troops, both actually and relatively to other disease, in Bermuda, Jamaica and the Mediterranean; a minimum importance in Canada, China, Home and Straits Settlements; while India holds an intermediate position. Its severity and fatality are its characteristics in all stations.

As regards the elucidation of causation these statistics are valuable on these points:— they show an existence of the disease in every variety of country, climate, and in all that foreign stations differ from those at home, or from each other; they show marked differences of the disease in stations approximating each other in climate, etc., marked differences in the same station comparing one year with another.

But however little support they give to the association of this disease in the army *directly* with such agencies as climate, soil, regional peculiarities, yet it is apparent, taking the broad facts, that there have been conditions in operation in many of the tropical climates which have *indirectly* assisted it.

Do any modifications in the symptoms occur abroad as distinguished from the disease at home? On this point the main difficulty resides in eliciting how far and how frequently divergencies from the typical disease are met with in Europe, and whether the recognised modifications in the army disease abroad are similar but extra developments only of these, or original departures from the type form. That divergencies do occur, and especially in tropical climates, in army life is beyond doubt and there are a few which require consideration.

1. *The onset of the disease.*—The main deviation concerns the access of the fever which approximates ague in character. Some of these instances are clearly nothing more than an excess of the cold sensation which accompanies the onset of other specific febrile diseases, and liable to be similarly regarded in these as in enteric fever; but naturally this tendency so to refer the fever access finds its maximum in countries where the paludal element is a common feature. On the other hand, it is undoubted that the old periodic poison is often roused into activity by the new developing disease, and does then impress itself upon the fever giving it an "agueish type." It does not however follow that the prior existence of ague so modifies all cases of enteric fever; it may not be observed in individuals where from their antecedents it might be

expected. It is clear, however, that the European disease has this feature in common with the tropical disease; it is a phase of the virus evolution untrammelled by the paludal element, and apparently intensified in hot climates.

2. *The eruption.* The deviations concern its non-occurrence and non-recurrence in crops. Personally I do not think I have seen it it in more than half, and this proportion is borne out by reported cases generally. The recurrence in crops does not appear to be common. The first appearance may range between the third and seventeenth day of the pyrexia. But there is an undoubted difficulty in discriminating between the eruption and insect bites, and in detecting them when accompanied by "prickly heat" or sudamina, or concealed by counter-irritants, which leads to hesitation in drawing conclusions on this point. What more common than the bites of fleas, bugs or mosquitoes, in the tropics? and although it may be said that the puncture by the proboscis of the insect is decisive as to cause, yet this cannot always be seen in cachectic subjects. Nor does the usual position of the spots add much of a decisive nature, for, putting on one side the fleas and bugs, what more probable than that the patient should uncover his body surface in his weary tossings, while his arms, legs and upper part of the chest, remain under the shirt or clothes, and so have his abdomen and lower part of chest exposed to the mosquito? Hence, while allowing full force to deductions on the nature of the fever from rose red spots clearly recognised as an outcome of the disease process, the difficulties in coming to a correct conclusion in many instances, and

the obstructive features of sudamina and prickly heat in deciding upon their presence or absence must be allowed. The eruption is no necessary accompaniment of the virus, nor any indication of its intensity.

3. *Increased Splenic Dulness.* This as a clinical feature does not stand prominent in the army cases. From its constancy as a post-mortem detail it is apparent that the spleen does enlarge in this fever, and probably at an early period, yet as a rule it does not render itself subjectively an assistance to diagnosis, and the distension of the intestines often prevents any accurate appreciation as to its existence or extent. When too it has been noted during life as markedly enlarged and prominent there has generally been a prior malarial element to obscure a conclusion as to the causes in operation in its production.

4. *Pulmonary Complication.* This appears, in the service, to be more than ordinarily frequent, even in minor cases of severity; as one of the lesions dependent on the virus evolution in the frame, and appearing generally about the tenth day of the fever. The form is generally that of implication of the smaller bronchial tubes, and individual lobules.

5. *Cardiac Derangement.* This is very marked in the tropical disease. There is undoubtedly a weakening of the heart's force from the first, a softness of the systole, a diminution in frequency as compared to acute disease in general, a marked tendency to be influenced by movements of the body and anything which throws a stress upon the organ, occasional intermittence in the later stage, all pointing to lessened power of this muscular organ, and requiring a careful watch.

6. *Renal Complication.* The frequency with which albumen is met with seems much less in the tropical disease, certainly it does not reach the proportion noted by Dr. Parkes (33·3 per cent).

7. *Irregular Perspirations.* These in the tropics are far from uncommon, often intense, occasional or frequent, generally occurring in the afternoon or evening, breaking in during the pyrexia but not necessarily producing a reduction of the temperature at the time though occasionally followed by a subsequent temporary decline shown as a lower reading of the ordinary remission, having no influence whatever in the curtailment of the disease but occasionally followed by increase of prostration. These perspirations are quite distinct from those met with in the later stage, or at the defervescence of the disease. The cause, or the reason for their appearance, is not obvious. In character they approximate those in septic blood poisoning, and I believe that this feature has, among others, led some observers to regard this fever as "remittent," especially as a lowering of the temperature does sometimes ensue; but that they cannot be merely dependent on the presence of the ague element in the frame is clear from a want of concurrence in many instances at least. They are not unknown in the European disease, and due probably to the animal virus; yet more frequent in the tropics from the great external heat *per se* weakening the circulation, relaxing the skin capillaries, and promoting intense action of the sweat glands.

8. *Range of Pyrexia.* It is probable that this point has been raised to an importance greater than the circumstances warrant.

Attempts have been made by several observers in Europe to differentiate enteric fever negatively, and also to substantiate its existence positively, by the thermometer, and the following is, I believe, a fair summary of the conclusions. The disease is not enteric fever :—

(*A*). If the temperature has been normal once during the first week of pyrexia.

(*B*). If the temperature rises to 104° F. during the first two days.

(*C*). If on the 2nd, 3rd, or 4th, evening the temperature approximates to normal.

(*D*). If the temperature on two of the first three evenings is the same.

(*E*). If it is the same on the 2nd and 3rd mornings.

(*F*). If, between the fourth and sixth day, the evening temperature of a person under middle age does not reach 103° F.

(*G*). If, in the second half of the first week, there is considerable abatement of the evening temperature.

(*H*). If, between the eighth and eleventh days, the temperature is below 104° F., enteric fever may be excluded with the greatest probability.

(*I*). "Most certainly are we justified in positively diagnosing abdominal typhus, when previously healthy persons of youthful or middle age, after being ill about five days, or perhaps a week, exhibit evening temperatures of 103·5° to 104° F. or a little higher, alternating with morning temperatures which are 1·3 to 3·7° F. lower."

It will be observed that all but one of the excluding summaries refer to the first week of the disease.

Now it is undoubtedly rare in army practice (and more so apparently in civil life) to see the patient before the fourth day; there is all but invariably the same statement of three or four days (occasionally longer) fever before reporting himself as sick; and the thermometer on the evening of admission generally shows the highest fever point for several consecutive days at least—the fastigium has been reached. Hence we very rarely indeed get the opportunity of applying to these cases the summaries *b*, *c*, *d*, *e*; and in point of fact I cannot find a single instance of an undoubted case where the thermometer has been used before the fourth morning. So that whatever theory may suggest, practically we have to commence with the fourth day of fever for our scrutiny into the nature of the case we have to deal with.

As regards summaries *f*, *g*, *h*, there are already on record many examples which illustrate divergencies from them, in irregularities of temperature and lower readings.

Now, in several of these the nature of the disease was substantiated post-mortem, and in those in which recovery took place the clinical details leave little room for doubt, yet the application to them of these summaries would exclude them from the enteric fever list. They all occurred in India, and the conclusion (not limited to this country) is evident, that enteric fever, whether seen among soldiers, among civil Europeans and half castes, or among the natives, will not stand the same sifting process by the thermometer as the disease in Europe is asserted to do. I do not mean to state that cases of enteric fever, both in India and elsewhere, are not met with which comply with these excluding tests, for I have myself seen such; but I must express my belief that the exceptions are so numerous as to negative the possibility of differentiating enteric fever by the thermometer from other diseases on the basis of these summaries.

As regards the substantiative summary, I may say that my own experience (and as far as I can glean, the observations of others also) shows that while an evening rise during the second week to 104° for two or three evenings, especially from the seventh to the tenth day, in severe continued fevers, not specific, is occasionally met with, yet this rise is not continuous, and so the latter feature probably does demonstrate the case as enteric; but on the other hand, it must be allowed that enteric fever may run its course or prove fatal and yet show no rigid adhesion to any such temperature phase.

Again, if we look to the thermic range as a whole, comparing the recorded charts of the disease with that of Wunderlich, it must be acknowledged that the approximations to it are not numerous, while the divergencies are many. All but invariably the records of the temperature rise from health are a blank, and when fatal the termination of the chart as to defervescence is a blank, so that in the vast majority we have only the intermediary period to compare and sift; and this, while showing a continued fever range, is marked as a rule by frequent irregularity, in considerable variations from day to day, and in variations during the day. Instead of the extraordinary uniformity observed in Wunderlich's chart, variations in the body temperature in accordance with the onset of complications and exacerbations of diarrhœa and other symptoms, temporary circumstances, have been generally noted; and if the temperature be an exponent of the acute disease processes going on in the frame, and anti-pyrexial remedies any use at all, it is difficult to understand such undeviating tracings on physiological principles.

Summing up tropical enteric fever, on the lines of the type chart, we find:—that the ascent from health is probably reached between the third and seventh day of pyrexia; that the intermediate period is irregular from first to last with considerable diurnal fluctuations; that the sudden fall from the intermediate period of pyrexia is not uncommonly absent; that the later diurnal undulations are occasionally supplanted by a gradual decline, with no great diurnal range, extending to the termination of the case; and that even when the fall is sudden and well marked a gradual merging into the normal body heat may be observed in the place of the diurnal undulations. As a rule, I believe that the thermometer does not attain the same height in Indian cases as in the European disease of equal symptom severity; a scrutiny of the recorded temperature charts will not uncommonly reveal fatal cases considerably under the apparent European range from first to last; and the same holds good of scarlatina, small pox, and measles.

These divergencies at first sight may appear due to the fact that the individuals are exotics; but in rightly weighing this influence, it must be remembered that the natives of India at least do not come up to the standard; and if we attempt to trace them to prior diseases, such as ague, the cases for or against such a conclusion are tolerably fairly balanced. It is impossible to overlook the deteriorating influence of great heat and former diseased action in aliens in modifying the human frame, so that a close approximation in thermic range (equally as in some other symptoms) of cases of enteric fever seen in a native clime in the temperate zone, to cases of the same disease in the same race in the tropics, cannot be anticipated; yet allowing this, I cannot help thinking from what I have seen of the disease in Europeans and Eurasians in India, and in Europeans in the Mediterranean and North America, that in expecting enteric fever cases to follow closely the typical chart of Wunderlich we are raising an expectation which meets with very many disappointments in practice. As before said we rarely get the record of the fever advance from health, and although the readings of the thermometer during the decline may be useful for reviewing a case after its termination, yet for the fatal cases and for the diagnosis at the bedside we are limited to the intermediate period. This period of enteric fever, as compared with other tropical fevers, appears to be distinguished by its duration, by its continuous action for ten or more days in accordance with its severity; the moderate, equally as the severe cases, show this point—*a prolongation beyond what a corresponding severity in any other fever would give;* and for the thermometer to be useful for diagnosis the indications are that attention must rather be directed to this than to the temperature reading of a particular morning or evening. It is very doubtful, however, whether the thermometer *per se* suffices; in many cases at least it requires to be supplemented by the symptoms generally. One point is clear, by arbitrarily deciding that enteric fever in the tropics must comply in thermic range with the summaries of the European disease we exclude many cases which show the special intestinal lesion; while if these again are further whittled down by a necessitated compliance with the type range of Wunderlich (which must necessarily be based on very exceptional cases—on an extreme minority), we reduce the disease to a rarity and all but banish it in theory from the service in India at least.

The foregoing observations refer to deductions based on two readings in the day, morning and evening, and on the supposition that the latter is a fair index of the highest point during the 24 hours. This evening reading is not, however, always a reliable exponent of the highest diurnal fever range, for between the morning and evening in the tropics at least, there may occur considerable undulations of the body heat. As a rule we may say that the evening temperature is higher than the morning, though exceptions are far from uncommon. If, however, instead of being satisfied with the two observations we increase them to four or more, say at 6 a.m., noon., 4 p.m., and 8 p.m., it has been found in India that this disease is as undulatory during the day, and one day as different from another, as the temperature charts record from day to day. For example, at noon or 1 p.m. the daily fastigium is, as a rule, attained, and not in the evening. One day may show a regular ascent from early morn to evening, followed by a remission common to all fevers to the next morning, though this decline is not necessarily present. Another day may show the highest point at early morning gradually declining to evening; a third, commencing with the morning remission, may advance 2° to 3° F. towards noon and then recede in evening to a point higher than the morning or under it; a fourth may, commencing with the morning remission, continue to decline to about 10 a.m., rise at midday and remain so until evening or decline, or declining from midday may again ascend in the evening, thus remitting twice in the day, or even three times in the 24 hours, should the nocturnal decline follow. The term undulatory appears to convey this feature of the diurnal body heat best. Surgeon-Major O'Farrell has noted and published facts of this nature, and I can fully corroborate him. The fever acme may be reached before noon, at noon, in the afternoon or late in the evening, though when it will occur and how (whether by gradual ascent or through intermediate depressions), it seems impossible to say. I have not met with a case in which the undulations of temperature were similiar each day; on the contrary several of the modifications may be met with in the same case on different days. They do not characterise any esp cial case, and they vary in the individual case; I have failed to connect them with any particular cause or condition; they are less frequent in the first half of the disease. How far they are dependent on the enteric fever cause, how far or if any on external conditions of great heat or moisture, or how far due to treatment, food, or stimulants, and especially to the cold or cool water application to surface of body, there are insufficient data from which to make deductions; but the tendency of cool water applications to cause remissions in the temperature chart is acknowledged. The practical deduction is—that the evening observation requires to be supplemented by one at noon at least.* If the exact range of body

* It seems to me that much advantage to the enquiry into tropical fevers would result if medical men would, as opportunities occur, carefully record the diurnal temperature phases. We have the pyrexia of enteric fever spoken of as remittent in type, and hence a reference of it in causation to marsh miasm. Every fever is remittent in the sense that it tends to decline from evening to morning or at some period during the day from the highest point, and enteric fever is no exception; but carefully tested is there, beyond an occasional tendency to fall towards, or on an exceptional day reach the normal temperature (so intermitting), any tendency of the continued pyrexia of enteric fever, as a whole, to approximate the paludal pyrexia? Personally I think the answer negative. As far as my observations go, from frequent thermometer readings during the day, the enteric pyrexia is essentially undulatory; on the other hand, the ague paroxysms, or the daily rise and decline of the malarial remittent exacerbation, are essentially regular and gradational. The fever comes on, the temperature ascends gradually to the highest point and then declines, either to normal in ague, or to a low fever point in the remittent form; there is no interruption, and one day repeats the other. This is very unlike enteric fever, from day to day, or during the day. The types seem to me essentially divergent, even when they seem to approach in broad outline, and I would ask Medical Officers in the tropics to test the point for themselves, taking clear cases of each and thermometer readings at intervals of 2 and 4 hours only. Paroxysmal is the character of one and gradational in its development, but regular and uniform in course, and it is possible by medicines suddenly to suppress the disease; undulatory is the pyrexial character of the other, irregular, an impossibility to say when the diurnal acme is reached, and an impossibility to prevent the daily continuity of the disease.

heat be desirable the intervals of record should not exceed four hours.

It has occurred to me, in searching for a possible explanation of the divergencies of the evening observation, especially in India, from the type chart, that these diurnal undulations may be partially elucidatory of the point. An evening fall from the morning reading seems unduly frequent in tropical enteric fever as compared with the European disease; now does the explanation lie in an earliness of the acme and a more early remission in the tropics than pertains to cases in temperate climes? I know of no observations of the diurnal range of temperature in the European disease with which to compare the Indian and tropical cases; but if the highest range of pyrexia in the twenty-four hours in European cases is recorded in the evening reading, which does not hold good in the tropics, it follows that in comparing the one with the other at an especial hour of the day, and making deductions therefrom, we err; rather should we compare the highest point reached, be the hour of the day what it may. In so doing I believe we should bring into closer approximation cases of the same disease in different climes, and should include many Indian cases with an evening temperature below 104° F. between the eighth and eleventh days which are consequently excluded by the European summaries, but which are unquestionably enteric fever if clinical facts and the intestinal lesion, as observed post-mortem, be conclusive as to nature. In the European cases I think I am correct in saying that the deductions are made on the hypothesis that the evening reading represents the highest diurnal fever range, but this is clearly not so in Europeans in the tropics, or in all natives of India. If the remission took place early in the day in the European disease, instead of late in the evening as it apparently does, the result would be, with the present method, irregularity from the type chart, and an approximation to the chart of the tropical disease; or if the highest temperature reached during the day were recorded instead of the evening reading in the tropical disease, there would occur a closer approximation to the European chart, the explanation lying in the variation of the daily fastigium as to hour. It is apparent that in bringing the same rules to bear on tropical as on European cases, we are going beyond what present knowledge warrants, we are assuming a conformity in special details in the tropics as in temperate climes, in aliens as in natives, and this conformity in disease does not exist.*

These then appear the main clinical deviations of enteric fever in the tropics, and the important one is the temperature range, not probably so much *per se* as from the great stress which has been laid on this symptom of diagnostic import. That marked divergencies are far from uncommon in the European disease, and to an extent not generally recognised in class books, must, I think, be allowed; and hence

* But the divergencies from the accepted idea of a progressive rise from the remission of morning to the evening, and of the evening being the highest point during the day, are not limited to enteric fever. In febricula, bronchial catarrh, puerperal ephemera, measles, I have observed undulations almost as marked as in enteric fever—considerable fluctuations between morning and evening.

the most reasonable view appears to be, that the temperature ranges of enteric fever in the tropics, are but amplitudes of the modifications observed at home, and probably due to the effects of climate in its widest sense.

And here it seems well to say a few words on the asserted hybridity of this disease with paludal fever. A perusal of the Blue Books will show that the term "typho-malarial" has been used by medical officers in Gibraltar, Malta, Jamaica, Cape, Ceylon, India. This composite word was originated by Dr. Woodward during the late Civil War in America. It would appear that no mere engrafting of enteric fever on an ague-stricken frame was regarded as typho-malarial, but only when the attack was of a mixed character from the entrance simultaneously of both exciting agencies in the system. So long as the paludal poison can be diffused through air or water, and if the ascribed media or causes of enteric fever be based on fact, there can be nothing theoretically antagonistic to the two agencies entering the system in the same way at the same time; but this does not imply a community of origin or causation. There is reason to suppose that one or two of the cases recorded by Dr. Massy at Newera Ellia in Ceylon were of that nature. But if such occurrences were common in the service they should be most frequently observed in those countries and stations where enteric fever exists and paludal fever predominates; and yet it is not so. Taking the paroxysmal fevers combined (intermittent and remittent) at Gibraltar, for the nine years, 1859-68, the ratio of admissions per 1000 of strength was only 4·9, and the deaths ·8; at Malta, for the same period, the ratios are 4·2 and ·02; at Jamaica, 129·9 and 2·32, but here it is especially noted that these fevers are all but limited to the plain stations and rarely occur at Newcastle from which the term typho-malarial is returned; at the Cape, 25·1 and ·17; in Bengal, 462·6 and 2·08; in Madras, 164·6 and ·69; in Bombay, 439·2 and 1·68. So that looking to the countries or stations from which the hybrid disease is returned, the only one which gives a basis in the statistics for assuming the probability of such occurrence is India; yet the country "par excellence" in which the designation occurs is the Mediterranean. On the other hand, the paludal countries are:—the Windward and Leeward Islands, 257·4 and 1·85 ratios per 1000 of strength; China, 676·3 and 6·20; Mauritius, 264·1 and 2·62, and for late years much in excess of this; Ceylon, 115·5 and 1·69, and the Straits Settlements; from all of these enteric fever has been returned, and yet the hybrid disease has received no recognition, and the same may be noted of individual stations. It is strange, at least, that the term typho-malarial should be more frequently met with in those countries where the paludal fevers are far from common, and where the remark in the yearly statistics is far from uncommon, that the cases of paroxysmal fever in the returns "originated elsewhere."

It is hardly necessary to remark that the paludal poison cannot *per se* give rise to enteric fever, nor the enteric causation to paroxysmal fevers, nor can they have a common origin; the statistics alone suffice to negative these points. If enteric fever were dependent on paludal miasm, or if the so-called typho-malarial cases were due to the two causes combined, then on the known pathology of marsh fevers we ought to find the individuals subsequently illustrating the paludal poison in the system, but the results of an enquiry as to whether enteric fever cases showed during a reasonable period after recovery the presence of the malarial element in their bodies was decidedly adverse to such a conclusion.

The onset of febrile disturbances in the tropics may simulate ague; ague and enteric fever may be often combined in the sense that enteric fever may occur in a marsh impregnated person, and the paludal poison may by being roused into activity confer a periodicity on the febrile disturbance, but this is a feature which is not special, but common to many other diseases.* Such cases were excluded from the original scope of the term typho-malarial, and allowing it in the instance of enteric fever would result in the coining of as many words as diseases which can be modified by the prior existence of the paludal poison in the frame.

But there is good reason to suppose that this is not what is intended (at least in many instances) by the medical officers so designating the foreign disease, but the deduction is apparently made from the tendency of the pyrexia to diverge from the type chart and to assume a supposed remittent character,† and

* There is no difficulty in furnishing instances, but a good example on a large scale occurred in Mauritius, 1873, when an epidemic of dengue was introduced; "the disease attacked 26 per cent of the troops and in almost all the cases was more or less complicated with malarial fever."

† The point is well illustrated in a case by Dr. Bushe, A.M.D.,

the occurrence of anomalous perspirations. On this point Dr. Murchison says:—"The pyrexia of enteric fever is essentially remittent, and cases have occurred in my own practice and been noted by Trousseau and other observers, especially in malarious countries, where it has put on at first an intermittent type." "Moreover it may happen that cases of enteric fever, mostly mild, present the intermittent character from first to last; and that they are really cases of enteric

summarized in the *Brit. Med. Jour.*, April 30th, 1881:—"enteric fever with typho-malarial symptoms." A lance corporal, age 23, service 2 years, had never been abroad and had never had ague, admitted from the Royal Barracks, Dublin. The case commenced with "continued rigors"; until convalescence set in the symptoms and temperature phases were "those of an ordinary case of enteric fever;" but during the convalescence the patient was liable to "frequent remissions with the regular rigors succeeded by the hot stage and sweating of true malarial fever for which it was necessary to treat him with quinine." Hence it was only at the commencement and termination that the paludal paroxysm was simulated, and my chief reason for bringing it forward is to show that this so-called malarial character is independent of climate for cause, is seen in the army in the United Kingdom no less than on foreign stations, and is independent of prior ague or traced malarial element in the frame at the time being, and occurring in the otherwise ordinary course of European enteric fever. Rigors are not uncommon at the onset, and the type of the fever at the close is remittent if not intermittent, and in the absence of traced malaria with known modifications of the enteric disease, is it necessary to go beyond the enteric cause itself to explain the phenomena? I have seen essentially the same sequence in Measles in India in three children of the same family, no paludal element could be traced nor had the children shown the slightest subsequent indications eighteen months at least having elapsed, but in them quinine failed in its action to stop the daily recurrence of the febrile paroxysm.

fever is proved by their occurring in the same family, and possibly at the same time, as typical and perhaps fatal cases of that disease." Here then a not uncommon similarity of the pyrexia of European enteric fever to that of paludal fever is acknowledged, both in instances in which a paludal element might have been present and in instances in which it was not, and consequently in which this character of the fever was due to the enteric cause *per se*; and hence its mere presence even if combined with other symptoms in tropical cases cannot be considered in themselves sufficient to stamp the disease as hybrid, or to justify the coining of a term which to most minds conveys a complex ætiology. The acknowledgements that enteric fever may, wherever it occurs, in its temperature phases occasionally superficially simulate paludal fevers, and that this feature is a marked one in individuals in other climes than their own "who have recently left their own country;" that pure enteric fever may go through its evolution in the tropics as elsewhere without close approximation to the "type chart;" these would go far to dissipate much of the doubt underlying the true nature of the army disease, and would tend to more statistical correctness. Such acknowledgements would not confuse deductions made at the onset of the fever from the gradual progressive daily rise of the enteric, the rapid hourly advance of the malarial remittent, nor would it oppose deductions made from the course of either disease as a whole; but it would indicate that mere thermometer variations in the progress of the disease (during the period intermediate between the febrile commencement and its final decline) were insufficient *per se* to determine the nature of the fever from which the individual was suffering.

Relative also to diseases of the intestinal canal and to simple febrile disturbances, enteric fever stands apart in every portion of the globe. There is no correlation in numbers, season generally, or severity; corps or stations with a high general fever ratio do not return the maximum of enteric disease. The fever tables by Sir A. Home for Madras, and those for India generally, given by the Army Sanitary Commission, are very conclusive; and they show equally that the components of the continued and paroxysmal fever classes are not convertible potentialities, one temporarily taking the place of the other in time or space.

Its Ætiology.

Summary of the Disease Details at Home and Abroad.

United Kingdom.—Here we have the soldier under his natural climate and surroundings, but dwelling apart from the civil population in barracks. Some of these (especially the older ones) are to all intents and purposes an integral part of the town of which they form the garrison, closely adjoining the houses with common sewers and water supply, and not uncommonly located in the poorest part; others again, as at camps, and some stations as York, are comparatively isolated; others too, while closely abutted upon by the surrounding population, have their own conservancy and water-supply. And from these diversities, we have, on the one hand an exposure of the occupants to any diffusible disease in the surrounding population, and on the other a freedom from such exposure on the part of the corps as a whole, but not including individuals who from some one or other reason visit the civil quarters and so subject themselves to the conditions there existent; and between these extremes there are considerable variations. The stations are arranged in the Blue Books in groups having features in common, or in districts. In 1871, the disease was more prevalent and fatal at the camps and "remaining stations."* In 1872, Dublin heads the list with 2·64 admissions per 1000 of strength, followed by "London and Windsor" and the "remaining stations." In 1873, "Autumn Manœuvres," but this was exceptional and dependent on an outbreak at Yannaton, and following this group are "Dublin," "remaining stations," and "large manufacturing towns." In 1874, "Dublin" again gives the highest ratio, 7·34 per 1000 of strength, followed by "remaining stations." That this high ratio of Dublin coincides with very marked defects in the sewerage arrangements, and sanitary defects in site, construction and surroundings of the barracks generally, is I think clear; and with the next highest ratio we have the sanitary defects of old unreformed towns, the group embracing many of the Irish sta-

* Chiefly such towns not included in the other groups or large towns where only a small detachment of troops is quartered; "the group is largely made up of old, and sanitarily speaking, unreformed towns."

tions such as Mullingar, Kinsale, Fermoy, Buttevant, the health condition of which, as to conservancy and water supply, was not of a high standard. On the other hand, the comparatively isolated camps give the lowest ratio, and next the seaports, dockyards, and arsenals, while the "large manufacturing towns" and "London and Windsor" fluctuate. With the arrangement of stations in districts in 1875 Ireland heads the list, and a clue is given in the frequency with which the conservancy arrangements (cesspits in numerous stations) are complained of in the sanitary reports, and the frequency with which well water (at stations especially with cesspits) had been found contaminated; both conditions favouring the diffusion of the disease when introduced. Next to Ireland is the Eastern district in England and the Home district with the Guards mainly at London; and here again, in the latter, the site of the barracks and their surroundings render the inmates very liable to participation in any outside communicable disease. On the other hand, Aldershot Camp and the Channel Islands return no disease whatever. In 1876, the ratio varied from 4·30 per 1000 of strength in the Home district to ·26 in the South Eastern. In 1877, the Channel Islands gave no admission, Chatham only one, the Home district the highest, 1·95 per 1000. In 1878, the highest ratio was at Woolwich, 3·67 per 1000; Dublin gave 2·44; while there was no admission in the Chatham, and the S.E. and Channel Islands gave only one case each. In 1880 Ireland gives the highest ratio especially the Cork district, the Channel Islands are high, while in England and Scotland the Home district predominates.

Throughout this period Ireland (especially Dublin) and the Home district give a continuous high ratio; Chatham, South East district, and generally Aldershot, are uniformly low; while now and then, one of the groups or one of the stations, in some particular year, gives an excess at variance with its general tenor. There is a very wide diversity between them, and it is apparent that some of these stations furnish opportunities for the development and diffusion of the disease much greater than others; the high ratio of enteric fever follows very closely the prevalence of insanitary conditions, whether the causes of these conditions be existent in the military quarters, or in the town of which they form the garrison, or common to both. That the close contact of our troops with the civil population forms an important factor in the prevalence of enteric fever, as in other diseases also, is clear, and this feature not uncommonly annuls the best devised sanitary measures within the barracks and to an extent not generally allowed.

Taking the period from 1860 to 1873 inclusive as a guage of the influence of special occupation of branches of the service on enteric fever prevalence and mortality we find as follows.—There is no marked range in prevalence to be traced; the Cavalry of the Line heads the admission ratio with ·82 per 1000 of strength, followed closely by the Household Cavalry and Foot Guards with ·70, and these by the Infantry regiments and Royal Artillery with ·59, the minimum being reached by the Artillery Depôt Brigade with ·28. The mortality to cases treated is greatest in the Artillery Depôt Brigade (608 per 1000) Household Cavalry and Foot Guards (500 and 388 respectively), and least in the Line Cavalry (203). That this greater mortality is more apparent than real is shown by this:—that each of the three segments have returned in certain years more deaths than admissions, a fact not observed in the other segments; and the application of the necessary correction to these figures while reducing the proportionate mortality to much the same rate as the others would augment the admission ratio, and with the result of making the Household Cavalry and Foot Guards equal to, if not in advance of, the Line Cavalry, and the Artillery Depôt Brigade equal to the Depôts generally. This done, and taking the admission and death ratios in conjunction, enteric fever assumes a maximum importance in the Household Cavalry and Foot Guards; intermediate are the Cavalry regiments, Infantry, and Royal Artillery; and last the Depôts. These facts clearly indicate that the nature of the duties of different branches had but little influence on the disease; the favouring conditions for its prevalence were greatest amongst the Household troops and least at the Depôts, and with the former locality of barracks would tell.

Yet more, the exciting cause of the disease was very limited in its sphere of operation, and in some instances at least very localized in its influence. Thus, from 1860 to 1878 the proportion of attacks to those serving was only ·73 per 1000 of strength, and taking the years 1870-5 as a fair index, and assuming that the whole of the attacks were in men under 30 years of age—within the susceptible years especially—we only get a proportion of attacks to strength within this age of 1·61 per 1000, showing how few were exposed to the disease cause. As examples of localization; in 1871 at Aldershot the disease was limited to the 33rd Regiment and Army Service Corps; at Mullingar in the same year the disease was arrested by the removal of the men from one wing of the barracks; and in 1875 in the small compact barrack of Kinsale containing only part of a regiment (officers, men, women, and children) in permanent buildings and huts, the attacks were,—among the officers two cases may be regarded as such, women none, children possibly four, and among the men, from one hut no cases came, from four adjacent huts one man in every $5\frac{7}{15}$ had enteric fever, while in the permanent barrack rooms only one man in every $35\frac{5}{6}$.

There are two defined features discernible in the distribution of enteric fever pointing very clearly to difference of association.

1. *The sporadic nature* of the majority of the attacks. Many stations and many corps in same station returning cases never numerically great, cases widely dispersed as to time and space, isolated as to each other and cropping up at intervals; in fact not indicating a cause common to many or located within the corps, but an exposure of the individual only, and contrasting strongly with the features of an epidemic however small. This is almost a yearly observation in the Army Medical Blue Books, and in 1874 is regarded as a good proof of the generally satisfactory state of the internal sanitation of the barracks.

2. The occasional occurrence of a *localized outbreak*.

Here the cases whether few or many succeeded each other so rapidly and were so limited in time and space as to indicate that the cause existed in or near the quarter of the troops, and was one to which several were exposed at one and the same time, not in their individual capacity, but as susceptible components of a community. There are only eighteen outbreaks of this nature detailed between 1859-80, in point of fact they are exceptional, and when occurring seem to be connected with existent sanitary defects as localizing influences within or near the barracks. Of localizing conditions:—At Shorncliffe in 1870 there were foulness of drinking water in tanks and emanations from escaped fæcal matter from water-closets; at Pembroke Camp in 1870 there were contaminated well water and latrine effluvia; at Aldershot in 1871 there were impure water and defects in surface drains; at Mullingar 1871 there were latrine emanations; at Devonport in 1872 there were impure water supply drawn from a district in which the 19th Hussars in the following year contracted the disease, and the disease prevalent in the town, together with internal defects in barracks in latrines and probable tank water contamination from them; at Newport and Brecon contaminated well water; at Kinsale in 1873 the well water was contaminated from cesspits; at Newbridge and Military Prison Dublin there was an escape of sewer gas into habitations; at Limerick the well water was contaminated by sewage; at Kinsale in 1875 there were impure well water and effluvia from drains and an old cesspit; at Hilsea there were emanations from sewage on land; at Hilsea in 1876 forbidden well water; at Shoeburyness in 1878 the bursting of a drain pipe; at Buttevant in 1880 impure well water.

Of the ascribed causation or source of the enteric fever cases which were isolated we have as follows.—In 1862 at Canterbury "outside barracks." In 1869 at Colchester "obscure but probably from the neighbourhood." In 1870 at Aldershot "emanations from defectively-trapped drains;" at Dover "brought by recruits or men off furlough." In 1874 five instances in which the disease was clearly contracted at some other station than under which it appears in the statistics; at Parkhurst "well contaminated with sewage." In 1875 at Colchester brought from outside by "recently joined men especially by recruits for one particular regiment"; at Dungarvan "contracted outside"; at Carlisle Fort referred "to the drinking water"; at Ballincollig "escape of sewer gas" in the room the man worked; at Kinsale "impure well water; at Cork, one was "contracted outside," and one from an "untrapped drain" inside the barrack. In 1877 at Chester faulty latrines; at Preston the same; at Coventry "sewer gas escape in room;" at Newcastle-on-Tyne drainage and latrines faulty; at Halifax "contracted outside"; at Liverpool water might have been contaminated by sewage. At Tipperary in 1880, of five cases four were believed to have been imported. In some few of the above, the ascribed causes are generally associated with localized outbreaks, and if rightly connected, their sphere of influence must have been originally very restricted and immediately guarded against, or in the instance of impure drinking water at Carlisle Fort the supply cannot have been that common to the occupants.

If we link the recorded cases together, whether as outbreaks or sporadic, we find :—

1. That in the major number of instances impure drinking water—well water with a probable contamination from cesspits, tank water contaminated after storage by fæcal material or by absorbing sewage gas and perhaps specific effluvia—was the medium by which the disease was introduced.

2. That in a minor number of instances contaminated air was the medium, generally from cesspit or latrine emanations, more rarely from sewers, untrapped drains, sewage on land, escaped material from waterclosets, or bursting of pipe.

3. There are no recorded instances in which articles of food—milk, meat, ærated waters—furnished the medium, and the instances traced to personal contact with the sick are rare.

It is clear that among the military in the United Kingdom from 1859 to 1880 the disease rarely, if ever, prevailed where good sewage arrangements—proper conservancy—and a pure water supply brought from a distance, existed in barracks; the favouring conditions of the disease have been cesspits, well water supply (especially when obtained near centres of habitation, in the barrack square), barracks contiguous to a poor civil population or located in badly-sewered towns.

Looking to the seasonal prevalence, the information is but scanty in the sporadic cases constituting the majority, but where the point is noted the last quarter of the year is the period mentioned. On the other hand, the localized outbreaks occurred as under:—during first quarter 4, second quarter 1, third quarter 4, fourth quarter 5, in four instances no information.

We get the cases proportioned to age as under:—under twenty years, 50 per cent; between twenty and twenty-five, 37 per cent; between twenty-five and thirty, 5 per cent; between thirty and thirty-five, 3 per cent; between thirty-five and forty, 3 per cent.

The details indicate also that the early years of service are those during which the soldier is likely to suffer from the disease, and this is very apparent in the Kinsale outbreak in 1875, when among twenty-one cases the service periods ran as follows:—under one year of service 8 attacks; between one and two, 5; between two and three, 3; between three and four, 1; between four and five, 3; between five and seven, 1.

Of the mortality to cases treated, we find that from 1860 to 1878 the ratio was 272 per 1000, but varying between 192 and 522. In 1877 while 341 per 1000 was the mortality for the whole home troops, it varied from 250 in the home district to 500 at Cork and 600 at Dublin. At the Dublin Military Prison the ratio was only 187, at Pembroke Dock 210. At Kinsale, in 1875, 360. Comparing the ratio of mortality in the army at home with that in civil life we find the military returns not so favourable as the civil—272 per 1000 against 205; but when we take into consideration that the civil statistics include more youths at eighteen and under whose chances of recovery are greater than above that age and that the disinclination to return mild cases as enteric in the service operates in the United Kingdom as on foreign stations, and mentally apply a corrective, the conclusion will probably be that the mortality ratio in both segments of the community is much the same.

So far we have approached the subject from the disease standpoint, from the fever prevalence to the associated conditions, fæcal contamination, organically impure water. If now we reverse the method, and ask were these conditions only present when the fever prevailed ? we find examples in the Sanitary reports in numbers to illustrate this point :—that fæcal contamination of air and drinking water, with conditions similar to the ascribed surroundings of enteric fever, in the military community in the United Kingdom from 1869 to 1878, has existed among the same community during the same period when enteric fever did not exist, without causing any appreciable disease in some instances and causing disease other than enteric in other instances ; in some instances also, with a continuance of the insanitary conditions, enteric fever has subsequently been associated in the same stations. The inference from these facts I leave for the present.

We may summarize the details of the army home disease as under.—

1. The number of attacks to strength or to age susceptibility has been very small.

2. There has been no marked divergence in prevalence in different branches of the service.

3. As regards stations, the ratio has been greater in those having inherent sanitary defects, or being insanitarily situated, or in close contact to a thick poor population.

4. It has particularly affected the men under twenty-five years of age,—a disease of early manhood and short service.

5. It has appeared under two aspects,—(*a*) sporadic

cases (in the majority) relegated, as a rule, in origin to the civil community, and from their diffusion showing a widespread existence of the disease in the United Kingdom,—and (*b*) localized outbreaks (in the minority), with features showing a circumscribed sphere of operation of the cause, "house epidemics."

6. When it has obtained a footing in barracks as an epidemic there have been insanitary conditions explanatory of such localization, though these conditions have also existed unconnected with enteric outbreaks. Fæcal contamination of air and impure drinking water have been the insanitary conditions, especially with a water supply from wells and cesspit conservancy.

7. The outbreaks have been independent of any particular quarter of year, yet more frequent with the rainy season.

8. The mortality has been less under the age of twenty, but it has varied considerably in different outbreaks.

9. The phenomena of the disease among the military run parallel with the civil disease.

Question of the Conveyance of Enteric Fever from Home to Foreign Stations, or from one Foreign Station to another:—the Disease on Board Ship. There is a large stream of soldiers outwards from the United Kingdom to foreign stations and *vice versâ*, and a lesser one from one station to another, do they convey the disease in an active or latent state? If we look for an answer in the disease returns on board ship, we find as follows, taking the outward section first.—From 1860 to 1869, we have an outbreak of fatal fever on board a transport to Mauritius 28 days after starting, 56 cases and 9 deaths, some, probably all, were enteric in type; 4 admissions and 3 deaths in a detachment to Calcutta; two admissions "among troops proceeding to the East;" one among troops to India and Ceylon, and this year (1865) 40 admissions and 8 deaths from continued fevers are returned, six of the latter on board one vessel, and most in one brigade, R.A., for India; 10 admissions and 6 deaths among troops to the East, and on one vessel the first case occurred four weeks after embarkation, the cause was believed to be local, on the other "after the ship had been two months at sea," "origin not to be traced." From 1870, we have five cases in troopship to India the disease appearing eight days after embarkation; two cases in separate vessels; two admissions to the Cape; one admission to Bombay; two admissions among troops proceeding outwards; a case to Bombay, the disease probably contracted before embarkation and giving an interval of 21 days. So that in spite of all the care bestowed on medical inspections prior to embarkation, enteric fever in a latent state does evade our scrutiny to appear subsequently as developed recognized disease while at sea, and this is not a very uncommon occurrence. Should the date of exposure to the cause be within a day or so of embarkation, there is nothing improbable or impossible in the disease remaining quiescent during the voyage to develop after landing in any of the Mediterranean stations, in Halifax, N.A., Bermuda, West Indies, or even the Cape; while with the voyage to India now done in 28 days, a man might be landed in Bombay in the first stage passing stools highly infectious, or from a case on board men may contract the disease, land apparently in good health, and exemplify the malady on the journey to their station or after arrival at it. The rapidity with which the disease occasionally appears in a corps after arrival in India, has been remarked on by Surgeon-General Innes (Blue Book, 1878); and the Army Sanitary Commission in their report on enteric fever in the Bombay Army, 1876-7, say—"there are cases given in which the fever showed itself as soon as the men had set foot on land in Bombay;" clearly indicating that the source of origin must be sought either in an introduction with the corps, or some condition met with very soon after disembarkation; and as regards the latter point let it be remembered that most of the corps arrive in India during the cold weather, when climatic conditions characteristic of the country, and specially inimical to health, are at a minimum or absent.

Again, if we look to the statistics of transfer of troops from abroad to home, or from one station to another, we find as follows.—An admission among troops returning from the East; a fatal case from "India and China," and one death from Mediterranean to "other station;" one admission among troops transferred "between colonies;" one fatal case from Cape and Australia to home, and the 69th regiment transferring the disease from Quebec to Bermuda; one admission "from India to home;" one case on board the "Malabar" when returning from Bombay; two cases at Gibraltar from Cyprus; five cases in the "Orontes" from South Africa; in Canada, 2 officers, 4 men, 1 woman, from the

"Crocodile," disease contracted in Bermuda; two cases in "Euphrates" from Malta to Bombay; and in 1882 numerous examples from Egypt, the disease developing after arrival at home stations.

Hence, then, with the above facts before us, of the disease appearing during the voyage or after it, and of the occasional long incubation of the virus,* there is nothing against a possible transference of enteric fever by the troops from home to other stations, or from one station to another, or from abroad to home, in a latent or developed state. The diffusive power of even a mild case (should the excreta find favouring conditions) is acknowledged; the bustle of disembarkation and movement of troops to stations are not the most favourable circumstances for carrying out sanitary details; the disease not only occasionally appears very soon after the arrival but adheres to young corps in India and elsewhere to the exclusion of older ones in the same station; and with these points before us the conclusion is an obvious one, that importation as an element in explaining the origin of some of the disease in foreign stations among new comers, cannot be thrust on one side as valueless, and that we cannot disregard such possible transfer of a portable malady or neglect the precautions which suggest themselves. Nor can we ignore the possible bearing of importation in the past in explaining its present endemic existence in stations.

* From observations by Dr. Saunders, A.M.D., at the Cape, and from examples from Egypt, it seems certain that the recognised time of the incubation period must be extended to six weeks, or even nearer two months in exceptional instances.

Gibraltar.—There has been a very great fluctuation of disease in years from 1859 both as to prevalence and mortality, varying in the former from ·90 to 7·45 per 1000 of strength, and in the latter from 117 per 1000 of cases treated to 600. The amount is about four times that in the United Kingdom.

From 1868 to 1878, out of 16 corps newly arrived at Gibraltar (11 from England, 3 from Malta and 2 from Bermuda) the 2nd Batt. of the Rifle Brigade heads the list of numerical frequency from enteric fever in the first year of service, 11 consecutive cases being returned from it in 1875; the 2/23rd Regiment also a new arrival that year gave 4 cases, and the 1/4th similarly placed gave 2; and the experience in the other new corps is much on a par with the two latter. So far as Gibraltar is concerned not more than $\frac{1}{5}$ of the newly arrived corps give a preponderance of enteric fever over older corps in the command, while the number of the attacks on these occasions have been but few and examples of excess in older corps over new comers not uncommon. As showing the divergent results among corps in this station we have in 1875, one corps recently arrived giving no enteric case; 4 in their first year giving respectively ·99, 3·08, 6·17, 16.49 admissions per 1000 of strength; 1 in second year giving 4·76; and 1 in third year giving no case. It is clear that, taking as a test the new corps, on exposure to this climate (in its widest sense) an individual recently arrived, even if he be within the susceptible age, runs but a very slight risk of becoming an exponent of the enteric agency in his system. That the climate and general conditions there existent do exert a prejudicial influence on new comers is shown by the results of a corps from England in its first or even second year of service, in excess of sickness as compared to older regiments in the command or regiments from some other stations having already done part of their foreign tour; but the forms are "febricula," "simple continued fever," "rock fever," "diarrhœa," "dysentery,"—heat, intemperance, exposure to general insanitary conditions, and the cause (not elucidated) of that peculiar febrile disturbance with rheumatic sequelæ known here as "rock," and in the other Mediterranean garrison "Maltese fever." The cases of "seasoning" disease are numerous and general in corps, on the other hand the enteric fever cases are few and exceptional. Here, as at home, we have the enteric disease illustrated under its two aspects—sporadic cases and localized outbreaks; but the former have predominated immensely. The tendency among medical officers at this station (taking the expressed opinions as a test), is to link the fever with existent sanitary defects—with sewerage and drainage imperfections, and close contact with a thick surrounding population. The insanitary conditions of the rock are due to overcrowding, surface and subsoil contamination from long occupation by human beings and neglect of cleanliness, defective drainage and sewers, and small rainfall, with deleterious results on air and water (the latter less frequently contaminated than the former); the military participating in a less degree in these defects than the civil population. Surrounded as some of the barracks are by a closely packed dirty native population, or underrun by badly constructed and deficiently flushed sewers, or as at Wellington

Front, King's Bastion, and Grand Casemates near the sea level and contiguous to sewer openings, it is difficult to understand how, in spite of cleanliness and good internal economy, their occupants can, completely or at all times, escape any transferable disease existent in the native community; and that enteric fever is endemic on the rock, among the military with features indicating a source outside barracks, and more rife among the occupants of the barracks placed as above noted, cannot be questioned. The influence of locality is very perceptible, both in the production and arrest of disease. On this rock too there are many examples of insanitation—sewers bursting in barrack yards, offensive drains, bad latrines—and no consecutive enteric fever.

