THE LUNGS;

THEIR USES AND THE PREVENTION OF

THEIR DISEASES;

WITH PRACTICAL REMARKS ON THE

USE OF REMEDIES

BY

INHALATION.

BY

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Breathing seems to render life to the blood, and the blood continues it in every part of the body.—JOHN HUNTER.

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PREFACE.

THERE are no diseases more important than those of the lungs ; none more varied in their character, and none for the treatment of which a more extensive variety of remedies has been employed. It is to bring into notice an almost neglected class of remedies, not however to the exclusion of others, together with the importance of a systematic use of the lungs as a preventive of disease, that this publication is made. The application of remedies by inhalation, is that to which the writer refers, in connexion with other means. This has been his practice for some years past, and the results here stated are from a considerable amount of experience in their employment. Some formidable affections of the lungs demand all the resources of the physician, while many others, in all their forms, will require nothing more than such as can be employed in respiration.

With reference to the subject of a proper use of the lungs for the prevention of pulmonary diseases, the author is indebted chiefly to the obser-

vations he has made in the personal examination of about thirteen hundred applicants for life insurance. A marked difference was found to exist among them, and which could uniformly be referred to the fact that various conditions of life, habitual occupations, voluntary employment, etc., influence the powers of respiration, and that the respiratory function exercises a great control over the health of the individual. The hints thus received have not passed unheeded by him, but on every suitable occasion have been used to direct the employment of obvious means to prevent the invasion of pulmonary affections, or to remove them in their incipiency, with a success that has often surprised him.

As the suggestions made in this work, both for the prevention and management of pulmonary diseases, are the results of much experience, they are published with a full confidence, that if judiciously followed they will be attended with success in the treatment of the early stages of some of the most dreaded maladies with which mankind is afflicted.

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I.

ORGANS OF RESPIRATION.

All animals possess organs for respiration, adapted to the medium in which they live.

Fishes have the branchiæ or gills, over the delicate fringes of which the water received by the mouth passes, imparting to the blood circulating within the thin membrane, of which the branchiæ are composed, the vivifying influences of the oxygen, which the water as well as the atmosphere contains. Many of the larger fishes have lungs, resembling in many respects those of terrestrial animals. Where these exist, air is necessary for respiration, and they are obliged to rise to the surface of the water in order to breathe.

Among the animals that respire air, insects have the simplest arrangement: the air entering the body by means of small openings in the sides, communicating with longitudinal air-tubes in which the air circulates. Birds, mammals, and reptiles have proper

lungs; the first named class possesses, besides, an arrangement similar to that of insects, with reference to the circulation of air though the body, after it has been introduced into the lungs. The large amount of air in their bodies gives them lightness, and enables them to rise and support themselves easily in the air.

Some of the reptile tribe have gills at an early period of their existence when living in the water, and lungs afterwards when they live on the land.

The lungs in man consist of a mass of a light spongy texture, formed of innumerable branches of the tube which conducts the air. These branches terminate in minute sacs, composed of an exceedingly delicate membrane, through which the air acts upon the blood beneath.

The lungs constitute the respiratory organ. Their natural stimulant is the atmospheric air, which passes into them at the moment they undergo an augmentation of their size by the expansion of the sides of the chest. The air, received into the deep-seated parts of the lungs, where the branching air-tubes terminate in cells, undergoes a change in the

condition and relation of its elements, and is then expelled by the return of the sides of the chest to the comparatively contracted state in which it existed before the introduction of the air. From the reciprocal action of the air and lungs results the function of respiration, the direct and sensible effect of which is the conversion of the dark blood, carried to the lungs by the veins, into blood of a bright red color, which is returned by the arteries to the remotest parts of the system for the purpose of repairing the waste of the body, and maintaining it in its integrity. When the blood has performed this office, it again passes into the veins, destitute of its bright color and renovating qualities, to be re-transmitted to the lungs, that it may again undergo the alterations necessary to carry on the various functions of the different parts through which it uninterruptedly circulates. If from any cause this change is not effected, death speedily ensues.

Before describing the uses of the lungs, the nature of the air upon which all their movements depend ought to be considered.

II.

ATMOSPHERIC AIR.

The atmospheric air is that elastic fluid which envelopes the earth, forming a layer of about fifty miles in width. Although comparatively so thin, constituting scarcely the two hundredth part of the size of the globe itself, it nevertheless exercises upon the various phenomena that pass upon the surface of the earth, influences as varied as they are important.

The atmosphere then forms a spherical ring, in the interior of which is placed the globe; so that the movements upon the axis, and those annually performed around the sun, are common to both.

Although the terms air and atmosphere are synonymous in ordinary language, it should be borne in mind that the mass of gaseous fluid called the atmosphere, contains in it, independently of air, water also in every form in which it can exist, imparting to the rays of light and heat all the modifications exhibited in the various meteorological phenomena.

The air, like all other gases, possesses weight, compressibility, and elasticity. It has no color in small masses, and the blue appearance which is presented to us in the space above, and which is called the sky, is owing to the modifications produced by the reflexion of the rays of light.

It is composed of 21 parts of oxygen gas, and 79 of azote, with a trace, occasionally, of carbonic acid gas.

The proportions in which the oxygen and azote exist to form pure air have always been found to be the same in all places; at sea and on the land, on mountains and in valleys, the admixture never varies. The differences which exist in the action of the air of different climates, and of different seasons, are attributable to other causes. They arise from its greater or less weight, and from the modifications which the air undergoes from heat, light, electricity, and humidity; in a word, these variations result from the presence of new principles—such as occur in the neighborhood of stagnant water—in places where many animals are crowded together, etc.

Weight and pressure of the Atmosphere.—

The weight of the atmosphere, depending partly upon its height and density, are properties which have been long ascertained by means of the ascent of the mercury in the barometer, and of water in syphons and various other hydraulic machines.

It has been found that the pressure of the atmosphere sustains a column of quicksilver, in the tube of a barometer, of the height of about thirty inches; and hence it follows that the whole pressure of the atmosphere is equal to the weight of a column of quicksilver, having an equal base, and about thirty inches in height. The weight of a cubic inch of quicksilver is about $8\frac{1}{4}$ drachms, the weight therefore of 30 inches will be about 15 pounds. Such is the weight of the atmosphere on every square inch of surface. A man's body contains about fifteen square feet, and he consequently sustains a weight of 32,343 pounds.

This pressure is so great that no animal could ever exist, if it were not equal from above, from below, laterally, and in every part; and counterbalanced from the interior by the elasticity of some other elastic fluid, doubtless the air contained in the circulating and other fluids. It is thus that the equilibrium

is maintained throughout the body equally—compression being in every direction.

Pressure by a high column of air causes easy respiration. The air from its density abounds in renovating principles, and consequently imparts to the system all the advantages which result from the full action of this function; that is, an ability to sustain violent and continued exercise, a prompt renewal of the blood that passes through the lungs, and a sensation of vigor throughout the whole body. Whenever this pressure is increased by any change in the condition of the air, ascertained by a high state of the barometer, there always exists an indescribable sensation of strength, for the simple reason that all the energies are increased by vigorous respiration.

Under a pressure of a column of air a little less than that at the level of the ocean, such as exists upon the top of mountains of moderate height, respiration, without being more full, becomes more frequent, the circulation more rapid, the movements more prompt, the muscular development greater, and the complexion more ruddy, while the appetite and digestion are improved. The supe-

rior physical condition of the inhabitants of mountainous regions arises from the lessened pressure of the air, but which is compensated by its density, from the more uniformly low temperature which there prevails; so that the mountaineer, notwithstanding his elevated situation, actually respires more dense air than is found in the heated valleys below.

The weight of the air varies in the same place from periodical causes, which, in certain climates within the tropics for example, act with sufficient power to affect the barometer at different periods of the day. These are the changes which constitute the diurnal variations. It also varies from other circumstances of an irregular nature, such as rain, wind, etc., producing another order in the causes of barometrical changes which may be denominated accidental.

Fluidity of the Air.—The movements of the air are owing to its fluidity: it is this physical property that gives rise to many of the changes which so rapidly occur around us, and which are so quickly supplanted by an effort to be restored to its former conditions. The movements of the air constitute

the winds, depending upon the variations of temperature.

When the heat dilates a portion of the air, this portion, lighter than the other, rises to a more elevated place and is immediately replaced by another and a colder portion. What occurs daily in our apartments, is but a counterpart on a small scale of the great changes in the atmosphere without.

The sea and land breezes within the tropics afford a good illustration of the effects of a comparative warmth and rarity of the air. The heat of the earth from the sun rarifies the air, and the cooler and denser air from the sea flows in, causing the sea breeze—and at night the greater duration of the warmth of the sea, which from its being more deeply heated than the earth retains its heat after the earth has cooled, produces a flow of air from the land, causing the land breeze.

The effects of wind upon the lungs arise from the temperature and humidity of the atmosphere manifested in transporting fogs from the sea, and from the distribution of injurious emanations, etc.

Temperature.—Although the quantity of heat given off from the sun is without doubt

uniform, there are nevertheless a great many circumstances which modify its accumulation in the different parts of the surface of the earth. Thus the obliquity of the sun's rays, always increasing as we leave the equator, is the principal cause of the progressive diminution of heat which is remarked in the temperature in proportion to the increase of the latitude; and in the same zone, there are numerous conditions which exercise a similar influence. A chalky or sandy soil reflects powerfully the rays of the sun, and contributes to the increase of heat. The temperature decreases in proportion to the distance above the level of the sea: under the equator, mountains whose base is excessively hot, exhibit the modified condition of the temperate zone at the middle, while the summit is covered with perpetual snow. The inclination of sections of country augments or diminishes the obliquity of the sun's rays, and consequently their temperature. The evaporation of water influences temperature; islands are always more cool than continents. Winds cause a variation in temperature according to the nature of the

country they traverse, and the humidity they bear.

The atmospheric temperature may be arranged into three divisions: the first between zero and 40° is cold; between 40° and 70° temperate, and all above hot. The temperature in our climate, in the city of New York, ranges from zero to 93°; in the country at the North, the thermometer often descends lower. The influence which these states of atmosphere exercise upon the lungs is closely connected with its humidity; indeed the temperature and hygrometric condition of the air are inseparable when their effects are to be studied with reference to their influence upon the lungs.

The influence which the air in its various conditions exerts upon the lungs, in the production of disease, will be considered when we come to the subject of the causes of pulmonary affections.

III.

USES OF THE LUNGS.

It is not intended to go into anything like an investigation of the nature of the chemical changes which occur in the blood in its passage through the lungs, whereby it is submitted to the action of the oxygen contained in the air. Whatever is necessary for the comprehension of the facts, which are evidently connected with the function of respiration, will be stated as briefly as the subject will admit, without detailing the elaborate experiments or entering into the theories of physiologists. The uses of the lungs will be exhibited by reference to the effects produced upon the different classes of animals by the action of respiration, and thus a far more extended field of observation will be spread before us than if the investigation were confined to man alone; while the whole subject will be kept within the limits of well ascertained facts and the natural inferences which may be drawn from them.

It has been seen that the air contains a considerable portion of oxygen gas; this was formerly denominated vital air from the absolute necessity of it to preserve animal life. When this is absent, animal life cannot be supported. All living creatures must have oxygen—fishes as well as such animals as live in the atmosphere. Fishes breathe the water through the gills as terrestrial animals breathe the air; if the water be deprived of its air, the fish dies. On examining the gills of the fish an exceedingly delicate membrane is found to exist, which lies between the blood passing through them and the air which acts upon it. This is also the case with the lungs; the air reaches the blood only as it comes in contact with the exceedingly fine, transparent, and closely formed texture, which forms the air cells. The blood reaches the lungs of a deep purple color, and sometimes even almost black. After having been spread over the internal surface of the membranous part already referred to, and thereby exposed to the influence of the air which has passed into the lungs by respiration, it is changed into a bright vermillion color, and passes again into the heart to be

distributed throughout the body, while the air, having performed its office, is passed out of the lungs by expiration.

The action of the atmosphere and the blood is reciprocal; for while the blood has changed its color, the air also has changed its condition. The blood has received something from the air, which renders it fit to revisit the remote parts of the body, while the air has likewise been altered so as to render it useless in the lungs, and is therefore thrown out. It is evident that the blood has been so renovated by its circulation through the lungs, as to place it in a proper condition to carry on the nourishment of the body. What this change is, we will be better prepared to understand when the effects of respiration and the nutrition of the body are considered.

The first effect produced by respiration is the influence of the air upon the colored portion of the blood. This colored part is ascertained to consist of minute globules, which, although existing in every part of the blood, is nevertheless capable of being separated from it. When the blood coagulates, it forms into two portions; the thick and

jelly-like portion, the crassamentum, containing a highly animalized substance, the fibrin, and the red globules; and the thin serous fluid containing the albumen.

As these small globular particles are the only portions of the blood that possess a red color, which is the only part that gives visible evidence of the change produced upon the blood, it appears reasonable to suppose that they are more readily acted upon by the air than the other portions, and it is chiefly from their alterations of color that we estimate the amount of action of the air upon the blood. What this action is, it is difficult to determine. It has been referred to the small amount of iron that they possess, and that it is that substance which attracts the oxygen from the air. But to whatever peculiarity it may be referred, it is doubtless the part of the blood upon which the air more especially acts, as they possess the only part known to possess any specific chemical qualities; the serum having none, and the fibrin has none different from those of the muscular fibre, which does not appear to possess any peculiar chemical relations.

The amount of the red globules of the

blood is in proportion to the powers of respiration possessed by the animal. Where respiration is feeble, the blood is less colored than where it is performed with vigor. Red blood exists in many fishes, reptiles, in all other terrestrial animals, and in birds.

The presence of the red globules being inseparably connected with the development of the heat of the body, and the process of animal nutrition, all the remarks which are made with reference to the influence of respiration on these two conditions of the animal system will equally apply to the formation of the red coloring particles of the blood.

The precise mode by which the heat of the bodies of animals is produced, is not yet satisfactorily explained by experimenters, and it is unnecessary for us to state anything beyond the simple fact of its dependence upon respiration, the object of this essay being to illustrate the influence of that function upon the animal economy. The production of heat and the nutrition of the body are intimately connected, and depend for their perfection upon the proper aëration of the blood; and heat appears to depend upon

the development of the animal powers, which are all controlled by the respiratory organ.

To understand the influence of respiration in the production of heat, we may commence with the examination of those animals which appear to possess the lowest degree of respiratory power; these have a temperature scarcely above the surrounding medium in which they live. The muscle, the oyster, etc., are at the lowest point of animal temperature. John Hunter found the temperature of the earthworm to be $58\frac{1}{2}$ degrees when the atmosphere was at 57°. Black slugs and the garden snail at $55\frac{1}{4}$ in an atmosphere of 54°. Fishes in general have a temperature scarcely exceeding two or three degrees above the water in which they live, and as they have comparatively large respiratory organs, they would seem to be an exception; but this arises from the density of the fluid in which they exist, which, on this account, rapidly abstracts the heat of their bodies.

But even among fishes there are evidences of the influence of largely formed gills. Some of the salt water fishes with red blood

have large gills supplied with nerves of unusual magnitude, and a temperature of 99°, in the sea at 80½°. This is found to be the temperature of the bonito. The cetaceous fishes have lungs, red blood, and comparatively a large amount of heat.

Reptiles have larger lungs and a greater amount of heat. Thus lizards have a temperature of 86° in an atmosphere of 71°; the frog 72½° in an air at 68°.

Insects, birds, and animals possess much greater powers of respiration, and consequently of maintaining heat. That of insects has been long since carefully investigated. These animals in the larva state approach nearer to worms in the amount of their heat, it being scarcely two degrees above the surrounding air; but in the perfect state, their temperature ranges from four to ten degrees above the atmosphere.

In all insects the power of producing heat is not manifested immediately upon their emersion from the larva state; but so soon as they have acquired strength, and the whole system is stimulated by their locomotive powers, and the respiratory movements have become active, great increase of heat

immediately ensues. These experiments have been tried upon bees, sphinges, and other strong and active insects, and the temperature observed to rise five degrees in two hours.

Insects forming the coleopterous order, such as beetles, have large respiratory organs, and are among the number that possess the largest amount of temperature.

The heat of insects is greatest among those that fly. Those which pass most of their time in an active state upon the wing evolve the most heat, such as bees and butterflies; activity, increase of respiration, and the evolution of heat being always associated. Hornets and wasps are less active, and have less heat. Terrestrial insects that do not fly have a lower temperature, and among the beetles, such as fly, as the cockchafer, have a higher temperature than those of the same order that remain upon the ground.

Mr. Newport, in his curious experiments on bees, gives an account of the generation of heat when the nymphs are about to come forth from their cells. This is effected by the efforts of the "nurse bees" to increase the heat of the nests and communicate

warmth to the cells. "The manner in which the nurse bee performs its office is by fixing itself upon the cell of the nymphs, and beginning to respire very gradually; in a short time its respiration becomes more and more frequent, until it sometimes respires at the rate of 130 or 140 times in a minute." In one instance, the thermometer introduced among seven "nurse bees," stood at 92½°, whilst the temperature of the external air was but 70°.

All other animals that have much exercise also consume much oxygen, as is evident in birds. The temperature of birds is greater than that of terrestrial animals, as they possess greater respiratory powers, and have more powerful exercise. The more powerful and rapid the flight, the greater the heat of the body, as they respire a larger quantity of fresh air. Ducks and geese have a temperature of 100° to 107°, while in the gull and the swallow the temperature is as high as 111½°.

The organs of respiration in man are smaller than those of a large number of other animals; his respiration is less full, and consequently his heat is

less. The temperature of the human body is 97° ; that of nearly all other animals is four or five degrees higher.

All animals respire quickly from inordinate exercise, and become hotter ; when at rest they become cool from the decrease of respiration. A man when asleep respires less frequently than when awake, while the thermometer indicates about two degrees less temperature in the skin ; hence the feeling of chilliness so frequently experienced after a nap taken without covering.

Where respiration is carried on in its perfection, the creature possesses the highest organization ; when this is imperfect, a corresponding imperfection exists in the nutrition in every possible degree, according to the capacity of the lungs to perform their functions.

The chyme which is the mass of nutritious matter digested and prepared in the stomach and bowels from the food, before it enters the blood, consists essentially of albumen.

The chyle, also, which is the next degree of animal digestion, and is the intermediate fluid between the chyme and the blood, although more elaborate, consists principally of the same elementary substance.

Albumen is the most simple of all animal material and of which all the others are formed. In the egg it constitutes all the white part and the larger portion of the yolk; and the embryo of every animal is found to be chiefly composed of albumen. Where independent existence has not yet been established, and the animal has not as yet breathed, albumen abounds in every part. Since therefore such an imperfect condition of the organization exists before respiration, it would seem that this function is necessary for the perfection of the animal structure in all its parts.

This will be more apparent when the chemical constituents of fibrin, which is albumen in its advanced state of organic perfection, are considered.

Fibrin is highly organized albumen. It exists abundantly in well formed blood in a fluid state, while the muscles consist mostly of it in a solid form. Albumen is composed of 8 equivalents of carbon, 7 of hydrogen, 3 of oxygen, and 18 of nitrogen; fibrin of 6 equivalents of carbon, 5 of hydrogen, 2 of oxygen, and 18 of nitrogen. The nitrogen remains the same in amount, while the relative

quantity of all the other ingredients is diminished.

This alteration is effected by respiration; not always, however, performed exclusively by the lungs, as nature is abundant in her resources, and often acts to a limited extent vicariously by the skin, liver, etc., when the proper function of the lungs is impaired. It has been long remarked that men when hung, retain the heat of the body for a much longer time than when death occurs from any other cause; the effort that nature makes to maintain life by means of the skin and the partial effect of the air upon the blood that circulates in minute vessels beneath it, maintaining the heat. It is a very common remark, that the body of a suicide from hanging, when discovered, was "still warm," but the inference drawn from this, that death must therefore have been quite recent, is not always correct. Indeed so important is respiration in the animal economy that some of the lower animals respire by the skin equally as well as by the lungs; that is, the peculiar influences of the external air are communicated through the skin to the small blood-vessels beneath, and thus the changes in the

blood are effected. The frog, for example, may be kept alive by means of the respiration through skin alone. So important is the skin to this animal that it will die if it is covered with oil as speedily as if the lungs were removed.

Respiration through the lungs, however, is the mode whereby most animals produce the changes above mentioned. The changes consist in the excess of nitrogen in the red and renovated blood, which is thus prepared for distribution by means of innumerable branches of arteries for the purpose of supplying the waste of the body. The albumen of the system is thus supplied with the requisite material for the formation of the more highly organized materials.

If respiration be imperfectly performed, the organization must be correspondingly defective: if it be fully and efficiently carried on, the proper alterations are effected in the blood, and perfect nutrition is the result, in the production of the proper change in the albumen for all the purposes of the animal economy.