Comparing classes in the military community as far as the returns allow, we find (taking the mortality) a proportion of deaths per 1000 of strength, officers 1·55, men ·75, women 3·02, children 1·66. The numbers except in the men are limited, but as far as they go they show a greater prevalence of the disease among the women and children, and least among the men; they indicate one point very clearly, a point no less perceptible in the corps composing the garrison, marked variability in segments of the same community placed under the same climatic influences.

The disease, though not limited to any particular period of year, yet is more prevalent during the latter half, its maximum coinciding with diminishing heat, with advancing rainfall (filling of tanks, washing of surface soil, cleansing out of sewers, assisting putrefaction); its yearly accession is not coincident with, but follows the maximum of simple continued fevers.

Malta.—The statistics show that so far as the garrison was concerned the enteric cause from 1860 was a very fluctuating element in the production of sickness and mortality, varying in yearly admissions between ·81 and 15·16 per 1000 of strength. In the causation of the total mortality among the troops this disease takes a higher position in this island than in any other station, home or foreign. In amount it is about six times as much as in the United Kingdom, and much more severe.

It is not always possible to ascertain the result of exposure to this island climate of "new comers;" but out of 22 newly arrived corps, between 1868-78, 10 are shown to have returned enteric cases within the first 12 months. In 1872 the individual corps are particularised, and if this year be taken as a fair exponent it is clear that, as a rule, new regiments are not long resident without some of their members encountering the conditions necessary for the production of the fever and exemplifying such exposure, thus:—the 1/18th arrived from Ireland in January and during the year returned 4 cases, and in 1873, 3; the 1/13th, which had suffered from enteric fever in 1869 at Gibraltar, arrived in January or February and gave 6 admissions, and 3 in the following year; the 28th regiment also from Gibraltar, at same time, gave 4 admissions, 1 in 1873, 1 in 1874; the 74th also from Gibraltar, at same time, gave no enteric fever case, but 2 in 1873. The exemption of one corps, and the paucity of cases in the others, are noteworthy features. The medical history of the island is, that during the first hot weather at least, febricula, simple continued fever, the so-called

"Maltese fever," and possibly diarrhœa or dysentery, are common; the three former follow the exposure to the general agencies present during the great heat, and few escape one or other of them; one regiment on arrival repeats the former one. On the other hand, enteric fever is no necessary sequel of exposure to these agencies, either in first or subsequent years, the cases are few, corps of equal service in the command vary greatly both as to the existence of the disease and also as to amount when present, thus showing that the conditions necessary for its origin are exceptional and variable as to time and place. Enteric too bears no relation to the simple febrile forms as to number, prevalence, seasonal relation, mortality and age of affected.

That locality is a very powerful element in varying the amount of this disease among the segments of the military community of this garrison is beyond doubt; but a something beyond this is essential for its origin, which shows that locality ranks but as a predisposing influence only. The major prevalence in the island is linked with a thick population on a limited space; yet within this limited space, no corps far distant from another, the results in the different barracks are very variable, and not only so but in the same barrack at different times. The Artillery in upper St. Elmo, overlooking the sewer openings of the town, are usually marked sufferers; the Engineers in St. Francis barracks, comparatively isolated and fairly placed, and Pembroke Camp, removed from other habitations, give an opposite result; the lower St. Elmo barracks, Floriana and Verdala, are variable.

We find in this island also, the disease assuming the same distribution phases as elsewhere:—sporadic (vastly in the majority), and limited outbreaks; these latter generally not implicating many, apparently from the source being early detected and guarded against.

The amount of disease is but small compared to the numbers serving, which it must be remembered are frequently changed, thus presenting ever fresh material for the exemplification of the cause; and small compared to the numbers within the susceptible years of age. That something beyond age influence, recency of arrival, and exposure to climatic causes in the widest sense, is essential to generate enteric fever is shown in these examples. Dr. Marston in his paper on Fever in Malta (Blue Book, 1861), says:—"It is noteworthy that the Battery stationed at the fort in question (Tigné),* although composed of the youngest men, and last comers of the brigade, suffered in a far less degree than any other battery," "and equally observed in the variable experience of the recently arrived infantry corps." In 1872, the 1/18th regiment had 235 men under 20 years of age, and 241 between 20 and 30, or 476 within the susceptible period, and yet this fresh mass returned but 4 admissions from enteric fever during the year.

Among the men, from 1860 to 1878, the ratios per 1000 are:—admissions, 4·79; deaths, 1·66; mortality to cases treated, 335. Among the officers,

* Isolated on a point of land at mouth of harbour, and removed from surrounding insanitary conditions and contact with thick population.

from 1875-9, in an aggregate strength of 892, the mortality for the period was 1·12 per 1000 of strength; the admissions in 1875 amounting to a ratio of 8·84. Among the women, aggregate strength 1780, the admissions for 1875-6 equalled 3·53 per 1000, and the ratio of mortality to cases treated 333; for the whole period the mortality per 1000 of strength was 2·80. Among the children, aggregate strength 3398, the admissions in 1875 were 1·21; in 1876, the mortality was 3·59, and during the whole period was ·88 per 1000. These figures being incomplete do not admit of a comparison in details, but they indicate a considerable divergence in segments of the military community, of the same race under the same conditions of climate, soil, &c.

The seasonal prevalence is the last quarter, not that it is absent at any time but that some conditions then present are eminently favourable for the development and diffusion of the disease—advancing rainfall, saturation of the porous surface rock with moisture, washing of surface, flushing and dislodgment of material from drains and sewers, filling of tanks; in short, with the rainfall moisture supplies the requisite for germ development, for putrefaction, and the resultants are put in mechanical movement by the water in soil and sewers and brought into contact with the susceptible human frame in one or other way.

In this island we have a surface devoid of soil, a soft, porous, absorbent rock. A water supply by rainfall stored in tanks, supplemented by an aqueduct from the high ground, the water good but limited in amount; that in the tanks of the natives very contaminated, that in the military quarters not so often illustrating contamination as at first sight the arrangement would suggest. The conservancy a combination of cesspits and sewers, the sewage arrangements with many defects, the sewers bad in construction, "nothing but long cesspools" cut out of the porous rock, and although lined with an impervious coating, yet, from breaks of continuity or other cause, often allowing of soakage. A thick, poor, native population with ideas on sanitation absolutely wanting, with enteric fever endemic though generally classed as "enteritis," and habits essentially favouring its existence. The barracks are ill adapted for the purpose, rarely originally intended as such but formerly used as store houses (Verdala, Pembroke Camp and a few excepted), ill-ventilated, and with defects not remediable; and except two or three so closely surrounded by the civil population that it is impossible to shield the inmates against the insanitary conditions of the neighbourhood, or diseases of a communicable nature which may exist in the native community.

As bearing on the military we have the following defects associated with enteric disease set forth in the Blue Books.—Exposure of earth saturated with sewage escape; exposure of sewer contents; atmosphere loaded with emanations from sewer mouths; effluvium from drains; cleansing of an old offensive cesspit; sewage atmosphere from ventilating shaft; contaminated tank water; exposure of drains opened. These conditions however have not always been followed by enteric prevalence.

In the remarks by medical officers from time to time, there is evident a greater disposition here than elsewhere to connect the diseases of the military community with those of the civil population, the former in some years at least, and enteric fever also, rising and falling with the latter. Here undoubtedly, to climate or any such general conditions weighing on all, the charge of causing enteric fever cannot be laid ; the limitation of the disease as to numbers, to segments, to particular ages chiefly, to the months chiefly when the climatic peculiarities are on the decline oppose it, equally as the positive evidence of the association of the outbreaks. With the disease existent among the civil population, the susceptible soldier, even if the cause be not brought to him in the barracks in which he is quartered, is liable on frequenting the native haunts to meet the disease cause, and hence (the latter being regarded the more usual mode of its contraction) sporadic cases among the military are the rule. The localized outbreaks when traceable are generally connected with fæcal effluvia, rarely with water contamination, and this is in accord with the relative predominance of these two media in the mass of sanitary defects. General insanitary conditions in barracks are common enough in Malta, but by a bad common conservancy system and close contact with a native population the soldier here is subjected in a high degree to conditions essentially powerful elsewhere in the propagation of enteric fever. Fæcal contamination of air by its very frequency constitutes a disturbing element in drawing deductions on the enteric fever cause ; but that those barracks which are especially exposed to such a condition are those which have produced during the period of this enquiry the greatest number of cases is beyond doubt.

Ionian Islands.—Here we have illustrations of these points:—(1.) of a high sick ratio following recent arrival and exposure to summer heat, and generally taking the form of simple febrile disturbance; (2.) of the majority of new corps early producing cases of enteric fever; (3.) of this disease adhering to corps in successive years; (4.) of the forms of disease from which corps suffered being dependent on the island in which located. Enteric fever had its head quarters at Corfu, it was never absent at Fort Neuf, and caused at least two-thirds of the total mortality.

The history of Fort Neuf, and in a minor degree of the Citadel in Corfu, is that of continued and typhoid fever prevalence in the corps occupying them, whether old in the command or new comers—and then excessive; while, in the other islands paroxysmal fevers were not uncommon.

In 1859, it is remarked:—"The sewerage is most defective, and the sewage, when it reaches the tideless sea, renders it almost putrescent. The water, for instance under Fort Neuf, receives a large amount of the sewerage of the town of Corfu, and if anyone approaches it in a boat, and thus stirs up the stagnant sickening fluid, the stench is perfectly overpowering. Situated as the town is, exactly between the Citadel and Fort Neuf, both must in some degree suffer, but the former certainly in a less degree than the latter." In 1861 is a table of the admissions and deaths from "fever" (the latter all enteric) in the different barracks in Corfu, "all in immediate proximity to the sea, at heights varying from 30 to 180 feet," the Citadel, Forts Neuf and Abraham; the death ratios in them, per 1000 of strength, being 8·8, 11·9, and 0 respectively. In it there are several points of interest. The 2/2nd had suffered much in the previous year from paroxysmal fevers in the other islands; the segment of it in Fort Abraham, "high up with its spacious airy rooms," had no deaths from typhoid fever in spite of suffering much from the mild climatic heat fever; the segment of it in the Citadel had at least a mortality ratio of 6·8 per 1000 of strength; clearly here, so far as enteric fever is concerned, the paludal virus has no influence nor climatic agencies, the conditions to which those in the Citadel were exposed were all important; the fact of its being an old corps in the command gave it no immunity. The interior of Fort Neuf is represented as "beautifully clean, but the stenches that arise from the mouths of the town sewers opening into the harbour in its immediate vicinity are most abominable"; it gave the maximum deaths, and the ratios in it varied with the position of the quarters, decreasing with elevation above sea level —tents, 30·3; lower barracks, 11·9; upper, 9·4. In the Citadel, where the nuisances were similar in kind to those at Fort Neuf, but less in degree, there was a lesser ratio of mortality; but even here, the differences in the component quarters were marked; and that there were clear local features in its old Venetian barracks with its major mortality, is shown by the blotting-out result of moving a large detachment merely across the harbour to the island of Vido.

More perfect examples of the connexion of this fever with a limited local special cause, of its disconnection with climate and the paludal virus, and of the futility of mere internal sanitation alone to exclude it should it exist in the neighbourhood, can hardly be adduced than those these islands furnish. The history of Fort Neuf reads like an experiment:—the result of exposing successive bodies of men, originally healthy, well housed, well cared for in barracks, to emanations from fæcal decomposing matter derived from another community in which enteric fever is endemic. One body repeats the experience of the former one exactly; continued fevers, frequent and numerous; enteric fever, varying in years, but never absent during the year, and culminating during the autumnal months, its period of prevalence in the civil population.

Summing up the Mediterranean stations, we find that enteric fever is endemic in the old ancient civilized cities of this inland sea; from 1860 to 1880 it is constantly returned from our garrisons, in 1878 our troops met with it in Cyprus and suffered proportionately much from it, and our ships of war moving from one point to another do not escape its influence; while in 1882 in Egypt, the "half-way house" to India, we there encountered it and transported it on return to several of the home stations.

The Mediterranean troops are generally derived from the United Kingdom, and as a rule do not remain more than three or four years, hence there is a frequently recurring new young material to exemplify the conditions under which our soldiers are cast; yet, taking the years from 1870 (whenever the figures are available) as an index, the returns give only a proportion of enteric fever attacks of 4·92 per 1000 of strength, and assuming that all these were in men under 30 years of age the proportion only amounts to 12·99, indicating beyond doubt (if nothing more were available) that the agency must have been circumscribed and limited in sphere of action which allowed of the exemption of over 980 out of every 1000 individuals susceptible by age at least. Malta with its soft absorbent rock structure, and the hottest climate of the three stations, has returned most enteric fever; the Ionian Islands with their rich vegetable soil, and warm equable but healthy climate, stands intermediate; the precipitous isolated rock of Gibraltar, with the coolest climate, returns the least. In all, our troops were brought into close contact with an insanitary native population; in all, the general conservancy arrangements were decidedly bad; in all the water supply (tank and aqueduct in Malta, tank and well water in Gibraltar, tank and reservoir in Corfu) had shown defects in quantity and occasionally in quality. Fæcal contamination of air, and in two or three instances contaminated water, were associated with outbreaks in all the stations; those barracks which have been located near sewer openings into the sea have produced the maximum of enteric fever. In all, the seasonal prevalence has been in the later months of the year, with decline of high summer heat and advance of rainfall. The evidence from these Mediterranean stations is especially important as bearing on the tropical disease, two of them being European, and the other intermediate in position and climate between Europe and Africa, and it may also be added Asia.

British North America. Troops were quartered in Canada, Nova Scotia, New Brunswick, Newfoundland and British Columbia.

The first notice of the disease is at Halifax in 1862, an outbreak in which the civil and military participated, connected with the opening of "numerous drains and sewers and noxious accumulations of filth, while at the same time the water supply was very defective." In 1865 at St. John's, New Brunswick, "typhoid fever was very prevalent among the civil population, arising from the insanitary conditions of the town, and several cases occurred among the detachment there quartered"; and this is repeated in the following year. In 1866 we have examples of the following:—(*a*) with bad conservancy (cesspits) and water supply (wells), enteric fever endemic in the civil population of one of the towns and the military participating in the disease in spite of no local cause in the barracks; (*b*.) with the same insanitary conditions in another town malignant scarlet fever among the civil population extending to the military; (*c*) with impure well water to a third garrison is sequential diarrhœa: the conditions favourable to, and often associated with enteric fever prevalence being present in all, but in one only does this disease exist.

Between 1862-9 Nova Scotia returned a ratio of enteric fever nearly three times as great as the Home troops, and greater than the Presidency of Bombay, in proportion to the numbers serving; in 1865 it attained a proportion not often met with in any station in any climate, reaching an admission ratio of 31·56 per 1000 of strength, and a mortality to cases of 333 per 1000. Throughout the period, in Canada, the ratio is a low one, lower than the Home troops, and the mortality less.

As regards the climate of British North America, a greater contrast to the majority of the foreign stations of the army cannot be pictured. An intense dry cold in winter which hermetically seals up the earth and rivers and arrests all vegetative and putrefactive processes; a short spring during which the entire surface soil is left porous and loose as a sponge from the thawing of the contained congealed expanded moisture in winter, and freely permeable by the surface water set free from the accumulated winter's snow; a hot summer characterized by intensity of vegetative growth; a short autumn of hot days and cold nights; in fact, two seasons of temperature extremes linked by short intervals, one of these intervals marked by excessive earth moisture, the other by diurnal temperature variations. As bearing on our especial subject, we have in the community at large a drainage and a sewerage very defective, coupled with a water supply often liable to contamination. With these conditions enteric fever is one of the diseases from which the civil population, in the towns especially, suffers, but certainly not in proportion to the existence or prevalence of these fostering conditions, and as compared with many other countries. In the spring the surface impurities (five months accumulation, and of the most variable character) are washed by the melting of the snow into the streams and lakes, the subsoil is thoroughly searched by the large bulk of penetrating snow water, the cesspits often are flooded, and the wells filled ; impure drinking water is now extremely common, diarrhœa, and often dysentery, are the prevailing diseases, and enteric fever springs into existence here and there, continuing in a lesser ratio throughout the summer and subsiding with the advance of winter. The seasonal prevalence of enteric fever follows the short spring, but at no period is the disease necessarily absent ; it fluctuates with favouring or restricting conditions.

If we turn to the military we find this :—that some stations returned no cases during the year or for successive years, some an occasional one, others as at St. John, N. B., numerous examples when the disease was prevalent in the civil population ; the cases generally sporadic, in fact picked up by individuals from the sources outside. British Columbia during four and a half years of this period returned no case of enteric fever and had a high general health standard, and Newfoundland with an average annual strength of 284 from 1860-8 also returned no case in spite of insanitary conditions abounding.

From British North America we learn that a bracing vigorous climate of marked salubrity does not annul the enteric cause, but it does not favor its spread as compared to warmer moister climates with fostering insanitary conditions about equal ; the cold dry winter renders it latent, though the dispersion of it in the spring, and its occasional virulence among the military, show that the intense cold had

had no modifying influence on the virus *per se*. It seems probable too that the rapid and intense vegetative growth which quickly follows the short spring tends to curtail the impetus then given to the diffusion of the cause, possibly through the rapid removal and appropriation by the plant of animal organic matter and the elements of putrefaction—the surroundings of the virus—as soon as formed from the soil and water, whereby perhaps the virus itself becomes destroyed by the removal of the conditions essential for its vitality and growth.

Bermuda.—In the military statistics for 1866 we first meet with typhoid fever as a separate component of the continued fevers. It would certainly appear that this form had not been represented to any extent or degree since 1859 at least, as during the whole six years only one death from continued fevers combined is returned. But from 1866 to 1878 in no year has it been absent, though fluctuating from ·50 admissions per 1000 of strength to 49·13, the yearly average for this period being a very high one, in excess of all the foreign stations garrisoned during the same period. Here enteric fever takes a position in the combined total disease and mortality list higher than at any other foreign station (not exceeded by any in the admission proportion, exceeded by Malta in the mortality) ; in fact it was the disease of the period. And this is the more important in view of the comparative infrequency and mildness of the other continued fevers, and marked absence of the paludal form unless contracted in other countries.

In these islands the military disease, from 1866 to 1870, is remarkably localized as to place or corps;

some corps or sections being severely affected while the rest remained free—now the Engineers, then in two consecutive years the 15th regiment in two separate sections, one after another, and among the men quartered near two towns; removal to another island suffices to check the disease. In 1870, the 69th regiment lands from Canada in an infected state, and gives 28 cases. From 1871, isolated cases replace the outbreaks. There are several instances to show an immunity on the part of the new comers from the disease, even when associated with age susceptibility, and even when the disease did exist among older corps in the command, indicating that exposure to these islands' climatic peculiarities was insufficient in itself to generate enteric fever. Here too the enteric ratio bears no relation as to numbers, season, or mortality, to the simple febrile forms.

Yet even here, in this region of maximum ratio in the army for the whole period, the proportion of attacks to numbers serving and to the susceptible ages is but small, indicating how far from general the cause was, how removed in nature from an influence weighing on all. On the other hand, when the disease had become localized it showed a proportionate prevalence greater than usual, a cause potent but very circumscribed in its sphere of operation, and by its very potency then and by its influencing a high ratio in proportion to those brought under its influence no less demonstrating its prior absence from the community, and its marked difference in nature from hitherto existing causes and conditions.

Among the officers, women, and children, from 1876 to 1878, with an aggregate strength respectively of

283, 587 and 1124, only one case was returned—a child in 1876, not fatal. During these years, a few sporadic cases occurred among the men.

Looking to seasonal prevalence, the disease has occurred among the military in each quarter of the year showing that the cause existed in the islands, and that the conditions necessary for the development of the disease were present no matter the season or month, heat or cold, dryness or the opposite; yet taking a lengthened period, its ascendancy has been generally during the later months, following the onset of the rainy season. Here, as elsewhere, rainfall and soil moisture clearly assist its diffusion.

Among the ascribed causes we find mentioned:—existence of latrines as cesspits, climate acting on new comers, insanitary condition of St. George's, escape of foul gas from drains, foulness of tank, disturbed material in choked drain, contracted at St. George's. That the disease prevailed in a greater ratio among the troops quartered near the chief town —a recognised source of danger with enteric fever endemic—is clear, equally as that localizing insanitary conditions existed among the military, in many instances capable of developing the disease when introduced. Emanations from drains and cesspits (atmospheric contamination) often figure in the sanitary reports; and that grave defects in the conservancy system existed is shown by the mention of them, or the fact of their removal is noted; while on the other hand, the tanks for storage of the water-supply, rarely, if ever, during the period, are made the subject of complaint. Overcrowding in barracks, and very defective conservancy arrangements, with close contact of native population in some localities, mark the period of localized outbreaks; with the displacement of cesspits by earth closets, and latrine and sewer improvement, sporadic cases have displaced the former limited epidemics; the inference undoubtedly being that the source of supply of the disease cause to the military being the same throughout the period—the native towns in which it is endemic (excluding the instances of importation)—with the former insanitary conditions the introduced disease diffused itself in the military community, while with the extirpation of these fostering influences the disease in later years has not gone beyond the original individual sufferer.

West Indies.—In Jamaica, or rather its hill station, is the interest centred. The statistics show years in which no disease was returned among the troops, occasional cases, and one severe epidemic. In the mild equable climate of these islands we find enteric fever present in the Bahamas, Jamaica and Trinidad, at least; among the troops both white or black; and the existence of the disease among the native coloured populations is beyond doubt.

The history of the hill station at Newcastle is noteworthy, for with every advantage of climate, it is apparent that enteric fever became endemic there simply from the neglect of sanitation which was allowed to prevail. In 1859 we find an extremely low ratio of continued fevers, and a few examples of paludal stricken individuals; in 1869 defects of cesspit conservancy were mentioned, and only then as about to be remedied; then follow years of grave insanitation; in 1872 there is a fatal case of enteric fever, but where contracted and when occurring no details are given; in the latter end of 1873 there are several fatal cases, "fæcal contamination of air and water" abounding; in 1874 there is an epidemic of the disease; following this sanitary measures are put in force, and 1875 records no case, nor apparently do the succeeding years up to 1880. The potency of these insanitary conditions to foster and diffuse enteric fever is palpable in this station, but it is equally clear that something more than these was wanting to generate it. There is no mention made of the introduction of the disease at Newcastle, but it existed in the plains, and could have been as easily carried to the hill station, as from the hill station to Port Royal and Up Park Camp.

Sporadic cases were, in these islands, as elsewhere, more numerous than localized outbreaks; and with the latter were associated marked conservancy defects, and at Newcastle contaminated water also. Fæcal contamination of air was the usual medium through which the disease was diffused; but this condition was not limited solely to the site and occasion of enteric fever prevalence. In 1859 the disease was present in the first quarter of the year; in 1872 entirely in the fourth; in 1873 present throughout the year, but greater in the second and third quarter; thus showing an independence of season so far as the necessary association of conditions was concerned.

The selection of the young soldiers as victims was shown in the death ratios of the Newcastle outbreak.

If we exclude Newcastle, the black troops have more frequently given exemplifications than the white; yet the insanitary surroundings have been the same in both races on those occasions when the disease existed.

The evidence from the West Indies is on a par with the preceding stations as to climate. Here are white troops scattered throughout these islands; we find the enteric ratio fluctuating, but as a rule an unit merely here and there, and only represented on a large scale in that station in which the tropical temperature did not exist, and in which the natural conditions approached the temperate zone, yet even here not a constant element but exceptional only.

No less pronounced is the disconnection of this disease with the paludal fevers widely dispersed and frequently met in the islands. Were enteric fever allied in origin to the paludal fevers, Demerara and British Guiana should have furnished a high ratio, whereas the opposite is the fact; the maximum of enteric fever was in the island less paroxysmal, and here in the station least so. On the other hand, the enteric data point to a cause limited in space and time, connected with human aggregation and neglect of hygiene.

St. Helena.—The history of this island since 1859, so far as enteric fever is concerned, is a blank with the exception of 1874 when one case is returned, but no information is given of the circumstances under which it occurred. That enteric fever was not excluded from the civil population by the absence of favouring conditions is clear. In such a climate, with such a native population set in such unsanitary surroundings, here certainly were the elements for spontaneous generation of enteric fever, if such be possible, or fostering influences for its endemic location on introduction from without; and placed as the military were, they could hardly have escaped an exemplification of the disease now and then contracted from the civil population ; yet no such case is met with on record in the earlier years of this period, at a time when the military were in closer contact with the civil element and under much worse conditions than later on when located mainly on Ladder Hill. It is quite possible that enteric fever might have been prevented from being introduced into this small island community by its remote isolated position and quarantine system equally as smallpox appears to have been, "no instance of the latter having been known to exist in the memory of the oldest inhabitant."

West Coast of Africa.—Like St. Helena, the enteric recorded page from all the widely separated stations grouped under this regional littoral name is a blank with the exception of 1867, when one fatal case is returned from the Gold Coast out of a strength of 238 black troops. It is true that the white troops here located are but units, and composed of officers and a few non-commissioned officers; yet the black force is amply sufficient to exemplify the diseases of the country and climate, and from the West Indies we know that they are not exempt by race peculiarities from the enteric cause when it is present.

In this hot, moist, equable, tropical climate, noted for its insalubrity, we have fæcal foulness in all shapes, and the paludal virus in a very marked degree, —a soil saturation by ordure since the human race first occupied it to the present time, a soil reeking with vegetable decomposing products and vegetable life. Here certainly we should meet with typical examples of diseased action due to such conditions, but so far as enteric fever is concerned we find it wanting; absent with most reckless disregard of all sanitation—with marked fæcal pollution of air, soil, and water; absent in a climate with the features associated with rapid putrefaction, rapid growth of low vegetable organisms, and low forms of animal life; absent with the paroxysmal virus at an acme; absent when the white troops, fresh to the climate and under the exposures incidental to warfare, came under these adverse health conditions* and suffered from them; absent among the black troops in the 1863 expedition. What other reasonable inference can be drawn than that these conditions in themselves do not, and cannot constitute the cause of enteric fever?

The Cape.—The enteric ratio for the period up to 1878 is greater than at home, about the equal of Gibraltar and India, but the disease less fatal in character; it is very variable, in some years absent, and greatly in excess during warfare with field exposure of the troops. With a low ratio of simple fevers and ague, we have here an amount of enteric fever as great as the hot plains of Hindostan, and greater than the adjacent malarial island of Mauritius.

Its climate is described as "salubrious," as "one of the finest in the world," yet with very decided natural advantages we find the enteric ratio ex-

* Vide Sir A. D. Home's Report, 1873.

ceeding stations far less favourably situated, and with camp life assuming an importance rarely met with elsewhere. That insanitary conditions abounded in the garrison towns is clear, in fact the reports are a recapitulation of unremedied defects; that the troops participated in the frequent fæcal contamination of air is equally clear; while within the barracks, defects in conservancy were not uncommon. The statement made by Dr. Lawson at the Epidemiological Society (*Lancet*, 1880, July 10th, p. 53), from experience partially derived in this colony, on "fæcal causes" of enteric fever, runs parallel with the Blue Book details.

Among the civil population disease of a mild form was common, and as regards the military the enteric history during peace time is one of sporadic cases picked up in the civil haunts, the disease not often obtaining a footing in barracks. During the war of 1877-8 the details point to disease originally derived from the towns and localized at three separate points at about the same time by the filthy surroundings of the camps and conservancy system; in 1880 the ratio reached the excessive figures of 54·21 admissions per 1000 of strength, and 9·90 deaths, the disease raged in the Transvaal and Natal, and "medical officers are pretty well agreed in assigning the cause of it to polluted water supply at the various camping grounds on the line of march."

The seasonal prevalence was from March to May, during the autumnal months of this region, at a time when the temperature is receding to the lowest reading in July, and following the main rainfall of the year.

Mauritius.—From 1860 to 1878 the enteric ratio is about double that of the United Kingdom, but the disease much more fatal. The barracks were not of the best, but the main sanitary defects were over-crowding to 1868, and contiguity to a dirty thick population from bad selection of site, with all that this embraces in exposure to diseases of infectious nature which exist and surrounding sanitary defects. Putting on one side the disease for the year 1860 as probably introduced, it throughout appears to have been essentially "sporadic," the cases occurring all at Port Louis and derived from the civil haunts. The only time of comparative excess was in 1867 when this station had reached a marked intensity of foulness and impurity, malarial and enteric fever rife in the civil community and the military participating in both; in the former disease to a very high ratio, in the latter to nine cases in all the garrison. Following the sanitary measures then carried out, and the reduction of the garrison, with the stringent care exercised within the barracks, we have the enteric disease all but absent, but the paludal fever remains in force. The sanitary reports of this island are interesting from the examples they furnish of water and air contamination by fæcal material, with consecutive bowel flux from the former but no sequential enteric fever. Throughout the period susceptible and recently arrived members were present in the military community, yet the enteric fever was often absent, and never went beyond isolated individual cases. In 1872 there was a recrudescence of paludal fever in the 32nd regiment, "very young men suffered in a far higher ratio than those of more mature age;" "under

20, the proportion of attacks per 1,000 of the strength was 250, between 20 and 30 years of age 40·82." Hence the greater tendency of young unformed constitutions (which necessarily mean also recent arrivals) to fall under the influence of malarial poison is as apparent in Mauritius as at Kirkee in 1868; it is clear that this constitutional element in the chain of disease causation comes into play with other agencies than the enteric cause.

Ceylon.—From 1860 to 1878 the ratio of admissions for the period from enteric fever was little more than double that of the United Kingdom, but its frequency is underrated in the returns, while the mortality ratio to cases treated is overrated. Among the military we find it represented at the sea coast stations of Colombo and Galle, and at the hill station of Newera Ellia. When any connection is traced between existent disease and the conditions surrounding it, it is with cesspit latrines, with defective drainage, with sanitary defects in the vicinity of barracks, with a surrounding native population in which the disease exists.

Straits Settlements.—We find a climate which embraces in a marked degree tropical features; we find troops quartered here fresh from England, the Cape, Japan, China, native troops from Madras; the 80th regiment especially, from Ireland, with very many young soldiers in the ranks—material thoroughly adapted to test existent conditions as capable of producing enteric fever. We find paroxysmal fevers and simple continued fevers referred to climate, diarrhœa and dysentery referred to drinking water undoubtedly fæcally contaminated during the Perak

War; yet in several years enteric fever was absent, and in no one did it constitute but an insignificant fraction of the sickness or mortality. The first case recorded after the separation of the garrison from other commands, and after four years absence of the disease from the returns, was among the native troops and coincided with the relief of the native regiment by one from Madras; and the first case among the white troops in the following year was imported from Hong Kong. There is no statement made of the existence of the disease in the native Malay community, nor are the few cases among the military elucidated as to causation or surroundings.

China.—" Enteric fever apparently was first recognised as a distinct disease in 1859, but as no history of its incidence upon the natives prior to that date could be ascertained, it was inferred that it was generated among the British troops in the north, in active warfare in the field, who at that time were exposed to local conditions of excremental poisoning." (Smart). Both European and native Indian troops suffered from it. Hong Kong has produced examples from 1860 to 1878, though in some years the disease was absent, and in no year did the number go beyond a few cases. Here, after an absence of the disease in the garrison for three years, we find it reappearing in 1872 with the arrival of a wing of the 1/10th from Japan where it had suffered severely from the disease in 1871; and from 1872 the few cases occurring are connected (when detailed) with fæcal (possibly specific) contamination of well water and air, from drains in barracks, and in the later years with increasing prevalence of grave continued fevers in the civil population; the disease here too is shown to have been preventible by cutting off the contaminated source.

Japan.—The climate of Japan is described as most agreeable and salubrious in the southern parts, temperate, not unlike that of England. Surgeon Orton, the medical officer in charge 1869, says:—"The fevers most commonly met with" (speaking of the Japanese) "are typhus and enteric fevers, the latter probably in a great measure due to the general custom which prevails of collecting in open tubs the ordure and urine for manure and leaving them close to dwellings uncovered where they often remain unemptied for weeks and months together, rendering the atmosphere in the neighbourhood of dwellings so offensive that foreigners can with difficulty approach them; intermittents and remittents also occur in the swampy rice districts." In 1871, of the military quarters it is stated that "latrines as they now are cannot but be sources of pollution to the air all about them, and of danger to any one entering them."

The history of this station, during the seven years of occupation from 1864, is an instructive one. It opens with a transferrence of cholera from China; the troops first sent suffered much from the results of former service, but in this healthy temperate climate they improved greatly. For the first three years no enteric fever occurs, then comes a solitary case in the garrison in 1867. In 1868 a new regiment arrives from a healthy station (the Cape) replacing the older ones, and the general health is as good as that of the troops at home. The year following their arrival produces another case of enteric fever, the next year 5 with small-pox also, and the year after that an epidemic of 60 cases in a force of 391, the disease continuing until its withdrawal in August; the continued fever (common) also advancing from 1869 onwards. Hence then, if the atmospheric contamination of the air from the latrines existed in the two previous years as in 1871, a sufficient explanation of the simple fevers is forthcoming; a common source of enteric fever and small-pox existed in the native Japanese community; while the latrine conservancy system in barracks presented exceptional fostering influences for the special cause on introduction from without, as presumably occurred in 1871. The garrison of Yokohama was small in 1871, but in proportion to numbers the enteric ratio is higher than any other recorded throughout the service during the period from any one station.

Australia and New Zealand.—So far as Australia is concerned the chief interest is centred in the recognition of the disease in this remote southern colony, the military giving a case here and there only during the years from 1860-70. In New Zealand the interest centres in the advance of the disease to a serious height under the circumstances of camp life and field service, receding to a complete subsidence on the return of the troops to barracks; the disease here being the same as elsewhere, "following the same laws," "becoming endemic under great foulness of camps, and showing its infectiousness by implicating fresh bodies of men located near its haunts" (Dr. W. A. Mackinnon).

India.—With this dependency of the British Crown we enter especially on debatable ground,—whether enteric fever owes a similar causation as in Europe, the influence of climate, the question of immunity of the native community. The existence of enteric fever in India is beyond the region of doubt ; and in clinical and post-mortem details at least, it follows the European disease.

In the statistical returns "typhoid fever" first appears in 1861, and then in all the Presidencies; Bengal gives 24 cases, Madras 2, Bombay 1. From this to the present date there is no year in which the disease is absent, but the amount fluctuates considerably, and taking the period as a whole the later years give a marked excess as compared with the earlier ones. The explanation of this augmenting ratio is apparently to be sought in the improvement of diagnosis and differentiation of fevers into their proper categories, rather than in an actual increase ; indeed Dr. Innes, speaking of this fever as no new disease in India, says :—" Dr. Bryden points out the very significant fact that the ratios of fever mortality (in the gross) of past years, if taken in relation to month and newly arrived regiments, is nearly absolutely identical with that of enteric fever at the present time." If then enteric fever be at present correctly diagnosed, such a statement is tantamount to saying that the bulk of fatal fevers in India is, and has been from the first, enteric in nature ; an admission which, if correctly interpreted, has important bearings.

India holds an intermediate position between the temperate climate stations and the Mediterranean and Bermuda, and relative to other diseases enteric fever does not assume the same importance here as in many of our foreign stations ; in fact it owes its present prominence solely to the large number of the

European troops there located. Bengal and Madras return much the same amount, Bombay less.

Up to 1868 typhoid fever is given in bulk for each Presidency, with no information as to its prevalence or otherwise at stations or in corps except in a few instances. That the surroundings of the disease elsewhere were not wanting in many of the stations occupied by our troops in India, and as possibly elucidatory of the disease occurring subsequently in them, is clear from the sanitary reports. Between 1859 and 1868 the main defects were bad site of barracks in several instances, latrine arrangement as cesspits, an indifferent water supply; drainage is often made the subject of complaint, and the danger from proximity of native villages, towns and bazaars, with all they entail in the way of bad sanitary surroundings, liability to contamination of air and water from surface ordure fouling, and the transferrence of communicable disease endemic among them, is often and forcibly pointed out; all these have an intimate bearing on enteric fever if the disease follows the same laws in India as in other stations, home or foreign, occupied by us. The main improvements of the period are comprised in new barracks, the so-called dry earth system of conservancy generally carried out in Bengal and Bombay, but hardly, if at all, commenced in the replacing of the cesspit system in the Madras Presidency, and improved drainage at several stations. The water supply, chiefly by wells with the danger inherent in the system, and the danger from the surrounding native community remain. When the conditions associated with the existence of enteric feve outbreaks were elucidated, we find that in three instances there was atmospheric contamination from latrines, and in one contaminated well water from old shut up cesspits. The main recorded sanitary defects since 1869 come under: (*a*) contaminated water supply, (*b*) defective drainage, (*c*) close contact with native populations and their sites of habitation, and in a less degree (*d*) bad conservancy arrangements; the three former are continuous since 1859, the latter had been greatly improved in Bengal and Bombay before 1869, but in the Madras Presidency had made but a tardy progress; and enteric fever outbreaks were connected by Medical Officers with such defects. The details as to stations and corps are more complete in this portion of the period.

1. *Stations.*—On the question of the conveyance of the disease from home we have seen that cases are occasionally met with among troops proceeding to India, and "in many instances the occurrence of the disease follows so soon, one or two months or less, after the arrival of a corps in this country, as to lead to the inference that it must have been contracted on the way up from the port of embarkation." (Dr. Innes). Of this there are several illustrating examples, and these give a clue to the explanation of some outbreaks in stations soon after the arrival of new corps, the station being either previously free or the out-going corps perhaps presenting a few sporadic cases in the previous 12 months, while the phenomena of the disease in the incoming corps are those of endemic prevalence with a limitation to itself. Again, the appearance of the disease at camps and on the line of march is not uncommonly noted in the yearly summaries. In 1874 the first attacks in G/11 R.A.

were on the march from Allahabad to Nowgong. In the 85th regiment at Meerut, in 1874-75 (Surgeon-Major Skeen's details), 18 men were admitted with enteric fever into the regimental hospital between December 2nd and January 16th; they all belonged to a detachment which left Futtyghur on October 22nd, and arrived at Meerut November 9th. There was no enteric fever at Futtyghur and the last case in Meerut was in May; the men marching in occupied the quarters of the detachment proceeding on relief; the wells, privies and latrines were used by them in common with the rest of the regiment, and the source of all supplies was the same. The disease was clearly contracted on the march, and it is believed at Khoorja where a fatal fever (regarded as typho-malarial by Dr. Hogg) existed among the native population during especially September and October. The proportion which these cases bore to the strength was 131·94 per 1000, except 4 all were over 25 years of age, all had been 4 years in India, 1 aged 22 had been brought up in the country and 1, an Eurasian, 20 (a medical subordinate) had never been out of it; the outbreak was during the cold months, and 23 days elapsed between the termination of the march and the commencement of the outbreak. As regards this period, Dr. Skeen remarks:—"There was ample time to permit of its being carried as far as Umballa or Dagshai by marching, and further than Lahore or Calcutta by rail before its development." "A detachment, 261 strong, left Meerut on November 11th, and reached Futtyghur on the 1st December; in this party two suspicious cases occurred. Another party of 61 left the latter station on the 2nd December, arriving at Meerut on the 21st; no similar attack has been observed." In 1876 there is the asserted transfer of the disease by the 73rd regiment to Subathu, and its possible re-transfer from this hill station to Lucknow in 1878 by the same corps. In 1879 the 70th regiment carried the disease from Mooltan to Subathu; "the proportion of men affected over 24 years of age and 2 years Indian service was unusually large." In 1880 the 30th regiment conveyed the disease from Bareilly to Ranikhet in April. In 1873 the disease is conveyed by two individuals from Cannanore to Wellington, and there extends to two other individuals. In the same year a case at Palaveram had arrived only four days before from Madras. Two solitary cases, in 1871 and 1875, are returned from Port Blair, Andamans, one was taken ill three days after his arrival from Rangoon, the other 14 days after arrival from Madras. In a case at Wellington in March 1876 it is remarked that "there is every reason to suppose that this man brought the seeds of the disease from Trichinopoly." In 1877 at Secunderabad, an Artilleryman had been on leave at Trichinopoly; he returned on June the 18th, on the 24th was on the sick list with "ulcer," and on July 7th was reported as suffering from enteric fever. At the same station and in the same corps on July 30th there was a case; he had deserted a month before and had been brought back from Conconada.

These facts show that it is not always possible to refer the origin of the enteric fever returned from a station to the circumstances and conditions there existent, for introduction has not been uncommon, and to an extent not generally allowed. They show also that numerous sources of the disease exist scattered throughout the country, and outside the ordinary range of the permanent stations, in rest camps, camping grounds, bazaars, &c., and that in the Indian disease there is a possibility of its transferrence in a latent state, in the bodies of individuals, from one station to another by land and sea, subsequently developing and producing its like in other individuals in the new place, under climatic features the most opposed ; and these latter features of the Indian disease bring it within the circle of those regarded as specific.

A tabulation of stations* demonstrates the widely diffused range of the disease in India from one end to another, from the sea coast through intermediate levels to the highest hill station ; the presence of the disease cause continuously in some, for a successive period only in others, interruptedly again in some, very occasionally only in others, in a few not at all ; these features bearing no relation to position of station on Indian soil. The yearly continuity of the disease does often concur with largeness of station, and the occasional case stations are as a rule small, so that numbers may go somewhat to explain these features by regulating the frequency or otherwise of the points of contact with the disease cause ; but to these there are notable exceptions. It is apparent that the disease cause in the station itself, throughout the period embraced, is far from uniform, generally variable, not uncommonly absent for a year or more, and this again bearing no relation to site. If we compare one plain station with another, or sea

* For seven consecutive years.

coast or hill stations in the same or other presidency either by the period or by years, we find marked diversity, its prevalence in one being no indication of its prevalence in another. Take again the same station, and compare one year with another, and variability is the rule; a variability marked by occasional absence, or at least by yearly fluctuations of considerable degree. To an outside source must be debited the excess at some stations in some years, and sometimes to the presence of a fresh recently arrived corps, but on the other hand there are high ratios which cannot be so explained; and among new corps, there are (*a*) possible introduction from other country, (*b*) contraction from the civil population "en route," (*c*) special local causes within or surrounding the station, to be considered equally as (*d*) climate, as bearing on the undue prevalence in them of enteric fever. It is apparent too that the arrival of a corps fresh to the country is not necessarily followed by sudden or large advance of enteric fever ratio. Putting aside these points, there yet remains much enteric fever which attacks troops after having settled down in the station, and in their subsequent years of service, which has to be explained either by the station itself, or special features of the corps, or the conditions which surround the troops, and so far as climate, elevation above sea level, soil, &c., go in the way of explanation, the disease returns from stations are decisive.

Let us take into consideration the grouping of stations* seacoast, plains and hills. Burmah, a fair example of a tropical climate, gives a lower ratio than any other series. The sea coast is low in amount,

* For a period of seven years ending 1878.

and that of Bengal gives less than that of Madras or Bombay Presidency, though curiously enough the stations of Calcutta, Madras and Bombay (and we may include Rangoon) are remarkably uniform with each other. When, however, we come to compare other seacoast stations with them, it is apparent that something else than site with its moist, comparatively equable, enervating, atmosphere is necessary to explain the numerical variation of enteric fever at stations similarly situated in these respects. Passing inland we get the "plain stations" and "table-lands," less moist than the sea coast, hotter, drier, with greater variations in the temperature range, and varying in these features between themselves, and we find them, though much in excess of the sea coast group, yet fairly agreeing in the different Presidencies, the plain stations of Bengal being somewhat higher than the others. If however we look to the individual stations of the group all concordance vanishes. In Bengal the healthy (generally speaking) station and good climate of Hazaribagh heads the list for the period, 16·6 per 1000 against 2·35 for Benares and Delhi and 2·76 for Cawnpore. In Madras we get the all but European climate of Bangalore giving 6·03 against ·76 for hot Bellary and 1·51 for Kamptee, also a hot dry station. In the Bombay Presidency the range goes between 1·82 Kirkee and 6·40 Neemuch. Not only could these examples be extended largely, but the stations in themselves in their yearly variations show how much more potent were other conditions than climate and site. Passing to a higher level we get the hill stations, approximating the temperate climates. The results from these are extremely variable; in bulk, in Bengal, the enteric ratio is in them somewhat larger than the seacoast stations; yet we find the larger stations, over the same series of years, returning more enteric fever than the plain stations, and one of them (Subathu) in 1878 giving a higher ratio for the year than any of the plain stations for the whole series of years, except Bareilly in 1878. In 1877 the hill stations head the groups, greatly in advance of the others. In the Madras Presidency, not only does Wellington head the groups for the period, but taking individual years the ratio of 1877 is only exceeded by one station—Cannanore on the seacoast in 1873. It is clear that the hill climate is not antagonistic to its diffusion, and that the disease is equally capable of flourishing there as in the hot dry plains, or the moist coast stations; where the highest ratio for the year shall be, is dependent on other circumstances than elevation above sea level or climatic causes. Bareilly has given the highest ratio for any one year, ordinarily one of the healthiest of the plain stations in Bengal; next is Subathu in the hills, and next Cannanore on the west seacoast; the ratios being, per 1000 of strength, 72·5, 57·2, 47·4—the three highest stations in individual years for the period representing the variations of climate in Indian stations. It may be asked, what is there in common in climate between any plain station, the seacoast and hills, to form the necessary factor for the enteric fever which exists and flourishes in the one as the other? And why, in the station, if climate be responsible, do we find it varying so much under similar features of garrison components? *e.g.*, Bareilly, from 1·06 per 1000 in 1875 to 72·5 in 1878; Umballa in 74, 7 and 8, with 4·80, 5·46, and 25·12 respectively; Rawul Pindee in 1872 with 11 cases, in 75, 4, in 78, 13: these stations in these years being similarly placed in having a recently arrived regiment in its first year's exposure to Indian heat. Nor would it be difficult to adduce other instances both as regards new corps or the opposite. It seems to me that this one point of pronounced yearly variation of disease in the same station is sufficient in itself to negative such a general cause as atmosphere or soil, were all other obstacles to its reception removed. Even if we allow further modifications as an age limit to climatic influences, and these operating especially, or only, on recent arrivals, the discrepancies are not removed. And it is needless to say that stations similarly placed should repeat the same result, yet in 1874 Hazaribagh returns 35 cases, Cawnpore 1, Lucknow 18, Umballa 7, all with a corps in its first year's exposure.

Heat and moisture are the two prominent features of a tropical climate; the former especially unnatural to the British European soldier, universal except in the hill stations, and combined in some, particularly near the sea coast, with great moisture, and with great dryness in the central plain stations. We find enteric fever existent and developing in the heat and in the cool hills, in the moisture of the seacoast and the dryness of Central India, in the combined heat and moisture, and in the combined heat and dryness; it is universal, independent of the degree of prevalence of these features. Rather than the disease prevailing in ratio to the heat and moisture, the tendency of the station and regional statistics is in support of the inference that the disease has existed proportionally more where these climatic features are less pronounced,—in table-lands and some hill stations particularly, than in those of little elevation or on the seacoast.

The deductions made from the station returns on the bearing of atmospheric influences and site on enteric fever apply very closely also to the soil. This varies much in composition and configuration at different levels and regions, but what we want (assuming its potency) is some feature common to all to explain the enteric cause which is so universal, the presence of which would allow us to predict the existence of the disease. Take however stations on alluvial ground whether at the mouth of the river or inland, compare these with stations on higher levels where the hard rock formation comes near the surface, or the sandy soils of the desert, or the scanty surface soil overlying impermeable strata as at Mean Meer or Secunderabad, (disintegrated porous granite being the upper soil in the latter), or the deep reddish friable loamy soil of Bangalore, what is there in the natural chemical or geological composition of ground to act as an exciting agent of enteric fever? Each station too retains its major peculiarities of soil year after year, and if the enteric cause be of it, it should be a constant general element in the disease of the station. It is quite possible, nay very probable, that soil in its mechanical arrangement, in its conformation to the surrounding country, in its capability or otherwise of penetration by air and fluid, may exercise a secondary influence in assisting or opposing the conditions found to be associated with the diffusion of the disease, but this is distinct from the primary cause.

(2). *Corps.*—Let us now see what light is thrown upon the subject by the history of corps after arrival in India, giving a few examples.

The 63rd regiment arrived from England in the latter end of 1870; in 1871 it had 18 cases and 4 deaths; in 1872, 7 cases; 1873, 5; in 1874, 6 cases, and the two following years 1, and 0.

The 89th regiment from England arrived in October 1870 giving 4 cases; in 1871 giving 12; in 1872, 16 cases; in 1873, 4, and 5, not more than 2, 1, 1.

The 54th regiment arrived in November 1871; in 1872, 12 fatal cases of "fever" occurred in the regiment which Dr. Innes speaks of as all no doubt enteric; in 1873, 2 cases from station;* in 1874 station returning no case; in 1875, two.

The 44th regiment arrived in November 1871; in 1872 and 1873, no case; in 1874, 3 from station; in 1875, the station returning 2 cases; in 1876, the corps giving 18; in 1877, 15; in 1878 and 1879, none.

The 48th regiment arrived in India February 1872, free until it returned 1 case in 1877.

The 40th regiment arrived in November 1872; in 1873 giving 23 cases; in 1874 at Lucknow, giving 10; in 1875 apparently had 2 deaths; in 1876, the stations returning 6 cases; in 1877, 0; in 1878, 0.

The 51st regiment arrived November 1872; in 1873

* In this and succeeding instances the cases from stations are not separated into the component corps, and hence probably the numbers are in excess so far as the corps is concerned; they are quoted however as the wish is to gauge the maximum of disease.

returning 25 cases; in 1874, 12; in 1875, the station returning 5; in 1876, 3 from station.

The 43rd regiment arrived in November 1872, giving in December 14 cases; in 1873 giving 30; in 1874 1 case; in 1875 the station returning 4; in 1876 and 1877, 1 and 2 cases; in 1878 and 1879, none.

The 67th regiment arrived in December 1872; in 1873, 5 cases; in 1874, 4 cases; in 1875, 2 cases; in 1876 to 1878, no case; in 1879 and 1880 in Afghan giving several fatal cases.

The 10th Hussars arrived in February 1873, in this year, 1874 and 1875 no case is returned from the station, 1 in 1876.

The 2/22nd regiment arrived in November 1873; in 1874 having 35 cases; in 1875, 1 case from stations; in 1876, 3 cases.

The 73rd regiment arrived in February 1874 from Ceylon, Dr. Innes gives 3 deaths from enteric fever in it during the year; in 1875 the station returning 7 cases; in 1876 corps giving apparently 8 cases; in 1877 giving 17; in 1878 returning cases but number not stated.

The 1/18th regiment arrived November 1874 from Malta; in 1875, stations returning 1 case; in 1876, 2 cases.

The 2/9th regiment arrived November 1874; in 1875 one case in the regiment.*

The 34th regiment arrived November, 1875; in January 1876 it gave 18 cases, none in 2nd or 3rd quarter of the year; in 1877, 1 case from station; in 1878, 6.

* Yet, as illustrating the varying results from the same station, in 1878 the 2/8th, a new arrival, gave 15 cases.

The 33rd regiment arrived in December, 1875; in 1876 no case from station; in 1877 the regiment returned 1 case, and in 1878, 4; in 1879, 4.

The 14th Hussars arrived in March 1876, this year the station returned no case; in 1877 the regiment gave 7 cases; in 1878, 0; in 1879, 1.

The 2/16th regiment arrived Feburary 1876 giving 17 cases; in 1877 it gave 10; in 1878, 0; in 1879, 1.

The 2/13th regiment arrived in March 1878 from Malta but gave no enteric fever; in 1879, 1; in 1880, 28.

The 12th Lancers arrived January 1877 and gave no enteric fever; in 1878, 3 cases were divided between it and the 1/21st regiment; in 1879, 0.

The 4/60th regiment arrived in December 1876, 1 case being returned from the station; in 1877 corps had 22 cases; in 1878, 45.

The 100th regiment arrived in November 1877, the station returned 1 case in 1878.

It must be conceded that the experience of corps newly arrived in India is a diversified one, and also diversified in the subsequent years of service. Some illustrate the disease very soon after landing in India, others after their arrival at the station; some severely in the first year, others moderately (in the maximum), others not at all in the first year or even for the succeeding year or years. Some commence with a high ratio and show a gradual decline year by year; others as the 1/25th and 34th regiments give a high ratio in the early part of the first year, and in the succeeding part of this, and the following years, show an all but, if not complete absence of disease; others give but a very few cases in the first and succeeding years ; others give no disease for at least two years ; others return but little or no disease for the first one or two years and then exemplify localized outbreaks ; in others again the disease is continuous from year to year, independent of the first year's experience, a feature which has obtained for them the cognomen of "infected regiments." Now are these details in accord with such a general agency as climate operating on new comers and youths ?

It is a difficult matter to follow the experience of each draft. I think I am correct in saying that as a rule no regiment is more than 3 years in India without receiving an accession to its original strength to supply the blanks caused in it, and continuing these accessions at intervals until approaching the termination of its period of foreign service, 10 or 12 years ; and if the enteric cause does lie in climate operating on youths and new comers, these drafts should furnish their regular and uniform quotum to the enteric fever ratio of their corps as they joined ; but the figures give no support to this necessary sequel of the climatic hypothesis. The nearest approach to sequence of disease on drafts is in the case of the "infected regiments," but these are exceptional. As illustrating the results in one station noted for enteric fever, in the drafts as a whole the attacks were at the ratio of 47 per 1000, but varying from 100, 74, 43, to 0, according to the corps they joined ; in fact these drafts exemplify the divergent results of recent arrival in India, quoad enteric fever, equally as the recently arrived corps as a whole ; they are, however, the more important inasmuch as they represent different branches of the service in the same station under the same climatic and soil influences.

Looking to the returns as a whole, a prominent feature is the fewness of cases as compared to the numbers serving in the country; for example, from 1861 to 1878 the attacks of enteric fever were only in the ratio of 2·41 per 1000 of strength. If we limit the numbers to the susceptible period "par excellence" of the European disease, and debit all the cases to this time of life, we get for the 5 years 1872-6, for the three Presidencies, a ratio of 6·1 per 1000. These facts indicate a marked restriction of the cause, and especially as the major part of the whole force is within the age susceptible period.

If we endeavour to ascertain the ratio in which new comers were attacked there are certain data to guide us.—

In 1872 there were 4 regiments in their first year of service, the combined strength was 3118, the actual number of enteric cases in each is not given for all, but if we debit the non-recorded instances with all the disease returned from the stations they occupied the enteric attacks are only at the rate of 6·3 per 1000 of strength. The 70th regiment with 125 under 20 years, and 657 under 30, are debited with 11 from the station; the 44th regiment had 719 under 30 and returned no case.

In 1873 there were 5 regiments, strength 3917, and 3 severely affected; they give a ratio of 24·7 per 1000. The 40th and 51st regiments combined had 802 under 22 years of age and 330 designated as "weakly," and yet they only return 48 cases.

In 1874 there are 6 regiments with a strength of 4635 and the enteric ratio is 11·8 per 1000 of strength; the one especially affected was the 2/22nd with 584 men under 25 years of age, and assuming that the attacks were all within this age the ratio is but 59 per 1000.

In 1875 there are 5 regiments with a strength of 3795, and the enteric ratio is 7·9 per 1000.

In 1876 there are 5 regiments, with a strength of 3755, and the enteric ratio is 14·3 per 1000. Of these regiments 2 gave no case, 3 were severely affected.

Did these newly arrived men suffer as such—as coming under tropical influences, or was some other influence, as youth, in play as elsewhere and as in the European disease? Under any view it is apparent that the cause acting on them must have been extremely limited in its sphere of operation.

Again, there are features in some of the outbreaks which also show how restricted in space and time the disease cause was, and the instances are chiefly among new comers. In the 2/22nd the attacks were limited to three companies, and to one of these in especial, and the outbreak culminated after the decline of the hot season; in the 1/25th the attacks were all but limited to three contiguous bungalows out of twenty-four the regiment occupied, and markedly to one of these three, and they stopped when climatic causes were at an acme; in the 43rd the disease was limited to the segment at Cannanore—to the unmarried men, the detachment at Calicut, Malleaporum, the officers, the married quarters giving no case whatever, and the height of the outbreak was in the first quarter of year; in all there were men on the same footing as to age, recent arrival, climatic and soil exposure as the affected segments, they gave no corresponding disease either at the time or when climatic causes were at an acme. In the 34th the outbreak was entirely limited to the month of January, and during the ensuing first year's exposure to climate no case occurred. In the 2/16th (a new arrival) and the 44th (old) at Secunderabad the outbreaks are both described as "house epidemics," the disease operating only in a limited space. In E/4, R.A., the cases came from two of three blocks. In the 4/60 the disease in 1877 stopped when the heat was at an acme, and that in 1878 followed the onset of the rains. Now, in what did the differentiating essence in these corps consist, what was there special to certain segments? not Indian climate, soil, service, recent arrival, youth of members, duties, different food supply; a something local, limited, but within its range powerful in influence.

Comparing the officers, women and children, with the men, we find for four years as follows:—officers 2·20 admissions per 1000 of strength, women 1·09, children ·67, men 4·94. These figures also show divergence in the segments of corps arranged as to status and sex, all alike exotics on Indian soil. The excess of disease among the men is clear, and a pregnant observation occurs in a report by the medical officer in charge of the 33rd Regiment at Kamptee. He says:—"It is impossible to come to any just conclusion on so few cases as have occurred in the regiment during the year, but they are so far peculiar. In the first place they occurred altogether among single men. No officers, women or children were attacked. In fact, it was precisely in that class which would be most likely to subject itself to the danger of contagion outside barracks that individuals were seized." And this is not a solitary observation in the same direction.

Again, in the yearly details, the limitation of the disease to one corps to the exclusion of others in the same station, and of the civil community and prisoners in jails, is more than once noted.

Hence then the inference is that the explanation of the variable results in different corps and drafts (on an equality as to service in the country, and youth of components), of the fewness of the attacks among those exposed to Indian service and its accompaniments, of the varying disease results in the components of the corps, the exclusiveness of the disease as to corps and communities in the same station, the limitation of some outbreaks in corps recently arrived to particular segments of it, to time and to locality, must be sought in some conditions which are not common to all, but which weigh on some to the exclusion of others in varying degrees of intensity. Moreover, these conditions are not limited to corps in first year of Indian service but may be exemplified in results in some subsequent year, and then show a potency not much if at all lessened by the previous immunity and exposure to one or more hot seasons; and what is true in this respect of the community affected is equally true of the individual, "acclimatization" does not confer an immunity, nor does it lessen the influence of the cause on the human frame. The station to which the newly arrived corps is sent has a great influence on the results. But even in the bad station it becomes necessary to limit our enquiry to the corps itself, or a segment of it, or to individuals, to explain the phenomena of the disease. It is immaterial too whether the corps arrives at the beginning of the cold season or hot; rapid subjection to the tropical heat does not augment the disease ratio.

Turning our attention to branches of the service the results do not support any deduction on special work; they are variable one year with another. The cavalry and horse artillery have given an excess in some years, and (according to the Sanitary Commission) the reason assigned by medical officers for the difference is connected with foul stables and stable duties, and attention is drawn to the fact that horses in these stables are liable to attacks of enteric fever. If the connection be justified it opens up a hitherto unrecognized source of the human disease, and it is an interesting point in comparative pathology. It has an obvious bearing on all the mounted corps, and the results in Egypt give an excess to these, with much sickness among the horses. It is clear, however, that this extra prevalence is not general to them, and in some the explanation of the excess is to be traced to other circumstances, as locality of barrack.

Turning now to the disease side of the question we find as follows.—

(3). *Seasonal Prevalence.*—The returns from all the Presidencies combined for five years give the disease in quarters of the years as follows:—183, 480, 456, 266 cases.

In no month of the year is the disease absent but it predominates in May and September, the former a little in excess of the latter. It gradually rises with the heat, but commences to recede before this culminates; advances again in the rains, and recedes rapidly again with cool dry weather. There is no very marked difference between the dry hot season and the rainy one, but these two give rather more than double those of the cool months. In the second and third quarter, heat and rain, are to be found the great influencing means, taking India as a whole; the former predominates in 1875-7, the latter in 1874, in 1876 and 1878 they approximate.

If we take the Presidencies individually we get results not quite in accordance. In Madras and Bombay the third quarter coincides with excess of enteric cases, the same period in Bengal is associated with a decline. There is a decline in all with the declining rainfall, continued markedly into the cold season in Bombay, less so in Bengal and Madras. If we take the localized outbreaks apart from the isolated cases, the same tendency is apparent; in the Bengal Presidency they run according to the quarters of the year—1, 6, 5, 0; in the Madras Presidency—1, 2, 3, 1; in the Bombay—0, 0, 2, 0. These localized outbreaks are, as we shall see, generally associated with air or water contamination, the former would probably be more frequently exemplified in the hot season, the latter in the rains; on the specific theory the chances of contamination, through introduction of disease, would be the greater with the more often occurrence of the sporadic cases, and sporadic cases concur in frequency with the outbreaks in all the Presidencies.

If, instead of amassing the years together, we look to the quarters of successive years, we find thus.—For the Bengal Presidency we have 7 years, and of these the maximum prevalence of cases during the

2nd quarter is in 4, while in 3, the highest numbers are during the rainy season ; hence Bengal does not give an uniformity year by year, but is in accord with the other two Presidencies 3 out of 7 times. In the Madras Presidency, during 6 years, the excess is during the rains in 3, in 2 it occurs during the second quarter, and in 1 during the cold dry weather. In the Bombay Presidency, for 6 years, the maximum is equally divided between the hot and rainy seasons. In no year, in any of the Presidencies, is the maximum during the fourth quarter. Hence the years taken singly bear out the period as a whole in indicating influences both in the second and third quarters, but show that these influences fluctuate from year to year in the same Presidency. Amassing the Presidencies together, out of 19 years, we get 9 years of excess during the second quarter and 9 years during the third ; so that the potency of these seasons appears equal. When however we come to individual stations, we cannot trace the same features, for the disease is not a constant element in them. There are however 3 or 4 instances in which it was present in a corps throughout the year in the same station; thus in 1874, at Hazaribagh, the cases run in quarters 2, 10, 22, 1 ; at Agra in 1878, 2, 5, 20, 14 ; at Subathu in the same year, 1, 7, 8, 4 ; and in all the maximum is in the rains ; and were enteric fever endemic in our military quarters we doubtless should see it rising and falling in conformity with the seasonal tendencies.

The facts show that no one season can originate enteric fever in India, that it is in existence throughout the year and can disseminate itself at any time, but does as a rule receive assistance from natural conditions present in certain seasons. These conditions are heat and rainfall. Heat is greatest in the second quarter to end of June, as a rule. At about the end of the second quarter the ground, tank, and well water are at the lowest level; with the third or rainy quarter the ground surface is flushed, impurities accumulated on the surface or penetrated into the soil are carried by the rainfall into the tanks, and into the wells through the subsoil, if not also into them by surface washing; the water in the soil and natural or artificial receptacles commences rapidly to rise, attaining its maximum height probably about September; with the fourth quarter the water generally commences to sink, and so continues through the first quarter and the second. That the disease in India is not dependent on mere change of level in the subsoil water is clear.

To apportion the potency of each natural condition, in producing seasonal prevalence, is not easy. Both act indirectly. Heat produces rapid putrefactive changes on most animal substances brought within its range, the emanations from fæcal material in India quickly follow. Great heat soon induces desiccation, and reduces the ordure to a minute powder on which the wind can easily act and diffuse into the atmosphere. The native habit of depositing on the surface, either in the common deposit ground near the community, or anywhere convenient (road side or gully) on a sudden call, brings human ordure under the influence of tropical heat, and rapid diffusion into the atmosphere of some elements with the watery constituents, and more tardy diffusion of the dried pulverizable mass, are facts which the senses of smell and vision place beyond doubt. Exposure of human ordure in other ways, for storage and cultivation, tells the same tale. These are points undoubtedly common throughout India, operating as above detailed, especially during the hot season, when no small proportion of the sum total of enteric fever among the military community exists, and the absence of rainfall to convey the exposed material from the surface fully allows aerial contamination to continue in force.

Coincident with this excess of atmospheric heat is the decreasing water supply, its concentration, the increased chances of contamination from drainage of a larger area of subsoil; and when the supply is limited, as not uncommonly happens, there is the possible introduction of water from generally unused sources for human consumption or wells previously used for other purposes but not for drinking supply,—an acknowledged danger but not apparently rightly appreciated in its bearing on enteric fever. These features of atmosphere and water characterise the period of maximum prevalence in the Bengal Presidency. With the rainfall, moisture comes into play to assist heat in the putrefaction of surface impurities, to supply a possible essential for the development of the virus or germ hitherto latent, to mechanically convey the cause into the storage places of water supply, and bring it by this medium into contact with its nidus for growth and reproduction in the human frame—the special small intestine glands. This feature characterises the maximum in Madras and Bombay Presidencies.

These are the ways apparently in which season acts in India, and these general deductions will I think receive support from the ascribed surroundings of the disease itself. There are unquestionably individual outbreaks and cases which do not fall in with this seasonal relation, but this *natural* method of enteric diffusion is not the sole one; human intervention, special and accidental circumstances, have their influence; and many of the exceptions, instead of detracting from, rather add to the deductions arrived at as to the mode in which heat and rainfall operate.

(4). *Influence of age.*—Surgeon General Innes in his special report gives the year 1877 in Bengal as an example; the table shows a ratio of 12·9 per 1,000 of strength at 22 years and under, rapidly declining to 1·05 per 1,000 at 30. For five years in Madras Presidency the figures agree with that in Bengal, only under 20 years of age the ratio is greater—14·73 per 1,000.

The marked susceptibility of the young soldier to the cause, especially when under 20, gradually but rapidly declining with increase of years, is beyond doubt in India as elsewhere. The proportion of deaths to attacks at the different ages tends to reverse the prevalence ratio. Youth while giving the greater number of attacks also gives the greater number of recoveries, taking in the service the age of 20 as the standpoint; the chances against recovery are great at middle age and upwards in India. The Madras figures support the inference that if soldiers of 20 years of age and under were kept out of India a very marked impression indeed on the mortality list, through enteric fever decrease, and in a minor degree on the sick list, would be produced; while if the exclusion were extended to 25 years we should reduce enteric fever to very small proportions in the Military European community.

(5.) *Prevalence as to service period.*—The figures to elucidate this point are I believe wanting. We have the results for 1877 in Bengal placed by Dr. Innes in yearly sequence; those of one year and under give 12·88 per 1000, followed for successive years by ratios 5·63, 2·13, 5·05, ·35, 2·29, etc. In this year (and others are apparently similar) the actual number in their first year of service was greater than at any other period of service except the fourth year, and yet but 13 out of every 1000 of these were attacked by enteric fever. Recency of arrival as increasing the chances of contracting the disease appears at first sight demonstrated beyond doubt, and yet it is difficult to say how far this excess in the first year was associated with the constitutional disturbance following transfer to a tropical climate, and how far due to the early age of those forming no small part of the main mass. According to our present system of reliefs the chief age susceptibility as a a rule concurs with recency of arrival; those under twenty years cannot help being for the major part in their first year's exposure. From the remarks made from time to time it is all but certain that the main stress of the disease falls upon the younger segment, and it would appear that the reason why the first year's men suffer so much from enteric fever lies not so much in the fact that they are exposed to a tropical climate for the first time, as that the major number of them are within the susceptible age. To thoroughly solve this question we want a series of new corps arranged as to age, and the enteric attacks at each, during their first year of service; mere arrangement as to years of service and corresponding cases does not suffice as it does not disentangle the age element. That mere length of service is not a strong modifying influence seems clear from the table itself; the second and fourth year's service give nearly equal ratios, and the third, sixth, and eight year's men are about the same the last giving a somewhat larger proportion, the seventh year men give over three times as much as the fifth ; and it is apparent that no amount of exposure to Indian climate suffices to give an immunity from the enteric fever cause, three years have no more protecting influence than one. If other circumstances concur to render the individual susceptible to the cause it matters not whether he has been in India for two or eight years. At Kinsale in Ireland the service ratios were on a par with those in the Indian tables.

(6.) *Features of distribution of disease in corps.*—As elsewhere we have the two aspects of sporadic cases and localized outbreaks; the former preponderating, and the latter rarely more than two on an average in the year, and in some years absent.

So far as the sporadic cases are concerned the data indicate that the cause is not to be found in any feature common to the whole corps—climate, season, the barrack itself, food as ration, water supply, conservancy, etc., but in some condition limited to the individual himself, differentiating him from the rest, and influencing him while the remainder of the same community was free. In the major number of cases we have to fall back upon the common features of the whole as to the source of the disease, and these point to a contraction of it outside the military enclosures. There seems much to guide us in this, by what other diseases of a specific and communicable nature reveal. We know that very close personal intercourse does go on between the military and the native or other civil community around, we know that soldiers and their belongings do visit the bazaars and native haunts for various reasons, that natives come in close contact with the military in the barrack itself, that the asserted means of transfer of the disease in Europe exist in India; we have eruptive fevers among the military ascribed to communication from the native population, and enteric fever running as regards its prevalence phenomena in parallel lines with them; why then should we stop short in the natural and reasonable deduction that the source of the enteric fever cause is the same as in the eruptive fevers when the basis on which our conclusion rests is essentially equal in all except small-pox, and here our knowledge is due to exceptional circumstances —the facility of its recognition by all. The chief obstacle to this view of a derivation of the enteric fever among the military from the civil population rests in a disbelief on the part of some, and a statement of denial on the part of a few, that this disease is one from which the natives of India suffer; but the fact seems put out of sight that there is an European civil element, and a considerable half-caste element, the influence of which on the military cannot be ignored, nor can we ignore the influence of former disease in the military segment itself (existent at least in all three Presidencies since 1861) as possibly elucidating that in later years. Of the susceptibility of the native to the disease there is no doubt, and Indian medical literature, from at least 1869, supplies illustrating examples, for instance.—

In the report for hygiene, 1869, Dr. Parkes extracts the following from Dr. de Renzy's report on the Punjab for 1869:—"A widespread and fatal fever prevailed in many parts of the Punjab which was not clearly identified. At the same time enteric fever prevailed in the jail (Rawul Pindee) and perfect histories and post-mortem examinations are given. In the first six months, out of 1105 mean strength, there were 563 attacks (50 per cent.) and 84 deaths (equal to 14·92 per cent. of cases treated)." In 1872 thirteen cases of enteric fever are returned from the Native Bengal Army. In the Indian Medical Gazette, March, 1874, is a communication from Dr. Norman Chevers on "the Hooghley fever" in which he says: —" Enteric fever is recognized as holding a distinct position in India; in four post-mortem examinations were conditions of the small intestine indisputably characteristic of true enteric fever." In the Blue Book for 1874 the disease is recognized as present among the native population of Palaveram and Thayetmyo, both of which stations returned cases among the troops that year, and the medical officer at the former adds that "at the time of its occurrence (*i.e.* among the European troops) it was rife among the men of the native regiment there." In the Sanitary Report of British Burmah for 1878, Dr. Crombie established the existence of enteric fever among the natives of Burmah; three cases with typical intestinal lesion were observed in the

Rangoon Jail hospital, and Dr. Gregory noted the occurrence of another case in the town. In the Indian Medical Gazette, March 1876, are notes on enteric fever by Dr. J. O'Brien, 43rd Assam Light Infantry. He brings forward five cases to prove the existence of the disease in the province of Assam, all Sepoys, four aged 22, and one 30, all fatal and substantiated by post-mortem examinations; the small intestines in the three first cases were sent as preparations to the museum at Calcutta and the curator remarks:—"I have never yet seen such well marked and true specimens of the enteric lesions as these you have sent." In the two first cases "the origin was distinctly traced to the use of water of a tank in the middle of the Sepoy's lines." In the circulated extracts from Annual Reports, Bengal Presidency, there are details of an outbreak of enteric fever by Surgeon O'Brien, in 1880, in the 44th native infantry at Shillong, 6,449 feet above sea level; six cases among Ghoorkhas, four of them recruits and admitted a few days (16 in the longest) after joining the corps, the disease was believed to have been imported. At the same time there were two other cases in the 10th N. I. similarly situated as being "probably contracted at Gowhatty through which they passed to Shillong;" about seven cases subsequently were noted among natives, one among the European residents, one in an Eurasian (half-caste) and one in jail. Assuming the correctness of the above details we have here illustrations of enteric fever among the native hill population, and introduction of the disease into a corps and station by recruits joining—counterpart of enteric fever history in the service in England.

There are many other examples of the foregoing, and they show that the native of India is not exempt from enteric fever in his own country; of the existence of the disease in the Eurasian class, and among the civil European Community there also is no doubt; hence that the disease is common to the community at large in India, irrespective of race, is beyond dispute. And it is equally clear that the native of India does not enjoy an immunity on other soil, for the disease is returned among the native troops in Hong Kong, North China and Singapore; and Dr. Smart, 13th L.I., recognised its presence among the Bombay coolies at Mauritius both during life and after death.

Opinions of infrequency are not uncommonly based on the records of hospitals and hospital experience, and the great differences of current views may possibly be due to the age of the class coming under the eye of the observer; and each may be in accordance with facts and the known laws of the disease. If the disease be existent in the native community (and it is difficult to understand its absence on the putrescent, specific or climatic theory), knowing as we do their insanitary habits, how is it possible that the susceptible youthful member can escape coming under the cause? The reasonable inference is, that as in smallpox so in enteric fever, they do not escape, and that the adults rarely illustrate either disease owing to exemption purchased by an attack in early life.*

* Suggestive details are present in the annual report of the health of Calcutta for 1880. Fevers constituted about 1/3rd of the registered mortality, and deaths from fever in 1880 are classified as follows:—typhus 26, enteric 451, simple continued fever 2077, ague 31, remittent 1210. So that no small proportion

Among the natives we have the disease proved as existent from such widely separated points as Assam, Rawul Pindee, Calcutta, Bareilly, Madras, Burmah.

This supplies a link which was wanted on the specific hypothesis (but on no other) to explain the sporadic military cases.

By air contaminated in or near the native habitation, by drinking contaminated water as such or under the garb of aerated waters, ginger beer, etc., by milk watered from the nearest tank or kept in the native habitation absorbing effluvia, by cows feeding on foul litter or actual ordure or contaminated grass, by carelessness of puckally in obtaining drinking water, through the dhoby by washing clothes with infected clothes or in infected water, by breathing air from manured fields, from sewage carts passing from barracks or elsewhere, by inhaling with the air dried germs set in motion by tropical heat from fæcal matter, to say nothing of other ways, means for the

was recognised as enteric, but (and here comes the point of present interest) no less than 240 of the deaths under simple continued fever were in infants under one year of age and due to "*a combination of fever and diarrhœa*". Another point of interest comes out in the mortality ratio shewing marked excess of severe fatal fevers among natives over British troops; thus the fever mortality among Mahometans is given as 10·54 per 1000 of population, mixed races 9·7, Hindoos 8·4, non-Asiatic 2·1, other classes 2. These figures show a vast amount of fatal fever of *continued* type among natives, predominating among flesh-eaters; it would be a point of interest to elucidate this mass of continued fever and the reason for its marked fatality. Enteric is the unduly fatal continued fever among Europeans, and if the same cause (clearly existent) is not in equal operation among natives, wherein does the explanation lie, and the fatal tendency of the simple febrile disturbances?

transfer of the disease are certainly not wanting. It may be brought to the soldier in barrack, but let him go outside the enclosure, let him in his stroll approach native dwellings, let him go along the thoroughfare from the cantonment to the surrounding villages—the route for natives bringing in their agricultural produce, let him in search of game go over manured fields or near manure deposits, and how long can he be before the eye and nose are capable of detecting the presence of ordure? But suppose he goes into the native haunts in pursuit of so-called pleasure, remaining possibly for hours and probably drinking, introducing foulness by lungs and stomach, is it surprising that enteric cases crop up here and there, at irregular intervals, affecting individuals only while the corps generally is intact?

The margin of error in relegating most of the sporadic cases to an outside community, the cause acting through similar media as in the localized outbreaks, seems infinitesimally small; the clenching of one link in the chain of causation (positive proof of such contraction of the disease) only is wanting, and this looks as if supplied by the case mentioned by Brigade Surgeon Chapple (B.B. 1880)—a sergeant contracting the disease through fæcal emanations from the filth deposit of the city of Lucknow. The segment from which the susceptible soldier may derive the germs is a matter of uncertainty and indifference—native, halfcaste, civil European, former corps.

As before said the localized outbreaks are not numerous nor are they elucidated as to cause or connection in all instances, but when so are as follows.—

Fæcal effluvium from cesspits and drains, noxious effluvium from latrines, well water contaminated from old cesspits, fæcal effluvium from latrines, polluted tank water by natives, noxiousness of conservancy arrangements, probably emanations from a foul latrine ground, probably impure water, contaminated well water, contaminated well water possibly by specific stools, contaminated water supply, suspected water impurity, probably well water impurity, insanitary state of latrine, contaminated well water. These are instances of contamination in the barrack or military quarter, and instances more remote are:—drinking water "en route," polluted well water, fæcal contamination of air from native ordure deposit (2), thought to be due to adjacent native latrines, encampment near fever village. An individual case is referred to the condition of a drain, and another to inhaling effluvium (fæcal). In the Jutogh outbreak at Bishop Cotton's School, the source was effluvium from latrine; at the Lawrence Asylum, Mount Aboo, want of conservancy arrangement was the fault; at the Lawrence Asylum, Ootacamund, contaminated water supply.

While we are dependent so much on wells for our drinking water, it is difficult to ensure freedom from contamination always; we may protect the immediate surroundings from surface washings and prevent fouling of the vicinity by natives and animals through sentries or otherwise, yet the control of the whole drainage surface is another matter so long as the wells are not far distant from habitations or allow of human approach. It is difficult to ensure a prior immunity of the ground in which the well is sunk, and we know not how long the latent disease germs may retain their vitality in old contaminated tracks; we cannot limit the drainage area in the subsoil, especially in dry weather and when the well is deep; we cannot always exclude atmospheric germs. And difficult as the explanation undoubtedly is in many instances, the fact is beyond dispute (both as elucidated by enquiries in connection with enteric outbreaks, and at times when no such outbreaks existed, and by the numerous water testings) that the wells used for the supply of drinking water by our troops have become from time to time impure, and this impurity due to sewage matter in several instances. Proof too exists on this point of well impurity in barracks, in the acknowledged danger latent in the system of having two supplies, one for drinking and one for other purposes. The water supplied to our troops from a distance has been found contaminated and a source of disease in more than one station; and if the supply be from tanks, if these be near habitations or approachable by natives, how is it possible, with their existent habits, that human ordure and filth of all sorts can be excluded with the surface water sweeping the slopes and surface drains? We may filter this water, but can we rely on this process for germ exclusion even when well carried out, to say nothing of the chances of imperfection from negligence or faults in the apparatus? And if we extend our observations beyond the military to the other communities the dangers lurking in the water supply are abundant.

What more crucial test, as to the conditions under which the soldier comes quoad enteric fever, can be devised than the system at present in vogue and particularly exemplified in India? We transfer bodies of young susceptible immature men abroad, the major part of them within the age most prone to be influenced by the enteric cause; we withdraw them when age immunity is in progress; they are exotics, and as such all existent conditions, climatic or otherwise, are inimical to them compared to the native races and older communities; their body tissues are essentially mobile and extra susceptible to any agency healthy or morbific; their ignorance of what to avoid is complete, their carelessness proverbial; they land from the confined space of ship-board, they come in contact with different communities one after another on their journey to their station at rest camps which are not and cannot be under such sanitary safeguards as permanent stations; they drink of different water supplies not filtered; they arrive at their station where all is new to them, their curiosity is aroused by the novelty of the situation, they are free from the sexual restrictions of ship-board, they resort to the native haunts: is it surprising that they often illustrate the presence of communicable maladies in the long range of country over which they have passed; that (knowing what we do of the foulness of native haunts and of the existence of the disease in India among all communities) enteric fever rapidly claims its victims, and in numbers greatly in excess of the more mature and longer service men; that the disease is proportionally excessive in the first year, and declines as service advances? Would it not be surprising if it were otherwise, and would not the contrary be a clear proof that enteric fever in India is not as elsewhere and requires a different explanation for its existence?

We know that in India the disease is capable of transferrence, and in the new locality reproducing its kind; and there are certain facts, apart from the evolution in the frame of the disease itself, which indicate that this cause must be special and the same throughout. We have it widely diffused yet recognised as the same at all points, the same in natives as in half-castes and Europeans; we have the continuity of the disease in some corps year after year, and if we agree in the inference which the epithet, "infected," applied to them conveys—a transferrence of the disease from one to another,—or if we refer the explanation to contact with the disease cause of the corps in successive stations, the deduction is the same under both aspects, that the cause must be similar to produce the same results when transferred to another, or in successive localities one after another; we find the cases coming under the same conditions in a localized outbreak the same in type, the mild ones as the severe all having the "enteric" stamp; we find these enteric cases and type forms disappearing with the removal of the cause; we find some new corps following in the footsteps of older affected ones and taking up the same disease type, possibly even to segments of the corps in the same limited space; what but the same special element, removable at will, can produce such uniform undeviating results? And that this same element can be transferred from the sick to others we have reasonable proof in India in 14 instances at least.

I may mention here, too, an instance which came under my personal notice in the family of an apothecary in the quarters connected with a hospital. Three cases of enteric fever suddenly occurred in the only household with children in these quarters, on an isolated spot on the outskirts of a plain ; in the adjacent hospital there has been a fatal case of enteric fever, none elsewhere in the vicinity ; the first of the three occurs within three weeks of the accidental saturation of the soil 80 yards distance with enteric intestinal discharges from the dead body, and the last within eleven days of the first, in young members of the family most likely to have rambled and to have come in contact with the immediate atmosphere of the spot. After careful enquiry the conclusion I arrived at was, that the emanations from this soil originated them, and that these emanations were specific in character.*

Tersely summed up we may say that the foregoing details indicate that the present enteric fever among the military in India cannot be placed to

* In regard to the fluids from post-mortem examination, in view of the asserted absence of a recognized disease cause and immunity of natives, it certainly would be a matter of interest at least to ascertain how they are disposed of. Are they caught in chatties as a rule, and carted away, and to where ? do they find their way into a drain ? What means are taken to render them innocuous ? Are they spread broadcast on land as manure near the cantonment ? The sweeper class, who do the dirty work in hospitals, is directly brought in contact with them, those also who convey the filth cart to its destination, and how many more after the filth is deposited ? Surely this one small segment of the subject, carefully considered, ought to cause a hesitation in such a sweeping assertion that the causes of the European disease do not exist in India ?

recent introduction by the troops, nor to climate or soil or military service; that it follows the same laws as elsewhere; that the asserted causes of the disease in Europe exist in India; that evidence in support of its specificness is not wanting; and that several of the outbreaks have been clearly connected with insanitary conditions, to wit, fæcal fouling of air or water.

Summary of the details from the army stations home and abroad, and deductions on causation. It is now necessary to link together the observed data of enteric fever in the service as a whole, and from them to evolve a theory of causation.

1. The wide range of the disease, and its marked individuality, are conspicuous features.

2. Within the same region or country there has been marked diversity in stations, whether these stations have been on the same footing as to climate, soil, elevation above sea level, or the opposite; and the same feature is apparent in the same station in successive years.

3. The universality of the disease, its recognition as the same in clinical and post-mortem details in climates most diverse, the varying results in climates approximating each other, the diversified experience of stations in the same climate and of the same station from year to year, indicate how impossible it is to link enteric fever in the service generally with climate as cause; or any fraction of it, except on the hypothesis that the same results are brought about differently as the site may be, now North America, now India, Home or the Antipodes, Bermuda or Japan; but on the assumption that such a defined

disease must have an equally defined cause, *no known natural condition will explain enteric fever in the service.*

4. It is not possible to connect the disease with transferrence from a temperate climate to countries more or less tropical. Recently arrived corps have suffered in a higher ratio than older corps, but exceptions to this are numerous, and the degree is very fluctuating; and these divergent results are not connected with any special country, but have been illustrated alike in the Mediterranean, Bermuda, Jamaica, India. Functional disturbances are common among new comers in tropical climates, especially on the approach of the hot season; the recently arrived are unduly susceptible to any of the disease agencies as compared to natives and aliens of longer residence, and among these there may figure the enteric cause; and should it be present, and the newly arrived be brought in contact with it, then extra susceptibility becomes conspicuous. The individual experience, too, is on a par with the experience of masses, that *enteric fever is no necessary outcome to arrival in a tropical country.*

5. If we take as an index the proportion of cases to strength in any one or all stations, we see clearly how *limited in scope among the military the disease cause was*; the highest for the period is Japan (12·08 per 1000), 2 per 1000 is about the average for all stations combined.

6. The station and corps experience is very variable, not only as comparing one station with another and one corps with another in different stations, but in the same station the different corps and even seg-

ments of the same corps suffered very unequally, showing that *the disease conditions were far more restricted than the common conditions of the station or corps.*

7. *It is not possible to explain the origin of the disease as we see it among the military to special work of the soldier or special work of any particular branch.* In nearly all the countries we occupy it is common to the civil and native communities also, and common to all branches of the military community. The duty on which the soldier is engaged, and contact with horses, may offer more opportunities for contracting the disease, yet both are accidental in nature. At home the Guards, mounted and foot, are somewhat in excess of the same branches of the Line; in Bengal the R.H.A. and Cavalry have given an excess in some years; in Bermuda the Royal Engineers have given numerous cases, in Malta the reverse; the Artillery—Royal Horse, Field Batteries and Garrison—have given very different results, not to be explained by the differentiating feature of "mounted" in the two former. The divergent results show that some closer and more important influence than branch of service work is in operation as a rule.

8. *It is not possible to explain the present foreign disease by recent "introduction."* Its transferrence by persons from country to country, its portability, is beyond doubt, even to our most remote foreign station. Introduction may partially explain the sum total of a period of years, and accretions may be repeated from time to time; but for the main mass of present foreign disease we want an explanation of its origin in individuals and in corps where transferrence is negatived, and this must be sought in the conditions

existent in the countries, and with which our troops come in contact.

9. The importance which is attached to this disease in the service cannot be due to the number of cases, for this is small and in itself would not engage attention, but to *the great proportionate mortality*. Its influence on the sick list is subordinate to the loss to the service by deaths and invaliding from sequelæ. The fatality of the cases (rather more than 1 in 3) distinguishes this disease from other febrile affections generally met with; and this is a common feature linking it as similar in all climates, and differentiating it from other fevers.

10. *Age is the most potent modifier of susceptibility among the military*. This is one of the universal features of enteric fever. The explanation of the age element doubtless lies in the presence of those glandular structures in a mature and impressionable state in which the cause germinates and fructifies on entrance into the body, and the normal tendency of these to retrogress and atrophy after manhood is reached; the deviations from the age rule receiving elucidation by the individual modifications which these glands occasionally exemplify in retaining their maturity (and doubtless impressionability) far beyond the usual period. Early manhood and short service coincide as a rule, and hence their respective ratios of enteric prevalence coincide as seen in the Kinsale outbreak in England in 1875; and with the present composition of our corps and present system of relief the maximum of disease abroad will as a rule follow recency of arrival, less from the fact that soldiers are meeting adverse climatic and soil peculiarities for the

first time, as that the main mass of them are structurally more impressionable to the enteric cause than later.

11. *The position of season to enteric fever is a subordinate one.* Enteric fever exists independently of season in all countries ; yet it is apparent that at some periods of the year in all (but not necessarily the same throughout), there are conditions which are favourable for its prevalence, probably by acting either on the germ or its surroundings.

Atmospheric heat, cold, dryness, especially when extreme, may all influence provided the cause be within their range ; but the great natural assistant is the rainfall, in giving moisture for growth and putrefaction, in causing water circulation on the surface and in the subsoil, in its mechanical removal of material from drains and hidden receptacles : the greater number of regional seasonal prevalence, no matter the climate, come for explanation to this factor. Its influence is markedly apparent in those regions where the seasonal peculiarities are well defined, and less so in those where the rainfall is general throughout the year. The advance of the rains in the tropics, and the melting of the accumulated snow in British North America, are identical in the disease results, through washing of surface soil and subsoil leading to contamination of water supply ; the mechanical influence of the rainfall in the exposure of hitherto concealed sources of disease in drains and sewers, where the water supply in the dry season is insufficient for flushing, is shown in some of the sequential autumnal prevalence of enteric fever in the Mediterranean ; and in those countries where the rainfall is general, the varying level of water in the subsoil, now coming near the surface and influencing disease germs there present, now receding and carrying them into reservoirs, may explain the time element in some of the enteric fever outbreaks. On the assumption that the enteric cause is a germ or fæcal material operating through air and water, the seasonal prevalence, expressed through the influence of natural conditions in diffusion, receives reasonable explanation in all lands.

12. *In all countries the military disease is seen under the two aspects of sporadic cases and localized outbreaks ;* and the numerical relation which one bears to the other varies only within certain limits, the former predominating.

(*a*). *Sporadic cases.*—In the Home stations they are referred to the civil community; the current opinion of a causal connection with filth, or another case, being assumed as correct. That some of these cases have originated in the civil haunts is apparent as in the instances of recruits joining their depôts and men coming off furlough, but there is no such clear evidence in the majority; and the disconnected character (so far as other cases in the military community are concerned) of them does not lead to their being regarded as different in nature from the disease generally, or due to a different cause. Some of them are shown to have had an origin similar to the outbreaks, the conditions limited to the individual ; and the inference is drawn, that the unknown ones had an origin similar to the known ones ; the absence of a traced connection with filth or germs outside barracks being not considered sufficient to neutralize the deductions drawn from the disease itself, and the ascertained associations of other cases; climate and natural causes are not brought in to fill up the void. It is only when we come to deal with foreign stations that doubt is seen to creep in; the same basis does not (to the minds of some) justify the same conclusion in the one country as in the other. The features of these individual cases are the same abroad as at home, a possible outside source exists, some of the cases are so traced, the evidence from the localized outbreaks is the same; yet the absence of traced connection in many cases, and absence of information as to exposure, lead some to depart from the known and to bring in climatic and heterogeneous causes to explain the unknown; this not being due to observed and marked differences in the disease itself, but to an inability of the man to trace the source, the absence of cause in the barracks, and the inability of the medical officer to elucidate it in the special case under consideration. The means of diffusion of the disease in Europe from one community to another are present also abroad, whether the soldier be exposed to them or not; there they are for transferring disease should the requisites concur. The derivation of enteric fever from the civil community has been so referred at Gibraltar, Malta, Ionian Isles, Bermuda, Nova Scotia and Halifax, Cape, Mauritius, at a few Indian stations and particularly at Bangalore.

Sanitation may be complete in a barrack, no defects existent, we may be certain of the original purity of the soil, and retained purity of it (for example to the contrary Secunderabad), yet so long as it is considered inexpedient to limit our soldiers to the barrack enclosures, or links between the communities exist, sporadic cases of enteric fever will assuredly continue to occur, should the disease retain its present characteristics and the sanitary condition of the surrounding communities remain as it is.

But if we refuse this conclusion, if we negative the identity of the sporadic cases with outbreak cases, and decide that the one as in the other does not own like causation, where is a practical working theory to be found which will embrace the ascertained facts? We cannot trace different causes in the bed-side or dead-house data; and on what grounds then are we to refer the case to the known causation of many cases, and when to a heterogeneous and variable cause? Assuming for the moment the potency of other causes, what relation do the cases so arising bear to the cases caused by polluted air or water, or contracted from a former case? are they also capable of originating similar disease in another? are the discharges innocuous, powerless for evil as ordinary diarrhœa dejecta? can this disease, heterogeneous in causation, propagate its kind, breed true? Important questions are certainly involved in the conclusions arrived at, practical and hygienic.

The reason for transferring some cases to climate, alone or supplemented by other conditions, certainly does not lie in ascertained and appreciable differences in the disease itself; and if it arise from an inability to connect the case with a former case or with exposure to putrescent causes, then this inability, be it due to ignorance of the conditions under which the patient has been placed, want of information, non-existence of the causes in the habitation, non-recognition of them in the surroundings of the barrack or in the adjacent civil communities—negative basis at the best, surely does not warrant us in raising a positive basis of causation at variance with the known surroundings of many cases, at variance with the phenomena of the disease as a whole ? Between the known facts of a case, and the knowable yet unelucidated ones, is a broad margin which may remain a blank in spite of all our enquiries ; but because we cannot show an exposure to certain conditions, it does not necessarily follow that such exposure has not taken place; and surely when we are brought face to face with peculiar results occurring from time to time and recognised as similar when occurring, the more reasonable conclusion is that the same cause has been in operation to produce the results; and if we cannot elucidate that cause in all as we can in some, rather to refer this inability to want of knowledge than that nature has been at variance in her operations in bringing about the same defined results by causes widely dissimilar. Difficulties we certainly encounter in following the beaten track, but in diverging from it, instead of meeting firmer ground, quagmires only await us.