If we observe the conditions of the lower animals where the respiration is but an im-

perfect function we shall find them abounding in the simpler principles of animal substance—albumen. Snails, larvæ of insects, consist chiefly of albumen. Turtles, lizards, serpents, frogs, etc., exhibit clearly the imperfection of the nutritive process, it being carried on but sluggishly, while the result is but the formation of what is the simplest, and comparatively an imperfect state of animal organization. Albumen and gelatine constitute a large part of the bodies of these animals.

It is evidently in our power to trace the influence of a more complete organization in the lower animals among such as have a more complete respiration. Many for instance present a larger amount of gelatinous matter, which is more perfect in its organization than albumen. This is the case in many fishes where there are large gills, as the cod, the bonito, and the red fish of the Gulf of Mexico. In these fishes, and especially in the last mentioned, there is a great amount of the organs for respiration and renovating the blood, and the flesh approaches both in color and firmness to that of the more perfect animals.

As we ascend still higher in the scale of animated nature we find firmness of muscular structure existing in proportion to the development of the organs of respiration and the power which exists for exercising it. That it does not depend altogether upon the kind of food used by the animal is certain, from the fact that all of those that have large lungs and large respiratory powers live upon vegetable aliment, which is much less nutritious than animal food.

If we seek for examples among quadrupeds, where can we find more striking examples than in the ox, or horse, and other herbivorous animals? The ox possesses large respiratory organs, the throat being unusually large; each rib is remarkable for its width and for the large muscles which move it, and no animal possesses a frame that abounds more in nutritious qualities and greater strength. The same remark will apply to the horse, in which the respiratory powers are very great both in a wild state and when trained for labor or for the race-course. The huge frame of the elephant also is composed of highly developed parts remarkable for their firmness and great strength, while

the comparative size of his lungs is not the least of his peculiarities. Like the ox and horse, the ribs are very thick, wide, and strong, and many in number; the ox having thirteen pair, the horse eighteen, and the elephant twenty, contrasting remarkably with many other animals in the greater number and superior strength of these parts.

This does not arise from the actual size of the animal, for many of the smaller animals have an equal number with the horse or ox—the hare, rabbit, guinea pig, and other small animals, having thirteen to fifteen pairs, all these animals have a powerful respiration.

Indeed the respiratory function and nourishment of the body are perfect exactly in proportion to the perfection of the respiratory organs. This may be seen by comparing these organs as they exist among cold-blooded animals. Frogs have no ribs; they, however, have a sternum, or breast bone. Serpents have a sternum and no ribs; so with respect to turtles, crocodiles, lizards, etc., some one or other of these parts is deficient in them all.

It has been seen that man stands among the lowest of animals with respect to the

heat of his body, and it may be fairly assumed that his powers of nourishment are also less, as the analogy is maintained throughout wherever an opportunity exists for ascertaining it. While we are now speaking of the actual anatomy of the mechanical powers of respiration, it will not be out of place to compare that of man with other animals. Of *thirty-one* animals *twenty-seven* possess a larger number of ribs than man, while he stands among the lowest of animals in point of the number of ribs and the size of the thorax; the remaining number, *five*, having like him, but twelve ribs on each side.

From this sketch of the effects of respiration in different classes of animals, it appears that the production of animal heat and the control of nutrition are the obvious uses of the lungs; and that these effects are always in proportion to the size and perfection of these organs. The practical use of these facts will appear when the causes and the prevention of pulmonary diseases are considered.

IV.

CAUSES OF PULMONARY DISEASES.

The greatest number of the diseases of the lungs arise from the *direct effects* of the atmosphere when it possesses some alteration in its physical condition, whereby it becomes a source of irritation to the tender mucous membrane of the lungs; the influence of the air also is effected through the medium of the skin, cold and dampness combined acting often in this way.

The diminution of the pressure of the air is very rarely felt by us while remaining in our usual dwelling places; if it is, it rarely produces any effect beyond weariness, lassitude, and in some persons a sensation of smothering. These feelings occur on the approach of a storm, when the barometer is low. In those already ill with pulmonary disease, such as consumption, a low state of the barometer is usually attended with a great aggravation of most of the distressing symptoms, such as difficulty of breathing and cough. It is only on ascending to a great

height that a diminution of pressure is found to produce decided disease. Under these circumstances, the respiration becomes frequent, painful, and labored, and the pulse quickened, in connexion with a general feeling of indescribable sinking and debility.

A very common effect of rarified air at a great height is the dryness of the throat. This is produced by the rapid evaporation which takes place in very high regions.

In the celebrated balloon ascension of M. Guy Lussac in 1804, the effect on his throat was so powerful that it was difficult for him to swallow a small piece of bread. So also M. De Saussure, in his ascent of the Alps, experienced the same inconvenience and pain, which was temporarily relieved during a storm, but which returned when the storm had ceased.

Besides these effects, others of a more serious nature have occurred, such as bleeding from the nose, eyes, and ears. After one or two days' sojourn in these elevated regions, the respiratory functions accommodate themselves to the state of the atmosphere by the enlargement of the chest and increased powers of respiration. While the gas which

circulates with the blood, and which was at first expanded by the diminished pressure of the external air, and thereby caused the hemorrhage above mentioned, having become diminished, the bleeding ceases.

In our climate we do not experience any of those winds which are so suffocating and so productive of disease, such as the simoom or the sirocco. The cold easterly winds bring with them an amount of moisture of a low temperature, which is productive of irritation and inflammation of the bronchial tubes. High winds are always not only annoying, but fraught with danger to such as are easily impressed with variations of temperature or weight of the air.

Temperature.—This must be considered in connexion with the humidity of the air; in the first place we will trace the effects of heat combined with dryness.

The first effect of dry heat is to furnish the lungs with rarified air, which is lighter than that ordinarily inspired, and contains less respirable materials in a given bulk than cold air. When the temperature is not raised to a high degree there is nothing experienced in the respiration beyond a slight

inconvenience, and an acceleration of breathing, as the lungs, receiving at each inspiration air insufficient to supply the wants of the system, are obliged to repeat their movements more frequently.

The effects of 65° to 75° of temperature are but a slight augmentation of breathing and of the circulation, and a prompt action of all the functions; such as are experienced on the return of spring after a cold winter. These effects vary in different individuals. Those of large lungs experience a sensation of fulness and heat, while those in whom the pulmonary development is small scarcely have any other than a feeling of agreeable stimulation.

If the heat is over 90°, the air is rarified to a considerable degree, and there must be a very marked diminution of the amount of respirable materials. The number of inspirations increases, and a feeling of great distress and suffocation is experienced, and congestion of the lungs is the result. This state will occur in laboring men during the great heats of summer, and especially among such as abound in blood; death from this cause not unfrequently ensues.

The necessity of confining our remarks to the effects of these agents in producing diseases of the lungs alone, forbids the examination of all the consequences of an over-excited state of the body from excessive heat. The study of the effects upon the brain, and the production of various diseases by an over stimulated or congested state of this organ, would itself fill a volume, and must here be altogether omitted.

The next condition of the temperature of the air is its union with moisture.

In all parts of the globe particles of water unite insensibly with the air, constituting evaporation. It depends upon the caloric which causes the expansion of the water, which, when in vapor, unites with the atmosphere.

Evaporation is more rapid in proportion to the heat of the water, to its agitation, and to the extension of its surface.

When the air is very hot it will absorb a large quantity of water, without being sensibly present. But if the air receives water from any source, as the surface of the ocean for example, beyond its capacity of saturation, that is, more than it can contain, it be-

comes sensible, and condenses, producing fogs and mists when near the earth, and clouds when removed a short distance from it.

The effects of this state of the air upon the lungs are much the same as those already mentioned, except that it is more marked; under its influence the breathing is usually more powerful and the feeling of lassitude greater; the blood is less completely renewed, and the whole nervous system experiences a depression. Persons of debilitated constitution, termed "delicate," experience greater inconvenience from a hot and moist condition of the air than others. Such as are predisposed to acute inflammation of the air passages experience a relief in a moderately moist atmosphere. Besides the direct effects of hot and moist air upon the lungs, decomposition of vegetable and animal substance is rapidly effected by it, and predisposition to disease is thereby produced; it is also to this cause that many fevers are to be attributed.

A cold and dry condition of the air is that which prevails in the interior and northern part of the Middle States and parts of New

England. The effects of this are those produced by highly condensed air. Cold, condensing the air, supplies abundant invigorating materials for respiration, and developes these organs when properly used.

Cold, however, requires that the individual should possess a certain amount of vigor, be well clothed, and well nourished. Otherwise, cold will produce debility, as is seen among those of a lymphatic temperament, or on those badly fed and clothed. It is injurious to very young children and to the aged. There is always an increase of the pulmonary difficulty of old people in cold weather, and many die of pneunonia in the winter ; indeed, five-sixths of all the deaths among the inmates of the hospitals for the reception of old people, are from this disease during the winter seasons.

Wet and cold air produces decidedly bad effects upon the lungs in causing inflammation of these organs and the parts appertaining to them. In delicate persons the abstraction of heat from the membrane lining the air tubes, greatly deranges their functions ; and by the efforts of nature to return the lost balance, active inflammation is pro-

duced; and bronchitis, together with more or less inflammation of the lungs, is the result. The breathing of cold damp air is the cause of many pulmonary affections both directly and indirectly induced, as it brings out the latent predisposition which otherwise might have lain a long time inactive.

Cold and damp act also through the skin in the production of pulmonary diseases of all kinds, and a common cause of these affections is sitting in a draught of cold air especially when the body is heated, wet feet, or wearing damp clothing.

A very serious source of diseases of the lungs is the minute particles, which float in the air, such as coal-dust from the grates in which there is an imperfect draught. Many persons of delicate lungs will often experience a great amount of soreness and irritation about the throat and in the interior of the chest upon stirring the fire of anthracite, arising from inhaling the small particles of otherwise impalpable powder; such effects rarely occur from the use of bituminous coal.

The effect of the delicate and fine powder upon the membrane in the interior of the

lungs may be understood by a similar effect upon the eye by the blowing of dust; were it not that the constant closing of the eye, and the ridge of stiff hairs that are upon each lid protect the eye from the dust, there would be a constant exposure to the irritation of the dust flying about in the air; whenever a small portion reaches the interior of the eyelid, so great is the irritation, that it very materially interferes with the exercise of the proper functions of the eye, or even ultimately destroys its functions altogether. Certain mechanical particles also drawn into the nostrils will immediately excite the membrane, and sneezing and even pain will be induced. The mucous membrane lining the nose is but a continuation of that which passes throughout every part of the lungs. But although these minute, rough substances, finely divided and drawn by breathing into the lungs, do not produce immediate pain, being lodged in the fluid and mucus contained in the lungs, yet when continually inhaled, they excite inflammation, which, spreading through the texture of the lungs, produces a train of symptoms which will be productive of the most serious effects.