(*b*). *Localized outbreaks—limited house epidemics.*—These are not numerous in the service, but more frequently met with in some countries than others, not uncommonly occurring in the same barrack at intervals. At Home they are conspicuous in Ireland with conservancy and water supply the same as in some of our foreign stations, and particularly so during the early period of this enquiry ; they decline with sanitary advance, and owe their existence to sanitary defects often previously unrecognised; frequently they have been suppressed by recognition and removal of or withdrawal from the infected medium, and rarity of elucidation of the introductory case (assuming that such an one is necessary) is general. The surroundings of the outbreaks are wonderfully alike, be the climate what it may; the Mediterranean, India, repeat the experience of Home Stations.

Hence then from the general side of the question, by a process of deduction from the statistics, distribution features, &c., we arrive at the conclusion that the cause of the military disease must be sought in some limited condition acting on individuals and segments only; and from the disease side of the question we find that a few cases have originated from contact with a former case, and others have been traced to contamination of breathing air or drinking water, through local sanitary defects, by fæcal or organic material; it being inferred that the same surroundings characterized the unelucidated cases. This being so we come to this point, that not only is the disease similar throughout the service, but the service disease is the same as the civil European; the military details give support to the civil deductions, and *vice versa*; well-grounded objections in one section would be fatal to the whole.

There is not a system of conservancy—sewers, cesspits, tubs, dry earth—or a system of drinking water supply—from a distance, rainfall locally stored up, wells—which has not been associated with an outbreak in the service. That the systems are not of equal importance in the way of offering opportunities for development and dissemination is apparent; and it is hardly necessary to remark that the disease is not connected with any especial one As to conservancy, the cesspit, sewer, tub, iron pan, even the earth's surface, are all on the same footing as receptacles of the excreta; they are harmful as they offer opportunities for the lodgment, decomposition, and diffusion of excreta emanations or products, and so far they act as adjuvants to the enteric cause. Cesspits must always be a source of danger; but the sewer perfect in construction and working is one thing, the sewer allowing of accumulation, gas escape, or leakage into ground is another, and under the latter aspect may be lessened in sanitary value to the level of the cesspit or even worse from its wide ramifications; the dry earth system—earth duly applied, absorbing fluid, removal rapid, and working complete—approaches perfection, but with earth indifferently or rarely applied as so often is seen among the military, receptacles old and admitting of escape on the surrounding earth surface as at Kirkee in India and Newcastle in Jamaica, and cartage defective in details allowing of splashings and emanations from the tubs as they pass along the road, it may become as potent for evil as the badly constructed latrine. Hence we must discriminate between the system itself, and defects in materials, construction and working. Sewers have been associated with the disease in Ireland, Malta, Gibraltar, Corfu, Hong Kong, and in the Mediterranean particularly in barracks situated over or near the openings into sea; latrines opening into sewers in Ireland and Mediterranean; cesspits in England, Ireland, West Indies, Bermuda, India;

tub receptacles and removal in India ; dry earth system in West Indies and India ; natural system of squatting in India especially; drains, regarded as minor sewers, are widely noted with the disease existence: in frequency, cesspits and sewers take the first place, dry earth the last.

Of the system of water supply, that by wells has more frequently been associated with the disease prevalence, and this is not to be wondered at considering the opportunities they offer for contamination especially when associated with cesspit conservancy; rarely does the water appear as the medium in the Mediterranean ; stored-up tank water has been illustrated in England, West Indies, Malta and India ; water brought from a distance in England. The mode in which contamination has been effected has not often been brought to light in the water outbreaks, but the evidence is hardly less pointed, and is as strong circumstantially as the surroundings of the subject will probably allow.*

Tersely put we may say that the two media (atmosphere and water) are about balanced in the service during the period embraced in this enquiry; though the position each occupies in the diffusion of the disease varies considerably in each

* But it seems to be a subject for elucidation whether the water must necessarily be contaminated by fæcal matter for the development and diffusion of an introduced germ element. The original derivation of the germs from the diseased body and chiefly through the intestinal discharges being acknowledged, may not the germs set free from their excreta surroundings live, develop, and become diffused in ordinary organically tainted water? There are features which tend towards an affirmative reply.

country and at different times, and it is obvious that it must and will vary relative to the particular sanitary defects; the country, climate, or soil, do not alter the results. Place Kinsale in Ireland and Fyzabad in N.W. India in apposition; both are noted stations for enteric fever, both have returned much intestinal derangement when enteric fever was not present, both have shown contamination of water supply and noxious conservancy arrangements, both have been remarkable for localized outbreaks of enteric fever in successive regiments succeeded by years in which no enteric fever existed, in both the disease has been traced to the water supply, and in both cutting off the particular supply has arrested the disease; and strangely enough in both the 1/25th regiment figures but in different positions, for in 1873 it relieves the enteric affected 57th at Kinsale after the abolition of sanitary defects and suffers not, in 1876 it relieves the infected 51st at Fyzabad and the segment of it located in the quarters occupied by the invalids of the 51st suffers considerably. Wherein can be perceived a difference in the associated enteric fever, at Mullingar (cesspits) Cannanore (West Coast of India—latrine tubs) and Kirkee (Bombay Presidency—earth fouling from dry earth pans), with fæcal emanations? Cutting off contaminated water is equally potent in Wales and Hong Kong, and sanitary measures are followed by the same results at Newcastle in Jamaica as at Hazaribagh in Bengal.

In order that enteric fever may arise three points are needful: (*a*) the cause, (*b*) susceptible individuals, and (*c*) links to connect the agent with the recipient.

Again, in the enquiry into the cause of an outbreak or existent disease in a community, we cannot limit our attention solely to the human race but must extend it to animals, for enteric fever is one of those diseases which illustrate close structural links between man and some mammals lower in the creation scale. Horses, cows, calves, and apparently sheep and rabbits, also suffer; and considering their occasionally perverted habits, the facilities for disease transferrence to them from men, through ordure eating in India and other countries, or fouled grass, (to say nothing of their drinking water contaminated in many ways) are apparent; possibly they too return the compliment through meat and milk or ordure to man.

I presume that no one will regard as mere coincidences the occurrence of the enteric outbreaks with organically contaminated air or water—generally fæcal; or doubt that they were connected ætiologically; and it is necessary to ask, given the contamination, what does analysis of the subject reveal as to the agent and its nature? Did the ordure elements in themselves originate the disease, or was there an additional element present without which these were impotent? or in other words, to which of the current theories, the putrescent spontaneous one or the specific one, do the military examples incline? The facts of transportation and extension in the new site, and the individual examples regarded as due to the presence in the same hospital, and generally in the same ward, of a previous case, both strongly support the specific theory, though possibly they will not by some be considered conclusive, as origin of new disease from an existent case through intaking of putrefying fæcal elements is allowed on both sides. Yet fæcal material in rapid change is not so uncommon in cases in military hospitals in the tropics; on the contrary, it would be rather difficult to say when cases of diarrhœa or dysentery are not to be found ; there is not that especial care taken as to disinfection, rapid removal, and prevention of deposit in the common receptacles of these as in cases of enteric fever ; and if enteric fever can arise in this way why do cases not more often occur ? why only when an enteric case is present ? why again should the type of the induced disease be so closely adhered to ?

In excrement we have numerous constituents, from the elements taken in as food—animal, vegetable and mineral,—to elements derived from the body in health —excretions from glands, saline constituents, organic particles,—and elements the result of diseased action, general or local—changed secretions and excretions, organic elements impressed by disease agency and modified beyond recognition, special disease entities ; and these form a very heterogeneous mass, the import of each of which in the ascribed disease causation requires to be guaged. Soon after the passing of normal excrement, provided the circumstances admit of it, decomposition ensues, and the mass is ultimately resolved into gases and mineral residue. Now so far as the latter is concerned the results upon the human frame are fairly well ascertained, also the gaseous products have an influence of known value; and hence to the organic constituents in the intermediate state between original stability and final elementary retrocession must we look for an explanation under the spontaneous theory. That these are capable of influencing deleteriously the human frame is beyond doubt, but the known results do not come up to the standard of such a distinct disease type as enteric fever. Has fæcal contamination been generally followed by enteric fever outbreaks? The military data supply an answer, and a negative one. Undoubtedly latrine emanations have been present to an offensive and deleterious degree over and over again, the presence of sewer gas has been recognised, the water has been found impure times out of number and the source traced to drains, sewer leakage—fæcal fouling beyond doubt, disease has been present with these defects and traced to them, and yet enteric fever has found no illustrations. This is a feature not limited to any one climate or land, it is an experience common to all quarters of the globe in which the British soldier has served; it suggests that ordinary fæcal material under any conditions is insufficient *per se* to generate the disease. How can enteric fever be absent from any community approaching primitive in character on the hypothesis that ordinary excreta suffice? If so, there is no reason why an individual should not be self-infecting, and the illustrations frequent, but I think that experience will veto this. Nor does it seem that the position is much improved if, having negatived the potency of ordinary excreta, we turn to those from a diseased intestine not enteric. This hypothesis is an acknowledgement that the healthy discharges do not suffice, though it does not acknowledge that the cause is a special one; like the putrescent theory the disease can arise spontaneously, the difference is in a limitation of the cause—to stools from a diseased person containing altered albumenoid elements. Is the experience of our military hospitals, especially in the tropics, for or against such a conclusion? In all the numerous instances of intestinal diseases producing frequent discharges can a single example of enteric fever arising in attendants or other patients be adduced where the facts undoubtedly exclude the enteric cause or enteric case? I think not, nor can I find one.

It is however generally agreed upon that in the stools the disease cause mainly lies, and with fæcal contamination several of the military outbreaks were undoubtedly associated, the inference being that this contamination was of a special character to cause the exposed results. How except on the hypothesis that a definite peculiar disease cause was present in some instances of contamination and not in others can we explain the sequence of events? Take for example the station of Kinsale in Ireland, on a fairly good site but with very defective conservancy and water supply. In 1870 the 1/22nd regiment was quartered there, the well water was contaminated by a drain from the hospital latrine, an outbreak of diarrhœa follows; in 1871 the well water is again "unfit for use;" in 1873 is an outbreak of enteric fever, conservancy cesspit and water supply by wells, and withdrawal of the regiment and sanitary measures brought to bear on these points render the barracks harmless to the corps re-occupying them; in 1875 there is another outbreak of enteric fever connected with impure well water and drain emanations; frequently has the water supply been found on analysis unfit and impure. Now what was there in the well water in 1873 and

1875 which was not present in 1870, 1871? The discriminating factor was clearly not fæcal material; yet that there was a definite something present in 1873 and 1875, and wanting at other times, is proved by the results, and that entity originated a series of profound lesions in the human frame, distinct and similar in all, which we call enteric fever. Take again Sheerness in 1860, Leith fort in 1877, Glencorse and the Possil Burn in 1878, fæcal contamination of air from sewers in the two former, from a brook—an open sewer to all intents—in the latter; compare these with the escape of sewer air in the Dublin prison, the latrine emanations at Mullingar in 1871, the sewer air at Newbridge in 1874; in all the contamination was beyond doubt and recognised, but why should the same apparent (roughly speaking) condition be associated with enteric fever outbreaks in the last instances and not in the first? And the evidence from the foreign stations runs in the same groove; take the West Coast of Africa experience as to well water and air contamination and no enteric fever; the water contamination in Fredericton and St. John's, N.B., in the former enteric fever absent, in the latter present; the impure well water at London, Canada, with its diarrhœa outbreak; the frequency of latrine emanations in Bermuda and Jamaica, enteric fever only occasionally; the experience of such barracks in Malta as St. Elmo, Floriana or Verdala—when it may be asked, especially in the former from the contiguous sewer openings, are odours unmistakable as to origin absent, and why is enteric fever not always equally present? Why did fæcally contaminated water in Bangalore in 1880 not produce enteric fever when the Mean Meer well water in 1868 to 1870 did? Why should a particular well at Kamptee in 1880 produce an outbreak when impure well water was clearly recognised there years before? Why at Neemuch should the foul latrine suddenly be connected with an enteric outbreak when its foulness had been recognised and reported on some time before? The details of stations will supply numerous other instances in which insanitary conditions of air and water from fæcal presence existed without enteric fever; and in those instances in which the disease was associated, it is inferred that a something was present which entered the human body in the contaminated air or water, producing a definite train of symptoms which fæcal elements *per se* could not produce.

We see emanations from sewer openings or ordure deposit places noted as generally existent throughout the year, but at a certain period (the season when enteric fever prevails in the community at large, and that not necessarily the season of putrefaction excess) we find the military exposed to them giving cases or a marked advance, how can we explain this time element except on the hypothesis that the cause is present or in excess at one period and not at another? Again on the hypothesis that the enteric cause is a distinct disease entity, the type of the cases—all having the enteric stamp, be they placed in nomenclature under enteric fever, diarrhœa or simple continued fever, during an outbreak—is in accordance with the natural law; but on the theory that such a heterogeneous product as intestinal excreta is the exciting cause how shall we explain the peculiar type in the outbreaks, why are there not intermingled with the enteric cases cases of simple diarrhœa and continued fever no less stamped as simple beyond doubt, why not gradational cases illustrating the links ? Why too should not enteric cases enter into the results of fæcal fouling in the diarrhœa outbreaks, for here is the asserted cause producing disease, and that disease not enteric fever beyond doubt? We may regard the subject from another point. Examples there are in the station details of outbreaks of malignant scarlatina, yellow fever, cholera, having essentially the same insanitary surroundings as the enteric fever outbreaks, are we to say that these forms, very dissimilar in themselves, are all outward expressions of the one cause ? Do not, on the contrary, the facts indicate that the atmospheric or water fouling is not the cause, but the nidus in which the special virus exists—the fostering bed of any one of them, and acting the same to all as the medium *par excellence* in which each lives and grows and diffuses itself on introduction ?

That the excreta from an enteric patient can explain such phenomena is known ; the elements, in a very diluted degree, can and do produce disease similar to the disease which produced them. Dr. Cayley in the Croonian Lectures mentions "a clear piece of evidence," and notes the time length of the sequential disease from the previous case :—"Typhoid stools were burned in a dunghill. Some five weeks later, five persons who were employed in removing dung from this heap were attacked by typhoid fever; these alvine discharges were again buried deeply in the same heap, and nine months later one of the two men who were employed in the complete removal of the dung was attacked and died." He adds:—"Dr. Murchison gives an instance in which six cases were spread over a period of eight years. I have recently seen an instance in which an interval of two years occurred, without apparently any fresh importation of the poison." It must, however, be acknowledged that in the outbreaks in the service the introduction of the special stool into the water or conservancy system has not been shown; a possible source of specific infection has existed in the surrounding populations; and even were the evidence defective on this latter point, the continuance of the disease among our own troops for a long series of years, derived originally no matter where or how, these troops frequently changed, and almost as frequently exemplifying the existence of the disease locally, would form a moderate basis at least to work upon to explain a possible and probable transfer of a communicable malady at the present time. Contamination of well water by stools (possibly specific), and that well water producing enteric fever, has been shown at Hongkong; a specific source is very strongly suggested in the 25th Regiment outbreak at Fyzabad; but the introducing case or cause, be the former included under another heading in nomenclature, be it in the person of a soldier, child, or woman, be it in the person of a native, be the germs air-borne or existent in introduced water for any particular purpose such as clothes washing, ultimately sinking by percolation or passing by surface into well, be they derived from ordure-manured fields within the drainage area, old cesspits, old burial grounds,—in fact, be the source of pollution what it may, and the mode of its occurrence what it may, be it derived from recent disease or latent germs of old disease hitherto shut off, drains, sewers,—the link connecting the outbreaks with a former case or introduction of special cause is wanting, and this want is as pronounced at home as abroad; it is no especial feature in any one station. At first sight this may appear damaging to the specific theory which necessitates that a case should be connected with a former case; but when we consider that in several of our stations, notably at home and in the Mediterranean, by common conservancy, water supply or close contact of barrack with civil habitations, by position of barrack, by underground drains, derivation of the contamination from the civil community is not only easy, but has been shown to have existed on a few occasions; when as in most of our position-isolated barracks in India the presence within the enclosure of so many natives as possible introducers either in person or things, the danger of well contamination by outside deposition within the drainage area and from old sources are weighed in the scale—all points independent of prior disease in the military communities as furnishing the introducing case; and when moreover we take the military community itself, and remembering the potency of mild cases consider the disinclination expressed by more than one medical officer not to return cases as enteric unless severe and coming up to the standard in all respects, remembering also the possibility of the case occurring among the women or children,—the absence of information as to the disease source of so many outbreaks is far from surprising. But granting this want, are the results less conclusive, do they not as unequivocally point to a special introduced element in time and place, as if our own hands had been employed in the air or water contamination ? and were the results less clear following a withdrawal in the enteric instances, than what they would have been with mineral poisoning ?

We may not be able to show how and when the virus was contracted, but because our efforts result in absolute negation are we justified in asserting that in the given case an exposure to the germ has not and could not have been incurred within the incubative period of the disease ? Were enteric fever a disease essentially and solely military, and dependent on direct transference, the time element might constitute a difficulty to the reception of this theory, but far from fatal to its acceptance when the transference is so indirect and mediate ; for, independent of the long period elapsing between cases in civil life—two years, and six cases over eight years—we have examples in the military details which point out how impossible it is to decide by a time test in the available information in the instances in question. In the Gwalior case (the germ considered to be on the walls or floor of the bare room), 46 days elapsed ; in the cases on board ship two months elapsed between the departure and outbreak ; at Fyzabad there was an interval of eight months between the last case in the former regiment and the first recorded case in the 25th regiment ; and at Meanmeer five years had elapsed between the shutting up of the old cesspits and the outbreak in the 85th regiment traced to well water contamination from them. The stools, infective soon after passing sometimes, though generally probably requiring an interval varying in countries, may, by being buried or deposited with other material, retain their potency certainly for many months, probably for years; they may, by congelation and probably by exposure to great dry heat, remain temporarily quiescent; or coming early under the process of putrefaction living elements or germs are set free. What is the history of such germs subsequently,—do they rapidly die, remain quiescent, or develop should the site be propitious; what influence upon them have heat, moisture, dry air, great cold, physically speaking; what if they pass into the bodies of susceptible animals and ultimately return again to man, as is probable; what are the differences, in respect to their ultimate favourable end in the intestine of a susceptible human being, resulting from remaining on the earth's surface, being buried, passing into water, or wind borne; if the diseased body be buried can the germs be resuscitated, brought again to the earth's surface from the depths by worms, as seems proven in anthrax among cattle and sheep; cannot flies transfer them from ordure to meat as human food? Is not our ignorance on these points very palpable? But if this germ can be wafted by winds in a dry state, attach itself to articles of clothing or food or room of building, if it can enter drinking water by itself and so evade our chemical recognition, or on the other hand entering simple organic tainted water and there reproducing itself, what is to prevent sporadic cases springing up where the available information as to exposure fæcal or special on the part of the individual may be, so far as he or we are capable of discerning, strictly and correctly *nil;* or what is to prevent an outbreak in sequence to water or latrine so infected, when the absence of information as to infecting introducing case would be strictly in accordance with facts? And the possibility of the germ finding its way into wells, by atmospheric transference in India, is allowed by Dr. Innes.

As a germ it may exist beyond the recognition of our senses and chemical tests, and evade our grasp until entering the human frame it finds its nidus in the gland elements of the small intestine and here reproduces its kind as the yeast plant in the prepared saccharine and nitrogenous fluid. In so doing it develops naked-eye features in the textures regarded as distinct, and as differentiating enteric fever from all other diseases in mankind and certain animals alike, be the climate and section of the human race what it may, hot or cold, dry or wet, European, Negro or Hindoo. Let any individual cognizant of the disease in one country, place his observations against others in other climates and sections of mankind; let him compare the results of diseased action, derived from different countries and at different times by different observers; and then putting all theory aside let him ask himself the question, is it within the range of experience, probability or possibility, for such identical structural lesions to have been brought about by several and dissimilar causes? There can be no doubt of the answer to a question under like conditions in the physical, animal, and vegetable world.

Hence then the conclusion arrived at is, that the specific theory more closely embraces the military data than any other, and is the only one which meets the requirements of the facts.

Its Pathology.

What are the inferences to be drawn from the revelations of the body during life and after death, as to the nature and working of the cause in the frame?

The subjects are generally young and in good health; but this disease may be engrafted on some chronic malady, or met with in an individual previously impressed with some other virus, *e.g.*, marsh miasm; or appear conjointly with some other acute disease, as fæcal poisoning or dysentery; the symptoms being modified in such instances and the post-mortem details complex. There is an incubative period of ten days to thirty, or more; and its latter part is marked by a general "malaise" which the patient cannot shake off but which increases. *Insidiousness* is the special characteristic of the onset—the difficulty of saying when and how it commenced, and *indefiniteness* the characteristic of the malaise itself—the difficulty of pointing out any one organ in particular in fault, or any one predominant symptom. Following this malaise which is unquestionably an integral, important, and characteristic part of the process (especially noteworthy in the tropics from the help it gives to diagnosis), is a generally recognised and well marked onset of fever continued in type, as a rule accompanied by looseness of the bowels. Two or three days of fever and diarrhœa lead to an inability to continue about, and this is generally the earliest date at which we see the individual suffering from it.

The other symptoms and lesions generally present and due to the virus evolution are,—general aspect of blood poisoning, brain exhaustion with delirium and occasional epistaxis, functional weakness of heart, evidence of abdominal irritation, accompanied by congestion of brain, liver, kidneys, and abnormal gland growth in the solitary and agminated glands of the small intestine, rose-red eruption on the skin, splenic congestion and softening, congestion of lungs, possibly implication of smaller bronchial tubes and lobular pneumonia; and these occupy about the first ten days of pyrexia of all but mild cases.

The second half of the disease embraces the retrogressive changes in the morbid material in the intestinal glands, and their influence on the viscera, with a corresponding variation in the pyrexia and general systemic derangement. Foremost are the mesenteric gland lesions; these, possibly enlarged by the virus and in connexion with the progressive growth in the lymphatic radicles, now become irritated and inflamed from absorption of necrotic material—septicæmic. Equally in the lungs, the congestion and lobular pneumonia may, as in the exanthemata, be due to the virus alone, but when they ensue in the later stage, and especially with impacted fibrinous patches of lung tissue, the evidence inclines to a septicæmic origin and transference of blood coagula, equally as the occasional formation of abscess in the liver or spleen.*

* A good example of this came under my personal notice in Malta. The young soldier was admitted with symptoms which in progression left no doubt that the disease was enteric, or typhoid fever as it was then called. On the 15th day of fever onset this man had a rigor, and the subsequent phases simulated intermittent fever, a disease from which he had not previously

In all severe cases there is a septic element added to the original virus consequent on the local changes in the gut, and it is to this second period of the disease that the accidental complications of hæmorrhage from the bowels, peritonitis, perforation, collapse, are limited. As far as my personal observations go, the tendency of the pyrexia of the last half is to assume a remittent type (that is so far as marked difference in the morning reading over the preceding or succeeding high reading is concerned) ; but the temperature chart is liable to show ascents due to lung involvment or increase of diarrhœa—the symptoms pointing to augmented irritability of the canal or peritonitis ; it is liable to show descents following profuse perspirations, intestinal hæmorrhage, perforation; or to gradually fall with progressive vital impairment to death, so as to simulate the reading of one aspect of disease decline. The data show that in the evolution of the virus no organ or fluid of

suffered, nor were there any examples of the paludal virus in the regiment at the time except in old cases contracted elsewhere; the rigor, heat, and perspiration recurred for five consecutive days but at irregular hours, and now the pyrexia was essentially intermittent in character. Following this the pyrexia was very irregular in character. On the thirtieth day rigors and intermittence returned with coagulation in the right popliteal vein and enlargement of liver. On the fiftieth day a liver abscess burst through the lungs. On the ninetieth he was discharged to light duty and ultimately recovered his health. The indications pointed to an origin of lesion terminating in abscess formation in the liver about the fifteenth day when the sloughing was in progress in the intestine, and the local lesions sufficed to change the type of the pyrexia from continued to intermittent, and from irregularity to intermittence.

the body escapes implication and deterioration; structurally the stress mainly falls upon the lymphatic tissues and spleen, but wasting of the body and anæmia is marked, the whole fabric is radically shaken, weakened function of brain and heart are continued into the prolonged convalescence, even if more pronounced sequelæ do not ensue in the garb of tubercular development, lung destruction, intestinal atrophy and marasmus, splenic enlargement with associated anæmia, glandular enlargements, venous blood coagulation and œdema especially in the lower extremities; the cause impress on the system is both searching and profound. Enteric fever when severe is essentially a double disease; its first half concerns the introduced virus gradually unfolding itself in regular sequence, and this is best seen in the mild and moderate cases; its second half concerns destructive processes, the elements produced and their influence on the system; the first is specific, the second not; by the first it is linked to the eruptive fevers, notably small-pox, by the second to the putrid blood-poisonings; and in a natural arrangement of disease its position is intermediate, bridging the interval between these disease classes.

Modifications there may be in clinical details which may approximate the case to other febrile states and other diseases; the eruption may be absent, diarrhœa may be substituted by constipation, the stools may diverge but little from normal in consistence or colour, the facial hue may be dusky and injected or of a sallow tone, the abdominal symptoms ill-defined, the continuity of the fever chart may be interrupted by remissions or even an occasional intermission;

these will probably not concur in the same case, but even so, what, so far as I can perceive, in spite of all these omissions of clinical details, marks out enteric fever from other forms, tropical or otherwise, are the gradual progress from health to malaise, an intermediate period of prolonged pyrexia beyond what any other form of equal severity would reach, and the prolonged convalescence. In South Africa in 1877-78 sore throat was a common accompaniment of the early period of the enteric cases, and in the *Blue Book* for 1878, in Malta it is stated that "in a few cases diphtheritic symptoms were present, in some of them well marked diphtheritic membranes were observed on the tonsils, and after death along the course of the intestinal canal covering in many instances the ulcers; the same was observed in one fatal case occurring in Cyprus." The extreme clinical deviations are however only seen in those exceptional instances of so-called "walking disease" in which the subsequent results show that the individual has been about his usual occupation while the disease has been evolving in his frame. A soldier may come to hospital with hæmorrhage from his bowels, or he may be struck down with head symptoms and coma, or peritonitis or lung complication may be the prominent symptom, he dies and the post-mortem reveals the peculiar intestinal lesion well advanced; here the virus has pursued its usual structural phases in the body unattended by those symptoms generally present, and for which the sick man seeks relief, until this sudden irruption of a complication reveals the hitherto hidden working of disease action. Such cases are not special to any one country.

In the small intestines we find a lesion which as far as we know (and experience does but confirm it) is peculiar to enteric fever. The catarrhal inflammation, although dependent for its existence on the special process in evolution, is found in other diseases local and general; disease in Peyer's glands* does

* These gland patches, the extremities of the lymphatic system in the intestines spread out for absorption and akin in function to the soft spongioles at the extremities of plant roots, have been found ulcerated in scarlatina, diarrhœa, enteritis, cholera, acute lung disease; more frequently in chronic diseases and notably in lung destructive lesions. Out of 88 carefully recorded fatal cases of chronic disease in the service (excluding lung destruction), 28½ years the average age but ranging between 17½ and 44, Peyer's glands were noted as diseased in 8 per cent. of these, and as atrophied and obliterated in 13 per cent. The abnormal condition was generally ulceration be the systemic derangement syphilis or malaria, chronic disease of liver or kidney; in syphilis pigmental degeneration was noted. At the age of 22½ they were completely atrophied with syphilis, at 17½ atrophied with profound malarial lesions in liver and spleen, and at 25 atrophy was far from uncommon; on the other hand at 44, with syphilis, the glands were still mature, and at 35 also, with cirrhotic liver. At 33 and 35, with syphilis, the glands were present but diseased. With chronic disease atrophy is the more frequent sequel, and this was common in cases of starvation among natives of India in the famine 1876-7; but the above facts show an age variability with disease as pronounced as in health. With chronic lung disease lesion in these glands is very common, ranging from mere enlargement to ulceration with thickened edges from cheesy material, and accompanied by catarrhal inflammation of the mucous membrane; substitute chronic for acute, and the phases in phthisis and enteric fever have much in common, in the intestine and in the mesenteric glands. Malaria is often associated with atrophy, and in two instances while the upper glands are noted as atrophied the lower were ulcerated.

not discriminate, nor does ulceration, be the condition what it may with which it is associated, or be it followed by the sequelæ of peritonitis, perforation, or hæmorrhage. Let us enter here into details. The changes in the solitary and agminated glands appear similar. We find the disease in Peyer's patches varying in the degree to which the morbid process has extended, and in the number implicated, generally not exceeding 10; and in size and degree of morbid change the maximum is conspicuous at the ilio-cæcal valve and both decrease upwards, the earliest phase being present in the uppermost patch. As a rule the entire gland substance of each patch is implicated, but in one instance the upper patch was only partially diseased, one half of it presenting a marked contrast to the other half, the thinned pitted substance of the upper half, evidently from previous atrophy, being not amenable to the disease cause. The diseased tissue is elevated above the intestinal surface, thickened to several times the normal gland amount, it projects into the gut and not uncommonly overlaps the gland edge from profuse growth; its surface is uniformly flattened, or possibly umbilicated in centre, or furrowed here and there from coalescence of original masses; it is tawny or dark brown in colour, firm, granular to the touch; it has much the aspect before destruction commences of a brownish sessile fungus in which rapid and exuberant development has caused the edges to overlap the site from which it springs. Highly congested vessels are seen in the vicinity, not only in the mucous membrane but in the deeper coats, and these are observed to be continuous with similar vessels in the portion of

L

mesentery corresponding to the patch and leading to the corresponding mesenteric glands. I have met with no fatal case before the 11th day of the fever, and in this instance the uppermost patch presented the appearance of firm, pinkish, beaded, semi-translucent structures closely packed side by side—individual vesicles enlarged—overlying a congested base; the patches lower down presented the features of maturity above detailed, while the lowermost patch had commenced to break up. Following the maturation of the diseased gland structure is the phase of retrogression and exfoliation, by the breaking away of portions successively from the enteric mass until the whole is separated, and the excavation remains as an ulcer or open sore. The process is essentially one of sloughing*—a breaking away of a distinct portion "en masse" as compared to the gradual molecular disintegration known as ulceration, and terminates only with the complete removal of the diseased elements; the excavation left has for its base actually, or all but bared, muscular fibre, or possibly merely cellular tissue and the peritoneal coat, its circumference is the cellular boundary of the original gland limit. In the ulcer no disease products beyond that of inflammation are present in the walls, and no extension follows from the special cause; often the coats are separable for some little distance beyond, as is seen by the passing of a probe and by submergence in water when the mucous or muscular will float from the others; but with the

* This seems to me to be the rule in all decidedly severe cases and in all the fatal cases I have met, but it does not follow that the elimination in the mild and moderate cases is also necessarily so produced.

separation of the necrotic gland mass destruction as a rule ends and repair sets in, the open sore cicatrizes, its edges smooth off, the surface skims over, and a thin fibro-cellular tissue takes the place of the former gland site, the healed surface indicating indelibly the extent of the extinguished disease action. As far as my observation goes, the process of destruction commences in the patch nearest the ileo-cæcal valve and gradually implicates one after another from below upwards. In this respect the retrogressive changes are in unison with the development process.* This destructive period is the one when what may be termed the accidental complications occur in the garb of hæmorrhage or perforation; in separation of the dead elements the lumen of a vessel may be laid bare and more or less blood escape into the intestine,† and after separation the thin base may not have sufficient mechanical strength or vitality for the part it has to play in maintaining the calibre of the gut intact; it may give way towards the centre and

* In health also, these lowest glands are structurally more conspicuous; in advancing atrophy they are the last to disappear; and in other diseases, (notably lung destruction), they are in unison with enteric details on these points.

† In one instance of fatal hæmorrhage the source was in the uppermost patch of disease. The man had passed with impunity all anterior diseased processes. The lowest patch was healing, edges of ulcer bevelled off, smooth and glistening, rapidly cicatrizing, the intermediate ones were progressing thereto and healthy in aspect, in the upper patch a small fragment of dead tissue was in the centre of the ulcer, and to this and the excavated rough surface small blood clots were adherent, but careful search failed to expose the vessel in fault; the man died on the 29th day from the commencement of fever.

one or more apertures be formed, which allow the contents of the gut to escape into the peritoneal cavity and set up inflammatory action. The more common process of perforation seems to consist of molecular disintegration of the thin tissues from deficient vitality leaving small smooth-edged apertures, but this does not exclude actual mechanical rupture, or sloughing of the whole calibre of the gut "en masse" passing away with the excreta. This accident of perforation would be more common than it is if nature did not by prior local lymph deposition thicken the peritoneal coat externally, and by glueing give the weak tissues the support of contiguous structures.

The building-up process in sequence to an introduced stimulus is the essence of the change in the intestinal glands of Peyer; at maturity the vitality of the diseased material is at an end—the initiating force in setting the abnormal process in operation and maintaining it has expended itself—it retrogresses, and is supposed to be removed into the body by absorption in the mild cases, or cast out into the intestine by ulceration or as necrotic sloughs in the more severe, time being an essential element: the earliest made post-mortem observations in enteric fever have shown this gland lesion in progress. So far as the textures of the body are concerned, enteric fever is in the first instance essentially a glandular disease, and the lesion in these structures is specific in the intestine*

* Indirectly the special character of the intestinal lesion receives strong support from the hospital records of lesions present with paludal and simple continued fevers, and famine results in natives of India. Whatever bearing these numerous observa-

and probably also in the mesentery, if not in the lungs; on the other hand the other lesions throughout the body, although dependent for their existence in the individual case on the enteric cause, yet, as far as we can elucidate them, are not special to enteric fever, but may be conjoined with other disease causes and other diseases specific or not.

If now we ask what assistance the microscope gives to the naked-eye details, we find as follows.—

That the blood undergoes changes very early in the disease is evidenced by the symptoms present, even if such changes evade our recognition. In some instances, soon after the febrile onset, the white corpuscles were numerous, somewhat smaller than usual, they were remarkably active throwing out numerous amœba-like projections in all directions, and this activity lasted for at least three hours after the blood was placed on the slide; in the liquor san-

tions have on the prevalence of enteric fever among natives, they show most conclusively that this glandular lesion of the small intestine is no outcome of the paludal poison, no necessary accompaniment of intermittent, remittent, or other fevers common in adult natives of India. Occasionally examples are met with, and this fact of exceptional occurrence in itself shows how distinct and peculiar this lesion is from the lesions of other febrile states. And no less pointing in the same direction are those cases where the clinical details approximate those of enteric fever, *e.g.*, occasionally septic poisoning, trichinosis, and the "Cornwall" outbreak referred to a parasitic worm by Mr. Power, recognized as a Pelodera nematode by Dr. Bastian. Other disease entities derived from outside may clinically simulate the enteric virus, may cause functional derangements closely resembling it, but not the less clear is it that they cannot originate the peculiar glandular lesion; for this the enteric cause alone avails.

guinis were very numerous, minute, but well-defined spherical homogeneous masses, as of albumen, but showing no movement even when kept for hours. In some instances too the red ones (or at least corpuscles not to be distinguished when quiescent from red) showed a similar tendency, throwing out projections sometimes conical, sometimes flask-shapen, and other times very irregular as to contour; with the throwing out of amœba-like processes the corpuscle became thinned out and lighter in hue, and then generally a spherical point or points (1 to 6) could be discerned in the interior very similar to the free masses in the liquor sanguinis; the process thrown out did not carry any colouring matter with it. This movement lasted for at least two hours, the processes projecting and retracting; all corpuscles did not show this activity, and this individualized action opposed any suggestion of the change being dependent on osmotic force or some altered condition of the blood after drawing. After this change had gone on some time it was very difficult to say which were red and which were white corpuscles. With reference to rod shaped bacteroid or fungus forms, I cannot say that, in spite of numerous examinations both in cases in Europe and India, I have observed them as constantly present, but occasional only. That organic forms may be present in the enteric blood during life, not met with in health, seems proven; but how far, or in what way, they are connected with the origin or evolution of the disease is for the future to elucidate.*

* The bacterium theory is of German origin. In the Blue book report of Hygiene, 1871, we read:—"Professors Coze and Feltz assert that in the blood of septicæmia, typhoid fevers,

The naked eye and microscopic features of the blood indicate that the function of arterialization is imperfectly carried out, that the red corpuscular formation is arrested and the white forms are in excess, that numerous globular particles which may be corpuscular lymph elements or disease entities (possibly bacterium germs) appear; that during the later stage of the disease the solid constituents decrease, fibrillation is imperfect and there is a tendency of the fibrine to deposit in the vessels and to break up after deposition, the colouring matter escapes into the serum; a decided tendency to retrogressive changes is observed which has led in a few instances to gas formation

and pueperal fever, there is present a linked or chained bacterium (B. Catenula), and they believe that the growth of these bacteria is the efficient cause of these diseases." Later on a fungus has been stated to be the cause, but negatived; and judging from some of the observations recorded at the International Medical Congress of 1881, and annotations in professional literature and periodicals since, the tendency to link the disease with a bacterium form has not decreased. Maragliano's observations (*Lancet* Oct. 28th 1882) of minute organisms analogous to micrococci in the blood generally, and rod-shaped ones in the blood of the spleen, appear to be the latest; the former however are much in accord with my own observations. Many of the enteric data certainly suggest an introduced organic atom evolving and developing in the frame. If however a causal connexion be established what a field of enquiry is opened up,—the natural history of the organism, the influence of surrounding conditions to modify it and the induced disease, its exact relation to the disease process, its original or present dependence or otherwise on the diseased body upon which would turn markedly the possibility or otherwise of eradicating enteric fever, the possible origin of cases independent of a former case, the possibility of modifying or preventing enteric full development by inoculating with artificial fluid, and other points hardly less important, in the vessels during life, and is shown by early putrefaction after death: in sum the evidence points to the existence of a something opposed to the vitality of the higher structures in the blood and the proper performance of the blood functions, though what that something is has hitherto escaped our grasp.

With reference to the lymphatic elements in Peyer's glands or glands of mesentery or lung, as far as my observations go, the elements present in the diseased tissue cannot be differentiated from those normally present except on the point of quantity; they are closely packed together and form a mass far beyond ordinary limits, but I think the number is extremely limited (if any exist) of those who could say, from microscopic inspection of a slide, the diseased condition of the body from which the section was taken, be the cause of the enlargement of the gland tissues what it may. When the diseased structure is breaking up then granular matter, fat particles, fibre debris, possibly pus corpuscles, are added to the disorganized gland elements, but I cannot say that I have recognized any outside forms in the garb of fungi, or other living organisms. As regards the other organs, the secretions or excreta, there does not appear any possibility of our demonstrating by our present aids—microscopic or chemical—additional exceptional elements above those present in health or other diseased states not enteric. I believe that "the granular albumenoid degeneration of the cells of the whole body" is invariably present in all the tissues in severe cases of enteric fever, and goes far to explain the marked derangements of function in several viscera which are not elucidated by divergent aspects from health recognizable by the naked-eye; this however is not a minute textural change solely observed in enteric fever.

Such may be stated to be the usual pathological sequence of events in enteric fever, but there are divergencies from it. Relapses are occasional, and the fact that these are often more severe than the original attack, which is apparently always mild, seems to offer an explanation. For a true recrudescence of the disease there must be gland elements not originally affected; or not destroyed and susceptible of re-inoculation; and it is clear that the first influencing of the system by the virus has not produced a complete immunity against a repetition as usual. The so-termed "walking cases" have been already referred to, and so far as the virus evolution is concerned have we not analogous cases in those exceptional instances of small pox and measles where with well-defined eruption we have but slight fever and constitutional disturbance? Again, in the opposite direction there are cases (noted by Dr. Budd) in which the individual suffers only from "malaise," and yet is capable of transferring the disease to another if the facts be in accordance with the statement. Here we get the systemic infection but no sequential glandular lesion, and an explanation is wanting. The smallness of the dose hardly suffices in view of our knowledge of mild cases in the outbreaks all bearing the enteric stamp and so recognized. Can the abortive result to the person be due to a prior attack, or the absence of gland structures from age or prior atrophy—no nidus for the virus to germinate in? It seems that here too we have analogies in the exanthemata. I may be wrong in my deduction, but I have seen cases which I believe to have been modifications of the same disease in individuals exposed one and all to the same source—small-pox modified by vaccination, as follows:—(1), malaise with marked systemic depression and acute lumbar pain; (2), these with febrile disturbance and an exanthematous eruption; (3), the same with a papular eruption; (4), the same with a vesicular eruption; (5), the same with well-pronounced small-pox pustules. In an outbreak of measles I observed in individuals, brought in contact with cases, examples of malaise, systemic disturbance, and peculiar breath smell, but no sequential eruption, and these in children and adults who had had the disease previously. Assuming that enteric fever can be so modified, the fact has an important bearing in tracing out causation and transfer of the germ from one to another in unrecognized ways; it is also important as showing a transfer of the virus independent of the intestinal excreta medium.

We thus find that the enteric virus may be expressed as (*a*) mere malaise, (*b*) mild case, (*c*) moderate, (*d*) severe—degrees of the same disease, all apparently capable of transferring it to another. The cause is supposed to multiply in the intestinal glands, but in the malaise case no such development can go on, and here it would seem that the original germ must pass from the human medium to another unmodified, or if germination did ensue after reception it must have occurred elsewhere in the body. And in the mild cases with supposed absorption of diseased products from the intestinal glands into the blood, the disease germs must find their way back again into the excreta from the blood by some other source than the solitary glands, or they must pass from the body in some other way than the intestinal discharges. Again, enteric fever is a structural disease in the sense that for the full development of it the existence of Peyer's patches, as a matrix, in a mature state is necessary. But the question arises, important pathologically and ætiologically, do the solitary glands atrophy equally as Peyer's patches, and if they do not (which seems so), and the disease be specific in them as in Peyer's patches, what influence has the virus on an individual whose Peyer's glands are atrophied but whose solitary glands are mature, he not having previously suffered from the disease? It seems to be doubtful as to what the correct answer is, but there are a few instances recorded of implication of the solitary glands alone when the enteric cause was present in the community; and I have myself seen two examples of disease which suggested that the cause had followed this limited outlet when the Peyer outlet was not available, these examples being diagnosed as enteric during life and abdominal symptoms (even hæmorrhage) well marked, yet the post-mortem showing atrophy of Peyer's, severe implication of solitary glands, with splenic and lung complication. Again, can an individual who has suffered once severely suffer again in a modified form in the solitary glands, can an individual whose glands are not destroyed by a former attack repeat the lesion?

Let us endeavour to obtain some idea of the mutual bearing of the pyrexia, and special intestinal lesion, to the cause.

(1). Is the pyrexia proportionate to the extent and degree of the intestinal gland lesion, or, in other words, can we gauge the internal disease by the thermometer? The answer is, I believe, no. In those occasional cases in which the individual "keeps about" with the lesion in progress in his intestine, it is apparent that the febrile disturbance must be slight if at all. Cases occur in which the fever and early systemic disturbance run very high and the symptoms point to marked severity of the attack, yet about the 14th day (or even before) the abdominal symptoms have gone, and it is clear that the usual destructive phases in the glands in severe cases have not been passed through. Again, cases occur in which the thermometric chart is never high throughout, but the attack proves fatal about the middle of the disease from general exhaustion, and the post-mortem reveals very extensive lesions in the gut; such cases appear to be far from uncommon in India. It would appear that increase of body heat arises with the structural changes set in operation by the virus, and that this may be modified (in occasional cases never arising or only late in the disease) or intensified beyond what is usually present as a general manifestation of the internal changes by individual peculiarities and probably constitutional changes due to climate. The indications are, that when the elevation of the body heat commences the diseased action in the glands of the intestine has advanced sufficiently to become in itself a local cause of systemic disturbance, of catarrhal inflammation of the surrounding mucous membrane and accompanying diarrhœa. Apparently in causing the pyrexia of the first week or ten days we have :—(*a*) the special gland lesion in the intestine, (*b*) the accompanying catarrhal inflammation of mucous membrane of gut, and possibly lesions in other viscera, and (*c*) the individual constitution already undermined by the virus, varying in the degree to which it sympathizes through its nervous system in disease processes in progress. The pyrexia would appear to be an exponent less of the extent and degree of the gland lesion than of the impressionability and sympathy of the system to the progressing changes. Hence it would be a reasonable deduction that the frame easily impressed by the local changes would be the frame equally ready to disproportionally express outwardly the internal virus, and so the prior malaise and the subsequent pyrexia may be found proportional to each other though not in ratio to the amount of virus in the system ; and in practice the cases with severity of early symptoms do not necessarily develop a long and dangerous illness with later complications, but not uncommonly abort ; on the other hand, some of the worst cases are those in which the general early symptoms are mild. Upon the whole, it seems that the younger the individual the more pronounced will be the pyrexia and general symptoms, and the less the possibility of gauging the gland lesion by the temperature chart. High pyrexia is in itself a dangerous element, especially in view of the granular degeneration of the tissue elements with which it is associated, but underlying this fever is the glandular lesion, and it is necessary to bear in mind that the extent and degree of this more important local change may find no corresponding exposition in the record of the thermometer; the connecting link is the sympathetic system, but its reactive power varies in individuals as to temperament, age, and body status.

(2). Is the intestinal gland lesion an accurate exponent of the virus, or, in other words, can we arrange enteric fever cases in ratios of poisoning by the extent, amount, and degree of specific change in the agminated glands? This would seem to be the rule, the dose of virus shown by the degree and extent of diseased action from the valve upwards. But there are two or three examples I have met with in which the brain symptoms in the early period of the pyrexia were very pronounced and apparently due to severe blood poisoning, yet the pyrexia was not unduly or correspondingly high, and after death the amount of diseased action (not its degree which was marked) was small, not more than five or six patches implicated, and few as compared to other more advanced cases with higher pyrexia. To refer the fatal result to the high body temperature was unwarrantable, but in these instances it seemed either that the system was intensely susceptible and so succumbed rapidly to a comparatively moderate dose of the virus when pyrexia was superadded, or that the virus was intense but did not find an outlet and exponent in the intestinal lesion. The latter appeared the more probable, for the reason that in all the cases the uppermost Peyer's patches were atrophied, in fact the structural nidus for disease development was limited. It would seem that in enteric fever, as in the eruptive fevers generally, the system is freed from the virus by the local changes set in operation, be they in the skin, mucous membranes, or glands; in action it expends its force so far as the affected individual is concerned; and hence in the present mentioned exceptional cases, the inference was that the nidus for the germ to develop in being limited in amount, the virus unduly impressed the brain centre leading to annihilation of function. Such cases would be analogous to indifferently developed or suppressed eruptions in the exanthemata, the stress falling upon the viscera, especially the nerve centres.

The pathological evidence points to an introduced special disease agent, successively unfolding its working in consecutive structural changes in the viscera, and in definite time periods.

Its Treatment.

We have two objects in view—to restore health, and prevent danger to others. In the first we have to be guided by (1) the nature of the disease and the pathological indications of the particular dangers of its stages, (2) the condition of the individual (age, constitution, period of disease) and especial symptoms, (3) empirical knowledge of what has been found of advantage; and in the second by what experience and pathology teaches of the modes in which the disease cause leaves the body, the media through which it acts, the conditions of its existence apart from the body, and the receptivity of individuals to the cause. We may arrange the details under the headings of medicinal, dietetic and hygienic treatment.

As to the nature of the disease, the conclusion arrived at is that it is due to a specific cause; but whether so or not, there is the fact, apart from all theory, that it is made up of stages of sequential evolution embracing a definite time period, and that it presents different degrees of intensity. During the first half we have symptoms referable to the cause in the system and the structural phases it originates—primary; during the second half symptoms referable to changes in the structural lesions—secondary. Again, we have no known antidote, we cannot prevent the evolution of the cause or cut short its stages, hence we have to guide the individual through the necessary disease cycle with the least injury to the system; and we may do much in limiting the range of disease action to that which is essential and the sympathetic systemic disturbance.

Medicinal.—In the early stage attempts have been made to curtail the pyrexia, or to moderate the disease degree, by quinine in large doses to ʒss. or more in the 24 hours. Should there be any malarial element, suspected only or clearly manifested by the character of the fever, the importance of reducing this to inertness is manifest, and the potency of one or two large doses of quinine to effect this is unquestionable. It may be assumed that quinine has no influence on the virus, it does not prevent the sequential phases, nor does it lessen their degree; but granting this, is this drug useless, has it no influence in modifying symptoms? It appears to have a sedative action on the vascular system and brain, and in large doses the thermometer not only does not mark so high an ascent of the body heat, but the morning remission is more marked and prolonged—the advance from it to the diurnal exacerbation is put back to some hour nearer midday or perhaps after. It is not easy to explain the difference of opinion in England and India on the value of this drug in enteric fever; its use is comparatively general in the latter, not to be traced wholly to the greater ague element, as its power is certainly not limited to such complication. Possibly however the depressed vital stamina of Europeans in the tropics from the unnatural heat and climatic causes (shown in marked weakness of circulation, tendency to perspiration and irregularity of thermometric course above that common to the disease in Europe), allows of the conservative influences of quinine being demonstrated to a degree not usual at home. Its action in opposing retrogressive metamorphoses and the development of low organic forms—bacteria—has been shown. Provided no special symptoms intervene, and it does not cause stomach derangement, the plan of giving some 15 grs. in the 24 hours for successive days is decidedly advantageous in the tropics.

The gland lesion is in progress, and can we modify it to the advantage of the patient? Mercury appears capable of so acting, although the rationale of the process is not clear. Disturbance of the biliary function in the first days of pyrexia is far from uncommon, sometimes associated with stomach irritability to a degree which calls for relief; and so far as my experience goes (seen also in other diseases), I know nothing so purely sedative on these viscera under these conditions as one or two large doses of calomel (gr. v to viij) combined with a little chalk or bicarbonate of soda. Cases appear to be lessened in severity, and the gland lesion more frequently to abort, under its continued administration in small doses, though it may be objected to as bearing on the drug influence that such cases were naturally moderate only. Its influence for good is limited to the period of development—first ten days of pyrexia; the younger the individual the more potent its impress, and it is I think best given in the form of calomel (gr. j or ij) with ipecac. (gr. $\frac{1}{3}$) and James's powder (gr. $\frac{1}{2}$) two or three times in the day. It is contra-indicated in excessive diarrhœa, extra valuable in constipation ; it acts also as a sedative on the vascular system and assists the excretory organs, and so far is clearly advantageous. It requires always to be given carefully, especially in the tropics, and not carried to the extent of bringing the system under its influence.

The bowel flux is an important point, three stools in twenty-four hours may be regarded as moderate ; its main cause lies in the catarrhal inflammation of the mucous membrane of the gut. In excess of moderate it tends to exhaust the system by draining away fluid, salts, and nutritive material ; limitation is indicated if the discharges be profuse. So far as the bowel flux is concerned, there is a wide difference between restricting the formation of it in the intestine and preventing the extrusion of it by the natural way. It does not follow that because stools are formed they must necessarily be ejected, as is shown by the accumulation seen in post-mortem examinations, or because no stools are passed that consequently none have been formed. As a rule we have very liquid stools very early in the disease, prone to decomposition and gaseous evolution ; by retaining these alkaline offensive stools in the gut we add to the abdominal symptoms of flatulence, distension, meteorism; and considering the condition in which the intestine is, undue expansion of its weakened and diseased coats can hardly be viewed with advantage; besides, we run the chance of lighting up old dysenteric disease in the large intestine by prolonged contact of such material. If the discharges be formed it is far better that they should be early removed; and if we had any drug which, while removing them, would also act as a sedative upon the mucous membrane, its administration would answer two good purposes, but apparently we do not possess such a medicine.

The indication is to limit the formation of the stools by allaying the catarrhal inflammation, and for this purpose Bismuth stands prominent. It acts as a direct sedative on the mucous membrane of throat, stomach, and intestines, and in the second place only comes the Pulv: Cretæ: co: simply or cum Opio; these, combined with a few drops of ol: anethi, seem to all but invariably exert a marked beneficial influence on all the alimentary canal symptoms during the first stage. The administration of acids or astringents, mineral or vegetable, alone or combined, for the bowel flux and abdominal symptoms in the early period, appears to be of questionable utility. So far as the dilute hydrochloric acid is concerned it stands on a better footing, as being better tolerated, more agreeable, and in small doses possibly assisting the stomach digestion; but its influence in checking the bowel flux, even in large doses, appears small, while its asserted power in curtailing the disease itself may be dismissed. Stronger mineral astringents are (as far as my experience goes) not well tolerated, flatulence is often complained of and abdominal pain or tension not lessened; their sedative influence seems small, and their action in the diminution of the intestinal excreta is one in which the other viscera share, and so far any local advantage seems considerably neutralized.*

It is possible that the intestinal flux may be so great as to require arrest at all hazards, and to this end potent astringents may be necessary; but it certainly has always seemed to me, that in the majority of cases, for moderating the discharges, we have means equally efficacious and less questionable in their influence in other ways. Lime water, especially conjoined with milk, may be of advantage, and so may be the exhibition of small doses of carbolic acid. We may, if necessary, fall back upon enemata of starch and opium; and the application to the abdomen externally of turpentine, from time to time sprinkled on flannel, retained in position by a flannel bandage tolerably firmly applied so as to exert uniform pressure and give mechanical support, not only is beneficial as a counter-irritant but also as tending

* Objections against their use in the first half may not apply to the last half of the disease; at first we have to do with a cause in process of evolution, and necessarily attended by retrograde metamorphoses of the tissues which add to the systemic depression and require to be eliminated, and hence so far as medicines tend to curtail the excretory functions of the viscera, so far they do harm generally in the first stage, even if they should have a local influence and an advantage to one symptom. What we gain on one point, we seem to accomplish by a corresponding loss on other points, with a doubtful result to the ystem generally.

to prevent the formation and accumulation of flatus. Hence then, so far as the bowel flux in this stage is concerned, if moderate in frequency and quantity it does not seem advisable to interfere; but should the stools tend to excess, then to use those drugs which have a local sedative action, and not to employ astringents unless circumstances compel us.

The pyrexia generally is a marked feature, and be the rationale of it what it may, waste of tissue and vital force accompany it. For its existence body material or nerve force must be used up, hence emaciation and brain exhaustion; and consequent upon it effete products are increased in the system, with a corresponding call on the excretory organs for their removal as an additional element of danger. Heat itself interferes with the functions of some of the viscera, especially the heart and brain; it is accompanied by a degenerative process in all the tissues, and if extreme the blood solids may separate from the fluids. Under every aspect this symptom is one which demands careful watching by the thermometer always. When pyrexia has once arisen there is no suppression of it until the disease has run its course; a quotum of it is due to the local lesions in progress, and to prevent this seems beyond our means; we may decrease the sum total of body heat by abstracting part as formed, but the possibility of keeping it within any given point of the thermometer may be questioned. Provided the pyrexia be moderate I do not think that we do much good in attacking it by powerful external means;* we had better attempt to

* What constitutes moderation may be debateable ground, but in enteric fever anything over 101° F. in the morning, or

retain it within this range by internal remedies which have a double influence.

We may have enteric fever fatal with only a moderate pyrexia throughout, and we may have the temperature declining from day to day to death; but if the body heat be so great as to form an element of danger through blood coagulation, brain oppression or exhaustion of the vital power, then to rapidly reduce it becomes of paramount importance. For reduction of pyrexia we have internal remedies—diaphoretics generally, cold drinks, quinine, aconite, digitalis, salicilate of soda or quinine, alcohol—and external application of cold—by water generally applied (sponging, packing, bath), by ice, douches or through evaporation; in the tropics too we may assist through the reduction of the atmospheric heat by punkahs, wet tatties, etc. The influence of some of these as common fever mixtures, cold drinks and ordinary sponging, are limited; quinine has been already noted; in

104° during the 24 hours, becomes a decidedly serious matter if continued in the tropics. There are however several points for consideration, whether the morning remission be marked or the high temperature retained throughout the 24 hours, whether continued from day to day or accidental only; the influence of heat on the body varies considerably, both in individuals and also in respect to the disease itself, prior condition of body, stage reached, &c.; and hence the condition of the patient and presence or otherwise of other symptoms do much to influence our conclusion. It is hardly necessary to remark that in paroxysmal fevers we may have the temperature running up to a point in the 24 hours which would all but certainly forbode a fatal result in enteric fever; the continuity of the pyrexia during the day and from day to day, varying only within a small range, is the serious point, far more so than a high point rapidly attained and probably as rapidly receded from.

aconite in small repeated doses we undoubtedly possess a powerful drug, yet its action on the heart is not uncommonly that of a depressant and in enteric fever the weakness of the organ is a notable feature; in digitalis on the other hand we have a drug which, in addition to its anti-thermic properties, by its power of moderating and strengthening the action of the heart, by its sedative action generally, and by its diuretic effects, is of great value; it is however less rapid in its action than aconite, and is more useful for continuous treatment than to effect a quick result; of the salicic acid salts my experience is limited, but within that limit not favourable; of alcohol notice will be subsequently taken. In the application of cool water to the skin we have a mode of reducing the body heat capable of modification in way and degree, local or general, sudden or gradual, in accordance with the object we have in view. Sponging of the body with tepid water occasionally repeated is agreeable and tends to keep the surface clean and pores of skin open even if its influence on the temperature chart be barely, if at all, perceptible; but if, and especially in tropical climates, with the addition of the punkah, we bring the temperature of the water down to a point which "feels chilly," if we apply it freely and frequently (say every ¼ or ½ hour) over the whole surface, not wiping it off, and cover the patient over lightly, we have a mode which, in addition to the above advantages, may influence the chart to 1 or 2 degrees. With the wet cold sheet and packing we may gradually but markedly reduce the surface heat and promote action of the skin without much inconvenience or exertion to the patient, and its application is within the scope of an ordinary attendant. By immersion in the bath, commencing with the water at the body heat and gradually lowering it 20° or more, or at a low point at once—say 80° or 70° F.—and keeping the body immersed from 5 to 15 minutes according to the result, we may abstract heat rapidly possibly to 3° or even a little more, and the renewal of the original pyrexial point may be postponed for a time. Yet carry out the bath details as carefully as we may a certain amount of discomfort, physical and mental disturbance, cannot be avoided; it is difficult to prevent the patient attempting to exert himself, and the younger the patient is the more the disturbance, and these are points worthy of consideration. In the means we use we must be guided by the object we have in view, the condition of the patient, the disease degree and disease stage, remembering that in enteric fever the pyrexia is not the sole item for our consideration. With the bath symptoms of prostration may rapidly follow or a depressing influence on the heart's action; the patient requires to be carefully handled in removal to and fro, carefully placed and supported in it, the effects registered and bad results warded off; it is a process which requires a skilled and trained official and attendants. By the application of cooled water in any way a tendency to skin action is given and the system generally is soothed, and if we continue the process the morning decline in the temperature chart becomes more marked—an impetus to a remittent type is set going. By pouring a stream of cold water on the head we may rouse the brain to action when stupor or coma are suggested or in progress, and by the continued application of cold to the head by ice, iced water, or evaporating lotions assisted by fan or punkah we may reduce delirium, quiet abnormal brain function and promote sleep. The pyrexia is a symptom that requires to be met in the way most advantageous to other symptoms, and it is impossible to lay down stringent rules as to the mode; external applications are more efficacious in proportion to the mildness of the abdominal symptoms. It is with the severe cases that the pyrexial difficulties centre, and with these it seems better to commence with internal remedies and sponging, and supplement these with packing or the bath as circumstances necessitate; in all cases being satisfied, so far as the external applications are concerned, with the reduction of the body heat within a probably safe range, say 101° F., and especially if we can keep it within that limit throughout the 24 hours. Comparatively speaking the pyrexia does not often kill, but it may assist the virus thereto, and any immoderate degree requires to be combated.

The frequency and variability of pulse, indicative of weakness of the heart's action, require consideration and marked attention in the tropics especially. The closest approach to perfect quietness of body and mind is very desirable, both *per se* and also on account of the influence which the opposite conditions have on the circulatory system. By cooling the atmosphere and body surface, soothing the senses, we may do something, also by the reduction of other symptoms, for all tend to react on the heart and brain; but the most powerful drug that we possess for the circulation is I believe digitalis, given in doses from 10 to 15 minims every three or four hours in conjunction with diaphoretics or quinine. In alcohol too we possess a power.

Headache, delirium, partly due to virus and partly to pyrexia, but conjoined always with brain weakness, may be partially met by the means we use for the reduction of the pyrexia, and the local application of cold may assist; but here again digitalis becomes useful, and if tremor be marked alcohol may advantageously be resorted to. Another symptom usually accompanying these is the want of sleep, and what helps to remove this will generally moderate the other nerve symptoms also. This is a point constantly complained of, it is a feature especially marked in the tropics, more particularly if the case occur during the hot weather. Towards producing sleep and so recuperating the exhausted frame, or at least preventing this being added to, we may do something by our general measures and lessening disturbance on call to stool by reducing the diarrhœa, but these rarely suffice and something more special is wanted. In severe cases the brain is already markedly oppressed, and opium by itself is contra-indicated from its narcotic effects and influence on the excretory functions in the first stage; but these may be modified by combination, and in Dover's powder we seem to possess such a preparation, which has also a good point (apparently from the ipecacuanha it contains) in its influence on the mucous membranes generally. The bromide of potassium appears to have no deleterious sequence, nor does henbane, which again may be combined with chloral with advantage. Even if we cannot obtain sleep without some disadvantage accompanying the mode in which we produce it, it is probably less harmful in the long run to use some one or other drug, than to allow the exhausting effects of "no rest" to continue night after night. What will act in one case or at one stage may not act in another; and if there be much tremor or delirium, very often the addition of ℥ss of brandy will produce what the drugs alone will not do.

Hence then, in the first stage of enteric fever we have to meet general and local symptoms due to the evolution of the cause. The mild and moderate cases may be left to themselves therapeutically, so long as no marked stress is thrown upon any one viscus, or any especial symptoms demand relief; but such cases require always careful watching, as the external signs cannot always be relied on to express the extent and degree of the special internal lesions in progress. But in the severe cases we have to secure (as far as may be) rest of body and mind, restoration of excretory functions generally, modification of the glandular evolution, relief of excess of diarrhœa, reduction of the pyrexia within safe limits, to allay brain symptoms, strengthen and quiet the circulatory system, moderate abdominal symptoms. The death tendency is through stupor and coma, high temperature, or general failure of the vital powers with no dominant stress on any one system or viscus; and our attempts must be directed to prevent the onset of these conditions, as the possibility of meeting them successfully when pronounced, is but small in Europeans in the tropics.

In the second stage we have to concern ourselves all but wholly with severe cases, and with retrogressive and destructive phases in the gland textures of the small gut.

The diarrhœa probably continues, but the conditions with which it is locally associated are different—with casting off necrotic gland elements ending in large ulcerated patches, with intestinal coats weakened especially at the excavated spots, with congestion of the mucous membrane often intense and widespread. At this stage too the sedative action of bismuth may be of advantage, but now (and especially if the stools be copious or frequent) the value of the mineral acids is undoubted. The sulphuric acid is especially useful, and often combines well with the dilute nitric acid and opium. And here the use of enemas is often conspicuous, starch and opium combined if necessary with tannic or gallic acid; by these we leave the stomach free for nutritive absorption. The external use of turpentine seems quite as beneficial in this stage also, especially if there be much tympanitic distension of the abdomen and pain; firm uniform support in the shape of a flannel bandage can hardly be otherwise than of advantage to the weakened intestines.

Great tissue waste, possibly due to more or less septic element in the blood, is going on, and quinine in moderate doses, with acids, is probably the best and most powerful drug we possess; it and opium are our sheet-anchors in the "typhoid state."

The profuse exhausting perspirations not uncommonly require controlling; they appear to be an index of the cerebral and circulatory weakness in this stage, to increase with septic indications, and to be assisted often by the tropical heat. Coolness of atmosphere, drying and wiping of surface, quinine, acids, especially the acid: sulphuric aromat: in combination with small doses of liq: opii sed:, suggest themselves. In the pyrexia of this stage there is a greater tendency to remission than in the first half of the disease with gland lesion advance, and this may be augmented by drugs and means already stated. The causes of abnormal body heat now seem to be,—retrogressive changes in the gut with associated vascularity, effete products in the blood, and complications. The exhibition of alcohol now more clearly suggests itself for the pyrexia, perspirations and prostration.

We may meet the pulmonary complication by counter-irritants, it may be necessary to give medicines specially bearing on it, but if it be moderate only it seems more advantageous to pursue a general plan leaving the local lesion to outward means; we may endeavour to prevent congestion by movement of the patient's body from one side to the other and so oppose blood stasis from dependent position.

We may now use opium for obtaining sleep to a degree not safe in the first stage, and by the exhibition of it may assist the diarrhœa and other symptoms.

Swelling of the abdomen, from gaseous distension of the intestines, becomes a point not only of discomfort but sometimes of danger from the upward pressure on the enfeebled heart; and not only so, but considering the weakness of the intestinal coats and the presence of ulcers with structurally and physiologically weak bases, stretching cannot but be deleterious. We may limit this gas formation by decreasing the discharge from which it originates by astringents, by the administration of charcoal by the mouth, and what has seemed to me of advantage the giving of turpentine in doses of m : v to x on sugar, and the use of enemas containing assafœtida and opium may help ; but when accumulated to a serious extent the gas must be allowed to escape by the careful introduction of a long tube. If it be connected with much fæcal accumulation the removal of the excreta by a bland or turpentine enema is indicated.

Hæmorrhage from the bowel, in connexion with separation of slough (be the degree of it what it may), is always an anxious symptom, especially if accompanied by reduction of temperature and indications of collapse, even should the amount actually passed be small; and the arrest of it or its limitation is what we have to aim at. Its source is generally the exposed vessel of an excavating patch, though it is quite possible that in a less degree it may be derived from an intensely congested mucous membrane. It is not easy to understand how styptic medicines can operate in these cases except in very large doses. Yet in view of the danger, acetate of lead, gallic acid, turpentine, may be administered by mouth or by enema, and ergotine may be injected subcutaneously; ice too by the mouth may be used and uniform pressure exerted over abdomen. The most valuable drug however is unquestionably opium, given with a view of arresting peristaltic action, by the mouth or as an enema.

Among the other accidental complications are ; (1) collapse with separation of large sloughs including a portion of the intestine beyond the diseased patch, and close to the valve; and (2) peritonitis without or with perforation. In these the indications are the same; to stop the movements of the intestines so as to secure local rest, prevent escape of gut contents, and allow of adhesions to neighbouring parts, and here again opium is the mainstay; we must limit the intestinal contents, give nutriment in a small bulk, and apply such external applications as turpentine, from time to time, with outward mechanical support by a bandage, if it can be borne. Peritonitis of a conservative tendency, thickening the base of the ulcer or adhering it for support to neighbouring tissues, is probably more common than is usually supposed; but in its dangerous aspect it may arise from escape of fæcal material into the serous cavity, mesenteric gland suppuration, splenic rupture or abscess. In all the accidental complications, of such fatal import, we may endeavour to reduce the chances of their occurrence by opposing those conditions which may assist in their production; great care in the quality and quantity of the food, care against abdominal muscular exertions, the reduction of the amount of the intestinal discharges and with these the lessening of the peristaltic action, the reduction of distension from inside by gas, and attempting to limit the destructive process in the gut, stand forward as important precautionary points.

Should pronounced symptoms of septic poisoning set in with marked delirium or tendency to coma, with gas formation in the blood or urinary suppression, I do not know that there are any special points to pursue apart from what suggest themselves in other diseases and beyond what has been already stated.

In the later period it is important to guard against the formation of bed-sores, and here great cleanliness, smoothness and elasticity of the bed, frequent changing of position, taking off pressure over bony prominences by surrounding pads, washing of the skin locally by lotions of diluted alcohol, alum or corrosive sublimate, support by plasters on leather, are important. Prevention is the great desideratum, for if a bed sore be formed the ensuing exhaustion is great, and chances of blood poisoning increased; moreover with such a condition the probabilities are increased of subsequent lung destruction, tubercular infection of system, and lardaceous changes in the viscera.

We have particularly to bear in mind, that in the last half conservation of the vital force is all important; we have to guard against exhaustion, septic poisoning as illustrated through the "typhoid state," coma and uræmia, and against accidental complications of hæmorrhage, peritonitis and collapse; in the tropics we have also to contend against the prior depressed vitality from climate and heat, and against the depressing effects of heat at the time should the case occur during the hot season.

With convalescence we have to meet a body markedly emaciated, debilitated, and anæmic; a brain weakened functionally and requiring a long period to regain its normal tone, a heart enfeebled in action, easily excited and depressed, a spleen not uncommonly enlarged especially in tropical countries and an oft cause of prolonged blood poverty, an intestine structurally and functionally deteriorated with marked local structural weakness. For these a period of rest from work (may be for months), is essential, removal from the climate if it be debilitating (and a sea voyage seems very advantageous), great care in food, great care in not overtaxing any viscus in the means we employ with a view to health restoration; and among medicines, blood and nerve tonics, iron and the phosphates, suggest themselves, and careful attention, but not over stimulation, if torpid, of the bowels is a marked point. By care during this period, and especially by removal from the plains in the hot weather in the tropics, and bracing up the frame, we may hope to ward off the sequelæ which occasionally follow at different subsequent periods. There is one, blood coagulation in the veins with œdema, which may occur with convalescence; but for this active treatment is rarely required, gentle friction, stimulation, and mechanical support, with attention to position of part in relation to circulation, usually suffice; as regards the others they have to be met as they arise.

Dietetic.—During the first period of the disease there is an instinctive antipathy to food as solid or even as thickened fluid, as much as a natural craving for water, the colder the better, to assuage the thirst and replace the fluids used up by the abnormal heat. Nutriment in a usable shape is required to meet the tissue waste and to maintain the vitality of the body through and beyond the period ordinarily occupied by the disease in its sequential evolutionary phases. Digestion speaking generally, taste and smell, for a large part of this disease, are very limited indeed. We may give nitrogenous solutions in the shape of beef-tea, broths, meat juices, milk; the former salted, and the latter diluted with water, will probably pass into the system and be there utilized; and these with water iced or cooled, ærated drinks, lime juice as lemonade, or acidulated drinks (*e.g.* very diluted hydrochloric acid which may assist the stomach digestion of meat elements), seem to meet all the requirements of mild, moderate, and many severe cases. Good nursing is all important, and the administration of proper nutriment, properly prepared, in small quantity at frequent but regular intervals of time, is one of the chief essentials. As regards quantity, I doubt if an ordinary adult will dispose of more than the soluble material extracted from 1½ lbs. of good lean beef or meat, and 1½ or 2 pints of milk, in the 24 hours; and even to such an amount as this, how often it is in excess of the natural inclination. A complaint is not uncommonly made that the beef-tea increases the bowel flux, but it has seemed to me that frequently it is the largeness of the amount given at one time, and not the nutriment itself which is at fault; the excess passing quickly from the stomach into the intestines, and as rapidly almost passed through and ejected as stools. A minor but important point is the cleansing and moistening of the mouth before giving nutriment, and to this end a weak solution of carbolic acid or chlorate of potash is here advantageous. As the case advances eggs may be added to the milk, and later on farinaceous substances as arrowroot, corn flour, or thoroughly softened and beaten up bread. We have especially to guard against irritating or indigestible materials, anything which will lead to gaseous formation; and caution is required in the addition of starchy and vegetable flours. The stools will often indicate how far digestion of such is really effected, and if they show the presence of the material in them we may be certain that in giving them we are answering no good end; better refrain than run the risk of gaseous distension or rendering the stools bulky. And even when convalescence has set in, there is still the necessity of continued caution; the mucous membrane of the small intestines has been for a long period under disease action, the lymphatics have been especially implicated, the coats generally have been weakened, and large parts are defective in stability; hence the necessity for a food supply nutritive but easily absorbed, free from all hard substances, not leaving much residue, and not taken in large quantities at a time. A gradual "feeling of the way" is essential, and it seems well to let all nutriment for the major part of the illness be of an animal kind.

And here it is necessary to introduce the question of alcohol in its double capacity as a drug and as a food, and practically in the severe cases as mild and moderate ones do quite well without it. Many of the individuals we have to deal with have been in the habit of taking alcohol (some freely) in one or other shape, so that it has not acted as a prophylactic, nor is there any evidence to show that it has lessened the impress of the cause on the system; while there is strong reason to conclude that if it has been freely taken, it assists the disease cause in its tendency to deterioration and death. Prior use of it to anything beyond decided moderation deadens its stimulating properties, and so the anticipated results from it under disease may be considerably modified by prior habits. The most potent results during disease will follow prior abstinence. Enteric fever is markedly asthenic, with much tissue metamorphosis and impaired function of brain and heart; alcohol is primarily a stimulant of these organs, reduction of frequency and increased force of the pulse, sleep, diminution of delirium and pyrexia, may ensue on its use; it is conservative so far as tissue change goes; but it is usually followed by a corresponding depression of function of the organs generally, and so it is double edged. Viewing it as a food it has the advantage of easy and rapid passage into the system with no deposit, but it cannot wholly take the place of other nourishment; and is it even partially a good way of introducing sustenance in enteric fever? Again as regards the stage of the disease, is its property of opposing changes constructive or destructive, of reducing excreta, advantageous in a disease cause pursuing a necessary evolution and attended by both phases in sequence, and in which a reduction of the excreta is usually associated with increase of impress of cause on the system? and what is its probable influence locally on the glandular Peyer's growth, on the inflamed mucous membrane, on the sloughing mass or healing ulcer, provided it accumulate in the blood or provided it pass rapidly on into the intestines with other nutriment administered at the same time and so become directly applied to the diseased structures, for if drugs have a local influence why not it also?

I think that we may dispose of the food question by saying that we have at our command more natural nutriment as easily introduced, as useful, and without ulterior bad results ; but its medicinal properties (and surely in disease this aspect is paramount) are not so easily disposed of. We have drugs capable of producing most of the advantageous properties of alcohol in enteric fever without any of its bad influence ; yet it may be said that in none of them do we possess such a combination of qualities, in so agreeable a form, so constantly at hand and so easily administered, and opinions of weighty observers are widely divergent as to its actual or asserted value in practice. If however it be given it seems well to use Brandy, in as pure a form as possible and in known potency. It is not easy to perceive any advantage to be gained in administering it continuously in the first stage in the majority of cases, yet should the nervous tremor be marked and the delirium active, should the brain show signs of failure of function, should the heart's action be frequent and weak—the pulse beats running into each other, the timely exhibition of an occasional dose of alcohol in combination with some other drug or with fluid food may avert worse results ; nay, good may follow. In the last half of the disease when retrogressive changes are very marked, the vital powers low, and conservation of force very necessary, the continued use of alcohol has more to commend it than in the first half. It is impossible to lay down any strict rule; the stage of the disease, the especial tendency, the age, constitution, condition, and previous habits, the particular object, all have to be considered ; but certainly the evidence tends to the view that the cases of enteric fever to be benefited by *continuous* exhibition of alcohol are limited in number. The condition in which it especially suggests itself is the typhoid state; then 6 or 8 ozs. of alcohol, freely diluted, given with drugs or with liquid nourishment, and continued from day to day, may be valuable. Personally speaking it appears better to employ nutriment and medicines for continuous use, and to keep alcohol in reserve for exceptional cases and exceptional states,—when there is a tendency of the vital powers to run low, or to produce a particular result, or to make a sudden call on the brain or heart, or to conserve the body against septic influences and rapid disintegrative processes; and on these points to be guided not by any particular dose but by the results we effect, and to give it in accordance with the object we have in view, concentrated or diluted, with medicines or food, as we desire a rapid sudden action or a more prolonged influence, and always in the form of good Brandy, refraining as soon as the object is attained.

Hygienic.—This heading resolves itself into surrounding the patient with good sanitation and prevention of the transfer of the disease. The former includes abundance of breathing space, ventilation, cleanliness of the body surface and room, frequent changing of bed-clothes, early removal of all excretions, removal of obstacles to air movements, placing of bed away from wall and corners, removal of carpets and absorbent materials, use of disinfectants, punkahs and fans for atmospheric circulation in hot climates, limitation of attendants in room to those that are essential, placing of bed pan or receptacle outside until wanted.

Among the measures to be adopted for preventing others contracting it (and the possibility of such is acknowledged) comes the question in hospitals of segregation, and the answer depends much upon the size and nature of the wards at our disposal and the facilities for carrying out what is required for the enteric patient without disadvantage to others. Not only is it necessary to consider the bearing of enteric disease on other patients but the influence of other patients on the enteric case. If we are in a warm or tropical climate with no necessity for door and window closure, if our wards be large and airy allowing a current of fresh air on both sides of the bed at will, and good distance between beds, then the chance of communicability may be set aside; but can these be further supplemented by reduction of light and the peace and quietness that the enteric case requires, will the presence of other patients not oppose these points? on the other hand will not the enteric delirium disturb others, and may not the free atmospheric movements possibly operate to their disadvantage? If these points can be decided in a satisfactory manner there seems no especial reason for segregation, but if there be any doubt at all, better to act on the doubt and isolate the cases. The necessity of having thoroughly competent trustworthy nurses, day and night, is apparent where so much of the result depends on the nursing and carrying out instructions, and these may be selected from the ages beyond the susceptible period of life, or among those who have already suffered. By thorough cleanliness, the use of non-absorbent often changed clothes, and care in the disposal of these, we may prevent the nurse acting as a medium of transfer. But we must go back beyond the period when the case is recognized. To separate the clothes previously worn, disinfect them, expose them to a high dry heat if possible for germ destruction or at least to free atmospheric movements, to wash them, disinfect the room unoccupied for a time, to disinfect the latrine shutting it off from use for a time if possible, these are points which suggest themselves, nor can they be regarded as superfluous. And in the washing of the clothes (equally applicable to those used and soiled during the case) it is well that they should be previously steeped in a disinfecting solution, washed apart and with plenty of water, well soaped and cleansed, and either boiled or exposed to heat and air before being put away ; the fouled water certainly should not be passed into drains or cesspits, or poured broadcast irrespective of soakage or near wells, or allowed to be subsequently used, better to spread it over ground at a distance and in connexion with growing crops or bury it. The cases among the women and children should not be treated in barrack quarters, with the absence of proper supervision over the stools, etc.; these are opportunities for disease transferrence probably overlooked. To remove them to a female hospital or ward for strict sanitation, to carry out the measures above detailed in their quarters, are as essential in the one case as the other. But unfortunately our power over the stools passed in barracks before the case comes under our charge is very small, if any at all; so too in the mild cases, the early period at least of women and children cases, and the products of post-mortem examinations; in unrecognized cases absolutely nil; and these are undoubtedly flaws in our sanitary armour view it as we will.

As regards the receptacles of the stools we may keep them for the case itself, expose them well to the air when not wanted, thoroughly clean and disinfect them each time, place a disinfectant at the bottom before use ; we may cover the stool as soon as passed with more disinfectants and dry earth, remove it at once and dispose of it without delay, not mixing it with other stools but burying it if possible ; perhaps the best disinfectants we can use are the chloride of zinc and carbolic acid. That by the means commonly adopted we temporarily disinfect the dejecta, and as a rule prevent infection to the individuals employed in the case, cannot be questioned ; but can we say that we have rendered them harmless in the future, and in a state to be passed into a latrine, sewer, or filth cart, with consequent commingling with other ordure and discharge in river or sea, or use as manure, for this after all is the point ? We know that the stools are infectious, that a small quantity suffices to infect many, that each case produces probably from 1 to 2 pints at least in the 24 hours and for several continuous days ; to destroy the contained cause the material we use must be very potent, caustic and thoroughly devitalizing in its effects, and in proportion to the stools ; by thoroughly saturating the dejecta we possibly can do it, but to the extent and way we usually apply agents I must admit that I am highly sceptical as to the result. And if we do not destroy the disease cause it is evident that we run the risk of continuing the disease on from one generation to another, from one corps to a succeeding corps in a station, in spite of all our sanitary measures and good systems of conservancy. We see enteric fever continued on from year to year in the civil communities, and the same disease forms an important item in the yearly mortality of most stations among the military segment at home and abroad; do not these facts indicate a neglect, or something very defective in the system or the working of details to oppose transference of the disease stated by the highest sanitary authority (Parkes) to be "easily preventible"? and in the face of these facts it is well to consider the subject afresh in order to elucidate the existent flaw on the assumption that our view as to source of disease cause is correct.

Heat applied to a boiling point is the only certain way to ensure germ destruction; and considering the importance of eradicating this formidable disease, the question arises why cannot this agent be also applied to the excreta as to the clothes? why should the means found undeniably potent to render other media harmless be brought to bear on the fountain head and main source of the cause supply? What is there to prevent temporary disinfection of the stools by the ordinary way, and once in the 24 hours the application of heat to a boiling point, an earthen or metal pot being used? The subject is one only of details, and where we have individuals collected in hospitals much difficulty in carrying it out ought not to be experienced. Take for example England with all its advance in civilization and acquired knowledge, and we read of 20,000 dying annually and 140,000 incapacitated by illness from this disease as the practical outcome of the means used for extirpating it; and much as is done in the military community at home and abroad, in a degree I believe generally wanting in civil life, there yet remains much before we can truly say that we have cut off all possibility of lineal
cent of enteric fever in our stations.

INDEX.

Printed by H. K. Lewis, 136 Gower Street, London, W.C.

CATALOGUE
OF
MEDICAL, DENTAL, PHARMACEUTICAL
AND
SCIENTIFIC PUBLICATIONS,

PUBLISHED BY

P. BLAKISTON, SON & CO.,

(SUCCESSORS TO LINDSAY & BLAKISTON)

1012 WALNUT STREET,

PHILADELPHIA.

These publications may be had through Booksellers in all the principal cities of the United States and Canada, or any book will be sent, postpaid, by the publisher, upon receipt of price, or will be forwarded by express C. O. D. upon receiving a remittance of 25 per cent. of the amount ordered to cover express charges.

Philadelphia, April 1st, 1883.

Mr. Presley Blakiston having on January 1st, 1882, purchased all the interest of the late firm of Lindsay & Blakiston will continue the publication and sale of MEDICAL AND SCIENTIFIC BOOKS at No. 1012 Walnut Street, Philadelphia, having associated with him his son, Kenneth M. Blakiston, and Frank W. Robinson, under the firm-name of

P. BLAKISTON, SON & CO.

MEDICAL, DENTAL, SCIENTIFIC

AND

PHARMACEUTICAL BOOKS

PUBLISHED BY

P. BLAKISTON, SON & CO. PHILADELPHIA.

☞Any book in this catalogue can be had from or through booksellers in the principal cities in the United States, or will be forwarded free, by mail or express, upon receipt of the price by the publisher.

AMERICAN HEALTH PRIMERS.

Edited by W. W. KEEN, M.D. Complete in 12 volumes, handsomely bound. Price, in cloth binding, 50 cents; paper covers, 30 cents.

I. **Hearing and How to Keep It.** With illustrations. By CHAS. H. BURNETT, M.D.

II. **Long Life, and How to Reach It.** By J. G. RICHARDSON, M.D.

III. **The Summer and Its Diseases.** By JAS. C. WILSON, M.D.

IV. **Eyesight, and How to Care for It.** With illustrations. By GEORGE C. HARLAN, M.D.

V. **The Throat and the Voice.** With illustrations. By J. SOLIS COHEN, M.D.

VI. **The Winter and Its Dangers.** By HAMILTON OSGOOD, M.D.

VII. **The Mouth and the Teeth.** With illustrations. By J. W. WHITE, M.D., D.D.S.

VIII. **Brain Work and Overwork.** By H. C. WOOD, JR., M.D.

IX. **Our Homes.** With illustrations. By HENRY HARTSHORNE, M.D.

X. **The Skin in Health and Disease.** By L. D. BULKLEY, M.D.

XI. **Sea Air and Sea Bathing.** By JOHN H. PACKARD, M.D.

XII. **School and Industrial Hygiene.** By D. L. LINCOLN, M.D.

"In their practical teachings, learning, and sound sense, these volumes are worthy of all the compliments they have received. They teach what every man and woman should know, and yet what nine-tenths of the intelligent class are ignorant of, or at best, have but a smattering knowledge of."—*Chicago Inter-Ocean.*

"These handbooks of practical suggestion deserve hearty commendation. They are prepared by men whose professional competence is beyond question, and for the most part, by those who have made the subject treated the specific study of their lives."—*New York Sun.*

AMERICAN PSYCHOLOGICAL JOURNAL.

Issued by the National Association for the Protection of the Insane and Prevention of Insanity. Edited by JOSEPH PARRISH, M.D.

Single numbers 50 cents; per annum, $2.00

ACTON, THE REPRODUCTIVE ORGANS.

The Functions and Disorders of the Reproductive Organs in Childhood, Youth, Adult Age and Advanced Life, considered in their Physiological, Social and Moral Relations. By WILLIAM ACTON, M.D., M.R.C.S. Sixth Edition. 8vo. Cloth, $2.00

"In the work now before us, all essential detail upon its subject matter is clearly and scientifically given. We recommend it accordingly, as meeting a necessary requisition of the day, refusing to join in that opinion which regards the consideration of the topics in question as beyond the duties of the medical practitioner."—*The London Lancet.*

"On the subjects of Impotence and Spermatorrhœa, those bugbears of so many weak and foolish persons, and sources of inexhaustible wealth to the quack fraternity, Mr. Acton discourses with good sense, and indignantly exposes the nefarious tricks of the scoundrels who, on the pretence of curing a disease which often exists only in imagination, extract enormous sums from their unwary victims. He seems to regard the spermatorrhœa-phobia, as we may term it, to be a species of monomania; but he judiciously advises that to a patient laboring under this form of mental malady, the tone adopted should be one of sympathy and attention; and that by the employment of appropriate moral and therapeutical means, a healthy and hopeful tone of mind be restored.—*The Medical Times.*

AGNEW, ON THE PERINEUM AND FISTULA.

Lacerations of the Female Perineum and Vesico-vaginal Fistula. Their History and Treatment. With many Illustrations. By D. HAYES AGNEW, M.D., Professor of Surgery, University of Pennsylvania. 8vo. Cloth, Price $1.25

So many applications having been made for these papers, as originally issued, the author has thought best, after a thorough revision, to place them before the profession in book form.

ALLEN, COMMERCIAL ORGANIC ANALYSIS.

An Introduction to the Practice of Commercial Organic Analysis. By ALFRED H. ALLEN, F.C.S. Vol. I. Cyanogen Compounds, Alcohols and their Derivatives, Phenols, Acids, etc. 8vo. Price $3.50

Vol. II now ready. 8vo. Price $5.00

Being a treatise on the Properties, Analytical Examination, and Modes of Assaying the various Organic Chemicals and Preparations employed in the Arts, Manufactures, Medicine, etc.

ALLAN, FEVER NURSING.

Notes on Fever Nursing. Addressed to nurses in hospital and private life. By JAMES W. ALLAN, M.D. 12mo. Illustrated. Price .75

ALLINGHAM, DISEASES OF THE RECTUM. Illustrated.

Fistula, Hæmorrhoids, Painful Ulcer, Stricture, Prolapsus, and other Diseases of the Rectum, their Diagnosis and Treatment. By WILLIAM ALLINGHAM, F.R.C.S. Fourth Edition, enlarged. Price, Paper covers, .75; Cloth, $1.25

London Edition, thick paper and larger type, $2.00.

"He is in charge of the only hospital in the world (St. Marks) devoted exclusively to diseases of the rectum, and he is recognized, both in this country and in Europe, as the highest authority upon diseases of this class."—*Louisville Medical Herald.*

"No book on this special subject can at all approach Mr. Allingham's in precision, clearness and practical good sense."—*London Medical Times and Gazette.*

"This book has always been a great favorite, and deservedly so. It is practical in tone and character, magisterial in its teaching, and valuable in showing operative results. It is by an author who, as an authority, has no superior."—*Gaillard's Medical Journal.*

"It is, as indeed the verdict of the profession has already pronounced it, one of the very best works on Diseases of the Rectum."—*American Journal of Medical Science.*

ALTHAUS, MEDICAL ELECTRICITY.

A Treatise on Medical Electricity, Theoretical and Practical, and its Use in the Treatment of Paralysis, Neuralgia, and other Diseases. By JULIUS ALTHAUS, M.D. Third Edition, Enlarged. 246 Illustrations. 8vo. Price $6.00

In revising this new edition the author has carefully brought each section up with the latest knowledge of the subject.

ANSTIE, STIMULANTS AND NARCOTICS.

With special researches on the Action of Alcohol, Ether and Chloroform on the Vital Organism. By FRANCIS E. ANSTIE, M.D. 8vo. Price $3.00

"He is an original worker and independent thinker. His opinions and conclusions are valuable, and cannot be neglected."—*American Medical Journal.*

ATTHILL, DISEASES OF WOMEN.

Clinical Lectures on Diseases Peculiar to Women. By LOMBE ATTHILL, M.D. 5th edition, revised and enlarged, with numerous illustrations. 12mo. Cloth. Price $1.25

"It is the concentrated essence of the knowledge of one who has become wise by reason of long and well-digested experience in the subjects treated."—*American Journal of Medical Science.*

"The work is one of great value to the general practitioner."—*American Journal of Obstetrics.*

AVELING, POSTURE IN OPERATIONS.

The Influence of Posture on Women in Gynecic and other Operations. By J. H. AVELING, M.D. Illustrated. 8vo. Price $2.00

A subject which hitherto has received but little attention is here treated in a very thorough manner, showing the importance of certain postures, and the various diseases produced by awkward and unhealthy positions.

BALFOUR, ON THE HEART AND AORTA.

Clinical Lectures on Diseases of the Heart and Aorta. By G. W. BALFOUR, M.D. Illustrated. 2d Edition. Price $5.00

"The whole work reflects much credit on its author, and firmly establishes his reputation as an authority on the important diseases of which he treats."—*London Practitioner.*

BARTH AND ROGER, AUSCULTATION AND PERCUSSION.

A Manual for the Student. By M. BARTH and M. HENRI ROGER. Translated from the 6th French Edition. 12mo. Price $1.00

BIBLE HYGIENE;

Or, Health Hints. By a Physician. This book has been written, first, to impart in a popular and condensed form the elements of Hygiene; second, to show how varied and important are the Health Hints contained in the Bible, and third, to prove that the secondary tendency of modern Philosophy runs in a parallel direction with the primary light of the Bible. 12mo. Paper, .50; Cloth, $1.00

"The scientific treatment of the subject is quite abreast of the present day, and is so clear and free from unnecessary technicalities that readers of all classes may peruse it with satisfaction and advantage."—*Edinburgh Medical Journal.*

BIDDLE, MATERIA MEDICA. Ninth Edition.

(*Contains all the changes in the Sixth Revision of the New Pharmacopœia.*)

Materia Medica. For the Use of Students and Physicians. By the late PROF. JOHN B. BIDDLE, M.D., Professor of Materia Medica in Jefferson Medical College, Philadelphia. The Ninth Edition, thoroughly revised, and in many parts rewritten, by his son, CLEMENT BIDDLE, M.D., Assistant Surgeon, U. S. Navy, assisted by HENRY MORRIS, M.D. Containing all the additions and changes made in the last revision of the United States Pharmacopœia. The Botanical portions have been curtailed or left out, and the other sections, on the Physiological action of Drugs, greatly enlarged. Octavo.

Cloth, $4.00; Leather, $4.75

"The additions are valuable, and we must congratulate the author upon having improved what was already so useful a work, both to the student and physician."—*Phila. Medical and Surgical Reporter.*

"It has been the design of the author to present in his work a text-book for the student. It is brief, and yet sufficiently comprehensive. His style is clear and yet succinct. He covers the ground—covers it well, and cumbers his work with nothing superfluous."—*Atlanta Medical and Surgical Journal.*

"One thing that particularly recommends this work to the student is, that the book is not so large as to discourage and cause him to feel that it is impossible for him to get over it and so much else in the short time before him."—*St. Louis Medical and Surgical Journal.*

"It contains, in a condensed form, all that is valuable in materia medica, and furnishes the medical student with a complete manual on this subject."—*Canada Lancet.*

BREWING, DISTILLING, ETC.

The Brewer, Distiller and Wine Manufacturer; a Handbook for all interested in the Manufacture and Trade of Alcohol and its Compounds. Edited by John Gardner, Fellow of the Chemical Society of London. Illustrated. Cloth, $1.75

SYNOPSIS OF CONTENTS.—Alcohol, its Preparations, etc.; Alcoholometry; Brewing and Beers; Varieties of Malt Liquors; Malt; Raw Grain; Sugar; Hops; Arrangement of a Brewery; Different Processes; Chemical Changes during Washing, Boiling, Cooling, Fermentation, etc., etc.; Storing and Clarifying, Porters, Ales; Analysis of Beers, Ciders, Perry, Mum; Liquors and Cordials, giving over 80 preparations. Other sources of Spirituous Liquors; Distillation of Alcoholic Liquors, including Rums, Brandies, Whiskies, Gins, etc.; Wine and Wine Making; Tests for Adulterations; Remarks on the Cultivation of Grapes, etc.; Imitation of Wines.

BLOXAM. CHEMISTRY, Inorganic and Organic. Fifth Edition.

With Experiments. By CHARLES L. BLOXAM, Professor of Chemistry in King's College, London, and in the Department for Artillery Studies, Woolwich. Fifth edition. With nearly 300 Engravings. Cloth, $4.00; Leather, $5.00

A most complete Text-Book for Schools and Colleges.