Workmen are often exposed to the injurious effects of mechanical irritation of the lungs from breathing air loaded with fine dust. The measurers of grain, sculptors, stone-cutters, grinders of cutlery, such as work in cotton factories, workmen in coal yards, all experience more or less the effects of the mechanical irritation of the lungs from this cause. The direct action of them is purely mechanical, and they produce their effects upon the air passages, and their indirect effects are the controlling and limiting of the power of the lungs in their exercise.

The softer dust, that arises during the fabrication of various substances into cloths, carpets, etc., is equally capable of bringing on serious irritation in the membrane lining the air tubes. Most of those who toil daily in an atmosphere of a close factory charged with the floating particles from weaving and other similar operations, almost always have greater or less chronic diseases of the organs of respiration. Dry cough soon seizes them, by which they are continually harassed; this is soon followed by pain in the chest, spitting of blood, and fever. Carpet weavers, ace makers, some workmen in cotton facto-

ries all draw into their lungs the fine particles of woollen or cotton, which occasionally produce upon the delicate mucous membrane, effects similar to those of harder and rougher substances.

Besides mere mechanical causes, there are others to which workmen are exposed, such as breathing chemical vapors, sulphurous fumes, smoke, and other irritating substances. The effects of breathing air loaded with deleterious vapors, are exhibited in the production of permanently difficult breathing, an affection very common to those criminals who are condemned by the laws of their country to work in metallic mines. These vapors are so irritating as to excite an immediate and perpetual cough. The vapors are loaded according to the nature of the mines, with particles of lead, copper, antimony, silver, arsenic, etc., and the air cells of persons breathing this atmosphere have been found contracted to half their capacity.

Other vapors appear to make an impression through the lungs upon the nervous system. Thus certain odors, as musk, the odor of the rose, and other flowers, however agreeable to the senses, are sometimes pro-

ductive of great distress; hence the danger of sleeping in apartments in which plants are kept, for a person may "die of a rose in aromatic pain."

In summer, during hay making, the agonizing effects of the effluvia from the odor of hay, are known to many a sufferer under the name of "hay asthma," while similar effects often arise from an exposure to the fumes of sealing wax and other effluvia or subtle vapors. Among them nothing surpasses ipecacuanha in the violence of its effects upon some persons. The effects of these substances are, in others, directly upon the air passages, as in the production of rose catarrh, etc.

The principal cause of the prevalence of disease of the throat among those who are in the habit of public speaking, is the inordinate and unnatural use of the delicate organs of the voice, in requiring them to perform an office for which they are not constituted. The lungs as the reservoir ought always to supply the necessary quantity of air, while the vocal organs give it articulate sound. The larynx is the most essential of all the vocal organs, and the parts composing it

are so exceedingly delicate in their structure that any exertion to cause them to perform a part for which they are not designed deranges them and destroys their healthy action, and congestion or inflammation is the result. This is brought about by the habit that many speakers have of neglecting to respire at proper intervals, and thereby fail to have the quantity of air needed to complete a long sentence; and to supply this deficiency a violent effort must be made by the small muscles that move the organs of voice. This unnatural use of them cannot fail to produce very serious effects.

These remarks apply more particularly to clergymen, among whom there exists, in general, a more quiet manner of speaking than is found among other classes of public speakers. The sustained tone of voice in which a considerable part of their public exercises are performed, leads directly to the neglect of the necessary efforts to supply the requisite quantity of air. This supply must, on the part of those who use but little muscular effort while speaking, be effected voluntarily. Public speakers of other professions, where there is much declamation or considerable

muscular effort, replenish the chest by instinctive and involuntary movements, as the respiration is always increased by exercise. The proper method of preventing the evils now referred to, will be considered in the chapter devoted to the subject of the prevention of pulmonary diseases.

The indirect effects of respiration upon the lungs in the production of disease, arise from the influence of respiration upon the process of nutrition carried on by the blood throughout the system. There is but one disease of the lungs depending upon this cause. Pulmonary consumption arises from the imperfection of the nutritive process. It is identical in its nature with scrofula, differing in no respects from it except in its seat. From the certain and slow decay of the whole system when the scrofulous affection is situated in the lungs, it has received the remarkably expressive name of consumption, when situated in other less vital organs it retains its proper name, but notwithstanding the name does not lose its identity in whatever part of the body it may manifest itself.

Nothing is more common than scrofula showing itself in childhood, and consumption

in the same individual at adult age. This arises from the peculiarities of the lymphatic system at the period of growth, but which it is unnecessary to consider in this work. So common indeed is the existence of these two affections at the same time, but in different stages of development, that tubercles have always been found in the lungs on dissection where scrofula has shown itself externally.

The deposit of this albuminous matter is made from the blood, and is the result of an imperfect nutrition, acquired from some circumstances under which the individual has been placed, or inherited from the parents, and maintained by the imperfection of the vital powers of the individual.

The matter contained in all scrofulous tumors, whether they are external, or situated in the lungs, is precisely the same. It consists of pale, opake albumen, more or less coagulated, resembling sometimes the whey, at other times, the curds of milk. Analysis shows that the animalized part of the matter contained in these tumors consists exclusively of albumen ; being 98.15 parts of 100, the remainder, 1.85, is nothing but salts of lime and soda.

The deposit of albumen constituting the disease in question, is sometimes connected with a slight inflammation or congestion of the part; this, however, is by no means essential. It is often a mere accidental circumstance, and appears to act by arresting the free circulation of the part, and thus preparing it for the deposition of the albumen. At other times an inflammation accompanies the swellings of the disease; this also is a mere accident, and arises from the distension, irritation, and pressure of the surrounding parts,—the inflammation being the consequence and not the cause of the disease.

It is a disease of pure debility with a large amount of imperfect materials circulating with the blood, and a great deficiency of proper healthy and organized substance. From this cause an imperfect composition of the body must ensue, which is thus predisposed to derangement and disease upon the occurrence of some exciting cause.

That it is a disease of debility is evident from the languor and paleness of persons affected with either in its incipiency or in

its matured state. Heaviness on slight exertion, and a frequent pulse, are the usual attendants upon the disease in all its forms; and when constant, are a sure sign of some organic difficulty, and, in the greatest number of instances, of the incipient formation of tubercles in the lungs. These signs always accompany debility.

When considering the uses of the lungs, the important influence of respiration upon the nutrition of the body was brought prominently to notice. It was then shown that where respiration was imperfectly performed, the nutritive process was also imperfect, and that albumen, the simplest form of animal matter, existed in abundance. To this rule there does not in any class of animals exist a single exception.

What is true with reference to animals as a class is also true in individuals. Those of feeble respiratory power abound in badly formed blood, are pale, and afflicted with deposits of albumen, constituting scrofula or consumption, according to the seat of the deposit. Scrofulous people have always narrow chests, and feeble powers of respiration; hence the want of suitable nutrition, and the

existence of the primitive and unorganized animal matter which abounds in animals of a lower class.

The existence of albumen in reptiles, and other animals of feeble respiratory powers, is as natural to them as the absence of heat in the blood; but when this occurs in those animals which possess naturally a much higher organization, it cannot be regarded in any other light than as a disease. The usual accompaniments of disease attend this state of the body, for persons thus affected, are not only feeble and pale, but an indescribable sensation of want of health, accompanied by chilliness either locally or generally, is always present. The latter symptom is precisely what might have been expected if the views taken of the uses of the lungs in preserving the heat of the body be correct. In the lower animals this want of heat is natural—in the more perfectly organized animals it is an evidence of imperfection, and is disease.

As was before remarked it is not intended to enter into the consideration of the chemical experiments or the various theories which have been advanced in relation to the influ-

ence of respiration upon nutrition, but merely to state the facts that appear to us in the broad field of animal life. The condition of the blood in phthisis, therefore, which has been a fruitful source of unsatisfactory theories, must be passed over, and the general effects of respiration in their ultimate results alone stated.

Persons predisposed to consumption have usually the chest contracted in some part, or there is a general diminution of its capacity, indicated by its narrow form, prominent shoulders, and a disposition to yield to the contraction by stooping forward. This state arises from the natural conformation of the parts, or it may occur from an inflammation in some parts of the lungs, followed by a contraction of the affected part. In either case an imperfect respiration is performed, the nutrition of the body is imperfect, and the albuminous deposits are formed.

Another and a very fruitful source of consumption is the imperfect respiration arising from sedentary habits, confinement within doors, or constant exposure to impure air in badly ventilated and crowded places, small and badly constructed bed-rooms.

These latter causes being capable of many and convincing proofs, and bearing at once upon the great principles urged in this work, it will be interesting to investigate it in the same manner as has already been done when considering the uses of the lungs, by examining their effects upon different animals.

Among the lower animals we may discover the effects of domestication and confinement, in their usual attendant, an imperfect respiration. Scrofula exists in the horse under the name of farcy; in the domestic fowl it exhibits itself as the pip; swine, shut up as they almost always are, without the opportunity of free exercise, are subject to the same disease; indeed, its name is derived from this animal. Pulmonary consumption is very common among cows that are kept constantly in stables. Mr. Youatt in his work on cattle gives the following account of the cause of this disease:—"There is one striking fact, showing the injurious effect of heated and empoisoned air on the pulmonary system. There are cow-houses in which the heat is intense, and the inmates are often in a state of profuse perspiration. The doors and windows must sometimes be opened,

and the wind blows in cold enough upon those that are close to them, and, one would naturally think, could not fail to be injurious. No such thing. These are the animals that escape; but the others at the further end, on whom no wind blows, and where no perspiration is checked, are the first to have inflammation and *consumption*."

Here are plainly exhibited the effects both of bad ventilation and a rarified air; neither condition containing a sufficient amount of oxygen for the purposes required by the animal, and in place of its natural vigor and high nutrition, a state of disease indicating the want of natural vigor appears.

Among domestic animals, the dog and the cat, although they are attacked with inflammation of the lungs, rarely if ever have consumption. It is well known that neither of these animals are ever placed in a state of confinement; they are allowed to rove about almost at will, and their domestic habits are more a matter of choice than of necessity. On the contrary, monkeys frequently have consumption; a disease of which the orang outang also died a few years since in the city of New York. These animals are of

necessity greatly abridged of their natural freedom; and, from what we have seen, a great diminution of the powers of respiration must ensue from the absence of natural exercise.

The deterioration of the atmosphere from crowding together a number of inhabitants in large towns and manufactories, is a very common cause of scrofula and consumption. These conditions are more common in Europe than in our country. A number of years since, Dr. Percival, of Manchester, in England, gave an account of the distressing effects produced by crowding together a number of people. The whole number of deaths from scrofula, as mentioned by him, was about one-third of the entire number of deaths among children of that place. In the hospital for sick children, at Paris, one half of the bodies that have been opened exhibited marks of scrofula in some parts of the body, either in the lungs or in other parts.

The bad effects of impure air on the tender and susceptible frame of children, I have often had occasion to observe, and have often noticed that it is far more injurious of itself than improper diet in older children; the lat-

ter, although unquestionably a great cause of disease, may yet be rendered digestible by habit; and an entire change of food, at first difficult of digestion, may become suitable for the child, and be easily digested; but the air must always be pure, the child never can thrive in impure air.

In accordance with this view, are the facts mentioned by Mr. Carmichael of Dublin, in his acount of the scrofulous disease which prevailed in the House of Industry in that city, where one hundred and fourteen children were lodged in one ward, the air of which became insupportable in the morning, while hundreds were confined in the school-room during the day. The disease prevailed under these circumstances in all its fatal violence, and in every form of ordinary phthisis and scrofula.

It is scarcely possible for us to conceive of the effects of confined atmosphere such as the inhabitants of some parts of the Alpine valleys experience. The effects of confined air during the summer are here rapidly dissipated by the friendly breeze or the sudden tempest, which have full sweep over the face of the entire country. There can be no

doubt, from the account of recent travellers there, that the physical deterioration of man in these regions exhibited by the goitre and the diminished stature, arises from the stagnant air which the inhabitants are compelled to breathe, from the impossibility of the usual motions in the air affecting the regions—added to the continued rarifications of the air by the heat which is reflected from one mountain side to the other.

The skin of these people becomes discolored, and covered with scrofulous sores, an enlargement of the thyroid gland takes place, and forms the goitre; while, from the general want of proper assimilation, the limbs become distorted. The grades of scrofulous disease, from the simple goitre to the more complete cretinism, are innumerable. All this arises from the causes already mentioned, for, according to Dr. James Johnson's observations made upon the spot, both goitre and cretinism prevail in the most intense degree in the gorges and ravines, while both disappear in proportion as we ascend the mountain, and when a certain altitude is reached, both maladies disappear.

In our public hospitals the effect of a

change in the mode of ventilation frequently demonstrates the truth on this subject. In one of the New York public charity Institutions the number of deaths was lessened by *one third*, by the adoption of some important improvements in the mode of ventilating the rooms.

A charity school in London, where scrofulous disease existed to a great degree, became healthy when another house was built, and fewer occupied a given space, and important improvements in ventilation were introduced.

Our workshops are built often with little regard to the health of the artisan. The ceiling is often too low, too many are crowded into a small space, and the apartment is frequently improperly heated and imperfectly ventilated.

One who has carefully observed in relation to this subject says, "I observed carefully, the state of health of a shop of letter-press printers in London. They worked in rooms similarly lighted and heated, and in which ventilation was equally neglected, the only difference being in the quantity of impure air which the several men had to breathe,

this quantity being ascertained by actual measurement of the rooms themselves. Among 104 men having less than 500 cubic feet of air to breathe, there were 13 who had spit blood, 13 were subject to habitual catarrh, and 18 to other diseases, making a total of 44 invalids. Of 105 men who had from 500 to 600 cubic feet of air to breathe, 5 had spit blood, 4 were subject to colds, and 23 to other diseases, making in all 32 invalids; while out of 100 men who had more than 600 cubic feet of air to breathe, 4 only suffered from spitting of blood, 2 from catarrh, and 18 from other diseases, making a total of 24 invalids."

Whatever produces weakness in the powers of respiration, or whenever there exists an insufficiency of oxygen, either by the admixture of the air with other gases, thereby lessening its relative proportion, or by its extreme rarification by heat or otherwise, strongly predisposes the system to consumption.

It is not generally known that excessive heat as well as excessive cold and dampness, when applied habitually, will produce a languid action, and the disease in question, as it

is, under such circumstances, a powerfully debilitating agent.

Dr. Alison, in the Trans. Med. Chirurg. Soc., vol. i., p. 397, remarks that "the pulmonic disease among the black troops (natives) of the Leeward Islands and Windward Islands was almost exclusively phthisis;" and "pulmonary consumption caused twice as great a mortality among the blacks as among the whites." Scrofula is a very common disease among the Hindoos, Hottentots, and negroes; the only difference appears to be, that the influence of cold is far more rapid in its effects than heat.

Sedentary occupations of all kinds, as they limit the action of the chest, lessen the powers of respiration and produce disease. If the sedentary habit is combined with a stooping posture, the capacity of the chest and the abilities of respiration have a double obstacle with which to contend. The lungs, from want of use, become small in size, while the contracted form of the chest which arises from habitually stooping, compresses them into still greater limit. The blood passing through them is but partially changed, and imperfect nourishment is the result. Paleness, lassitude, and often absence of mental

energy mark the condition of those who from necessity are obliged to subject themselves to the evils of confined air, absence of natural exercise, and unnatural postures. Pains in the sides, and lungs, and inability freely to respire, are what they daily experience. Spitting of blood, weakness of the digestive powers, an obstinate and too often an almost irremediable constipation of the bowels, are their habitual ailments.

In an account published a few years ago in a public journal of the comparative diseases of journeymen tailors, cabinet makers, and bakers, numbering thirteen hundred and sixty individuals, the influence of sedentary habits and constrained position in developing pulmonary diseases is remarkably exhibited. The diseases most destructive were those of debility, and occurred among the first mentioned. Of catarrhal fevers *one* in *six* of the Tailors was affected, of the Cabinet makers *one* in *nine*, Bakers *one* in *six*. Spitting of blood, Tailors *one* in *four!* Cabinet makers *one* in *one hundred and seventy!* the proportion not mentioned among Bakers. Of other diseases there did not appear to be much difference.

Who is there that cannot add to this list

of pulmonary affections from his own knowledge? The feeble form and pallid hue of the toiling sewing girl meet us at every turn, and these are among the greatest number of victims of pulmonary consumption. The sedentary sempstress suffers the most from this cause, and a premature grave is in most instances her end—her only relief.

But it is among the flowerets of the land who neither toil nor spin that the fatal disease also prevails, and too often from their own obstinate folly. The practice of tight lacing has for years been the object at which the satirist has aimed his shafts of wit, and against which the philanthropist has labored with his words of wisdom and caution, but we fear with but little effect. Although the use of corsets appears to have to some extent been abandoned, it appears also that it is but for the purpose of using the dress for the same object for which stays and corsets have been employed. A score or two of hooks and eyes now attach the dress with a power nearly equal to the multiplied power of the corset-lace and eyelet-holes. The writer one evening had an audible demonstration of this upon the sudden yielding of one or two of

these fastenings to the elastic force within. It is probably the fear of this accident that has induced the adaptation of the usual mode of tightening corsets to the ordinary dress worn at an evening party: and no internal elastic energy can overcome the power thus applied. The individual can affirm with truth that she wears no corsets, but a brief statement of the inability to respire under such pressure, will it is hoped bring such a reader as thinks she has complied with a plain rule of hygiene, to reflect upon the necessity of still greater advances towards a compliance with its requisitions, and to obedience in spirit as well as in letter.

When we breathe we take into the chest and expel a certain quantity of air which can be measured by a certain instrument constructed for that purpose. A middle sized man inspires about 80 cubic inches when dressed, and 106 when his dress is loosened. After a full dilatation of the chest he can inhale 126 cubic inches when dressed, and 186 when undressed. Now these experiments we must admit have never, it is believed, been performed with the ladies, and therefore we can only guess at the re-

sults in some of them. These surmises we must therefore leave for those most interested.

What can be the object for distorting the figure, and compressing it out of all natural symmetry? It arises decidedly from a false taste: it is a remnant of barbarism—to be regarded in a light similar to that in which the Chinese who compress the feet, or the Indians that flatten the head by artificial means, ought to be viewed.

This tight lacing prevents respiration,—the freedom of the circulation is impeded, the blood is forced to the face, at first of a deep red, then pale, and from imperfection of the nutritive process, dingy and cadaverous. From difficulty of respiration the nostrils are widened, and the lips are parted for the same purpose, or tightly compressed to assist the passage of air through the nasal passages. All this is extremely unsightly. In addition to these, there is an expression of greater or less suffering in the whole face, which ceases to be the seat of ingenuous expression—no emotion being exhibited with its appropriate expression, except it be that of pain, badly concealed by a forced smile.

There is no beauty, no grace in the constraint attendant upon this artificial state of distortion. Without freedom of movement there can be no grace. No harmonious union of features and symmetry of form can exist without an unrestrained and uncontrolled power of motion, whereby the most transient emotion of the mind may impart its delicate traces upon the face and form.

The inimitable chef-d'œuvre of Medicis exhibits the human form in all its perfections of beauty, symmetry, and grace ; and it is but the counterpart of nature unchanged and unadorned.

From all the facts stated when considering the uses of the lungs, and the causes operating indirectly in the production of pulmonary consumption, it is evident that the imperfect state of the respiratory function, arising from a limited capacity of the lungs, an imperfection in the air respired, or the combination of both, so far interferes with the process of nutrition as to prevent the proper elaboration of the simplest form of animal substance which results from the process of digestion. That the presence of albumen is the result of this imperfection in the re-

spiratory process. A condition marking a state of disease arising from deficiency in the vital powers, and consequently a state of debility, and the deposit of albumen in the lungs furnishing the usual symptoms which characterize pulmonary consumption.

V.

CHARACTERISTICS OF THE DISEASES OF THE RESPIRATORY ORGANS.

Catarrh.—This most common inflammation of the air passages, is attended with a secretion of mucus from all these parts; it is from this that the name is derived. In ordinary language it is called a *cold.* When the disease exists in the nose and parts adjacent it is called cold in the head; when in the throat, it is known as catarrhal sore throat; when in the trachea and throughout its branches in the lungs, it is familiarly known as cold in the chest.

Besides the seat of the affection constituting the varieties above mentioned, it may be considered as existing in three different forms. 1st, that of common cold; 2d, epidemic of influenza; and 3d, as it occurs in old people. In all these conditions there are some peculiarities common to each, but most of them belong to all.

The voice is a little changed in this disease; the alteration consists of a pe-

culiar sound, which is not easily described. It is more vibrating and hollow in its incipient state; after the continuance of the disease, where the secretions in the nose or throat are thickened, the stoppage of air in these parts produces that sound of the voice most strangely denominated "speaking through the nose," although the sound is the reverse. Hoarseness is the usual attendant when the seat of the affection is the upper part of the throat at the commencement, but disappears as soon as the mucus is freely formed in the part, and the cold becomes "loose."