"Professor Bloxam has given us a most excellent and useful practical treatise. His 666 pages (now 700) are crowded with facts and experiments, nearly all well chosen, and many quite new, even to scientific men . . . It is astonishing how much information he often conveys in a few paragraphs. We might quote fifty instances of this."—*Chemical News.*

BLOXAM. LABORATORY TEACHING. Fourth Edition.

Progressive Exercises in Practical Chemistry. By CHARLES L. BLOXAM, Professor of Chemistry in King's College, London, etc. Fourth edition. With 89 engravings. 12mo. Price $1.75

This work is intended for use in the Chemical Laboratory, by those who are commencing the study of Practical Chemistry. It contains:—

1. A series of simple Tables for the analysis of unknown substances of all kinds. 2. A brief description of all the practically important single substances likely to be met with in ordinary analysis. 3. Simple directions and illustrations relating to Chemical Manipulation. 4. A system of Tables for the detection of unknown substances with the aid of the Blowpipe. 5. Short instructions upon the purchase and preparation of the tests intended for those who have not access to a Laboratory.

"A great amount of valuable practical information is here condensed into a book of 260 pages, such as only a practical teacher could prepare."—*New England Journal of Education.*

BRUEN. PHYSICAL DIAGNOSIS.

A Pocket Book of Physical Diagnosis, for Physicians and Students. By EDWARD T. BRUEN, M.D., Asst. Prof. of Clinical Medicine, University of Penn'a. Illustrated by Original Wood Engravings. 12mo. Extra Cloth. Price $2.00

BENNETT. NUTRITION IN HEALTH AND DISEASE.

A Contribution to Hygiene and Clinical Medicine. By J. HENRY BENNETT, M.D. Third Edition, Revised and Enlarged. Cloth. Price $2.50

BY SAME AUTHOR.

THE TREATMENT OF PULMONARY CONSUMPTION BY HYGIENE, CLIMATE AND MEDICINE.

With an Appendix on the Sanitaria of the United States, Switzerland and the Balearic Islands. Third Edition much Enlarged. Price $2.50

"Any physician may take it up with every feeling of confidence that the views enunciated by the author will be found to be able, honest and orthodox."—*Medico-Chirurgical Review.*

BERKART, ASTHMA.

The Pathology and Treatment of Asthma. By JOSEPH B. BERKART, M.D. 8vo. Price $2.50

BEALE ON SLIGHT AILMENTS. New Edition. Just Ready.

Slight Ailments, Their Nature and Treatment. By LIONEL S. BEALE, M.D., F.R.S., Professor of Practice, King's Medical College, London. Second Edition. Enlarged and Illustrated. Price, Cloth, $1.25; Paper covers, .75 cents.
Fine Edition, Heavy Paper. Extra Cloth, Price $1.75

OUTLINE OF CONTENTS.

Introductory. The Tongue in Health and Slight Ailments. Appetite. Nausea. Thirst. Hunger. Indigestion, its Nature and Treatment. Constipation, its Treatment. Diarrhœa. Vertigo. Giddiness. Biliousness. Sick Headache. Neuralgia. Rheumatism. The Feverish and Inflammatory State. Of the Actual Changes in Fever and Inflammation. Common Forms of Slight Inflammation, etc., etc.

"We venture to say that among the numerous medical publications issued during 1880, there has been none which will prove more useful to the young general practitioner, for whom it is really intended, than this volume, while the time of the older physician might be much more unprofitably spent."—*American Journal of Medical Science*

BY SAME AUTHOR.

ON LIFE AND VITAL ACTION IN HEALTH AND DISEASE.

12mo. Price $2.00

THE USE OF THE MICROSCOPE IN PRACTICAL MEDICINE.

For Students and Practitioners, with full directions for examining the various secretions, etc., in the Microscope. Fourth Edition. 500 Illustrations. Much enlarged. 8vo. Price $7.50

"We have before us Prof. BEALE's work, *The Microscope in Medicine*, a book which it gives us pleasure to recommend to every student of microscopy, whether he be a physician or naturalist."—*Journal of the Franklin Institute, Philadelphia.*

"As a microscopical observer, and a histological manipulator, his (Dr. BEALE) skill and eminence are generally conceded."—*Popular Science Monthly.*

HOW TO WORK WITH THE MICROSCOPE.

A Complete Manual of Microscopical Manipulation, containing a full description of many new processes of investigation, with directions for examining objects under the highest powers, and for taking photographs of microscopic objects. Fifth Edition. Containing over 400 Illustrations, many of them colored. Octavo. Price $7.50

"The Encyclopædic character of this last edition of Dr. BEALE's well known work on the *Microscope* renders it impossible to present an abstract of its contents; suffice it to say, that anything in his department upon which the physican can desire such information will be found here, and much more in addition. It is, moreover, a storehouse of facts, most valuable to the physician, and is indispensable to every one who uses the microscope."—*American Journal of Medical Science.*

BIOPLASM.

A Contribution to the Physiology of Life, or an Introduction to the Study of Physiology and Medicine, for Students. With numerous Illustrations.
Price $2.25

PROTOPLASM; or MATTER AND LIFE.

Third Edition, very much enlarged. Nearly 350 pages. Sixteen Colored Plates. Part I. DISSENTIENT. Part II. DEMONSTRATIVE. Part III. SUGGESTIVE. One volume. Price $3.00

LIFE THEORIES; Their Influence upon Religious Thought.

Six Colored Plates. Price $2.00

ONE HUNDRED URINARY DEPOSITS,

On two sheets, for the Hospital, Laboratory, or Surgery. Each Sheet $1.00, or on Rollers, Price $1.25

BERNAY, CHEMISTRY.

Notes for Students in Chemistry. Compiled from Fowne's and other manuals. By ALBERT J. BERNAY, PH.D. Sixth Edition. 12mo. Price $1.25

BENTLEY'S STUDENTS' BOTANY.

The Students' Guide to Structural and Physiological Botany. By PROFESSOR ROBERT BENTLEY. Illustrated by nearly 500 Wood Engravings.
In Preparation.

BEASLEY. THE BOOK OF PRESCRIPTIONS.

Containing over 3100 Prescriptions, collected from the Practice of the most Eminent Physicians and Surgeons—English, French and American; a Compendious History of the Materia Medica, Lists of the Doses of all Officinal and Established Preparations, and an Index of Diseases and their Remedies. By HENRY BEASLEY. Sixth Edition, Revised and Enlarged. Price

BY SAME AUTHOR.

THE DRUGGIST'S GENERAL RECEIPT-BOOK.

Comprising a copious Veterinary Formulary; numerous Recipes in Patent and Proprietary Medicines, Druggists' Nostrums, etc.; Perfumery and Cosmetics; Beverages, Dietetic Articles and Condiments; Trade Chemicals, Scientific Processes, and an Appendix of Useful Tables. Eighth Edition. Price $2.25

THE POCKET FORMULARY and Synopsis of the British and Foreign Pharmacopœias.

Comprising Standard and Approved Formulæ for the Preparations and Compounds Employed in Medical Practice. Tenth Edition. 511 pp. 18mo. Price $2.25

BENTLEY AND TRIMEN'S MEDICINAL PLANTS.

A New Illustrated Work, containing full botanical descriptions, with an account of the properties and uses of the principal plants employed in medicine, especial attention being paid to those which are officinal in the British and United States Pharmacopœias. The plants which supply food and substances required by the sick and convalescent are also included. By R. BENTLEY, F.R.S., Professor of Botany, King's College, London, and H. TRIMEN, M.B., F.H.S., Department of Botany, British Museum. Each species illustrated by a colored plate drawn from nature. In Forty-two parts. Eight colored plates in each part.

Price $2 each, or handsomely bound in 4 volumes, Half Morocco, $90.00

"It would be impossible to enumerate all the new plants that are here delineated. The result is a work which, from all points of view, is a credit to the scientific literature of the day."—*London Lancet.*

"It is an indispensable work of reference to every one interested in pharmaceutical Botany."—*London Pharmaceutical Journal.*

"This work may be recommended as a most useful one to druggists, and all who desire to be familiar with the Botany of Medicinal Plants."—*Druggists' Circular.*

"The work when complete (it is now complete) will be the most valuable compend of Medical Botany ever published."—*Boston Journal of Chemistry.*

BRUBAKER, PHYSIOLOGY.

A Compend of Physiology specially adapted for the use of Students and Physicians. "No. 4, ?Quiz-Compend Series?" 12mo, Cloth. Price $1.00

"Dr. Brubaker deserves the hearty thanks of medical students for his Compend of Physiology. He has arranged the fundamental and practical principles of the science in a particularly inviting and accessible manner. I have already introduced the work to my class."—*Maurice N. Miller, M.D., Demonstrator of Physiology, Medical Department University of the City of New York.*

BYFORD. DISEASES OF WOMEN. New Revised Edition.

The Practice of Medicine and Surgery, as applied to the Diseases of Women. By W. H. BYFORD, A.M., M.D., Professor of Obstetrics and The Diseases of Women and Children, in the Chicago Medical College. Third Edition. Revised and Enlarged, much of it rewritten, with numerous additional illustrations.

Price, in Cloth $5.00; Leather, $6.00

"The treatise is as complete a one as the present state of our science will admit of being written. We commend it to the diligent study of every practitioner and student, as a work calculated to inculcate sound principles and lead to enlightened practice.—*New York Medical Record.*

"The author is an experienced writer, an able teacher in his department, and has embodied in the present work the results of a wide field of practical observation. We have not had time to read its pages critically, but freely commend it to all our readers, as one of the most valuable practical works issued from the American press."—*Chicago Medical Examiner.*

BY SAME AUTHOR.

ON THE UTERUS. The Chronic Inflammation and Displacement of the Unimpregnated Uterus.

An Enlarged Edition, with Illustrations. 8vo. Price $2.50

"A good book from a good man."—*American Journal Medical Science.*

"It is a sensible, practical work, and cannot fail to be read with interest and profit."—*Boston Medical and Surgical Journal.*

BRAUNE, TOPOGRAPHICAL ANATOMY.

An Atlas of Topographical Anatomy. Thirty-four Full-page Plates, Photographed on Stone, from Plane Sections of Frozen Bodies, with many other illustrations. By WILHELM BRAUNE, Professor of Anatomy at Leipzig. Translated and Edited by EDWARD BELLAMY, F.R.C.S., Lecturer on Anatomy, Charing Cross Hospital, London. Quarto. Price, Cloth, $8.00 ; Half Morocco, $10.00

"As a whole the work cannot fail to meet with a hearty reception by every progressive student of the human body. To the surgeon it is a contribution to the study of topographical anatomy which needs to be known to be properly appreciated. To such practitioners who reside in large cities, where anatomy can be studied upon the cadaver, it will afford a valuable aid, while to those who are without such means of study it is an almost indispensable addition to a working library."—*New York Medical Record.*

"We commend the book most heartily to the Profession."—*American Journal of Medical Science.*

BUCKNILL AND TUKE ON INSANITY.

A Manual of Pyschological Medicine: containing the Lunacy Laws, the Nosology, Œtiology, Statistics, Description, Diagnosis, Pathology (including morbid Histology), and Treatment of Insanity. By JOHN CHARLES BUCKNILL, M.D., F.R.S., and DANIEL HACK TUKE, M.D., F.R.C.P. Fourth Edition, much enlarged, with twelve lithographic plates, and numerous illustrations. Octavo. Price $8.00

"We have read no book in any language, and certainly none in English, which ought to be preferred to this for a text book, by those who wish to make a thorough study of the subject.—*Edinburgh Medical Journal.*

"We can heartily commend the work.—*American Journal of Insanity.*

BURDETT, HOSPITALS.

Pay Hospitals and Paying Wards throughout the World. Facts in support of a rearrangement of the system of Medical Relief. By HENRY C. BURDETT. 8vo. Price $2.25

"Mr. Burdett displays and discusses the whole scheme of Hospital accommodation with a comprehensive understanding of its nature and extent.—*American Practitioner.*

BY SAME AUTHOR.

COTTAGE HOSPITALS.

General, Fever, and Convalescent: their Progress, Management, and Work. Second Edition, rewritten and much Enlarged, with many Plans and Illustrations. Crown 8vo. Price $4.50

CONTENTS.—CHAP.—1. Origin and Growth of the Cottage Hospital System. 2. Comparative Success of Treatment in large and small Hospitals. 3. Finance. 4. Cottage Hospital Construction and Sanitary Arrangements. 5. The Medical and Nursing Departments. 6. Domestic Supervision and General Management. 7. Cottage Hospital Appliances and Fittings. 8. Cottage Fever Hospitals. 9. Midwifery in Cottage Hospitals. 10. Remunerative Paying Patients. 11. Convalescent Cottages. 12. Cottage Hospitals in America. 13. Mortuaries. 14. A more Detailed Account of certain Cottage Hospitals, with Plans and Elevations. 15. Selected and Model Plans criticised and compared, with a detailed description of various Hospitals. 16. Peculiarities and Special Features in the Working of Cottage Hospitals. With an Appendix containing much statistical and useful information.

"Mr. Burdett's book contains a mass of information, statistical, financial, architectural, and hygienic, which has already proved of great practical utility to those interested in cottage hospitals, and we can confidently recommend this second edition to all who are in search of the kind of information which it contains."—*Lancet.*

BUZZARD, NERVOUS DISEASES.

Clinical Lectures on Diseases of the Nervous System. By THOS. BUZZARD, M.D. Illustrated. Octavo. Price $5.00

CARPENTER, THE MICROSCOPE. Sixth Edition.

The Microscope and its Revelations. By W. B. CARPENTER, M.D., F.R.S. Sixth Edition. Revised and Enlarged, with over 500 Illustrations. Price $5.50

"Not only the student of medicine, but amateurs, and others interested in the study of natural history, will find this volume one of great practical value."—*New York Medical Journal.*

"It is by far the most complete and useful treatjse now accessible to the student."—*The Technologist.*

"As a text book of Microscopy in its special relation to natural history and general science, the work before us stands confessedly first, and is alone sufficient to supply the wants of the ordinary student."—*American Journal of Microscopy.*

CARTER, EYESIGHT. New Edition now ready.

Eyesight, Good and Bad. A Treatise on the Exercise and Preservation of Vision. By ROBERT BRUDENELL CARTER, F.R.C.S. Second Edition, with 50 Illustrations, Test Types, etc. 12mo. Price, Cloth, $1.25

"It is written in a lucid and agreeable style, conveying an easily comprehensible account of the structure of the eye and the function of vision, and gives a description of the principal anomalies of the latter, at the same time inculcating such salutary advice as may be beneficial for the preservation of sight."—*London Medical Times and Gazette.*

"There is much wholesome advice given on the 'Care of the Eyes in Infancy and Childhood,' and on this account, if no other, the book should be in the hands of every parent and teacher."—*St. Louis Courier of Medicine.*

CARTER, PRACTICE OF MEDICINE.

Elements of Practical Medicine. By ALFRED H. CARTER, M.D., London, Member of the Royal College of Physicians; Physician to the Queen's Hospital, Birmingham, etc. Crown 8vo. Price $3.00

"The object of this volume is to provide the student with a general introduction to the study of Medicine, and to bring the essentials of the subject, so far as required for the ordinary medical qualifications, within the grasp of those who have not the time or leisure to read the larger and more elaborate works on Practice."—*Preface.*

"Dr. Carter is favorably known as a London physician of learning and experience, and a clear writer. He aims to give a judicial epitome of practical medicine, and this is a well-prepared book."—*Philadelphia Medical and Surgical Reporter.*

CULLINGWORTH, ON NURSING. Illustrated.

A Manual of Nursing, Medical and Surgical. By CHARLES J. CULLINGWORTH, M.D., Physician to St. Mary's Hospital, Manchester, England. With eighteen Illustrations. 12mo. Cloth, $1.00

CAZEAUX'S GREAT OBSTETRICAL TEXT-BOOK.

A Theoretical and Practical Treatise, including the Diseases of Pregnancy and Parturition. By P. CAZEAUX, Adjunct Professor in the Faculty of Medicine of Paris, etc. etc. Revised and Annotated by S. TARNIER, Former Clinical Chief of the Lying-in-Hospital, etc., etc. Sixth American from the Seventh French Edition. Translated by WM. R. BULLOCK, M.D. One volume, Royal Octavo, over 1100 pages, with Lithographic and 175 other Illustrations on Wood. Price, Cloth, $6.00; Leather, $7.00

M. Cazeaux's great work on Obstetrics has become classical in its character, and almost an Encyclopædia in its fulness. Written expressly for the use of students of medicine, and those of midwifery especially, its teachings are plain and explicit, presenting a condensed summary of the leading principles established by the masters of the obstetric art, and such clear, practical directions for the management of the pregnant, parturient, and puerperal states, as have been sanctioned by the most authoritative practitioners, and confirmed by the author's own experience. Collecting his materials from the writings of the entire body of antecedent writers, carefully testing their correctness and value by his own daily experience, and rejecting all such as were falsified by the numerous cases brought under his own immediate observation, he has formed out of them a body of doctrine, and a system of practical rules, which he illustrates and enforces in the clearest and most simple manner possible.

"The edition before us is one of unquestionable excellence. Every portion of it has undergone a thorough revision, and no little modification; while copious and important additions have been made to nearly every part of it. It is well and beautifully illustrated by numerous wood and lithographic engravings, and in typographical execution will bear a favorable comparison with other works of the same class."*American Medical Journal.*

"The translation of Dr. Bullock is remarkably well done. We can recommend this work to those especially interested in the subject treated, and can especially recommend the American edition."—*Medical Times and Gazette.*

"We do not hesitate to say that it is now the most complete and best treatise on the subject in the English language."—*Buffalo Medical Journal.*

"It is unquestionably a work of the highest excellence, rich in information, and perhaps fuller in details than any text-book with which we are acquainted. The author has not merely treated of every question which relates to the business of parturition, but he has done so with judgment and ability."—*British and Foreign Medico-Chirurgical Review.*

"No work, in our estimation, bears any comparison to Cazeaux, in its entire perfectness; and if we were called upon to rely alone on one work on accouchments, our choice would fall upon the book before us without any kind of hesitation."—*West. Jour. of Medicine and Surgery.*

"We know of no work on this all-important branch of our profession that we can commend to the student or practitioner as a safe guide before this."—*Chicago Medical Journal.*

CHARTERIS, PRACTICE OF MEDICINE.

Hand-Book of the Practice of Medicine. By M. CHARTERIS, M.D., Member of Hospital Staff and Professor in University of Glasgow. With Microscopic and other illustrations. Price $1.25

"We have not often met with a book which can be so confidently recommended to physicians *or men* in general practice."—*Lancet.*

"The style in which it is written is clear and attractive. The illustrations are a marked feature in it. It can be recommended as a very reliable, handy book, well adapted for ready reference."—*New Remedies.*

CHAVASSE ON CHILDREN.

The Mental Culture and Training of Children. By PYE HENRY CHAVASSE. 12mo. Price, Paper covers, .50; Cloth, $1.00

The mental culture and training of children is of immense importance. Many children are so wretchedly trained, or rather not trained at all, and so mismanaged, that a few thoughts on this subject cannot be thrown away, even upon the most careful.

CLAY ON OBSTETRIC SURGERY. Third Edition.

A complete Hand-Book of Obstetric Surgery, with Rules for every Emergency and Descriptions of the more difficult as well as the every day operations. By CHARLES CLAY, M.D., with numerous illustrations. From the Third London Edition. 12mo. Price $2.00

"It is a useful and convenient book of reference; the illustrations are good, and the book will be found of value to the student and young practitioner, as well as to the skilled Obstetrician."—*American Journal of Obstetrics.*

CLEVELAND, POCKET DICTIONARY.

A Pronouncing Medical Lexicon, containing correct Pronunciation and Definition of terms used in medicine and the collateral sciences. By C. H. CLEVELAND, M.D. Twenty-ninth Edition. 16mo.

Price, Cloth, 75 cents; Tucks with Pocket, $1.00

This is a most convenient size for the pocket, and contains all the principal words in use, together with rules for pronunciation, abbreviations used in prescriptions, list of poisons, their antidotes, etc.

COHEN, INHALATION. Enlarged Edition.

Inhalation, its Therapeutics and Practice, including a Description of the Apparatus Employed, etc. By J. SOLIS COHEN, M.D. With cases and Illustrations. A New Enlarged Edition. 8vo. Price $2.50

"The book has the merit of containing much information that cannot be found elsewhere."—*N. Y. Medical Journal.*

"One of the best treatises we have seen on this subject."—*Medical Times and Gazette.*

BY SAME AUTHOR.

CROUP,

In its Relation to Tracheotomy. 8vo. Price $1.00

CLARKE, SURGERY.

Outlines of Surgery and Surgical Pathology, including the Diagnosis and Treatment of Obscure and Urgent Cases. By F. LEGROSS CLARKE, F.R.S. Second Edition. 8vo. Price $2.00

COBBOLD, PARASITES.

A Treatise on the Entozoa of Man and Animals, including some account of the Ectozoa. By T. SPENCER COBBOLD, M.D., F.R.S. With 85 illustrations. 8vo. Price $5.00

COLES, THE MOUTH. Third Edition, just ready.

Deformities of the Mouth, Congenital and Acquired, with Their Mechanical Treatment. By OAKLEY COLES, D.D.S. Third Edition. 83 Wood Engravings and 96 Drawings on Stone. 8vo. Price $4.50

"Altogether we must heartily congratulate Mr. Coles on this creditable completion of a work which cannot but redound to his credit wherever it is known."—*British Journal of Dental Science.*

"We recommend this book to the study of both surgeons and dentists"—*London Lancet.*

BY SAME AUTHOR.

A MANUAL OF DENTAL MECHANICS.

Containing much information of a practical nature, upon the Materials and Appliances used in Mechanical Dentistry. For Practitioners and Students. Second Edition, with 140 Illustrations. 12mo.

THE DENTAL STUDENT'S NOTE-BOOK.

A new Edition. 16mo. Price $1.00

CORMACK, CLINICAL STUDIES.

Illustrated by Cases Observed in Hospital and Private Practice. By Sir JOHN ROSE CORMACK, M.D., K.B., etc. Illustrated. 2 vols. 1,127 pp. Price $3.00

COURTY, THE UTERUS, OVARIES, ETC.

A Practical Treatise on Diseases of the Uterus, Ovaries, and Fallopian Tubes. By Prof. A. COURTY, of Montpellier, France. Translated from the Third Edition by his pupil and assistant, AGNES MCLAREN, M.D., M.K.Q.C.P.I. With a Preface by J. MATTHEWS DUNCAN, M.D., LL.D., F.R.S., Obstetric Physician to Saint Bartholomew's Hospital, London. With 431 Illustrations. One Vol., 8vo. Price, in Handsome Cloth, $6.00; Full Sheep, Raised Bands, $7.00

OUTLINE OF CONTENTS.

INTRODUCTION.—On the Anatomy, Physiology, and Teratology of the Organs of Generation. PART I.—GENERAL SURVEY OF UTERINE DISEASES. Diagnosis of Uterine Diseases in General; Treatment of Uterine Diseases in General; General Characteristics of Uterine Diseases. PART II.—UTERINE DISEASES IN DETAIL. Functional Disorders; Changes of Position; Morbid States without Neoplasm; Organic Alterations; Diseases of the Uterine Appendages; Pelvic Hemorrhages and Peri-uterine Hæmatocele; Cyst of the Ovary and Genito-pelvic Tumor; Sterility, etc., etc. INDEX.

"Courty's work has, since its first publication, been recognized everywhere. In France, its position is attested by the sale of two editions, numbering, I am told, ten thousand copies, and by the appearance of another, the third edition. I recommend to the careful study of my professional brethren a book which has already been crowned by the Institute of France."—*J. Matthews Duncan.*

CURLING, ON THE TESTIS.

A Practical Treatise on the Diseases of the Testis, Spermatic Cord, and Scrotum. By T. B. CURLING, M.D., F.R.S. Fourth Edition, Enlarged and Illustrated. 8vo. Price $5.50

"We believe this work to be the most trustworthy that can be consulted in this Department of Surgery, ... his pages abound with valuable suggestions and cautions that mark his intimate knowledge of the subject."—*London Practitioner.*

COOPER'S SURGICAL DICTIONARY.

A Dictionary of Practical Surgery and Encyclopædia of Surgical Science. By SAMUEL COOPER. New Edition, brought down to the present time. By SAMUEL A. LANE, F.R.C.S., assisted by various eminent Surgeons. In two vols. Price $12.00

COTTLE, ON THE HAIR.

The Hair in Health and Disease. By E. W. COTTLE, M.D. Partly from the notes of the late GEORGE NAYLER. 18mo.

CORFIELD, DWELLING HOUSES.

The Sanitary Construction and Arrangement of Dwelling Houses. By W. H. CORFIELD, M.A., M.D. Enlarged Edition, with Plans and Illustrations. 12mo. Price $1.25

COULSON, THE BLADDER. Sixth Edition.

Diseases of the Bladder and Prostate Gland. By WALTER J. COULSON, F.R.C.S. Sixth Edition. Revised and Enlarged, with 22 Engravings. 8vo. Price $6.40

CRIPPS, THE RECTUM.

Cancer of the Rectum. Its Pathology, Diagnosis and Treatment. By. W. HARRISON CRIPPS, F.R.C.S. Illustrated by Plates. 8vo. Price $2.40

DAY ON CHILDREN. Second Edition. Just Ready.

The Diseases of Children. A Practical and Systematic Treatise for Practitioners and Students. By WM. H. DAY, M.D. Second Edition. Rewritten and very much Enlarged. 8vo. 752 pp. Price, Cloth, $5.00; Sheep, $6.00

"Believing the work well adapted to meet the wants of the Student as well as the Practitioner, I will recommend it to the classes of Rush Medical College."—*DeLeskie Miller*, M.D., *Chicago*.

"On the whole, we must confess we are pleased with this book and can heartily recommend it—a recommendation which it does not appear to need, as it has already reached its second edition."—*American Journal of Medical Science*.

"Dr. Day brings to his task a large experience, and evidences a very thorough knowledge of the literature, native and foreign, pertaining to this special branch of medicine. The book has been written with great care, and the author is a good writer. The publisher's part of the task has also been excellently performed."—*Boston Medical and Surgical Journal*.

DAY ON HEADACHES. Fourth Edition.

The Nature, Causes, and Treatment of Headaches. Fourth Edition. Illustrated. By WM. HENRY DAY, M.D. Octavo.

Paper Covers, 75 cents; Cloth, $1.25

SUMMARY OF CONTENTS.—Headache from Cerebral Anaemia, Cerebral Hyperæmia, Sympathetic, Congestive, Dyspeptic or Bilious Headaches, Headache from Plethora, from Exhaustion, from Change in Cerebral Tissue, from Affections of the Periosteum, Nervous and Nervo-Hyperæmic Headache, Toxæmic, Rheumatic, Arthritic or Gouty Headache, Neuralgic Headache, and Headaches of Childhood, Early and Advanced Life.

"Well worth reading. The remarks on treatment are very sensible."—*Boston Medical and Surg. Journal.*

DALBY, ON THE EAR.

The Diseases and Injuries of the Ear. By W. B. DALBY, M.D., Surgeon and Lecturer on Aural Surgery, St. George's Hospital. With Illustrations. 12mo. Price $1.50

'A safe and readable introduction to aural surgery." *Medical Press and Circular.*

"Dr. Dalby has presented us with a very readable little book, which is destined to render much service in the saving of ears."—*N. Y. Medical Journal.*

"The lectures occupy 226 pages, are clearly and consisely written, contain a number of good illustrations, and are well worth the careful study of both student and practitioner. To aurists the work will be most welcome and valuable."—*Specialist.*

DILLINGBERGER, WOMEN AND CHILDREN'S DISEASES.

A Hand-Book of the Treatment of the Diseases Peculiar to Women and Children. By Dr. EMIL DILLINGBERGER. 12mo. Price $1.50

"It is a *magnum in parvo.* The style is simple, clear, lucid, and free from theoretical discussion. No one will regret the small outlay for this volume.—*Richmond and Louisville Medical Journal.*

DUNGLISON, THE PHYSICIAN'S REFERENCE BOOK.

The Practitioner's Ready Reference Book; a Guide in Office and Bedside Practice; containing Therapeutical and Practical Hints, Dietetic Rules, and General Information. By RICHARD J. DUNGLISON, M.D. Fourth Edition. 8vo. Price $3.50

"We can heartily commend this book as one that must prove very useful to the general practitioner."—*The Medical Record.*

"The demand for a second edition so soon after the publication of the first volume shows that this work is appreciated by the profession."—*Canada Lancet.*

DURKEE, VENEREAL DISEASES. Sixth Edition.

Gonorrhœa and Syphilis. By SILAS DURKEE, M.D. Sixth Edition. Revised and Enlarged, with Portrait and Eight Colored Illustrations. 8vo. Price $3.50

"We may, finally, recommend Dr. Durkee's book as eminently practical, well written, full of excellent counsel, and worthy of being consulted by every member of the profession. A late number of the *London Medical Times and Gazette* also speaks of the book in terms of the highest approval."—*Boston Medical and Surgical Journal.*

DAGUENET, OPHTHALMOSCOPY.

A Manual of Ophthalmoscopy, for the Use of Students. By Dr. DAGUENET. Translated from the French, by Dr. C. S. JEAFFRESON, F.R.C.S.E. Illustrated. 12mo. Price $1.50

"Its portable size, the condensed nature of its text, and the admirably systematic arrangement of its contents, render it extremely useful as a pocket manual for Students.—*Translator's Preface.*

DOBELL, WINTER COUGH AND CATARRH.

On Winter Cough, Catarrh, Bronchitis, Emphysema, Asthma, etc. By HORACE DOBELL, M.D., Lecturer at the Royal Hospital for Diseases of the Chest. Third Edition. With Colored Plates. 8vo. Price $3.50

BY SAME AUTHOR.

ON LOSS OF WEIGHT. Revised Edition.

Blood Spitting and Lung Disease. Colored Frontispiece of Lung. Tabular Map, etc. Second Edition Enlarged. 8vo. Price $4.00

DOMVILLE, ON NURSING.

A Manual for Hospital Nurses and others engaged in attending to the sick. 4th Edition. With Recipes for Sick Room Cookery, etc. Price .75

DRUITT'S MODERN SURGERY. Eleventh Edition.

The Surgeon's Vade Mecum; a Manual of Modern Surgery. By ROBERT DRUITT, F.R.C.S. Eleventh Enlarged Edition, with 369 Illustrations. 864 pp. 1878. Price $5.00

This is a most complete, accurate, and trustworthy Hand, or Text-Book of Surgery. Unrivaled as a book for the Student. Fully illustrated, and brought up to the present state of the science. In use in many Medical Colleges.

DULLES, ACCIDENTS.

What to do First, in Accidents and Poisoning. By C. W. DULLES, M.D. Illustrated. 16mo.

"Its usefulness entitles it to a wide and permanent circulation."—*Boston Gazette.*

"A complete guide for sudden emergencies.—*Philadelphia Ledger.*

"So plain and sensible that it ought to be introduced into every female seminary.—*Evening Chronicle, Pittsburgh.*

EDWARDS, BRIGHT'S DISEASE. New Edition.

How a Person Affected with Bright's Disease Ought to Live. By JOS. F. EDWARDS, M.D. Second Edition. 12mo. Price .75

"Physicians, as well as laymen, will find the work interesting, and will obtain many valuable hints as to the proper hygiene to be observed in this disease."—*Cincinnati Medical News.*

BY SAME AUTHOR.

CONSTIPATION. New Edition.

Plainly Treated and Relieved Without the Use of Drugs. Second Edition. 12mo. Price .75

MALARIA.

Malaria: What It Means; How to Escape It; Its Symptoms; When and Where to Look for It. 12mo. Price .75

VACCINATION AND SMALL-POX.

Showing the Reasons in favor of Vaccination, and the Fallacy of the Arguments Advanced against it, with Hints on the Management and Care of Small-Pox patients. 16mo. Price .50

These are invaluable little treatises upon subjects that enter painfully into the life experiences of a large majority of the human family. Dr. Edwards shows not only how they may be avoided, but in plain and simple language he tells those already afflicted with them how they may find relief.

EKIN, WATER ANALYSIS.

Potable Water. How to Form a Judgment on the Suitableness of Water for Drinking Purposes. By CHARLES EKIN. Second Edition. 12mo. Price .75

ELLIS, DISEASES OF CHILDREN.

A Practical Manual of the Diseases of Children, with a Formulary. By EDWARD ELLIS, M.D. Late Physician to the Victoria Hospital for Children, London. Fourth Edition Enlarged. Now Ready. Price $3.00

BY SAME AUTHOR.

WHAT EVERY MOTHER SHOULD KNOW.

12mo. Price .75

"It is only too true that our children have to dodge through the early part of life as through a labyrinth. We must be thankful to meet with such a sensible guide for them as Dr. Ellis."—*Pall Mall Gazette.*

FENNER, ON VISION, Second Edition, Enlarged.

Vision; Its Optical Defects, the Adaptation of Spectacles, Defects of Accommodation, etc. By C. S. FENNER, M.D. With Test Types and 74 Illustrations. Second Edition, Revised and Enlarged. 8vo. Price $3.50

FENWICK, THE PRACTICE OF MEDICINE.

Outlines of the Practice of Medicine. With Appropriate Formulæ and Illustrations. By SAMUEL FENWICK, M.D., Physician to the London Hospital. 12mo. Price $1.25

"This little work displays a sound judgment in the arrangement of its subject matter, and an intimate acquaintance with the practice of medicine possessed by but few writers, and should have been elaborated into a more comprehensive work. Of all the hand-books we have seen, this is certainly one of the best."—*Medical Herald.*

"It is an eminently practical little treatise, pervaded with much common sense, and will doubtless be found useful, particularly by advanced students."—*Boston Medical and Surgical Journal.*

BY SAME AUTHOR.

ON THE STOMACH.

The Morbid State of the Stomach and Duodenum, and Their Relations to Diseases of Other Organs. With 10 Plates. 8vo. Price $4.25

Atrophy of the Stomach and Its Effect on the Nervous Affections of the Digestive Organs. 8vo. Price $3.20

FOTHERGILL, ON THE HEART. Second Edition.

The Heart and Its Diseases. With Their Treatment. Including the Gouty Heart. By J. MILNER FOTHERGILL, M.D., Associate Fellow of the College of Physicians of Philadelphia. Second Edition, Entirely Re-written. Octavo. Price $3.50

"It is the best, as well as the most recent work on the subject in the English language."—*Medical Press and Circular.*

"The most interesting chapter is undoubtedly that on the gouty heart, a subject which Dr. Fothergill has specially studied, and on which he entertains views such as are likely, we think, to be generally accepted by clinical physicians, although they have not before been stated, so far as we are aware, with the same breadth of view and extended illustration."—*British Medical Journal.*

"To many an earnest student it will prove a light in darkness; to many a practitioner cast down with a sense of his powerlessness to cope with the rout and demoralization of Nature's forces, a present help in time of trouble."—*Philadelphia Medical Times.*

"The work throughout is a masterpiece of graphic, lucid writing, full of good, sound teaching, which will be appreciated alike by the practitioner and the student."—*Students' Journal.*

FULTON, ON PHYSIOLOGY.

A Text-Book of Physiology. By J. FULTON, M.D., Professor at Trinity Medical College, Toronto. Second Edition, Illustrated and Revised. 8vo. Price $4.00

FLOWER, DIAGRAMS OF THE NERVES.

Diagrams of the Nerves of the Human Body. Exhibiting their Origin, Divisions, and Connections, with their Distribution to the various Regions of the Cutaneous Surface, and to all the Muscles. By WILLIAM H. FLOWER, F.R.C.S., F.R.S., Hunterian Professor of Comparative Anatomy, and Conservator of the Museum of the Royal College of Surgeons. Third Edition, thoroughly revised. With six Large Folio Maps, or Diagrams. Royal Quarto. Price $3.50

"Admirably arranged, and will be of incalculable aid to the student of anatomy. Each of the large and beautiful plates is accompanied with explanatory text."—*N. Y. Medical Record.*

"The nerves and ganglia are clearly represented. The impressions are well made, and no doubt the diagrams will prove useful."—*Medical and Surgical Reporter.*

FLAGG, PLASTIC FILLING.

Plastics and Plastic Filling; As Pertaining to the Filling of all Cavities of Decay in Teeth below Medium in Structure, and to Difficult and Inaccessible Cavities in Teeth of all Grades of Structure. With some beautifully executed Illustrations. By J. FOSTER FLAGG, D.D.S., Professor of Dental Pathology and Therapeutics in Philadelphia Dental College. Octavo. Price $3.00

CONTENTS.—Introductory. Article 1. Plastic Filling. 2. Amalgam. 3. Amalgam continued. 4. Amalgam continued. 5. Attributes of Metals used for Amalgam Alloys. 6. The Making of Amalgam Alloys. 7. Tests for Amalgam. 8. Preparation of Cavities. 9. The Making of Amalgam. 10. Instrument for the Insertion of Amalgam Fillings. 11. The Insertion of Amalgam Fillings. 12. General Considerations Pertaining to Amalgam. 13. Gutta-percha. 14. Oxy-chloride of Zinc. 15. Oxy-sulphate of Zinc. 16. Zinc Phosphate. 17. Temporary Stopping. 18. Technicalities. Conclusion.

FOSTER, CLINICAL MEDICINE.

Lectures and Essays on Clinical Medicine. By BALTHAZAR FOSTER, M.D. Illustrated. 8vo. Price $3.00

"No one can peruse the thoughtful comments of our author upon every subject he considers, without feeling himself a wiser man for his pains."—*N. Y. Medical Journal.*

"It is the record of honest work, such as Dr. Foster may be proud of; we can recommend it to the profession; it may be read with profit and advantage by both practitioner and student.—*Edinburgh Medical Journal.*

FOX, ATLAS OF SKIN DISEASES.

Complete in Eighteen Parts, each containing Four Chromo-Lithographic Plates, with Descriptive Text and Notes upon Treatment. In all 72 large colored Plates. By TILBURY FOX, M.D., F.R.C.P., Physician to the Department for Skin Diseases in University College Hospital. Folio Size.

Price $1.00 each, or complete, bound in cloth, $20.00

No Atlas of Skin Diseases has been issued in this country for many years, and no complete work of the kind is now procurable by the Profession. This one, brought out under the editorial supervision and care of Dr. Tilbury Fox (the most distinguished writer on Cutaneous Medicine now in the English language), is partly based upon the classical work of Willan and Bateman (now entirely out of print), but completely remodeled, so as to represent fully the Dermatology of the present day.

"Preference will be given to this work over Hebra; not simply, however, because it is a home production, but by reason of the manner of its execution, the excellent delineation of disease, and the natural coloring of the plates. . . . The letter-press is entirely new. In the accuracy of the latter the subscriber may have the fullest confidence, since it is from the pen of Dr. Tilbury Fox."—*British and Foreign Medico-Chirurgical Review.*

FRANKLAND, WATER ANALYSIS.

Water Analysis, For Sanitary Purposes, with Hints for the Interpretation of Results. By E. FRANKLAND, M.D., F.R.S. Illustrated. 12mo. Price $1.00

"The author's world-wide reputation will commend this manual to all sanitarians, and they will not be disappointed in finding all the essentials of the important subject of which it treats."—*The Sanitarian.*

"The work is one which physicians practicing in the country and in villages and towns remote from medical centres cannot afford to be without."—*Medical and Surgical Reporter.*

BY SAME AUTHOR.

CHEMISTRY.

How to Teach Chemistry; being Six Lectures to Science Teachers. Edited by G. GEORGE CHALONER, F.C.S. Illustrated. 12mo. Price $1.25

FOX, WATER, AIR AND FOOD.

Sanitary Examinations of Water, Air and Food. By CORNELIUS B. FOX, M.D. 94 Engravings. 8vo.
Price $4.00

GALLABIN, DISEASES OF WOMEN.

The Student's Guide to the Diseases of Women. By A. LEWIS GALLABIN, M.A., M.D., F.R.C.P. Illustrated with 63 Engravings. 12mo.
Price $1.25

"Among all the various works on diseases of women with which we are acquainted, there is none which so nearly approaches the perfection of what a student's text-book should be . . . The work is well illustrated." —*Students' Journal.*

"Though the book is a small one and the subject extensive, yet so admirable is the style of the writer, and so careful his selection of words, that each disease is thoroughly treated of."—*Philadelphia Medical Times.*

"Its style is clear, elegant, and concise. It contains a great amount of information; indeed, we do not think the student or practitioner will find any book which will convey to him in so small a compass so much accurate knowledge about the pathology and diagnosis of the diseases peculiar to women."—*Medical Times and Gazette.*

GROSS, BIOGRAPHY OF JOHN HUNTER.

John Hunter and His Pupils. By S. D. GROSS, M.D., Professor of Surgery in Jefferson Medical College, Philadelphia. With a beautifully executed full length Portrait of the Author in his Study. A Handsome Octavo volume. Bound in Beveled Cloth.
Price $1.50

"It is refreshing to read the story of a life so fully devoted to science, and the reader will readily appreciate Professor Gross's enthusiasm for his subject, which led him to extend what was originally intended for an essay to its present size.

"The phototype of Sharp's well-known engraving of Sir Joshua Reynold's portrait is an excellent reproduction, and forms a fitting and handsome frontispiece.

"The volume will prove an ornament to the study table, where it will be a constant incentive to whatever is best and noblest in a noble profession."—*Boston Med. and Surgical Journal.*

BY SAME AUTHOR.

AMERICAN MEDICAL MEN.

American Medical Biography of the Nineteenth Century, with portrait of Dr. Benjamin Rush. Large 8vo.

GLISAN, TEXT-BOOK OF MODERN MIDWIFERY.

A Text-Book of Modern Midwifery. By RODNEY GLISAN, M.D., Emeritus Professor of Midwifery and Diseases of Women and Children in the Medical Department of Willamette University, Portland, Oregon, and Late President of the Oregon State Medical Society. With 129 Illustrations. One Volume, octavo, 624 pp.
Price, in Cloth $4.00; in Leather $5.00

GILL, ON INDIGESTION. Third Edition.

Indigestion; What It Is; What It Leads To; and a New Method of Treating It. By JOHN BEADNELL GILL, M.D. Third Edition. 12mo.

GANT, ON THE BLADDER AND PROSTATE.

Diseases of the Bladder and Prostate Gland and Urethra, including a Practical View of Urinary Diseases, Deposits and Calculi. Fourth Edition, Revised and Enlarged, with New Illustrations. 12mo.
Price $3.00

GIBBES, STUDENT'S PATHOLOGY.

Practical Histology and Pathology. By HENEAGE GIBBES, M.B. 12mo. Cloth.
Price $1.00

CHAP. 1. Introduction. 2. On Preparing Tissues for Examination. 3. On Cutting Sections. 4. On Staining. 5. On Double Staining. 6. On Mounting. 7. Method of Obtaining Animal Tissues, etc. Practical Histology, Pathology, Memoranda and Formulæ.

"This excellent little work is admirably adapted to fulfill the purpose for which it has been written. It is short, clear, and eminently practical. The author is evidently an accomplished histologist, and his book conveys the impression that it is based upon his own personal experience."—*The London Medical Record.*

GODLEE'S ATLAS OF HUMAN ANATOMY.

Illustrating most of the Ordinary Dissections and many not usually practiced by the Student. Accompanied by References and an Explanatory Text. Complete. Folio Size. 48 Colored Plates. By RICKMAN JOHN GODLEE, M.D., F.R.C.S. Forming a large Folio Volume, with References, and an Octavo Volume of Letter-press.

Price of the two Volumes, Atlas and Letter-press, Cloth, $20.00

"It is likely to prove as useful to the physician and surgeon as to the anatomist."—*Medical Times and Gazette.*

"The explanatory text is concise, well written, and contains many valuable suggestions for the surgeon." —*London Lancet.*

GOWERS, SPINAL CORD.

Diagnosis of Diseases of the Spinal Cord. With Colored Plates and Engravings. A Second Edition, Revised and Enlarged. By WILLIAM R. GOWERS, M.D., Assistant Professor Clinical Medicine, University College, London. 8vo. Second Edition. Price $1.50

BY SAME AUTHOR.

OPHTHALMOSCOPY.

A Manual and Atlas of Medical Ophthalmoscopy. With 16 Colored Autotype and Lithographic Plates and 26 Wood Cuts, comprising 112 Original Illustrations of the Changes in the Eye in Diseases of the Brain, Kidneys, etc. 8vo.

Price $6.00

EPILEPSY AND ITS TREATMENT.

Epilepsy and other Chronic Convulsive Diseases: Their Causes, Symptoms, and Treatment. Octavo. *Just Ready:* Price, Cloth, $4.00

NERVOUS DISEASES.

A Manual of Diseases of the Nervous System, for Practitioners and Students.

In Press.

"Dr. Gowers, while profoundly conversant with the literature of his subject, has not allowed himself to be influenced to an undue extent by the writings of others, but while fairly stating their views, where this is necessary, he at the same time brings to bear upon them the experience derived from his own extensive observations, and when, consequently, they receive confirmation or not at his hands, they are all the more valuable as being the outcome of the most searching and unbiased criticism. It would be impossible, within the limits of a short review, to convey an adequate idea of the extent of Dr. Gowers' work."—*Edinburgh Medical Journal.*

GREENHOW, BRONCHITIS.

On Chronic Bronchitis, especially as connected with Gout, Emphysema, and Diseases of the Heart. By E. HEADLAM GREENHOW, M.D. 12mo. Price $1.50

BY SAME AUTHOR.

ADDISON'S DISEASE.

Being the Croonian Lectures, delivered before the Royal College of Physicians, London. Revised and Illustrated by Plates and Reports of Cases. 8vo.

Price $3.00

"The book forms a most interesting and valuable monograph, comprehensive and exhaustive."—*British Medical Journal.*

HUGHES, COMPEND OF THE PRACTICE OF MEDICINE.

A Compend of Practice. By DANIEL E. HUGHES, M.D., Demonstrator of Clinical Medicine at Jefferson Medical College, Philadelphia. In two parts—

PART I.—Continued, Eruptive, and Periodical Fevers, Diseases of the Stomach Intestines, Peritoneum, Biliary Passages, Liver, Kidneys, etc., and General Diseases, etc.

PART II.—Diseases of the Respiratory System, Circulatory System, and Nervous System; Diseases of the Blood, etc.

Price of each Part, in Cloth, $1.00; interleaved for the addition of Notes, $1.25

*** These little books can be regarded as a full set of notes upon the Practice of Medicine, containing the Synonyms, Definitions, Causes, Symptoms, Prognosis, Diagnosis, Treatment, etc., of each disease, and including a number of new prescriptions. They have been compiled from the lectures of prominent Professors, and reference has been made to the latest writings of Professors FLINT, DA COSTA, REYNOLDS, BARTHOLOW, ROBERTS and others.