Respiration is not much affected in ordinary catarrh. The greatest inconvenience arises when the mucus formed in the air passages becomes thickened, as is very common in infants, when it is called the "snuffles." It becomes in them sometimes a very serious affection, from the impossibility to breathe while sucking. The efforts at respiration and the disorder of the circulation, arising from these efforts, will sometimes cause convulsions.

From this thickening of the mucus a partial stoppage will occur in the branches of the air tubes within the lungs, in every form

of the disease and at any age, making the respiration difficult for the time; this stoppage, however, is but temporary; a full respiration, followed by an irresistible cough, will usually remove all the causes of obstruction.

Cough is an invariable attendant of a "cold," whenever its seat is in any other part than in the "head." Too often much mischief is done by domestic prescriptions for cough alone, administering such remedies as will stop the cough without relieving the disease producing it. Anodynes for the relief of cough are the usual active ingredient in quack medicines, the arrest of this being so easily effected that the poor patient is deceived into the notion that he is speedily to be cured, without knowing that the cough is absolutely necessary to relieve the lungs from the accumulation which takes place in them. Cough is a natural action, an instinctive movement whereby the lungs are to be unloaded of the effects of the disease; and is precisely analogous, except that it is involuntary, to the blowing of the nose to remove the accumulation of mucus which takes place within that member.

In many persons, however, the cough is excessively annoying and prostrating; the aged suffer much from protracted cough, and measures should be adopted for the relief of such symptoms. A judicious physician alone is capable of judging of the propriety of such interference, and the extent to which it ought to be carried. The remarks adverse to the use of means for the arrest of the cough, apply only to the ignorant, indiscriminate, and injudicious use of the means for effecting that object; for nothing is more appropriate than a timely use of the requisite remedies for the relief of so annoying and sometimes dangerous a symptom.

Expectoration is closely connected with cough, for this cannot take place without the action of coughing.

At first, expectoration is scanty as the disease progresses, the unpleasant feeling of oppression and pain is relieved by the formation of mucus, and the passage of it from the lungs; analogous to this, is the flux of fluid from time to time in the eyes and nose, when the disease is situated in these parts, which usually relieves the pain and fulness over the eyes and about the head.

There is but little pain or fever in simple catarrh; neither of these is of sufficient importance to demand much attention.

The physical signs of catarrh in the early stage are dry, sonorous, and sibilant ronchi, and, in some rare instances, a total absence of respiratory murmur. But the clear sound upon percussion indicates a good condition of the vascular structure, the obstructions arising from a thickening of the mucous coats of the bronchi. When secretion is established, the mucous ronchus is heard, and according to the acute or deeper tones, is the situation of the disease in the smaller or larger bronchial tubes.

The catarrh of old persons is by no means an uncommon disease; it prevails in the fall and spring, and usually attacks such as are of a full but feeble habit.

The respiration is panting, noisy, and wheezing, and is at times so difficult as to oblige the patient to take an erect or sitting posture. The cough, frequent, short, and obstinate, sometimes producing vomiting. The expectoration is free, consisting of thin mucus.

Pain in the chest is rarely felt, but the

patient has wandering pains in the limbs, like those of rheumatism. The fever is often high, the skin dry, and the thirst great.

The countenance is generally pale, sometimes a little bloated, and occasionally the lips and tip of the nose are livid, and the cheeks assume the same shade of color.

The debility is very great, and, as the disease advances, the debility increases with an aggravation of all the symptoms. Although the mucus is abundant, the coughing becomes impracticable from debility, when the danger is very great.

Influenza.—This differs from other affections of the same parts, by its being caused by epidemic influence, and the debility which accompanies it on its invasion, which is common with all epidemic diseases. The peculiar characters of the disease exhibit, in different epidemics, every variety, from the slightest catarrh to the most obstinate and complicated disease.

In proportion to the violence of the invasion are the cough and violence of the respiration. But the characteristics of the disease are pain in the head, back, and loins, accompanied with great prostration of strength.

The eyes are suffused, with a tingling sensation in the nose, followed by sneezing and the discharge of a thin acrid fluid, while there is a redness and a stiffness in the throat, with a discharge of thick mucus. In proportion to the extent of the affection over the lungs, there exists more or less sense of stricture around that part. The accompanying fever increases every evening, and in severe cases has a distinct chill. The complications are varied and numerous, depending on constitutional peculiarities, and the peculiar condition of the atmosphere from local causes; in every form debility exists, which in some severe and complicated cases resembles the collapse of cholera. The expectoration, which at first was difficult, consisting of thick viscid mucus, becomes thick, copious, and purulent.

Bronchitis.—Closely allied to the forementioned diseases is bronchitis; an extension of either of them may form an inflammation of bronchial tubes. Bronchitis may make its invasion either as simple catarrh or suddenly assume its peculiarity, of inflammation of the bronchial air tubes.

Acute Bronchitis.—There is little change

in the voice in this affection beyond an occasional thickening; it presents much the same condition as is found in catarrh. The respiration is a little quickened, depending upon the violence of the catarrh or the continuance of the fever.

Cough is always present, at first dry, hard, and more or less painful. As the affection becomes relieved by the secretion of mucus, the cough, instead of being an annoyance, is for the most part a source of relief. In some instances, however, it continues to be a means of constant annoyance, and demands measures for its temporary mitigation. Expectoration at first is usually scanty; it afterwards becomes more copious and frothy, and sometimes streaked with blood; when it presents the appearance of the white of an egg, it makes a very severe form of disease, and its expulsion gives but little if any relief; when, on the contrary, it appears more like ordinary mucus, the expectoration affords, in most instances, decided relief.

The pain attending acute bronchitis is usually in the middle of the chest immediately beneath the sternum, and it varies in degree from a feeling of simple rawness to

an obtuse pain, and denotes the extent and degree of inflammation.

Fever is usually high, with thirst, headache, white tongue, and hurried respiration. If the inflammation be not relieved, the fever and accompanying symptoms increase, but when the difficulty of respiration increases, feelings of great depression appear; severe sweats occur, and congestion of the lungs takes place. In favorable cases, the disease declines between the fourth and eighth days, but if the symptoms increase after the latter period, the most unfavorable anticipations will likely be realized.

Chronic Bronchitis.—This form of disease is that which is found to prevail among those who are exposed to the inhalation of air loaded with dust, such as stone cutters, workmen in coal yards, grinders of cutlery, etc.

It also prevails as a result of the acute diseases already mentioned, and of whooping-cough, measles, small-pox, and some chronic diseases of the skin.

The lighter forms of chronic bronchitis are marked by habitual cough and expectoration of a slight degree, which are increased

upon sudden changes of weather or sudden exposure to change of temperature, from other causes. It often continues for many years without producing anything more than an inconvenience.

When, however, it arises among those exposed to the mechanical irritations above mentioned, or where it already exists, and the inflamed membrane is kept in a state of constant irritation by the mechanical particles in the air, such as those already mentioned, and the dust from a fire of anthracite coal, it is sometimes a very serious affection, demanding all the resources of art for its relief.

The respiration under these circumstances is very difficult, and the cough severe and harassing. The expectoration is often copious, and mixed with pus and blood. A fit of coughing will also end in severe hæmorrhage.

It is a disease which, if not speedily relieved by remedies, or an abandonment of the occupation and an entire removal of the causes producing and maintaining its existence, will certainly prove fatal.

The physical signs in acute bronchitis are sonorous and sibilous ronchi.

When secretion is established, a moist mucus ronchus is heard throughout the chest, corresponding with the process of expectoration.

Inflammation of the Larynx.—The voice in this disease becomes hoarse and loses its quality, and is either shrill or rough, or is altogether lost, at least that part which is formed by the larynx, the patient speaking in a whisper, with the lips and teeth only.

The dry, contracted, squeaking kind of hoarseness implies a worse disease than if it is moist. If the cough continues harsh and cracked until it is entirely lost, it indicates more destruction of the parts than if it is suddenly lost. Whatever defect there is in the voice, it is often only apparent when the patient attempts to speak loud, for the patient instantly acquires the habit of speaking in that tone, which is easily done.

Respiration is somewhat affected, and if the disease be violent, is performed with difficulty, and in the acute form the patient will be suddenly awakened by a feeling of suffocation.

The cough is dry, suffocating, and severe, as is the case with all inflammation about the throat unaccompanied by any secretion of mucus. In this disease, in its chronic form, the cough is more teazing and annoying than severe.

The expectoration at first is quite scanty, but as the disease advances there is often an abundant mucus and pus, which is sometimes streaked with blood. The recurrence of this kind of expectoration is sometimes attended with relief to the breathing, although the voice may become more affected, and there may be more pain and soreness in coughing; this marks the formation of ulcers. In very formidable instances, some portions of the bones and cartilages, which form the organs of voice, have been expectorated. They at times have fallen back into the trachea, and caused inflammation of that part, which has extended to the lnngs.

Pain.—There arise soreness and pain in the part affected, which latter is often only felt during the act of swallowing; this last is a peculiar symptom of the seat of the inflammation. Pain is so rarely felt that in more than half the cases that occur none

whatever is felt. Except in the acute form, but little fever attends the disease, even then it does not form a prominent symptom of the affection.

Asthma.—Pure asthma is a spasmodic disease. It is not unfrequently confounded with a congestion of the bronchial tubes, which, from some similarity of the symptoms with the present disease, has been called congestive asthma.

The *voice* in asthma offers no peculiarity of any importance; it is low, obscure, and husky, apparently from the great difficulty of furnishing a sufficiency of air from the lungs to perfect its sound. The patient is very unwilling to speak.

Respiration.—The distinctive mark of asthma is the difficulty of respiration; indeed, those who suffer attacks of asthma, are seldom free from shortness of breathing at intervals.

The efforts at breathing are exceedingly distressing; the body is bent forward, with the arms resting upon the knees; the chest is contracted with a feeling of tightness as if something were drawn around it.

The attack usually occurs about midnight

after a slight uneasiness in the respiration, with pain in the head during the evening. At an uncertain time after falling asleep, the patient is suddenly awakened by the increased violence of the respiratory efforts. He feels as if his lungs were enclosed in a ligature, which makes him feel the necessity of an erect posture, and a free exposure to the cool air.

Although there are great efforts at respiration, the chest is never fully dilated; the violent efforts of the muscles appear to retard, rather than assist respiration, and both inspiration and expiration are performed slowly and with a wheezing sound.

These symptoms continue for many hours, usually lasting until towards morning. The breathing then becomes less laborious and more slow; the inspirations are longer and more full. On awakening the next morning, the patient finds his breath freer and easier than during the night, but not quite natural. He still feels a tightness across the breast, cannot breathe easily in the horizontal posture, and cannot attend to any business without feeling a return of his breathlessness and uneasy sensations. If these, however, are

avoided, the breathlessness continues to become easier.

These fits of difficult breathing may return for several nights in succession, but with diminished force, until after a few nights the remissions become complete, and after four or five attacks, the disease may be considered as terminated.

Cough.—Although there is a wish to cough it is very difficult if not impossible, as coughing requires a full supply of air to be passed into the lungs. Coughing is always a favorable sign, and invariably brings up some mucus; when relief is experienced in proportion to the amount of expectoration. When this is free and abundant, relief will speedily follow.

The mucus expectorated is sometimes dark colored, and sometimes mixed with recent blood. Neither of these conditions is of any importance.

Fever is rarely present; the patient on the contrary complains of chilliness, and the whole surface of the body has a pale and shrunken aspect. When fever does exist, the disease is then dependent upon indigestion, or upon inordinate eating.

When asthma has once attacked an individual, it is liable to return frequently during the whole life. These attacks may sometimes be avoided by avoiding the causes which excite them into action, and which nothing but the watchful experience of the patient can detect.

Physical Signs.—In cases of pure spasmodic asthma the sound on percussion is generally good, but in very severe cases, dull. There are sonorous and sibilous ronchi, at the beginning, followed by sub-mucous and sub-crepitant ronchi. Some degree of wheezing and sibilus remains after the attack.

Inflammation of the Lungs.—Among the diseases of the respiratory organs there are none more formidable and obstinate than the inflammation which affects the substance of the lungs, if we except pulmonary consumption. It sometimes appears suddenly, without being preceded by any other, and at other times is a consequence or a complication of other diseases. In whatever manner it makes its invasion it presents the following characteristics. The voice is low and restrained, from the difficulty of filling the chest to supply the necessary quantity of air.

Efforts to speak greatly increase the oppression with which the patient is distressed. *Respiration* is frequent, short, and painful, increasing from fourteen in a minute, the usual number in health, to thirty and upwards during the same period. The difficulty of respiration compels the patient to assume an upright position, or to be supported in bed on the back, with the shoulders raised. *Cough* is short and dry at first, and when the inflammation is severe it often ceases altogether from the pain that it causes. It is in a little while attended with a scanty expectoration, but this affords but little knowledge of the extent of the disease; it is from the rapid and forced character of the respiration principally that the required information is to be gained.

Pain always attends this disease, in every degree—at times sharp, and again dull and diffused. The pain is always deep seated, and in different parts of the chest in different individuals.

When the pain is in the side and of an acute nature, inflammation of the lungs is then complicated with pleurisy.

The expectoration is at first composed of

a scanty mucus; it afterwards becomes of a dark sooty color, and viscid in its consistence.

Fever is always high, with hot skin, especially on the chest; flushed face: frequent and quick pulse, and all the usual attendants of fever are present in this affection.

The physical signs at the commencement are puerile respiration, and afterwards when the disease is fully formed, crepitant ronchus; when the lungs become hepatized, there is an absence of the respiratory murmur, with bronchial respiration. When suppuration occurs there is mucous ronchus. There is in all stages of the disease dullness on percussion. The parts most usually affected are the lower lobes of one or both lungs.

Pulmonary Consumption.—This is a disease characterized by a gradual wasting, accompanied with more or less cough and expectoration depending upon a destruction of the lungs, arising from the ulceration produced by the presence of tubercular masses in them. The following are the symptoms peculiar to this disease in the different modes of its progress.

1. It may make its invasion insidiously and

slowly. Often the first symptoms, most generally in the young,—between the sixteenth and twenty-fifth years—are, the patient becomes a little emaciated, has a constant cough, at first dry, or with only a small quantity of mucus. The pulse is always quickened; indeed, in many an instance this is the only sign in the incipient stage, scarcely ever beating less than 90 pulsations in a minute, and often as many as 120. The respiration also is more frequent than in health, amounting to about twenty-five in a minute, and is easily excited upon any exertion. The skin is dry, while there is a hot uneasy feeling in the cheeks.

The expectoration gradually becomes more copious, and from floating on the surface becomes heavier than the water, and sinks.

At this period of the disease the face altogether loses its color and becomes pale, sallow, and cadaverous ; but in many instances, especially in young females, it is of a peculiar delicate and transparent appearance, with a slight pink color in the cheeks.

2. The next form of attack is after catarrh or bronchitis. The patient has often had a "cold," finds that it is more protracted in its

duration than usual; or if he has been relieved from the most common symptoms, will suffer a recurrence upon a slight exposure to the cold air or dampness. At each attack, the urgency of the symptoms increases, and more particularly the shortness and frequency of respiration; the expectoration, which at first consisted of thin mucus, or a jelly-like substance, becomes thick, opaque, and has the appearance of pus. The pulse increases in rapidity, varying from 100 to 120 beats in a minute. The skin is hot and dry at night, when the patient is in bed; when he sits up he complains of cold. After a while, a slight moisture is perceived about the head and chest in the morning, after a night of fever; the first indication of hectic fever.

3. The third mode of attack is so obscure and insidious that for a long time no affection of the lungs can be suspected, from the absence of the usual signs accompanying the disease. The cough is very slight, and is on this account rarely noticed. Consumption may be suspected when there has existed for some time an indescribable feeling of weariness and indisposition, and when the patient's respiration is carefully watched, and

found to be rather more frequent and more limited than is natural. In addition to this he cannot take a full breath without a feeling of oppression. The pulse also is more quick than in a state of health, beating from 90 to 100 strokes in a minute, and easily excited to a greater frequency.

The use of the stethoscope should by no means be neglected when the case is obscure in its ordinary symptoms.

4. In another mode of attack bleeding from the lungs is the first symptom that attracts attention; this, however, is rather an indication of previous obscure disease, than a cause of consumption. A succession of such attacks must arise from some previous diseased condition of the lungs, which has escaped notice from the entire absence of the usual signs exhibited in pulmonary diseases. It appears to correspond with the state of the lungs connected with the want of the usual manifestations of consumptive symptoms, mentioned in the preceding class.

The condition of the lungs in which there exists an absence of the usual symptoms is various—sometimes slight chronic pneumonia, at other times congestion, again, the sim-

ple accumulation of tubercular matter. The symptoms attending these conditions of the lungs, causing hæmorrhage, are a dry, harsh skin during the day and part of the night, but easily made to sweat about morning. When cough is present, it is short, tickling, and sometimes occurs in violent paroxysms. Respiration is much quicker than natural, easily accelerated, and rendered laborious by exertion.

The physical signs in this class of patients will apply to the one immediately preceding. They consist of bronchial respiration, sometimes sonorous and sibilous ronchi. In the sub-clavicular, scapular, or sub-scapular regions fine mucous ronchi is heard; while more natural sounds exist in the inferior regions.

These are the different modes of the invasion of this most formidable disease; and however much it varies in the manner of its attack, the distinctive signs of the disease may be comprised in the following summary. Cough, with expectoration; quick breathing, often with a feeling of oppression or tightness of some part of the thorax, and easily increased upon exertion; hectic fever; di-

arrhœa ; and a gradual wasting throughout the whole disease.

Cough is the most constant symptom in pulmonary consumption. In the early part of the disease it is tickling, frequent, and almost always without expectoration. When the latter takes place it is usually frothy. The cough, at the commencement, depends for its character upon the nature of the attack. If this is accompanied with much inflammation, the cough is the most urgent symptom, as it causes a great deal of distress and pain, and interrupts the sleep. In the instances in which the disease begins more insidiously and with less fever, it is often very slight for weeks, and even for months, without attracting much attention. But it becomes more annoying and troublesome as the disease advances. When it is attended with much expectoration it becomes very troublesome.

Cough is violent in the active period of the disease, but as it approaches its termination, the strength of the patient is so much reduced that it is with great difficulty that he can cough. One character of the cough in consumption demands attention. It is, that

the sense of irritation is experienced in the throat, so that the patient will be led to think that the disease is seated in the wind-pipe and not in the lungs.

Expectoration.—In the beginning of consumption the expectoration consists of thin, frothy mucus, sometimes a part of it quite opaque and of a greenish hue. It always assumes an orbicular shape when received into any vessel; when into water, part of it sinks in a little while, and part remains partially floating, resembling clouds in the water. The part that sinks resembles small balls of cotton.

As the disease advances after the softening of the tubercles in the lungs, the expectorated matter becomes less abundant, and appears again like mucus expectorated at the beginning, or it may be altogether absent, when the cough partially ceases. The cough increasing without any expectoration, and being very irritating, and more or less painful, the patient imagines that he has "taken a fresh cold." Expectoration of thick matter comes on again as other tubercles soften; he then remarks that he is getting better, as his cough is becoming "more loose." It then gradually

loses its peculiar character and becomes as it was before. A continual recurrence of these symptoms almost invariably marks the course of pulmonary consumption.

Respiration.—The breathing is always quickened; the respiratory actions varying from 26 to 32 in a minute. This is always to be remarked whenever the patient is in motion.

The manner in which respiration is performed, seems to indicate an intolerance of the air on the part of the lungs, for it is no sooner inhaled than it is expelled, and the expiration is longer than the inspirations.

Percussion over the upper part of the chest, immediately under the collar bone, causes a duller sound than is natural, one side being usually more dull than the other. Over the mammary and sub-mammary regions the sound is sometimes preternaturally clear. In the axilla it is usually dull in the early stage, but as the disease advances it becomes clear.

The signs on auscultation also differ in different stages of the disease. Bronchial respiration in the commencement of the disease, is its characteristic sign.

In the next stage, before cavities have been formed, sonorous ronchi and sibilous wheezing are heard, with moist, mucous ronchus. The sound of respiration is more or less dull, usually completely so; and either during inspiration or at its close, there are heard the moist crepitating ronchus or fine mucous ronchus, or both combined, in the subclavicular or mammary regions before, the axillary region at the side, and the scapular region behind. A cooing sound will also be heard in the same regions.

All these sounds increase in intensity and coalesce as it were, and a gurgling sound is heard; this occurs at the end of a week or ten days. Air is afterwards heard to enter into the space where the gurgling sound was heard; this is the cavernous respiration, and when the patient coughs or speaks, a peculiar re-echo is heard.

The sound of the voice in this part is peculiar, vibrating strongly through the stethoscope, and seems to come directly from the chest to the ear. Spitting of blood may occur in consumption in three different forms: merely streaking the matter expectorated, or in the quantity of a teaspoonful or two, and

in a large, profuse bleeding. In some form or other, it occurs in almost two thirds of all the cases of consumption.