HABERSHON, ON THE STOMACH.

On Diseases of the Stomach—The Varieties of Dyspepsia—Their Diagnosis and Treatment. By S. O. HABERSHON, M.D., F.R.C.P., Senior Physician to, and Late Lecturer on, the Principles and Practice of Medicine at Guy's Hospital. Third Edition, Revised. Crown 8vo. Price $1.25

"As an expression of the results of long personal experience in both hospital and private practice, conveyed in agreeable though not always perspicuous diction, this contribution of Dr. Habershon's has special value of its own, and is so far entitled to the favorable consideration of the practitioner, as is already testified by a demand for a third edition."—*American Journal of Medical Sciences.*

HALE, ON CHILDREN.

The Management of Children in Health and Disease. A Book for Mothers. By MRS. AMIE M. HALE, M.D. Abounding in valuable information and common sense advice. New Enlarged Edition. 12mo. Price .75

"We shall use our influence in the introduction of this work to families under our care, and we urge the profession generally to follow our example."—*Buffalo Medical and Surgical Journal.*

HORWITZ, COMPEND OF SURGERY.

A Compend of Surgery, including Minor Surgery, Amputations, Fractures, Ligatures, Dislocations, Surgical Diseases, etc., with Differential Diagnosis and Treatment. By ORVILLE HORWITZ, B.S., M.D., with Illustrations. 12mo.

Cloth, $1.00

HARDWICKE, MEDICAL EDUCATION.

Medical Education and Practice in All Parts of the World. Containing Regulations for Graduation at the Various Universities throughout the World. By HERBERT JUNIUS HARDWICKE, M.D., M.R.C.P. 8vo. Price $3.00

"Dr. Hardwicke's book will prove a valuable source of information to those who may desire to know the conditions upon which medical practice is or may be pursued in any or every country of the world, even to the remotest corners of the earth. The work has been compiled with great care, and must have required a vast amount of labor and perseverance on the part of its author."—*Dublin Medical Journal.*

HARLEY, ON THE LIVER. Illustrated.

On Diseases of the Liver, with or without Jaundice. Diagnosis and Treatment. By GEORGE HARLEY, M.D. Author of the Urine and Its Derangements. With Colored Plates and Numerous Illustrations. Royal Octavo.

Price, Cloth, $5.00; Leather, $6.00.

"It is one of the *freshest, most readable*, and *most instructive* medical books that have been laid upon our table during the present decade. . . In conclusion, we commend again most heartily Dr. Harley's extremely valuable book."—*Philadelphia Medical Times.*

"The work is far in advance, in original and practical information, of any treatise on the subject with which we are acquainted, and is worth many times its cost to any physician treating hepatic troubles."—*Chicago Medical Times.*

"The whole subject-matter is treated in a masterly manner, and the work is destined to find a place among the classics."—*Medical Herald, Louisville, Ky.*

"It is the outcome of a mind that went to its task amply equipped therefor. It is the product of long thinking and ripe judgment. . . . We must content ourselves with this bare statement, hoping that those who read the book will derive as much benefit as ourselves."—*New Orleans Medical and Surgical Journal.*

HOLDEN, HUMAN OSTEOLOGY. Sixth Edition.

Comprising a Description of the Bones, with Colored Delineations of the Attachments of the Muscles. The General and Microscopical Structure of Bone and its Development. By the Author and A. DORAN, F.R.C.S., with Lithographic Plates, etc. By LUTHER HOLDEN, F.R.C.S. Numerous Illustrations. Sixth Edition, carefully Revised. Price $6.00

BY SAME AUTHOR.

ANATOMY.

Manual of Dissections of the Human Body. Fourth London Edition. With 170 Illustrations. Price $5.50

LANDMARKS.

Landmarks, Medical and Surgical. Third London Edition. Revised and Enlarged. Price $1.00

"Mr. Holden is the happy possessor of the faculty of writing interesting works on Anatomy. A part of the charm consists in the frequent references to practical points, and in the explanation of the advantages and objects of details of structures."—*Boston Medical and Surgical Journal.*

HEATH'S OPERATIVE SURGERY.

A Course of Operative Surgery, consisting of a Series of Plates, each plate containing Numerous Figures, Drawn from Nature by the Celebrated Anatomical Artist, M. Léveillé, of Paris, Engraved on Steel and Colored by Hand, under his immediate superintendence, with Descriptive Text of Each Operation. By CHRISTOPHER HEATH, F.R.C.S., Surgeon to University College Hospital, and Holme Professor of Clinical Surgery in University College, London. One Large Quarto Volume. Price $14.00

The author has embodied in this work the experience gained by him during twenty years of surgical teaching. It comprises all the operations that are required in ordinary surgical practice. He has selected for illustration and description those methods which appear to give the best results in practice, referring to the errors likely to occur and the best methods of avoiding them.

BY SAME AUTHOR.

THE STUDENT'S GUIDE TO SURGICAL DIAGNOSIS.

12mo. Price $1.25

"Mr. Heath is so well known, both as a practical surgeon, teacher and writer, that anything from his pen requires no introduction from the hands of reviewers, and scarcely any notice but the announcement of the fact that he has written a book."—*Medical Record.*

A MANUAL OF MINOR SURGERY AND BANDAGING.

Sixth Edition, Revised and Enlarged. With 115 Illustrations. 12mo. Price $2.00

"This excellent work should not be termed a 'Minor' Surgery, but it really consists of the sum and substance of Practical surgery. We would not exchange it for any book in our possession."—*Southern Clinic.*

HEATH'S PRACTICAL ANATOMY. Fifth London Edition.

Practical Anatomy. A Manual of Dissections. Fifth London Edition. 24 Colored Plates, and nearly 300 other Illustrations. Just Ready. Price $5.00

INJURIES AND DISEASES OF THE JAWS.

The Jacksonian Prize Essay of the Royal College of Surgeons of England, 1867. Second Edition, Revised, with over 150 Illustrations. Octavo. Price $4.25

HOOD, ON GOUT AND RHEUMATISM.

A Treatise on Gout, Rheumatism, and the Allied Affections. Their Treatment, Complications, and Prevention. By PETER HOOD, M.D. Second Edition, Revised and Enlarged. With some Considerations on Longevity. Octavo. Price $3.50

"The Observations on Treatment are specially to be commended."—*London Lancet.*

HOLDEN, THE SPHYGMOGRAPH.

The Sphygmograph. Its Physiological and Pathological Indications. By EDGAR HOLDEN, M.D. Illustrated by Three Hundred Engravings on Wood. 8vo. Price $2.00

HOLMES, THE LARYNGOSCOPE.

A Guide to the Use of the Laryngoscope in General Practice. By GORDON HOLMES, M.D., Physician to the Throat and Ear Infirmary. 12mo. Price $1.00

BY SAME AUTHOR.

VOCAL PHYSIOLOGY.

Vocal Physiology and Hygiene. With reference to the Cultivation and Preservation of the Voice. Illustrated. 12mo. Price $2.00

HOFF, ON HÆMATURIA.

Hæmaturia as a Symptom of the Diseases of the Genito-Urinary Organs. By O. HOFF, M.D. Illustrated. 12mo. Price .75

HUNTER, MECHANICAL DENTISTRY.

A Practical Treatise on the Construction of the Various kinds of Artificial Dentures, with Formulæ, Receipts, etc. By CHARLES HUNTER, D.D.S. 100 Illustrations. 12mo. Price $1.50

"It is the outcome of his own experience of some twenty years as a Mechanical Dentist, and contains, moreover, much derived from practical knowledge of other dentists. The value of the book is also much added to by illustrations. It will be very useful to the Dental Student, and to all Mechanical Dentists."—*London Medical Times and Gazette.*

HUTCHINSON'S ILLUSTRATIONS OF CLINICAL SURGERY. First Volume Complete.

Consisting of Plates, Photographs, Woodcuts, Diagrams, etc. Illustrating Surgical Diseases, Symptoms, and Accidents; also Operations and other Methods of Treatment. With Descriptive Letter-press. By JONATHAN HUTCHINSON, F.R.C.S., Senior Surgeon to the London Hospital, Surgeon to the Moorfields Ophthalmic Hospital, and to the Hospital for Diseases of the Skin, Blackfriars. In Quarterly Fasciculi. Imperial 4to. Volume I. (Ten Fasciculi) bound complete in itself. Price $25.00. Parts Eleven to Fifteen of Volume 2, Now Ready. Each, $2.50

HEWITT, DISEASES OF WOMEN. Fourth Edition.

The Diagnosis, Pathology, and Treatment of Diseases of Women, Including the Diagnosis of Pregnancy. Founded on a Course of Lectures Delivered at St. Mary's Hospital Medical School. By GRAILY HEWITT, M.D., Lond., M.R.C.P., Physician to the British Lying-in Hospital; Lecturer on Midwifery and Diseases of Women and Children at St. Mary's Hospital Medical School; Honorary Secretary to the Obstetrical Society of London, etc. The Fourth American Edition. Revised and Enlarged, with New Illustrations. Octavo.

Price, Paper, $1.50; Cloth, $2.50

"Readers of the former editions will not require to be told that the additions now made are of the highest possible excellence."—*Times and Gazette.*

"It is one of the most useful, practical, and comprehensive works upon the subject in the English language, a true guide to the student, and an invaluable means of reference for the teacher."—*N. Y. Medical Record.*

"The excellent work of Dr. Hewitt presents—in a form well adapted to conduct the student to a knowledge of the Diseases of Women, and to assist the young practitioner in his study of these diseases at the bedside of the patient—a very full and clear exposition of the views entertained by the most authoritative teachers as to their pathological treatment and their correct Diagnosis."—*Amer. Med. Journal.*

HAY, SARCOMATOUS TUMOR.

History of a Case of Recurring Sarcomatous Tumor of the Orbit in a Child. By THOMAS HAY, M.D. Illustrated. Paper. Price .50

HEWSON, EARTH IN SURGERY.

Earth as a Topical Application in Surgery, Being a Full Exposition of its Use in Cases Requiring Topical Applications. By ADDINELL HEWSON, M.D. Illustrated. 8vo. Price $2.50

HODGE, ON ABORTION.

On Fœticide or Criminal Abortion. By HUGH L. HODGE, M.D.

Price, Paper, .30; Cloth, .50

HODGE, CASE-BOOK.

Note-Book for Cases of Ovarian Tumors. By H. LENNOX HODGE, M.D. With Diagrams. Price, Paper, .50

HIGGINS, DISEASES OF THE EYE. Now Ready.

A Hand-Book of Ophthalmic Practice. By CHARLES HIGGINS, F.R.C.S. Ophthalmic Assistant Surgeon at Guy's Hospital. Second Edition. 16mo.

Price .50

CONTENTS.—SECTION I. Discharge from the Eyes. II. Intolerance of Light. III. Iritis and Glaucoma. IV. Diseases of the Eyelids. V. Watering of the Eye. VI. Acuteness of Vision, Field of Vision, Anomalies of Refraction, Astigmatism, Accommodation, Presbyopia. VII. Disturbance of Vision, Use of the Ophthalmoscope, Normal and Morbid Appearances. VIII. Injuries.

"We have rarely seen so much important information condensed in so short a space."—*American Medical Journal.*

HARRIS, THE PRACTICE OF DENTISTRY. Tenth Edition.

The Principles and Practice of Dentistry. Tenth Revised Edition. In great part Rewritten, Rearranged, and with many new and important Illustrations. By CHAPIN A. HARRIS, M.D., D.D.S. Edited by P. H. AUSTEN, M.D., Professor of Dental Science and Mechanism in the Baltimore College of Dental Surgery. With nearly 400 Illustrations. Royal Octavo. Price, Cloth, $6.50; Leather, $7.50

This new edition of Dr. Harris' work has been thoroughly revised in all its parts, more so than any previous edition. So great have been the advances in many branches of dentistry that it was found necessary to rewrite the articles or subjects, and this has been done in the most efficient manner by Professor Austen, for many years an associate and friend of Dr. Harris, assisted by Professor Gorgas and Thomas S. Latimer, M.D. The publishers feel assured that it will now be found the most complete text-book for the student, and guide for the practitioner in the English language.

BY SAME AUTHOR.

MEDICAL AND DENTAL DICTIONARY. Fourth Edition.

A Dictionary of Medical Terminology, Dental Surgery, and the Collateral Sciences. Fourth Edition, Carefully Revised and Enlarged. By FERDINAND J. S. GORGAS, M.D., D.D.S., Professor of Dental Surgery in the Baltimore College, etc. Royal Octavo. Price, Cloth, $6.50; Leather, $7.50

This Dictionary, having passed through *three* editions, and been for some time out of print, has been again carefully revised by F. J. S. Gorgas, M.D., Dr. Harris' successor as Professor of Dental Surgery in the Baltimore College of Dental Surgery. In his preface to this new edition, the editor says :—

"The object of the reviser has been to bring the book thoroughly up to the present requirements of the profession, the *Medical* portion having been as carefully revised and added to as that devoted more especially to *Dental Science*, while a number of obsolete terms and methods have been omitted. In nearly every one of the seven hundred and forty-three pages of the former edition corrections and additions have been made, and many new processes, terms and appliances described, some of which are not found in any other work published."

HANDY, ANATOMY.

Text-Book of Anatomy and Guide to Dissections. For the Use of Students. By W. R. HANDY, M.D. 312 Illustrations. Price $3.00

HILLIER, DISEASES OF CHILDREN.

A Clinical Treatise on the Diseases of Children. By THOMAS HILLIER, M.D. 8vo. Price $2.00

HUFELAND, LONG LIFE.

The Art of Prolonging Life. By C. W. HUFELAND. Edited by ERASMUS WILSON, M.D. 12mo. Price $1.00

"We wish all doctors and all their intelligent clients would read it, for surely its perusal would be attended with pleasure and benefit."—*American Practitioner*.

"It certainly should be in the library of every physician."—*Medical Brief*.

HUNTER, PORTRAIT OF.

Portrait of John Hunter. From Sharp's well-known Engraving; a copy of Sir Joshua Reynold's Portrait. For Framing. Large size, 9 x 11; sheet 16 x 20. Price, in the Sheet, sent free by mail, 50 cents; or, Handsomely Framed, Price $2.00

HEADLAND, THE ACTION OF MEDICINES. Ninth Edition.

On the Action of Medicines in the System. By F. W. HEADLAND, M.D. Ninth American Edition, Revised and Enlarged. 8vo. Price $3.00

"It displays in every page the evidence of extensive knowledge and of sound reasoning; it will be useful alike to those who are just commencing their studies, and to those who are engaged in the active pursuits of professional life."—*Medical Times.*

"The very favorable opinion which we were amongst the first to pronounce upon this essay has been fully confirmed by the general voice of the profession, and Dr. Headland may now be congratulated on having produced a treatise which has been weighed in the balance, and found worthy of being ranked with our standard medical works."—*London Lancet.*

JAMES, SORE THROAT.

On Sore Throat, Its Nature, Varieties and Treatment, Including its Connection with other Diseases. By PROSSER JAMES, M.R.C.P. Fourth Edition, Revised and Enlarged. With Colored Plates and Numerous Wood-cuts. 12mo. Price $1.25

"We can confidently recommend his therapeutic teachings as well worthy of the careful consideration of the Profession, for they set forth the practice of an enthusiastic worker, whose special experience has been large and lengthened."—*British Medical Journal.*

"The practitioner who buys Dr. James' unpretending little book will provide himself with a wise and practical clinical commentary, and with a well arranged digest of long and varied experience."—*Westminster Review.*

BY SAME AUTHOR.

LARYNGOSCOPY AND RHINOSCOPY.

Including the Diagnosis of Diseases of the Throat and Nose. Third Edition. With Colored Plates. 18mo. Price $2.00.

"It gives in a succinct form the approved methods of examination and treatment of diseases of the nose, throat, and larynx. The plan pursued is one well adapted to the needs of the general practitioner."—*American Medical Journal.*

JONES, AURAL ATLAS.

An Atlas of Diseases of the Membrana Tympani. Being a Series of Colored Plates, containing 62 Figures. With appropriate Letter-press and Explanatory Text. By H. MACNAUGHTON JONES, M.D., Surgeon to the Cork Ophthalmic and Aural Hospital. 4to. Price $4.00.

"The cases are well selected, the drawings executed from life, highly artistic and very conscientious, and the commentaries indicate familiarity with the subject and good judgment in dealing with it."—*British Medical Journal.*

BY SAME AUTHOR.

AURAL SURGERY.

A Practical Hand-book on Aural Surgery. Illustrated. Second Edition, Revised and Enlarged, with new Wood Engravings. 12mo. Cloth. Price $2.75

JONES, SIEVEKING AND PAYNE, PATHOLOGICAL ANATOMY.

A Manual of Pathological Anatomy. By C. HANDFIELD JONES, M.D., and EDWARD H. SIEVEKING, M.D., Physician to St. Mary's Hospital. A New Enlarged Edition. Edited by J. F. PAYNE, M.D., Lecturer on Morbid Anatomy at St. Thomas' Hospital. With Numerous Illustrations. Demi 8vo. Price $5.50.

JONES, ON SIGHT AND HEARING.

The Defects of Sight and Hearing, their Nature, Causes, and Prevention. By T. WHARTON JONES, M.D. Second Edition. 16mo. Price .50.

KIRBY, ON PHOSPHORUS. Fifth Edition.

Phosphorus as a Remedy for Functional Diseases of the Nervous System. By E. A. KIRBY, M.D. Fifth Edition. 8vo. Price $1.00

KOLLMEYER, KEY TO CHEMISTRY.

Chemia Coartata, or Key to Modern Chemistry. By A. H. KOLLMEYER, M.D. With Numerous Tables, Tests, etc. Price $2.25

KIRKE, PHYSIOLOGY. Revised and Enlarged.

A Hand-book of Physiology. By KIRKE. Tenth London Edition. By W. MORRANT BAKER, M.D. 420 Illustrations. *Now Ready.* Price $5.00

"This is undoubtedly the best work for students on Physiology extant."—*Cincinnati Med. News.*

KANE, THE OPIUM, MORPHINE AND SIMILAR HABITS.

Drugs that Enslave. The Opium, Morphine, Chloral, Hashisch and Similar Habits. By H. H. KANE, M.D., of New York. With Illustrations. Price $1.25.

"It contains a large amount of information collected with much labor and presented in a systematic manner. The subject of the chloral habit has not been investigated by any one, we believe, so thoroughly as by Dr. Kane."—*Medical Record.*

"It deserves to be read by those who feel an interest in discouraging the use of these dangerous drugs. The book is embellished by an excellent phototype frontispiece of Laocoön."—*American Journal of Pharmacy.*

"A work of more than ordinary ability and careful research. . . . For the first time, reliable statistics on the use of chloral are classified and published, . . . and it is shown that the use of chloral *causes a more complete and rapid ruin of mind and body* than either opium or morphine."—*Druggists' Circular and Gazette.*

KIDD, THERAPEUTICS.

The Laws of Therapeutics; or, the Science and Art of Medicine. By JOSEPH KIDD, M.D. 12mo. Cloth. Price $1.25.

"Dr. Kidd acknowledges two laws—that of *contraria contrariis* and *similia similibus;* but the cases he gives in his chapter on *ars medica* show that, like a sensible practitioner, he does not allow himself blindly to follow either the one or the other, but seeks out the cause of disease, and tries by rational measures to remove it. The cases are the most valuable part of the book."—*London Practitioner.*

LANDIS, A COMPEND OF OBSTETRICS. Illustrated.

A Compend of Obstetrics; especially adapted to the Use of Students and Physicians. By HENRY G. LANDIS, M.D., Professor of Obstetrics and Diseases of Women in Starling Medical College, Columbus, Ohio. Illustrated. 12mo. Cloth. Price $1.00: interleaved for the addition of Notes, $1.25

"The questions are well chosen, the answers clear, concise, and well up to the present state of obstetrical science. It will be a handy book for reference for practitioner as well as student."—*Prof. E. O. F. Roler, Chicago Medical College.*

"I have observed no statement to the correctness of which I could take exception. There are very few practitioners who cannot be instructed by its perusal."—*David Wark, M.D., U. S. Medical College, New York.*

"It is complete, accurate and scientific; the very best book of its kind."—*Prof. J. S. Knox, Rush Medical College, Chicago.*

"I have been teaching in this department for many years, and am free to say that this will be the best assistant I ever had. It is accurate and comprehensive, but brief and pointed."—*Prof. P. D. Yost, St. Louis.*

LEGG, ON THE URINE.

Practical Guide to the Examination of the Urine, for Practitioner and Student. By J. WICKHAM LEGG, M.D. Fifth Edition, Enlarged. Illustrated. 12mo. Price .75

This little work is intended to supply the Physician or Student with a concise guide to the recognition of the different characteristics of the urine, and though small and well adapted to the pocket, contains, probably, everything that could be gleaned from a larger work.

LEARED, IMPERFECT DIGESTION.

The Causes and Treatment of Imperfect Digestion. By ARTHUR LEARED, M.D. The 7th Edition. Revised and Enlarged. 12mo. Price $2.00

LIEBREICH, ATLAS OF OPHTHALMOSCOPY.

An Atlas of Ophthalmoscopy, containing 12 Full-page Chromo-Lithographic Plates, with 59 Figures. By R. LIEBREICH, M.D. Second Edition, Enlarged Large Quarto. Price $12.00

LIVEING, ON SICK HEADACHE.

Megrim, or Sick Headache and Some Allied Disorders. By EDWARD LIVEING, M.D. With Plates, Tables, etc. 8vo. Price $5.50

LEBER AND ROTTENSTEIN, DENTAL CARIES.

Dental Caries and Its Causes. An Investigation into the Influence of Fungi in the Destruction of the Teeth. By Drs. LEBER and ROTTENSTEIN. Illustrated. 8vo. Paper Cover 75 cents; Cloth, $1.25

"The work gives the result of patient observation, presents the deductions of its authors with a perspicuity and modesty calculated to secure for its positions a thoughtful consideration. We heartily commend it as an educational work."—*Dental Cosmos.*

LEWIN, ON SYPHILIS.

The Treatment of Syphilis. By Dr. GEORGE LEWIN, of Berlin. Translated by CARL PROEGLER, M.D., and E. H. GALE, M.D., Surgeons U. S. Army. Illustrated. 12mo. Price $1.25

"When such authorities as Dr. Drysdale (as we quoted a few weeks ago) condemn the use of mercury in syphilis as "too dangerous," while, on the other hand, eminent surgeons, such as Professor Gross, will not treat a case without that drug, general practitioners will gladly welcome any *media via* which gives us all the good effects of mercurials without any danger of their ill results appearing. This is what is accomplished by Dr. Lewin."—*Philadelphia Medical and Surgical Reporter.*

LIZARS, ON TOBACCO.

The Use and Abuse of Tobacco. By JOHN LIZARS, M.D. 12mo.

LONGLEY, POCKET MEDICAL LEXICON.

Students' Pocket Medical Dictionary, Giving the Correct Definition and Pronunciation of all Words and Terms in General Use in Medicine and the Collateral Sciences, with an Appendix, containing Poisons and their Antidotes, Abbreviations Used in Prescriptions, and a Metric Scale of Doses. By ELIAS LONGLEY. 24mo. Price, Cloth, $1.00; Tucks and Pocket $1.25

This is an entirely new Medical Dictionary, containing some 300 compactly printed 24mo pages, very carefully prepared by the author, who has had much experience in the preparation of similar works, assisted by the Professors of Chemistry and of Botany in one of our leading medical colleges.

"This little book will be welcomed by students in medicine and pharmacy as a convenient pocket companion, giving the pronunciation, acceptation, and definition of medical, pharmaceutical, chemical and botanical terms."—*American Journal of Pharmacy.*

"It would seem to be just the book for dental and medical students."—*Dental Advertiser.*

"It is, we believe, also the only lexicon in existence in which the pronunciation of words is fully and distinctly marked."—*Canada Medical Review.*

"This is a very compact and complete little dictionary. We commend it as particularly useful to students."—*New York Medical Journal.*

MAYNE, MEDICAL DICTIONARY. Fifth Edition.

A Medical Vocabulary, Being an Explanation of all Terms and Phrases used in the Various Departments of Medical Science and Practice, Giving their Derivation, Meaning, Application, and Pronunciation. Intended specially as a Book of Reference for the Student. By DRS. R. G. and J. MAYNE. Fifth Edition. Revised and Enlarged. Cloth. Price $4.00

MEDICAL REGISTER.

A Monthly Journal Devoted to the Literature of Medicine and Allied Sciences. Containing Critical Reviews, Book Notices, Miscellaneous News, and complete Bibliographical Lists of all New Books published on Medical and Scientific Subjects. Terms, per Annum, $1.00

An invaluable Monthly Reference List for Librarians, Professors, Specialists, and all wishing to keep acquainted with the Medical Literature of the day.

MACDONALD, MICROSCOPICAL EXAMINATION OF WATER.

A Guide to the Microscopical Examination of Drinking Water. By J. D. MACDONALD, M.D. With Twenty Full-page Lithographic Plates, Reference Tables, etc. 8vo. Price $2.75

"The volume is an excellent hand-book and will greatly facilitate the study of the subject."—*Popular Science Monthly.*

MACEWEN, ON OSTEOTOMY.

An Inquiry into the Ætiology and Pathology of Knock-knee, Bow-leg and other Osseous Deformities of the Lower Limbs. By WM. MACEWEN, M.D. Illustrated. 8vo. Price $3.00

MACKENZIE, ON THE THROAT AND NOSE.

Including the Pharynx, Larynx, Trachea, Œsophagus, Nasal Cavities, and Neck. By MORELL MACKENZIE, M.D., London, Senior Physician to the Hospital for Diseases of the Chest and Throat, Lecturer on Diseases of the Throat at London Hospital Medical College, etc., etc.

VOL. I. Including the Pharynx, Larynx, Trachea, etc. 112 Illustrations. *Now Ready.* Price, Cloth, $4.00; Leather, $5.00

VOL. II. Including the Œsophagus, Nasal Cavities, Neck, etc. Illustrated. *In Preparation.*

Author's Edition, issued under his supervision, containing all the original Wood Engravings, and the essay on "Diphtheria, Its Causes, Nature, and Treatment," formerly published separately. Each volume sold separately; purchasers of Volume I. will receive early information of date of issue and price of Volume II., upon sending their address to the publishers.

"We have long felt the want of a thoroughly practical and systematic treatise on diseases of the throat and nasal passages. Admirable essays have from time to time appeared; no standard work has been written. Any one familiar with laryngoscopic work must appreciate the valuable addition now made to this special department in the work before us. The entire work will include the consideration of affections of the pharynx, larynx, trachea, œsophagus, nasal cavities, and neck. The matter now presented complete for the first time is the result of the author's large and unrivaled experience, both in hospital and private practice, extending over a period of twenty years. There can be but one verdict of the profession on this manual—it stands without any competitor in medical literature, as a standard work on the organs it professes to treat of."—*Dublin Journal.*

"It is both practical and learned; abundantly and well illustrated; its descriptions of disease are graphic, and the diagnoses the best we have anywhere seen. To give examples of the thoroughness of Dr. Mackenzie's book, we may cite the chapter on diphtheria, which embraces 47 pages. The chapter on non-malignant tumors of the larynx would appear to be absolutely exhaustive. Nowhere else have we seen so elaborate a statement of the subject. We can predict for this work a high position, and congratulate its distinguished author upon its appearance."—*Philadelphia Medical Times.*

BY SAME AUTHOR.

THE PHARMACOPŒIA of the Hospital for Diseases of the Throat and Nose.

The Fourth Edition, much enlarged, containing 250 Formulæ, with Directions for their Preparation and Use. 16mo. Price $1.25

GROWTHS IN THE LARYNX.

Their History, Causes, Symptoms, etc. With Reports and Analysis of one Hundred Cases. With Colored and Other Illustrations. 8vo. Price $2.00

MACNAMARA, DISEASES OF THE EYE.

A Manual of the Diseases of the Eye. By C. MACNAMARA, M.D. Fourth Edition, Carefully Revised; with Additions and Numerous Colored Plates, Diagrams of Eye, Wood-cuts, and Test Types. Demi 8vo. Price $4.00

"As a book of ready reference on diseases of the eye it has no superior, and we may safely say, no equal in our language."—*Cincinnati Lancet and Observer.*

BY SAME AUTHOR.

ON THE BONES AND JOINTS.

Lectures on Diseases of the Bones and Joints. Second Edition. Demi 8vo. Price $4.25

MADDEN, HEALTH RESORTS.

Health Resorts for the Treatment of Chronic Diseases. A Hand-Book, the result of the author's own observations during several years of health travel in many lands, containing also remarks on climatology and the use of mineral waters. By T. M. MADDEN, M.D. 8vo. Price $2.50

"Rarely have we encountered a book containing so much information for both invalids and pleasure seekers." —*The Sanitarian.*

MEDICAL REGISTER.

Directory of Physicians in Philadelphia. Octavo. Cloth, $1.00

MARSHALL & SMITH, ON THE URINE.

The Chemical Analysis of the Urine. By JOHN MARSHALL, M.D., and EDGAR F. SMITH, M.D., of the Chemical Laboratory, Medical Department, University of Pennsylvania. Illustrated by Phototype Plates. 12mo. Price $1.00

MARSHALL, ANATOMICAL PLATES;

Or Physiological Diagrams. Life Size (7 by 4 feet) and Beautifully Colored. By JOHN MARSHALL, F.R.S. An Entirely New Edition, Revised and Improved, Illustrating the Whole Human Body.

The Set, Eleven Maps, in Sheets, Price $50.00
" " handsomely Mounted on Canvas, with Rollers, and Varnished, Price $80.00
An Explanatory Key to the Diagrams, Price .50

Dr. Marshall's Plates, from their size and perfection of drawing and coloring, excel any diagrams that have been published. They have proved invaluable in Medical Schools and Lecture Rooms. The low price at which they are offered brings them within reach of all.

No. 1. The Skeleton and Ligaments. No. 2. The Muscles, Joints, and Animal Mechanics. No. 3. The Viscera in Position—The Structure of the Lungs. No. 4. The Organs of Circulation. No. 5. The Lymphatics or Absorbents. No. 6. The Digestive Organs. No. 7. The Brain and Nerves. No. 8. The Organs of the Senses and Organs of the Voice, Plate 1. No. 9. The Organs of the Senses, Plate 2. No. 10. The Microscopic Structure of the Textures, Plate 1. No. 11. The Microscopic Structure of the Textures, Plate 2.

MARSDEN, ON CANCER.

A New and Successful Mode of Treating Certain Forms of Cancer. By ALEXANDER MARSDEN, M.D. Second Edition. Colored Plates. 8vo. Price $3.00

MARTIN, MICROSCOPIC MOUNTING.

A Manual of Microscopic Mounting. With Notes on the Collection and Examination of Objects, and upwards of 150 Illustrations. By JOHN H. MARTIN. Second Edition, Enlarged. 8vo. Price $2.75

MORRIS, ON THE JOINTS.

The Anatomy of the Joints of Man. Comprising a Description of the Ligaments, Cartilages, and Synovial Membranes; of the Articular Parts of Bones, etc. By HENRY MORRIS, F.R.C.S. Illustrated by 44 Large Plates and Numerous Figures, many of which are Colored. 8vo. Price $5.50

MUTER, MEDICAL AND PHARMACEUTICAL CHEMISTRY.

An Introduction to Pharmaceutical and Medical Chemistry. PART ONE.—Theoretical and Descriptive. PART TWO.—Practical and Analytical. Arranged on the principle of the Course of Lectures on Chemistry as delivered at, and the Instruction given in the Laboratories of, the South London School of Pharmacy. By JOHN MUTER, M.D., President of the Society of Public Analysts. A Second Edition, Enlarged and Rearranged. The Two Parts bound in one large octavo volume. Price $6.00

PART TWO.—Practical and Analytical. Bound Separately, for the Special Convenience of Students. Large 8vo. Cloth. Price $2.50

MAC MUNN, THE SPECTROSCOPE.

The Spectroscope in Medicine. By CHAS. A. MAC MUNN, M.D. With 3 Chromo-lithographic Plates of Physiological and Pathological Spectra, and 13 Wood Cuts. 8vo. Price $3.00

"This book is, without question, the best that has yet been published on the subject; to those not familiar with Physiological Spectroscopy it will prove interesting, while to those who are working in this field it is a necessity."—*New York Medical Journal.*

MASON, ON THE FACE.

The Surgery of the Face. By FRANCIS MASON, F.R.C.S. With 100 Illustrations, showing the various operations performed. 8vo. Price $2.25

Dr. Mason has for many years taken considerable interest in the surgery of the face, mouth, throat, and contiguous parts, collecting several thousand cases of the different operations having special reference to these regions, which, from their conspicuousness, form a very important part of the human body.

MAUNDER, OPERATIVE SURGERY.

Operative Surgery. Adapted to the Living and Dead Subject. By C. F. MAUNDER, F.R.C.S. Second Edition, with One Hundred and Sixty-four Engravings on Wood. Price $2.25

BY SAME AUTHOR.

THE ARTERIES.

Surgery of the Arteries, including Aneurisms, Wounds, Hemorrhages, Twenty-seven Cases of Ligatures, Antiseptic, etc. With Illustrations. Price $1.50

MAXON, ON PRACTICE.

The Practice of Medicine. By EDWIN R. MAXON, M.D. 8vo. Price $3.00

MAYS, THE THERAPEUTIC FORCES;

Or, The Action of Medicine in the Light of the Doctrine of Conservation of Force. By THOMAS J. MAYS, M.D. 12mo. Price $1.25

MEADOWS, OBSTETRICS, Revised Edition.

A Text-Book of Midwifery. Including the Signs and Symptoms of Pregnancy, Obstetric Operations, Diseases of the Puerperal State, etc. By ALFRED MEADOWS, M.D. Third American, from Fourth London Edition. Revised and Enlarged. With 145 Illustrations. 8vo. Price $2.00

"It is with great gratification that we are enabled to class Dr. Meadows' Manual as a rare exception, and to pronounce it an accurate, practical, and creditable work, and to unhesitatingly recommend it to both student and practitioner."—*American Journal of Obstetrics.*

"We cannot but feel that every teacher of Obstetrics has good cause to congratulate himself on being able to put in the hands of the student a book which contains so much valuable and reliable information."—*Philadelphia Medical Times.*

"On all questions of treatment, whether by medicines, by hygienic regimen, or by mechanical or operative appliances, this treatise is as satisfactory as a work of manual size could be: students and practitioners can hardly do better than adopt it as their vade mecum."—*The Practitioner.*

"The systematic arrangement of subjects, and the concise, practical style in which it is written, make the work especially valuable as a student's manual." *Chicago Medical Examiner.*

MEARS, PRACTICAL SURGERY.

Practical Surgery. Including: Part I.—Surgical Dressings; Part II.—Bandaging; Part III.—Ligations; Part IV.—Amputations. With 227 Illustrations. By J. EWING MEARS, M.D., Demonstrator of Surgery in Jefferson Medical College, and Professor of Anatomy and Clinical Surgery in the Pennsylvania College of Dental Surgery. 12mo. Price $2.00

"Professor Mears has written a convenient and useful book for students. We can most cordially endorse it as fulfilling well the promise made in its modest preface."—*Cincinnati Lancet and Clinic.*

"It contains a great deal of information upon the subjects of which it treats, in a convenient and condensed form. Each division is well illustrated, thereby rendering the text doubly clear."—*New York Medical Record.*

MILLER, ON ALCOHOL.

Alcohol. Its Place and Power. By JAMES MILLER, F.R.C.S. 12mo.

MILLER & LIZARS, ALCOHOL AND TOBACCO.

Alcohol. Its Place and Power. By JAMES MILLER, F.R.C.S.; and, Tobacco, Its Use and Abuse. By JOHN LIZARS, M.A. The two essays in one volume. 12mo. Price $1.00

MENDENHALL, VADE MECUM.

The Medical Student's Vade Mecum. A Compend of Anatomy, Physiology, Chemistry, The Practice of Medicine, Surgery, Obstetrics, etc. By GEORGE MENDENHALL, M.D. Eleventh Edition. 224 Illustrations. 8vo. Price $2.00

MEIGS AND PEPPER, DISEASES OF CHILDREN.

A Practical Treatise on the Diseases of Children. By J. FORSYTH MEIGS, M.D., Fellow of the College of Physicians of Philadelphia, etc., etc., and WILLIAM PEPPER, M.D., Physician to the Philadelphia Hospital, Provost University of Pennsylvania. Seventh Edition, thoroughly Revised and Enlarged. A Royal Octavo Volume of over 1000 pages. Price, Cloth, $6.00; Leather, $7.00

"With the recent additions it may safely be pronounced one of the best and most comprehensive works on Diseases of Children."—*New York Medical Journal.*

"Must be regarded as the most complete work on Diseases of Children in our language."—*Edinburgh Medical Journal.*

"We have seldom met with a text-book so complete, so just and so readable as the one before us."—*American Journal of Obstetrics.*

MATHIAS, LEGISLATIVE MANUAL.

A Rule for Conducting Business in Meetings of Societies, Legislative Bodies, Town and Ward Meetings, etc. By BENJ. MATHIAS, A.M. Sixteenth Edition. 16mo. Price .50

MORTON, REFRACTION OF EYE.

The Refraction of the Eye. Its Diagnosis and the Correction of its Errors. With Chapter on Keratoscopy. By A. STANFORD MORTON, M.B., F.R.C.S. 12mo. Price $1.00

"The author has not only given very thorough rules for the objective and subjective examinations of the eye in the various conditions of refraction which present themselves, but has entered into an explanation of the phenomena observed, which is at once scientific and elementary."—*Edinburgh Medical Journal.*

OVERMAN, MINERALOGY.

Practical Mineralogy, Assaying, and Mining, with a Description of the Useful Minerals, etc. By FREDERICK OVERMAN, Mining Engineer. 11th Edition. 12mo. Cloth. Price $1.00

OGSTON, MEDICAL JURISPRUDENCE.

Lectures on Medical Jurisprudence. By Drs. FRANCIS and FRANCIS OGSTON, JR. With Copper-plate Illustrations. 8vo. Price $6.00

"We have a high appreciation of Dr. Ogston's lectures, and can cordially recommend the work as accomplishing all that the distinguished author promised for it."—*American Journal of Medical Science.*

OLDBERG, PRESCRIPTION BOOK. 300 New Prescriptions.

Three Hundred Prescriptions, Selected Chiefly from the Best Collections of Formulæ used in Hospital and Out-patient-practice, with a Dose Table, and a Complete Account of the Metric System. By OSCAR OLDBERG, PHAR. D., Late Medical Purveyor, United States Marine Hospital Service; Professor of Materia Medica, National College of Pharmacy, Washington, D. C.; Member of the American Pharmaceutical Association, and of the Sixth Decennial Committee of Revision and Publication of the Pharmacopœia of the United States. 12mo. Price, Paper Covers, .75; Cloth, $1.25

The prescriptions given in this work are selected from the Pharmacopœias and formularies of the great Hospitals of New York, Philadelphia, Boston and London, or contributed from the practice of medical officers of the United States Service. The Dose Table includes nearly all of the remedies that have a place in the current *Materia Medica.*

BY SAME AUTHOR.

THE UNOFFICIAL PHARMACOPŒIA.

Comprising over 700 Popular and Useful Preparations, not Official in the United States, of the various Elixirs, Fluid Extracts, Mixtures, Syrups, Tinctures, Ointments, Wines, etc., etc., in constant demand throughout the country. Thick 12mo. 503 pp. Half Morocco. Price $3.50

"This volume is one of the most practical and valuable contributions to Pharmaceutical work of recent publication. It has received high commendation from many of our best pharmacists."—*Lazell, Marsh & Gardiner, Wholesale Druggists, New York City.*

OTT, ACTION OF MEDICINES.

The Action of Medicines. By ISAAC OTT, M.D., late Demonstrator of Experimental Physiology in the University of Pennsylvania. With 22 Illustrations. 8vo. Price $2.00

PAGE, INJURIES OF THE SPINE.

Injuries of the Spine and Spinal Cord, without apparent Lesion and Nervous Shock. In their Surgical and Medico-Legal Aspects. By HERBERT W. PAGE, M.D., M.C.CANTAB., F.R.C.S., Surgeon to, and Lecturer on Surgery at, St. Mary's Hospital, London. Octavo, Cloth. Price $4.00

PAGET, SURGICAL PATHOLOGY.

Lectures on Surgical Pathology, Delivered at the Royal College of Surgeons. By JAMES PAGET, F.R.S. Third Edition. Edited by WILLIAM TURNER, M.D. With Numerous Illustrations. 8vo. Price, Cloth, $7.00; Leather, $8.00

PARKES, PRACTICAL HYGIENE. Sixth Edition.

A Manual of Practical Hygiene. By EDWARD A. PARKES, M.D. The Sixth Revised and Enlarged Edition. With Many Illustrations. 8vo. Price $6.00

"Altogether it is the most complete work on Hygiene which we have seen."—*New York Medical Record.*

"We find that it never fails to throw light on any hygienic question which may be proposed."—*Boston Medical and Surgical Journal.*

"We commend the book heartily to all needing instruction (and who does not), in Hygiene."—*Chicago Medical Journal.*

PIESSE, THE MANUFACTURE OF PERFUMERY. Fourth Edition.

The Art of Perfumery; or the Methods of Obtaining the Odors of Plants, and Instruction for the Manufacture of Perfumery, Dentifrices, Soap, Scented Powders, Odorous Vinegars and Salts, Snuff, Cosmetics, etc., etc. By G. W. SEPTIMUS PIESSE. Fourth Edition. Enlarged. 366 Illustrations. 8vo. Cloth. Price $5.50

"An excellent book."—*Commercial Advertiser.*

"It is the best book on Perfumery yet published."—*Scientific American.*

"Exceedingly useful to druggists and perfumers."—*Journal of Chemistry.*

"Is in the fullest sense, comprehensive."—*Medical Record.*

PROCTER'S PRACTICAL PHARMACY.

Lectures on Practical Pharmacy. With 43 Engravings and 32 Lithographic Fac-simile Prescriptions. By BARNARD S. PROCTER. Second Edition. Octavo. *In Preparation.*

PARRISH, ALCOHOLIC INEBRIETY.

Alcoholic Inebriety from a Medical Standpoint, with Illustrative Cases from the Clinical Records of the Author. By JOSEPH PARRISH, M.D., President of the American Association for the Cure of Inebriates. 12mo. Cloth, $1.25

POTTER'S COMPENDS, FOR PHYSICIANS AND STUDENTS.

These Compends are based on the lectures of prominent Professors and the most popular Text-books. They will be found very serviceable to physicians, as remembrancers, and invaluable to students in the Quiz Class and Examination Room. By SAMUEL O. L. POTTER, M.D.

ANATOMY, with 63 Illustrations.

VISCERAL ANATOMY, with Illustrations.

MATERIA MEDICA, arranged in accordance with the Sixth Revision U. S. Pharmacopœia. 12mo. Cloth.

Price for each, Interleaved for taking Notes, $1.25; plain, $1.00

BY THE SAME AUTHOR.

SPEECH, AND ITS DEFECTS.

Considered Physiologically, Pathologically, Historically, and Remedially; being the Lea Prize Thesis of Jefferson Medical College, 1882. Revised and Corrected for Publication. 12mo. Cloth. Price $1.00

PENNSYLVANIA HOSPITAL REPORTS.

Edited by a Committee of the Hospital Staff. J. M. DACOSTA, M.D., and WILLIAM HUNT, M.D. Vols. 1 and 2, containing Original Articles by former and present Members of the Staff. With Lithographic and other Illustrations. 8vo. Price, per volume, $2.00

PEREIRA, PRESCRIPTION BOOK. Sixteenth Edition.

Physician's Prescription Book. Containing Lists of Terms, Phrases, Contractions and Abbreviations used in Prescriptions, Explanatory Notes, Grammatical Construction of Prescriptions, Rules for the Pronunciation of Pharmaceutical Terms. By JONATHAN PEREIRA, M.D., F.R.S. Sixteenth Edition. Price, Cloth, $1.00; Leather, with tucks and pockets, $1.25

PHYSICIAN'S VISITING LIST. PUBLISHED ANNUALLY.

THIRTY-SECOND YEAR OF ITS PUBLICATION.

SIZES AND PRICES.

For 25 Patients weekly.		Tucks, pockets, and pencil,	$1.00
50 " "		" " "	1.25
75 " "		" " "	1.50
100 " "		" " "	2.00
50 " " 2 vols.	Jan. to June / July to Dec.	"	2.50
100 " " 2 vols.	Jan. to June / July to Dec.	"	3.00

INTERLEAVED EDITION.

For 25 Patients weekly, interleaved, tucks, pockets, etc.,			1.25
50 " " " " " "			1.50
50 " " 2 vols.	Jan. to June / July to Dec.	"	3.00

PERPETUAL EDITION, WITHOUT DATES AND WITH SPECIAL MEMORANDUM PAGES. SAME SIZE AS THE 25 PATIENTS, INTERLEAVED. Price, $1.25

The Visiting List contains a List of New Remedies, a Diagram of the Chest, Upper Abdomen; a New Table of Poisons and their Antidotes. The Metric or French Decimal System of Weights and Measures. Posological Tables, showing the relation of our present system of Apothecaries' Weights and Measures to that of the Metric System, giving the Doses in both.

This last is a most valuable addition, and will materially aid the Physician. So many writers now use the metric system, especially in foreign books and journals, that one not familiar with it is constantly confused, and in many cases unable to understand the measurements or doses.

"It is certainly the most popular Visiting List extant."—*New York Medical Journal.*

"Its compact size, convenience of arrangement, durability, and neatness of manufacture have everywhere obtained for it a preference."—*Canada Lancet.*

"The book is convenient in form, not too bulky, and in every respect the very best Visiting List published."—*Canada Medical and Surgical Journal.*

"This standard Visiting List, for completeness, compactness, and simplicity of arrangement, is excelled by none in the market."—*New York Medical Record.*

POWER, HOLMES, ANSTIE AND BARNES (*Drs.*).

Reports on the Progress of Medicine, Surgery, Physiology, Midwifery, Diseases of Women and Children, Materia Medica, Medical Jurisprudence, Ophthalmology, etc., etc. Reported for the New Sydenham Society. 8vo. Price $2.00

PURCELL, ON CANCER.

Cancer. Its Allies and other Tumors, with Specia Reference to their Medical and Surgical Treatment. By F. ALBERT PURCELL, M.D., M.R.C.S. Surgeon to the Cancer Hospital, Brompton, England. 8vo. Price $3.75

RADCLIFFE, ON EPILEPSY.

On Epilepsy, Pain, Paralysis, and other Disorders of the Nervous System. By CHARLES BLAND RADCLIFFE, M.D. Illustrated. 12mo. Price $1.50

"To no authority can the medical inquirer turn for an analysis of the phenomena of epilepsy with more satisfaction than to the admirable essay of Dr. Radcliffe."—*American Journal Medical Sciences.*

ROBERTS, MANUAL OF MIDWIFERY.

The Student's Guide to the Practice of Midwifery. By D. LLOYD ROBERTS, M.D., F.R.C.P., Physician to St. Mary's Hospital, Manchester, etc., etc. Second Edition. With 95 Illustrations. 12mo. Price $1.25

"As an obstetrical manual, we think that of Dr. Roberts one of the best now offered to the Profession, as it comes with authority, and he possesses the ability to condense, and at the same time present a subject clearly."—*American Journal of Medical Science.*

"Concise, clear, and practical."—*Medical Press and Circular.*

"The present edition has been very thoroughly revised, some chapters having been entirely re-written. For its size, it forms a remarkably complete compendium of the subject, and can hardly be surpassed in the simplicity and clearness of its explanations."—*Obstetrical Journal of Great Britain and Ireland.*

REYNOLDS, ELECTRICITY.

Lectures on the Clinical Uses of Electricity. By J. RUSSELL REYNOLDS, M.D., F.R.S. Second Edition. 12mo. Price $1.00

"It is thoroughly reliable as a guide, very concise, and will be found exceedingly useful to the general practitioner."—*Canada Lancet.*

RICHARDSON, MECHANICAL DENTISTRY. Third Edition.

A Practical Treatise on Mechanical Dentistry. By JOSEPH RICHARDSON, D.D.S. Third Edition. With 185 Illustrations. 8vo. Price, Cloth, $4.00; Leather, $4.75

"Taken as a whole, Professor Richardson's work is a valuable contribution to the dental art, and is beyond all question the best treatise extant upon the general subject of Mechanical Dentistry."—*Dental Cosmos.*

RIGBY AND MEADOWS, OBSTETRIC MEMORANDA.

Dr. Rigby's Obstetric Memoranda. Fourth Edition. Revised. By ALFRED MEADOWS, M.D. 32mo. Price .50

PIGGOTT, ON COPPER.

Copper Mining and Copper Ore. With a full Description of the Principal Copper Mines of the United States, the Art of Mining, etc. By A. SNOWDEN PIGGOTT. 12mo. Price $1.00

PRINCE, ORTHOPEDIC SURGERY.

Plastic and Orthopedic Surgery. By DAVID PRINCE, M.D. Containing a Report on the Condition of, and Advance made in, Plastic and Orthopedic Surgery, etc., etc., and Numerous Illustrations. 8vo. Price $4.50

RYAN, ON MARRIAGE.

The Philosophy of Marriage. In its Social, Moral and Physical Relations, and Diseases of the Urinary Organs. By MICHAEL RYAN, M.D. Member of the Royal College of Physicians, London. 12mo. Price $1.00

ROBERTS, PRACTICE OF MEDICINE. Fourth Edition.

The Theory and Practice of Medicine. By FREDERICK ROBERTS, M.D. Third American, from the Fourth London Edition. 8vo.

Price, Cloth, $5.00 ; Leather, $6.00

Recommended at the University of Pennsylvania, Yale and Dartmouth Colleges, University of Michigan, and many other Medical Schools.

The unexceptional large and rapid sale of this book, and the universal commendation it has received from the profession, seems to be a sufficient guarantee of its merits as a Text-book. The publishers are in receipt of numerous letters from Professors in the medical schools, speaking favorably of it, and below they give extracts from the medical press, American and English, attesting its superiority and value to both student and practitioner. The present edition has been thoroughly revised and much of it re-written.

"*The best Text-book for Students in the English language.* We know of no work in the English language, or in any other, which competes with this one."—*Edinburgh Medical Journal.*

"It is a remarkable evidence of industry, experience, and research."—*Practitioner.*

"Dr. Roberts' book is admirably fitted to supply the want of a good hand-book, so much felt by every medical student."—*Student's Journal and Hospital Gazette.*

"It contains a vast deal of capital instruction for the student."—*Medical Times and Gazette.*

"There are great excellencies in this book, which will make it a great favorite with the student."—*Richmond and Louisville Journal.*

"To the student it will be a gift of priceless value."—*Detroit Review of Medicine.*

"We heartily recommend it to students, teachers, and practitioners."—*Boston Medical and Surgical Journal.*

"It is of a much higher order than the usual compilations and abstracts placed in the hands of students."—*Medical and Surgical Reporter.*

"It is unsurpassed by any work that has fallen into our hands as a compendium for students."—*The Clinic.*

"We particularly commend it to students about to enter upon the practice of their profession."—*St. Louis Medical and Surgical Journal.*

RINDFLEISCH, PATHOLOGICAL HISTOLOGY.

A Text-Book of Pathological Histology. By Dr. EDWARD RINDFLEISCH. Translated by Drs. WM. C. KOLMAN and F. T. MILLER. 208 Illustrations. 8vo.

Recommended as a Text-Book at the University of Pennsylvania and other Medical Schools.

"To be up with the times, our Pathologists must make themselves familiar with the thorough, clear, and almost exhaustive teachings of Professor Rindfleisch."—*Ohio Medical and Surgical Reporter.*

ROYLE AND HARLEY, MATERIA MEDICA. Sixth Edition.

A Manual of Materia Medica and Therapeutics. By Dr. J. FORBES ROYLE. Sixth Edition. Edited by JOHN HARLEY, M.D. 840 pages and numerous Illustrations. Demi 8vo. Price $5.00

RUTHERFORD, PRACTICAL HISTOLOGY.

Outlines of Practical Histology; being the Notes of the Course of Practical Physiology given in King's College, London, and the University of Edinburgh. By WILLIAM RUTHERFORD, M.D., F.R.S., Professor of the Institutes of Medicine in the University of Edinburgh (with additional leaves for Notes). Third Edition. Illustrated. [*In Press.*

"To the student and teacher of Practical Histology, this work can hardly help being a great boon. It is complete, yet short, perfectly clear and simple, and moreover every line bespeaks the outcome of an extensive practical acquaintance with the subject."—*Medical Times and Gazette, London.*

BY SAME AUTHOR.

THE ACTION OF DRUGS ON THE BILE.

An Experimental Research on the Physiological Action of Drugs on the Secretion of Bile. 100 Illustrations. 8vo. Price $3.00

SANKEY, MENTAL DISEASES.

Lectures on Mental Diseases. By W. H. O. SANKEY, M.D. 8vo. Price $3.00

SANDERSON AND FOSTER, THE PHYSIOLOGICAL LABORATORY.

A Hand-book of the Physiological Laboratory. Being Practical Exercises for Students in Physiology and Histology. By J. BURDON SANDERSON, M.D., E. KLEIN, M.D., MICHAEL FOSTER, M.D., F.R.S., and T. LAUDER BRUNTON, M.D. With over 350 Illustrations and Appropriate Letter-press Explanations and References.

Price, Two Volumes, Text and Plates, separate, - - - $6.00
" One " " " bound together, Cloth, 5.00
" " " " " " " Leather, 6.00

Adopted as a Text-book at Yale College. and used at other Medical Schools in America and England.

"Recognizing the fact that Physiology is emphatically an experimental science, it furnishes minute instructions for performing a great variety of experiments. A student could scarcely desire a better guide." —*Boston Medical and Surgical Journal.*

"We confidently recommend it to the attention of all who are interested in the wide and fertile field of Physiological research."—*New York Medical Journal.*

"This is a most superb book, and fills a hiatus which every physiological student has lamented."—*Chicago Medical Journal.*

SANDERSON, PHYSIOLOGY. Second Edition.

A Syllabus of a Course of Lectures on Physiology. By J. BURDON SANDERSON, M.D. For the Use of Students. Second Edition. 8vo. Price $1.50

SANDERSON, PRACTICAL EXERCISES IN PHYSIOLOGY.

8vo. Illustrated. Price $1.12

SANSOM, PHYSICAL DIAGNOSIS. Third Edition just ready.

The Physical Diagnosis of Diseases of the Heart. Including the Use of the Sphygmograph and Cardiograph. By ARTHUR ERNEST SANSOM, M.D. Third Edition. Revised and Enlarged. With Illustrations. 12mo. Price $2.00

BY SAME AUTHOR.

ON CHLOROFORM.

Chloroform. Its Action and Administration. 12mo. Price $1.50

SMITH, MANUAL OF GYNÆCOLOGY.

Practical Gynæcology. A Hand-book of the Diseases of Women. By HEYWOOD SMITH, M.D. Physician to the Hospital for Women and to the British Lying-in Hospital. With Engravings. Price $1.25

The object of the author has been to present the busy practitioner with a book systematically arranged, burdened with no discussions on vexed questions of pathology, and giving at a glance the salient points of diagnosis and treatment with clearness and brevity.

CONTENTS.—Chapter 1. On the Means of Diagnosis: On Touch—immediate and intermediate. On Sight—immediate and intermediate. On Hearing.—immediate and intermediate. 2. General Diseases. 3. Local Diseases—Diseases of the Ovary. 4. Diseases of the Oviduct. 5. Diseases of the Broad Ligament. 6. Diseases of the Uterus (unimpregnated). 7. Diseases of the Vagina. 8. Diseases of the Vulva. 9. Diseases of the Mamma. 10. Functional Diseases. 11. Diseases connected with Pregnancy. 12. Diseases connected with Parturition. 13. Diseases consequent on Parturition. Appendix of Remedies.

BY SAME AUTHOR.

DYSMENORRHŒA. Just Issued.

Its Pathology and Treatment. 12mo. Price $1.75

SMITH, RINGWORM.

The Diagnosis and Treatment of Ringworm. By ALDER SMITH, F.R.C.S. With Illustrations. 12mo. Price $1.00

SMITH, ON NURSING.

The Efficient Training of Nurses for Hospital and Private Practice. By WILLIAM ROBERT SMITH. Illustrated. Third Edition. Price

SMITH, ON CHILDREN.

Clinical Studies of Diseases in Children. By EUSTACE SMITH, M.D. Second Revised Edition. Price $2.50

MEDICAL HERESIES, HISTORICALLY CONSIDERED.

A Series of Critical Essays on the Origin and Evolution of Sectarian Medicine, embracing a Special Sketch and Review of Homœopathy, Past and Present. By GONZALVO C. SMYTHE, A.M., M.D. Professor of the Principles and Practice of Medicine, College of Physicians and Surgeons, Indianapolis, Indiana. 12mo. Cloth. Price $1.25

"This book gives, in a small compass, an excellent history of medicine, from its earliest day to the present time."—*Buffalo Medical and Surgical Journal.*

"Cannot fail to be of interest, not only to the medical profession, but to the general reader."—*Baltimore Gazette.*

"The work is pleasantly written, in an easy, familiar style, and has cost the writer much literary research." —*New York Medical Journal.*

"Students and others interested in the subject of medicine will find a digest of the entire controversy (between the various schools of medicine) presented in this volume."—*Journal of Education.*

"Professor Smythe has succeeded in writing a brief, clear, and interesting sketch of the evolution of medical eccentricities, and of modern homœopathy, its facts and fallacies."—*Philadelphia Medical Times.*

SAVAGE, FEMALE PELVIC ORGANS. Author's Edition.

The Surgery, Surgical Pathology and Surgical Anatomy of the Female Pelvic Organs. In a Series of Colored Plates taken from Nature, with Commentaries, Notes and Cases. By HENRY SAVAGE, M.D., F.R.C.S. New Edition. Issued by arrangement with the Author, from the original Plates. Quarto. Price $12.00

SAVORY & MOORE, DOMESTIC MEDICINE.

A Condensed Compend of Domestic Medicine, and Companion to the Medicine Chest. By Drs. SAVORY and MOORE. Illustrated. 16mo. Price .50

SCHULTZE, OBSTETRICAL PLATES.

Obstetrical Diagrams. Life Size. By Prof. B. S. SCHULTZE, M.D., of Berlin. Twenty in the Set. Colored.
Price, in Sheets, $15.00; Mounted on Rollers $25.00

SCANZONI, DISEASES OF WOMEN.

A Practical Treatise on the Diseases of the Sexual Organs of Women. By Dr. F. W. VON SCANZONI. Translated by A. K. GARDINER, M.D. 8vo. Price $5.00

SIEVEKING, LIFE ASSURANCE.

The Medical Adviser in Life Assurance. By E. H. SIEVEKING, M.D. 12mo. Second Edition, Revised. Price $2.00

SHEPPARD, ON MADNESS.

Madness, in its Medical, Social and Legal Aspects. A series of Lectures delivered at King's Medical College, London. By EDGAR SHEPPARD, M.D. 8vo. Price $2.25

STOCKEN, DENTAL MATERIA MEDICA. Third Edition.

The Elements of Dental Materia Medica and Therapeutics with Pharmacopœia. By JAMES STOCKEN, D.D.S. Third Edition. 12mo. $2.50

The first edition of this book was disposed of in a little less than four months. In making this revision the author has endeavored to make it still more useful by the addition of considerable new matter.

SUTTON, VOLUMETRIC ANALYSIS. Fourth Edition.

A Systematic Handbook of Volumetric Analysis, or the Quantitative Estimation of Chemical Substances by Measure, Applied to Liquids, Solids, and Gases. By FRANCIS SUTTON, F.C.S. Fourth Edition. Revised and Enlarged, with Illustrations. 8vo. Price $5.00

SEWELL, DENTAL ANATOMY AND SURGERY.

A Manual of Dental Anatomy and Surgery, Including the Extraction of Teeth. By H. E. SEWELL, D.D.S., M.D. With 77 Illustrations. 12mo. Price $1.25

"A valuable book for the general Practitioner who is in want of a practical manual relating especially to diseases of the teeth."—*Medical Brief.*

"It will be found useful to the general Practitioner in the management of many incidental affections connected with the teeth and mouth, which cannot always be handed over to the specialist."—*Pacific Med. Journal.*

STILLE, ON MENINGITIS.

Epidemic Meningitis, or Cerebro-spinal Meningitis. By ALFRED STILLE, M.D., Professor of Practice at the University of Pennsylvania. 8vo. Price $2.00

"The name of the author is a sufficient guarantee that this monograph is elegant in style, exhaustive of its subject and rich with practical suggestions."—*Philadelphia Medical and Surgical Reporter.*

STOKES, DISEASES OF THE HEART.

The Diseases of the Heart and Aorta. By WILLIAM STOKES, M.D. Thick 8vo. Price $3.00

SWAIN, SURGICAL EMERGENCIES.

Surgical Emergencies: Concise Descriptions of the Various Accidents and Emergencies, with Directions for their Treatment. By WM. PAUL SWAIN, F.R.C.S. Eighty-two Illustrations. 12mo. Price $2.00

CONTENTS.—CHAPTER I. Injuries to the Head. II. Injuries to the Eye. III. Injuries to the Mouth, Pharynx, Œsophagus, and Larynx. IV. The Chest. V. The Upper Extremity. VI. The Abdomen. VII. The Pelvis. VIII. The Lower Extremity. IX. Emergencies connected with Parturition. X. Poisoning. XI. Antiseptic Treatment. XII. Apparatus and Dressing.

"Many surgeons will thank Dr. Swain for the trouble he has taken to put them easily in possession of this refresher of *half* forgotten knowledge.—*The Practitioner.*

SWERINGEN, REFERENCE BOOK.

A Pharmaceutical Lexicon or Dictionary of Pharmaceutical Science. Containing explanations of the various subjects and terms of Pharmacy, with appropriate selections from the Collateral Sciences. Formulæ for Officinal, Empirical, and Dietetic Preparations, etc., etc. By HIRAM. V. SWERINGEN, M.D. 8vo.
Price, Cloth, $3.00; Leather, $4.00

"It is worthy of a welcome, and sure of a ready recognition of its merits."—*London Pharmaceutical Journal.*

"It will prove of great service to the pharmaceutical student, apprentice, pharmacist, druggist and physician, as a book of ready reference and as an aid to the study of scientific works."—*American Journal of Pharmacy.*

THOMPSON, LITHOTOMY AND LITHOTRITY.

Practical Lithotomy and Lithotrity; or, an Inquiry into the best Modes of Removing Stone from the Bladder. By SIR HENRY THOMPSON, F.R.C.S., Emeritus Professor of Clinical Surgery in University College. Third Edition. 8vo. With 87 Engravings. Price $3.50

"The chapters of most interest are those in which Bigelow's operation is discussed, and the final one, in which is a record of 500 operations for stone in cases of male adults under the author's care. Such a table has never before been compiled by any surgeon."—*Lancet.*

BY SAME AUTHOR.

URINARY ORGANS. Seventh Edition.

Diseases of the Urinary Organs. Clinical Lectures. Seventh London Edition. Enlarged, with 73 Illustrations. Price, Cloth, $1.25; Paper, .75

ON THE PROSTATE.

Diseases of the Prostate. Their Pathology and Treatment. Fifth London Edition. 8vo. With Numerous Plates. Price, Cloth, $1.25; Paper, .75.

CALCULOUS DISEASES.

The Preventive Treatment of Calculous Disease, and the Use of Solvent Remedies. Second Edition. 16mo. Price $1.00

"Catholic in his investigation of the fruit of the labor of others, cautious in all his deductions, rejecting all specious theories in the effort to obtain practically useful results, as clever with his pen as he is with the sound or lithotrite, one can scarcely wonder that he is esteemed the master that he is."—*American Journal of Medical Science.*

THOMPSON, COUGHS AND COLDS.

The Causes, Nature, and Treatment of Coughs and Colds. By E. S. THOMPSON, M.D. 16mo. Price .60

THOROWGOOD, MATERIA MEDICA.

The Student's Guide to Materia Medica. By JOHN C. THOROWGOOD, M.D. Illustrated. 318 pages. 12mo. Price $2.00

BY SAME AUTHOR.

ON ASTHMA.

The Forms, Nature, and Treatment of Asthma. 12mo.

TUSON, VETERINARY PHARMACOPŒIA.

A Pharmacopœia, Including the Outlines of Materia Medica and Therapeutics. For the Use of Students and Practitioners of Veterinary Medicine. By RICHARD V. TUSON, F.C.S. Third Edition. 12mo. Price $2.50

"Not only practitioners and students of veterinary medicine, but chemists and druggists will find that this book supplies a want in veterinary literature."—*Druggist and Chemist.*

THUDICHUM ON THE URINE. Second Edition.

The Pathology of the Urine and Complete Guide to Analysis. By JOHN L. W. THUDICHUM, M.D. Second Edition. Enlarged and Illustrated. 8vo. Price $5.00

"The treatise of Dr. Thudichum is well known as one of the medical classics of the language, and in completeness, thoroughness, and originality, the volume before us has few rivals in any branch of our science. For the specialist, for the physiological chemist, for the physiologist, the volume of Dr. Thudichum is a *sine qua non*, and to such the new edition must be a most welcome guest."—*Philadelphia Medical Times.*

TROUSSEAU, CLINICAL MEDICINE.

Lectures on Clinical Medicine, Delivered at the Hôtel Dieu, Paris, by A. TROUSSEAU, Professor of Clinical Medicine to the Faculty of Medicine, Paris, etc., etc. Translated from the Third Revised and Enlarged Edition by P. VICTOR BAZIRE, M.D., London and Paris; and JOHN ROSE CORMACK, M.D., Edinburgh, F.R.S., etc. With a full Index, Table of Contents, etc. 2 vols. 8vo. Sold by Subscription only. Price, Cloth, $8.00; Leather, $10.00

Sydenham Edition, Same Work. 5 Vols. 8vo. Large Print. Price $15.00

Trousseau's Lectures have attained a reputation, both in England and in this country, far greater than any work of a similar character heretofore written. In order to bring the work within the reach of all the profession, the publishers now issue an American edition, containing all the lectures as contained in the five-volume Sydenham edition, at a much lower price. Below are a few only of the many favorable opinions expressed of the work:—

"A clever translation of Prof. Trousseau's admirable and exhaustive work; the best book of reference upon the Practice of Medicine."—*Indiana Medical Gazette.*

"We scarcely know of any book better fitted for presentation to a young man when entering upon the practical work of his life."—*London Medical Times and Gazette.*

TEST TYPES.

Selections from Snellen's Test Types mounted upon heavy card board; suitable for hanging in the office. Price 50 cents

TIDY, MODERN CHEMISTRY.

A Hand-Book of Modern Chemistry. Organic and Inorganic. By C. MEYMOTT TIDY, M.D. 8vo. Price $5.00

"We doubt if any other chemical work containing so large an amount of information could be procured."—*Dublin Medical Journal.*

TILT, THE CHANGE OF LIFE IN WOMEN.

The Change of Life in Health and Disease. A Practical Treatise on the Diseases incidental to Women at the Decline of Life. By EDWARD JOHN TILT, M.D. Fourth London Edition. 8vo. Price, Cloth, $1.25; Paper cover, .75

"We believe Dr. Tilt brings much more than ordinary merit to bear on his subject, and handles it accordingly. Few books are issued that are more indispensable to the general practitioner."—*Phila. Med. Times.*

"Dr. Tilt's clear and concise style makes the book at once a pleasant one to read and an easy guide to follow, and we are quite sure it is the most valuable one we have on the subject."—*Boston Med. & Surg. Journal.*

"The best work on the subject."—*London Lancet.*

TOMES, DENTAL ANATOMY. Second Edition.

A Manual of Dental Anatomy, Human and Comparative. By C. S. TOMES, D.D.S. With 179 Illustrations. Second Edition. 12mo. Price $4.25

TOMES, DENTAL SURGERY.

A System of Dental Surgery. By JOHN TOMES, F.R.S. The Second Edition, Revised and Enlarged. By C. S. TOMES, D.D.S. With 263 Illustrations. 12mo. Price $5.00

"We rejoice that such books as these (Dr. Tomes' Works) are demanded by the profession, and that the men to write them are furnished by the profession."—*Dental Cosmos.*

TAFT, OPERATIVE DENTISTRY. Fourth Edition.

A Practical Treatise on Operative Dentistry. By JONATHAN TAFT, D.D.S. Fourth Revised and Enlarged Edition. Over 100 Illustrations. 8vo. Price, Cloth, $4.25; Leather, 5.00

"All the important operations, in all their modifications, are clearly discussed by the author, and the work is highly practical throughout."—*Dental Register.*

"It is a thorough and complete treatise on the Art of Practical Dentistry."—*London Medical Times and Gazette.*

TANNER, INDEX OF DISEASES. Second Edition.

An Index of Diseases and their Treatment. By THOS. HAWKES TANNER, M.D., F.R.C.P. Second Edition. Revised and Enlarged. By W. H. BROADBENT, M.D. With Additions. Appendix of Formulæ, etc. 8vo. Price $3.00

By this useful hand-book the character of any disease may be determined in a moment, and the general outline of treatment pursued by the best authorities made apparent.

"This work, like others from the gifted author, has already won for itself a reputation." . . . "It is in truth what its title indicates."—*New York Medical Record.*

"Finally, a chapter on the climates, countries, mineral springs, etc., best adapted to the various classes of invalids, makes this work the most complete practitioner's manual that we have yet seen.—*Chicago Medical Times.*

BY SAME AUTHOR.

THE DISEASES OF INFANCY.

A Practical Treatise on the Diseases of Infancy and Childhood. Third Edition. Carefully Revised and much Enlarged. By ALFRED MEADOWS, M.D. 8vo. Price $3.00

Recommended as a Text-book at Jefferson Medical College and other schools of Medicine.

"One of the most careful, ornate, and accessible manuals on the subject."—*London Lancet.*

"We consider the views of the author on the subject of therapeutics as rational in the highest degree."—*Boston Medical and Surgical Journal.*

MEMORANDA OF POISONS.

A Memoranda of Poisons and their Antidotes and Tests. Fifth American, from the Last London Edition. Revised and Enlarged. *In Press.*

This most complete Toxicological Manual should be within reach of all physicians and pharmacists, and as an addition to every family library, would be the means of saving life and allaying pain when the delay of sending for a physician would prove fatal.

TIBBETS, MEDICAL ELECTRICITY.

A Hand-book of Medical Electricity. Giving full directions for its Application, etc. By HERBERT TIBBETS, M.D. 64 Illustrations. 8vo.

TOLAND, PRACTICAL SURGERY.

Lectures on Practical Surgery. By H. H. TOLAND, M.D., Professor of Surgery, University of California. Second Edition. With Additions and Numerous Illustrations. 8vo. Price, Cloth, $4.50; Leather, $5.00

TRANSACTIONS OF THE COLLEGE OF PHYSICIANS.

The Transactions of the College of Physicians of Philadelphia. New Series. Vols. I, II, III, IV and V. 8vo. Price, per volume, $2.50

TYSON, BRIGHT'S DISEASE AND DIABETES.

A Treatise on Diabetes and Bright's Disease. With Especial Reference to Pathology and Therapeutics. By JAMES TYSON, M.D., Professor of Pathology and Morbid Anatomy in the University of Pennsylvania. With Colored Plates and many Wood Engravings. 8vo. Price $3.50

"This volume is the outcome of some fifteen years' special study and observation, and will be found to be a very well prepared monograph. . . . . . . His directions are clear and minute.—*Med. and Surg. Reporter.*

"The symptoms are clearly defined, and the treatment is exceedingly well described, so that every one reading the book must be profited."—*Cincinnati Lancet and Clinic.*

BY SAME AUTHOR:

GUIDE TO THE EXAMINATION OF URINE.

A Practical Guide to the Examination of Urine. For the use of Physicians and Students. With Colored Plates and Numerous Illustrations Engraved on Wood. Fourth Edition. 12mo. Price $1.50

Advantage has been taken, in bringing out a new edition of this work, not only to correct the previous one, but to make such additions of new Facts and Processes as would add to its value without materially increasing its size.

"Dr. Tyson commences with a short account of the theory of renal secretion, the physical and chemical characters of the urine, and the reagents and apparatus used in its analysis. Excellent rules are then given for detecting the presence of albumen, sugar, coloring-matters, bile, urea, uric acid, chlorides, phosphates and sulphates; and minute instructions for approximative and quantitative determination of most of those ingredients by volumetric analysis are supplied."—*Philadelphia Medical Times.*

"We have experienced both pleasure and profit ftom the perusal of this book. It is agreeably written, contains much practical information, and is, we believe, a reliable and satisfactory guide to the clinical examination of urine. We can recommend Dr. Tyson's book as one that amply supplies the clinical needs of the physician."—*Dublin Journal of Medical Science.*

THE CELL DOCTRINE. Second Edition.

The Cell Doctrine. Its History and Present State. With a Copious Bibliography of the subject. Illustrated by a Colored Plate and Wood Cuts. Second Edition. 8vo. Price $2.00

TURNBULL, ARTIFICIAL ANÆSTHESIA.

The Advantages and Accidents of Artificial Anæsthesia; Its Employment in the Treatment of Disease; Modes of Administration; Considering their Relative Risks; Tests of Purity; Treatment of Asphyxia; Spasms of the Glottis; Syncope, etc. By LAURENCE TURNBULL, M.D., PH.G., Aural Surgeon to Jefferson College Hospital, etc. Second Edition. Revised and Enlarged. With 27 Illustrations of Various Forms of Inhalers, etc. 12mo. Price $1.50

"Anæsthesia is a subject of great interest and importance to physicians and dentists, and everything that will aid them in better understanding the subject is sought with great avidity. This work we regard as the best aid in the study of the subject, and it presents the subject up to the present hour."—*Dental Register.*

TEALE, DANGERS TO HEALTH. Third Edition.

A Pictorial Guide to Domestic Sanitary Defects. By T. PRIDJIN TEALE, M.D., F.R.C.S. With Colored Plates. 8vo. Price $3.50

VACHER, CHEMISTRY.

A Primer of Chemistry, Including Analysis. By ARTHUR VACHER. 18mo. Price .50

VIRCHOW, POST-MORTEM EXAMINATIONS. Second Edition.

Post-mortem Examinations. A Description and Explanation of the Method of Performing them in the Dead House of the Berlin Charité Hospital, with especial reference to Medico-legal Practice. By Prof. VIRCHOW. Translated by Dr. T. P. SMITH. Second Edition. 12mo. With 4 Plates. Price $1.25

"A most useful manual from the pen of a master. . . . . For thorough and systematic method in the performance of post-mortem examinations, there is no guide like it."—*Lancet.*

"Its low price and portability make it accessible and convenient to every surgical registrar and practitioner."—*British Medical Journal.*

WAGSTAFFE, HUMAN OSTEOLOGY.

The Student's Guide to Human Osteology. By WILLIAM WARWICK WAGSTAFFE, F.R.C.S. With 23 Lithographic Plates of the Bones, Showing Muscle Attachments, and 60 Wood Engravings. 12mo. Price $3.00

WALTON, DISEASES OF THE EYE. Third Edition.

A Practical Treatise on Diseases of the Eye. By HAYNES WALTON, M.D. Third Edition. Rewritten and Enlarged. With five plain and three colored full-page Plates; and many other Illustrations, Test Types, etc. Nearly 1200 pages. 8vo. Price $9.00

WARNER, CASE TAKING.

The Student's Guide to Medical Case Taking. By FRANCIS WARNER, M.D., M.R.C.P., etc. 12mo. Cloth. Price $1.75

General Diseases.—Class 1. Class 2. Arthritic Diseases. Diseases of the Nervous System. Of the Vascular System. Of the Respiratory System. Of the Digestive System. Of the Liver. Of the Urinary System. Instruction for Case Taking.

WATERS, DISEASES OF THE CHEST. Second Edition.

The Diseases of the Chest. Their Clinical History, Pathology and Treatment. By A. T. H. WATERS, M.D., Fellow Royal College of Physicians. With Numerous Illustrative Cases and Lithographic Plates. 8vo. Price $4.00

"The present edition contains new chapters on hæmoptysis, hay fever, aortic regurgitation, mitral constriction, thoracic aneurism, and the use of chloral in certain diseases of the chest; other chapters have received additions of cases and remarks on treatment. Some characteristic sphygmographic tracings have also been added."—*Boston Medical and Surgical Journal.*

WOOD, BRAINWORK.

Brainwork and Overwork. By Prof. H. C. WOOD, JR. 32mo. Price, Paper cover, .30; Cloth .50

WEDLS, DENTAL PATHOLOGY.

With Special Reference to the Anatomy and Physiology of the Teeth. With Notes by THOS. B. HITCHCOCK, M.D., of Harvard University. 105 Illustrations. 8vo. Price, Cloth, $3.50; Leather, $4.50

WHITTAKER, ON THE URINE.

Student's Primer on the Urine. By J. TRAVIS WHITTAKER, M.D., Physician to Anderson's College Dispensary. With Illustrations Etched on Copper. 16mo. Price $1.50

Physiological Study of Urine—Sensation in Passing. Quantity. Color. Odor. Specific Gravity. History and Behavior. Sediment or Deposits. Chemical Study of Urine—Reaction. Albumen. Chlorides. Ammonia. Urea. Phosphates. Blood. Sugar. Bile. Microscopical Study of Urine and Urinary Deposits—Amorphous Urates. Uric Acid. Triple Phosphates. Phosphate of Lime. Feathery Phosphates. Oxalate of Lime. Urate of Soda and of Ammonia. Cystine. Tyrosine. Leucine. Cholesterine. Epithelium. Fat Globules. etc.

"The plates are possessed of great versimilitude, as well as in other respects admirable."—*Med. Times.*

"Neat and concise, and the illustrations are very good testimony of the claim which he makes of the suitability of the etching needle for delineation of microscopical appearances."—*Boston Med. and Surg. Journal.*

WEST, THE DISEASES OF WOMEN. Fourth Edition.

Lectures on the Diseases of Women. By CHARLES WEST, M.D. Fourth London Edition. Revised and in part re-written by the Author. With Numerous Additions by J. MATHEWS DUNCAN, M.D., Obstetric Physician to St. Bartholomew's Hospital 8vo. Price $5.00

Drs. West and Duncan are, perhaps, the most celebrated London physicians giving attention to the Diseases of Women, and together have made a most complete work, either for the physician or student.

WILKS, PATHOLOGICAL ANATOMY.

Lectures on Pathological Anatomy. By SAMUEL WILKES, F.R.S. Second Edition. Revised and Enlarged by WALTER MOXON, M.D., F.R.S., Physician to and Lecturer at Guy's Hospital, London. 8vo. Price $6.00

BY SAME AUTHOR.

DISEASES OF THE NERVOUS SYSTEM.

Lectures on Diseases of the Nervous System, Delivered at Guy's Hospital, London. New Edition, with Additions, Numerous Illustrative Cases, etc. 8vo. [*Preparing*.

"A book of great value, embodying as it does the results of the experience and observation of one of the most accomplished of the London Hospital Physicians."—*American Journal of Medical Science.*

WRIGHT, ON HEADACHES. Ninth Thousand.

Headaches, their Causes, Nature and Treatment. By HENRY G. WRIGHT, M.D 12mo. Price .50

WILSON, ON DRAINAGE.

Drainage for Health; or, Easy Lessons in Sanitary Science, with Numerous Illustrations. By JOSEPH WILSON, M.D., Medical Director United States Navy. One Vol. Octavo. Price $1.00

"Dr. Wilson is favorably known as one of the leading American writers on hygiene and public health. The book deserves popularity."—*Medical and Surgical Reporter.*

"Well written and well illustrated. Attention to its teachings may save much disease and perhaps many lives."—*Cincinnati Gazette.*

"Interesting as well as useful."—*Philadelphia Ledger.*

"Easily understood, and briefly and concisely presented."—*Providence Journal.*

"Will be found of value."—*Boston Transcript.*

"Worthy of praise as a popular statement of the subject."—*Boston Journal of Chemistry.*

"Will be sure to be a harbinger of good in every family whose good fortune it may be to possess a copy."—*Builder and Wood Worker.*

BY SAME AUTHOR.

NAVAL HYGIENE.

Naval Hygiene, or, Human Health and Means for Preventing Disease. With Illustrative Incidents derived from Naval Experience. Illustrated. Second Edition. 8vo. Price $3.00

WILSON, HOW TO LIVE.

Health and Healthy Homes. A Guide to Personal and Domestic Hygiene. By GEORGE WILSON, M.D., Medical Officer of Health. Edited by JOS. G. RICHARDSON, M.D., Professor of Hygiene at the University of Pennsylvania. 314 pages. 12mo. Price $1.00

CHAPTER I.—Introductory, page 17. II. The Human Body, 33. III. Causes of Disease, 66. IV. Food and Diet, 119. V. Cleanliness and Clothing, 169. VI. Exercise, Recreation and Training, 187. VII. Home and Its Surroundings, Drainage, Warming, etc., 221. VIII. Infectious Diseases and their Prevention, 269.

"A most useful, and in every way, acceptable book."—*New York Herald.*

"Marked throughout by a sound, scientific spirit, and an absence of all hasty generalizations, sweeping assertions, and abuse of statistics in support of the writer's particular views. . . . We cannot speak too highly of a work which we have read with entire satisfaction."—*Medical Times and Gazette.*

BY SAME AUTHOR.

A HAND-BOOK OF HYGIENE

And Sanitary Science. With Illustrations. Fourth Edition. Revised and Enlarged. 8vo. Price $2.75

WILSON, HUMAN ANATOMY. Tenth Edition.

The Anatomist's Vade-Mecum. General and Special. By Prof. ERASMUS WILSON. Edited by GEORGE BUCHANAN, Professor of Clinical Surgery in the University of Glasgow; and HENRY E. CLARK, Lecturer on Anatomy at the Royal Infirmary School of Medicine, Glasgow. Tenth Edition. With 450 Engravings (including 26 Colored Plates). Crown 8vo. Price $6.00

Recommended as a Text-book at Rush Medical College, Chicago; Bellevue Hospital, New York; St. Louis Medical College; Yale and Dartmouth Schools, and many other Colleges.

BY SAME AUTHOR.

HEALTHY SKIN. Eighth Edition.

A Practical Treatise on the Skin and Hair; their Preservation and Management. Eighth Edition. 12mo. Paper. Price $1.00

WILSON, SEA VOYAGES FOR HEALTH.

The Ocean as a Health Resort. A Hand-book of Practical Information as to Sea Voyages, for the Use of Tourists and Invalids. By WM. S. WILSON, L.R.C.P. Lond., M.R.C.S.E. With a Chart showing the Ocean Routes, and Illustrating the Physical Geography of the Sea. Crown 8vo. Price $2.50

CHAPTER 1. Curative Effects of the Ocean Climate. 2. The Various Health Voyages. 3. Time of Starting—Choosing a Ship. 4. Preliminary Arrangements. 5. Life at Sea. 6. Climate and Weather. 7. Management of the Health at Sea. 8. Occupations and Amusements at Sea. 9. Objects of Interest at Sea. 10. End of the Voyage—Future Plans. 11. The Homeward Voyage. 12. Australia: its Climate, Cities, and Health Resorts. 13. South Africa and its Climate. 14. The Meteorology of the Ocean.

APPENDIX A.—Outfit Required for a Voyage to Australia. B. Names and Addresses of some of the Principal Shipping Firms.

"All the information is supplied by, or based upon, the actual experience of the author; and the book may be confidently recommended to all who have to undertake, without previous experience, a sea voyage of any length. Medical men may consult it with advantage, and commend it to those patients whom they may advise to try the effect of a long voyage at sea."—*Medical Times and Gazette.*

"We have read every page of this book, and have derived both instruction and amusement."—*Lancet.*

WELLS, OVARIAN AND UTERINE TUMORS. Just Out.

The Diagnosis and Surgical Treatment of Ovarian and Uterine Tumors. By T. SPENCER WELLS, M.D. Illustrated. 8vo. Price, Cloth, $7.00

So long a time having elapsed since Dr. Wells has collected the results of his large experience in book form, the present volume will be eagerly looked for by all interested in this very important subject.

WOLFE, ON DISEASES OF THE EYE.

A Practical Treatise on Diseases and Injuries of the Eye. Being a Course of Systematic and Clinical Lectures to Students and Medical Practitioners. By M. WOLFE, F.R.C.P.E., Senior Surgeon to the Glasgow Ophthalmic Institution, etc. With 10 Colored Plates, and numerous other Illustrations. Octavo. Price $7.00

WALKER, INTERMARRIAGE.

Intermarriage, or, The Mode in which, and the Causes why, Beauty, Health and Intellect result from certain Unions; and Deformity, Disease and Insanity from others. Illustrated. 12mo. Price $1.00

WARD'S COMPEND OF CHEMISTRY.

A Compend of Chemistry for Chemical and Medical Students. By G. MASON WARD, M.D., Demonstrator of Chemistry in Jefferson Medical College, Philadelphia. Containing a Table of Elements and Tables for the Detection of Metals in Solutions of Mixed Substances, etc. 12mo. Cloth.

Interleaved for the addition of Notes, $1.25; plain, $1.00

WOODMAN and TIDY, MEDICAL JURISPRUDENCE.

Forensic Medicine and Toxicology. By W. BATHURST WOODMAN, M.D., Physician to the London Hospital, and CHARLES MEYMOTT TIDY, F.C.S., Professor of Chemistry and Medical Jurisprudence at the London Hospital. With Chromo-Lithographic Plates, representing the Appearance of the Stomach in Poisoning by Arsenic, Corrosive Sublimate, Nitric Acid, Oxalic Acid; the Spectra of Blood and the Microscopic Appearance of Human and other Hairs; and 116 other Illustrations. Large octavo. Sold only by Subscription.

Price, Cloth, $7.50; Medical Sheep, $8.50; Law Leather, $8.50

"We have no hesitation in pronouncing the work to be one of unusual merit. More readable than Taylor, more systematic in its arrangement, and more practical in its instruction, it will prove to the medical jurist, not less than to the general practitioner, a storehouse of useful knowledge, conveyed in an unusually graphic style."—*Dublin Journal of Medical Science.*

"The authors of this truly great work have largely supplied the want felt, sooner or later, by almost every doctor."—*Cincinnati Lancet and Observer.*

"All the best known works on Medical Jurisprudence have been laid under contribution for the production of the present volume. It contains almost everything that can be found in other works on the subject; but it is no mere compilation. Dr. Woodman and Dr. Tidy have both thought out the subject for themselves, and, with rare industry and acumen, have brought together a mass of facts which is little short of astounding. The book is worthy to take its place alongside of any work on the same subject, and must prove of great use to all who practice in criminal courts, and to all medical practitioners. We have no hesitation in recommending it to our readers."—*London Lancet.*

"Altogether the work will rank with the best of its class as a medico-legal hand-book, and cannot fail to gain a wide popularity."—*New York Medical Record.*

"It cannot be otherwise than a valuable contribution to the boundless subject of medical jurisprudence."—*Albany Law Journal.*

"The scope of this book is very wide, and its execution worthy of all commendation."—*Philadelphia Legal Intelligencer.*

WYTHE, ON THE MICROSCOPE.

The Microscopist. A Manual of Microscopy and Compendium of the Microscopic Sciences, Micro-Mineralogy, Micro-Chemistry, Biology, Histology, and Practical Medicine. By JOSEPH H. WYTHE, A.M., M.D. Fourth Edition. 252 Illustrations. 8vo. Price, Cloth, $3.00; Leather, $4.00

An Index and Glossary have been combined in this edition, so as to be a source of valuable information. Notices of recent additions to the microscope, together with the genera of microscopic plants, have been given in an Appendix.

"From what we knew of the author of this work, as a skilled practical Microscopist, a successful teacher of the science, and a practitioner of medicine and surgery of long and varied experience, we had a right to expect a good book from his hands. Our expectations are fully realized in the volume before us. The style is clear and distinct, and one reads the book with the utmost facility of comprehension. It is the more valuable to the physician and medical student on account of its closer application of the microscope to medical subjects than we find elsewhere. The numerous plates, many of which are beautifully colored, are not to be excelled. We feel proud of it as an American production."—*Pacific Medical and Surgical Journal.*

"This is one of the most valuable text-books on microscopy ever offered to students or practitioners of medicine. This edition has been greatly enhanced in value by the addition of chapters on the use of the microscope in pathology, diagnosis, and etiology, and numerous new illustrations, some of which are from Rindfleisch.

"The author very carefully brings out every necessary fact and principle relating to the use of the microscope, and now that this instrument has become an essential part of every practitioner's armamentarium, a practical guide and reference book is also a necessity, and we are fully warranted in reiterating the statement that this is one of the most valuable text-books ever offered to students and practitioners of medicine."—*The Cincinnati Lancet and Clinic.*

BY SAME AUTHOR.

DOSE AND SYMPTOM BOOK. Eleventh Edition.

The Physician's Pocket Dose and Symptom Book. Containing the Doses and Uses of all the Principal Articles of the Materia Medica, and Original Preparations. Eleventh Revised Edition.

Price, Cloth, $1.00; Leather, with Tucks and Pocket, $1.25

"The chapter on Dietetic Preparations will be found useful to all practicing physicians, most of whom have but little acquaintance with the mode of preparing the various articles of diet for the sick."—*Boston Medical and Surgical Journal.*

"Many a hard-worked practitioner will find it a useful little work to have on his study table."—*Canada Medical and Surgical Journal.*

WHEELER, MEDICAL CHEMISTRY.

Medical Chemistry, Including the Outlines of Organic and Physiological Chemistry. By C. GILBERT WHEELER, M.D. Second Edition. 12mo. Price $3.00

WOAKES, ON DEAFNESS AND GIDDINESS.

On Deafness, Giddiness and Noises in the Head; or, The Naso-Pharyngeal Aspect of Ear Disease. By EDWARD WOAKES, M.D., Senior Aural Surgeon to the Hospital for Diseases of the Throat and Chest. Third Edition. Revised and Enlarged, with Additional Illustrations. 12mo.

"No brief summary of his views could do full justice to the cogency and subtlety of his reasons. We prefer to commend the whole work to the thoughtful perusal of all intelligent medical practitioners who desire to rise above the level of mere routine empiricism."—*Lancet.*

BY THE SAME AUTHOR.

WOAKES, ON NASAL CATARRH.

Post-nasal Catarrh. Its Causes, Consequences and Treatment. *In Press.*

ILLUSTRATED BOOKS.

MEDICINAL PLANTS.

Being Descriptions, with original Figures, of the Principal Plants employed in Medicine, and an account of their Properties and Uses. By ROBERT BENTLEY, F.L.S., Professor of Botany in the King's College, and to the Pharmaceutical Society, and HENRY TRIMENS, M.B., F.L.S., late Lecturer on Botany at St. Mary's Hospital Medical School. In 42 Parts, each, $2.00, or in 4 vols., large 8vo, with 306 Colored Plates, bound in half morocco, gilt edged. $90.00

AN ATLAS OF TOPOGRAPHICAL ANATOMY.

After Plane Sections of Frozen Bodies. By WILLIAM BRAUNE, Professor of Anatomy in the University of Leipzig. Translated by EDWARD BELLAMY, F.R.C.S., Surgeon to and Lecturer on Anatomy at Charing Cross Hospital. With 34 Photolithographic Plates and 46 Wood cuts. Large imp. 8vo. $8.00

ATLAS OF SKIN DISEASES.

Consisting of a Series of Illustrations, with Descriptive Text and Notes upon Treatment. By TILBURY FOX, M.D., F.R.C.P., late Physician to the Department for Skin Diseases in University College Hospital. With 72 Colored Plates. In 18 Parts, each, $1.00 or, 1 Vol., Royal 4to, Cloth. $20.00

AN ATLAS OF HUMAN ANATOMY.

Illustrating most of the ordinary Dissections, and many not usually practiced by the Student. By RICKMAN J. GODLEE, M.S., F.R.C.S., Assistant Surgeon to University College Hospital, and Senior Demonstrator of Anatomy in University College. With 48 imp. 4to Colored Plates (112 Figures), and a volume of Explanatory Text. $20.00

A COURSE OF OPERATIVE SURGERY.

By CHRISTOPHER HEATH, F.R.C.S., Home Professor of Clinical Surgery in University College, and Surgeon to the Hospital. With 20 Plates drawn from Nature by M. LÉVEILLÉ, and colored by hand under his direction. 4to. $14.00

ILLUSTRATIONS OF CLINICAL SURGERY.

Consisting of Plates, Photographs, Wood cuts, Diagrams, etc., etc., illustrating Surgical Diseases, Symptoms, and Accidents; also Operative and other Methods of Treatment, with Descriptive Letterpress. By JONATHAN HUTCHINSON, F.R.C.S., Senior Surgeon to the London Hospital. Vol. I, containing fasciculi I to X, bound, with Appendix and Index. $25.00

Fasciculi XI to XV. Ready.

75