Hoarseness is another symptom that occurs in many cases; almost one third are affected with this symptom. The hoarseness varies in degree, and sometimes amounts to an entire loss of voice. Pulmonary consumption has in some instances been mistaken for inflammation of the larynx, from the remarkable prominence and continuance of this symptom.

Pain.—This is not a very common attendant of this disease. In the early stages, however, when there exists some inflammation, pain is felt in particular parts, and a feeling of weight and oppression throughout the chest, usually increased upon a full inspiration. The most usual place for pain to be felt in consumptives, is between the shoulders, and at the close of the disease at the lower extremity of the sternum.

Fever attends most cases of consumption. At the commencement it is usually inflammatory; the pulse varying from 90 to 120 beats in a minute.

In the second stage of the disease, hectic

fever makes its appearance in the greater number of cases. It resembles, in some respects, an attack of intermittent, commencing with chills towards evening, with pains, and a contracted skin. Heat, and dryness of the skin succeed, marked by a bright pink spot on the cheeks. A severe sweat follows, known by the name of night-sweat. One set of paroxysms usually occurs once in twenty-four hours, and sometimes there are two in the same period.

Wasting is a constant symptom of consumption; about one half of all the cases commence with this, as the most prominent characteristic. In the others it is connected with diarrhœa, sweating, and fever. The most common cause is, however, the want of nutrition in the system, from the diminution of the function of respiration.

VI.

PREVENTION OF THE DISEASES OF THE RESPIRATORY ORGANS.

Local Diseases.—Many of the local diseases of the respiratory organs may, in a great measure, be prevented by a careful watching and avoidance of their causes. These causes, in some instances, require the personal experience of the individual alone, apart from any general rules upon the subject.

Nothing so clearly shows the remarkable influence which individual peculiarities exercise in the production of disease, than the successful resistance made by the lungs of one person to the action of a cause which in another almost invariably results in departure from a sound and healthy condition of these organs. Causes of disease, and the remedies for its removal, are, for the most part, relative agents; they are especially so with reference to the lungs—none acting uniformly in every instance, but receiving their power from the condition of the part upon which they act, and the general predisposition of

the system. From this difference in the susceptibility of different individuals, it is obvious that no rules can be laid down that can be regarded as unerring guides. Experience, in many instances, offers the only safe rule for our conduct with reference to the avoidance of those atmospheric causes of diseases of the air passages, which arise from some physical modification in the air. An illustration may be given in the instance of asthma. This disease is excited in different individuals by directly opposite states of atmosphere, and that condition which produces it in one, will actually relieve it in another. Many asthmatics are relieved in damp weather, and experience the most of their affliction during the prevalence of dry and cold weather, or in situations that are constantly dry and cold. Some persons thus affected have actually removed to situations for relief, which others, similarly affected, have left for the same object. So again, habitual bronchitis is relieved in some, by the influence of a cold air, which by abstracting the heat of the inflamed part, causes a feeling of refreshment and an arrest of the cough; while others experience, under similar circumstan-

ces, positive injury, in the production of all the train of evils attendant upon this malady. These are extreme cases, but serve to illustrate the principle that all remedies, both preventive and curative, are not absolute, but relative powers.

Their influence can sometimes be ascertained by the experience alone of the patient; at other times they will require the careful investigation of the actual state of the lungs, to discover their natural or acquired tendency, that the exciting cause may be avoided or the suitable remedy applied. With these preliminary remarks the following suggestion on the mode of avoiding the usual effects of different conditions of the atmosphere are made.

While extreme heat or extreme cold is a cause of disease in the pulmonary organs, it rarely happens that they exist to such an extent as to render particular directions for their avoidance necessary. Man will instinctively leave any situation, if it be possible, where they exert their influence to the injury of health or the destruction of life; for their baleful effects are immediately felt. It is when sudden changes

of temperature in the air occur that great derangements arise, but without any very profound sense of evil at the time, for the extremes need not be great to produce these effects ; it is sufficient that the vicissitudes be sudden.

As preventives of diseases of the lungs from these causes, there are two general rules to be observed : 1, To render the condition of the air as uniform as possible, and 2, to accustom the system to the variations of the atmosphere where uniformity cannot be established.

The best method of artificially heating our habitations is the only subject that can come under consideration under the first rule, in connexion with a reference to suitable clothing.

The best mode of warming a house either throughout or in the different apartments, is that which will combine a uniformity of temperature with a suitable ventilation, whereby a continued supply of external air is admitted with its appropriate moisture. In addition to the admission of the air from without ensuring thereby a suitable amount of pure air, the humidity of the air must also be main-

tained, a condition which no artificial means has as yet been able to accomplish.

The open fireplace for an apartment is decidedly preferable to a stove or a furnace placed in the lower part of the house with flues to convey the heated rarified air into the room. The inconvenience of an open fireplace is that it produces a current of air along the floor or upon the back, whereby a cold feeling is produced, and those exposed to it are in truth exposed to all the evils which result from a current of cold air. This evil scarcely exists unless the weather be extremely cold, and then it becomes necessary to adopt some other or additional method of warming a house. This is best done by a stove placed in the entry, which accomplishes in a great measure the objects above stated—those of supplying heat and introducing at the same time a quantity of external air. A stove in a room rarifies the air where there is but little opportunity of its escape, and consequently but little is introduced into the apartment. A stove on the contrary placed in the main entrance to the house, receives fresh air continually, not only from the outer door being frequently open-

ed, but by means of cracks and other openings; the air being rarified ascends throughout the whole house, and escapes in various small openings in the upper part. To ensure this passage of air one flue of a chimney in the upper part of a house is sufficient. A free ventilation is thus established; indeed more fresh air is inspired than if no such arrangement was made; for in the latter case for want of something to set it in motion the air of the whole house remains stagnant, and although it is cold it is not pure.

An objection has been made to the use of entry stoves on account of the heat they occasion throughout the house, whereby the inmates are so accustomed to warmth that they are the more liable to be affected by the external air and the usual vicissitudes of temperature. This objection to the use of stoves can only arise where the air of the house is maintained at a high temperature; this should not be the object. To preserve a *uniformity* of temperature approximating to that which experience has found to be the best for maintaining the vigor of the system, should be the aim in artificially warming a house. The heat ought to be greater than the tem-

perature of winter weather without, as we have to provide for the diminished power of evolving animal heat while in a quiet state in-doors, but not so great as to amount to the warmth of summer. The summer heat of 75°, especially when the air is just saturated with water, as at sea, is the most agreeable and salutary temperature, when the body remains at rest. There is a great difference, however, between the temperature artificially produced in a limited space, and in the same state of atmosphere produced by natural causes. A want of the invigorating elasticity of the external air is uniformly felt, which no evaporation of water in the house can remove. It depends on some other condition of the air, perhaps upon its electric state. The house should therefore not be heated, but its temperature raised some degrees above the average temperature of winter, and kept uniformly at that point. If a temperature from 50° to 55° could be steadily maintained it would be found to be the most conducive to health, and obviate much of the danger that not unfrequently arises during the coldest of weather, on leaving a warm parlor for other parts of the

house, whereby a difference of temperature sometimes varying from 20° to 40° is experienced in a few minutes. Whenever a change in the atmosphere occurs to such an extent from natural causes, it is universally regarded as productive of very serious consequences,—the danger cannot be less when similar vicissitudes of temperature are encountered several times a day in passing through a house, where one room is warmed to the temperature of summer, and the adjoining one is at, or even below, the freezing point. The danger is greater than going out into the external air, for this is never done in cold weather without additional clothing.

To prevent experiencing these sudden changes, the air of the whole house ought to be kept at a temperature of 50°, and if any chilliness is experienced in the necessary occupations in the apartments where there is no fire—for it is not intended to make this supersede the use of an open fire in ordinary sitting rooms—it ought to be removed by adding something more to the clothes worn.

The objection to the heat of a house effected by artificial means may be made with

more reason when rarified air is diffused by means of flues connected with a furnace in the lower part of the building, which supplies heat only by rarifying the air, a mode of warming quite different from radiation. It is not intended to examine the subject of the difference between rarified heated air and radiant heat, beyond simply stating that radiant heat is the natural and most salutary. It is the form in which all living bodies are supplied by the sun and by reflection from surrounding objects; while it is rarified air, often loaded with various emanations, that is productive of many diseases arising from atmospheric causes. Next to an open fire, therefore, the heat from which is always radiant, a stove is best, if it is placed in an open part of the house, where the air can have access, and not in a close apartment.

The objection to the use of rarified air conveyed from a furnace in the lower part of the building is principally on account of the great heat and want of humidity of the air, which is evident from the cracking of the furniture, shrinking and warping of doors, etc. Such a condition of the air produces great inconvenience, and sometimes serious

evils in many that are affected with a delicate state of the lungs and air-passages; the heated dry air, absorbing moisture from every source, including the skin and bronchial tubes of the inmates of the house. The face becomes hot and dry, and coughing and irritation are quickly induced on entering a house heated in this manner, while immediate relief and a feeling of refreshment are experienced on emerging into the cold air without. It sometimes happens that too great a quantity of water is evaporated from the furnace, loading the air with an excess of moisture, exhibited particularly in the upper part of the house, which in many parts is covered with a dripping moisture, and the window-glass so obscured with dew as to lose its transparency. The principal evil of this state is, that the clothes absorb the excess of vapor, and the wearer experiences a chill upon going into the cold air—a state well known to be productive of very serious consequences. Another evil from the use of rarified air is, that in moderate weather the fires are often extinguished on account of the extremely uncomfortable heat; immediately the moisture contained in the hot air becomes

sensible and is deposited on anything around, causing a feeling of chilliness and dampness, not unlike that experienced upon entering a vault or cellar. The whole subject of warming a dwelling with rarified air, and supplying this air artificially with moisture, being founded solely upon theory, when put in practice, like most other theories that are not founded upon practical facts, only partially succeeds in accomplishing the object. Rarified air ought only to be used for convenience and economy, in churches and other places used for large public assemblages, where people are exposed but a short time to its influence.

To a certain extent the objections against the use of an air heating apparatus apply to a stove; but the supply of heat from a properly constructed stove can be more easily regulated and kept at a low degree, while its situation causes not only a large quantity of heat to be radiated, which a furnace never can do, but there is a constant supply of fresh air from without, all of which is diffused throughout the house. Besides, there does not exist any mode of producing artificial warmth, against the use of which some

objection cannot be urged; and while it is desirable to modify the temperature of a whole house, the choice ought to be made of the mode which is the least objectionable.

The next method of guarding against the influence of a change of temperature is by accustoming the system to these changes, as far as this can be done among persons surrounded by all the comforts and refinements of civilized life.

There is a constant disposition to seek for enjoyment and comfort by depending upon artificial heat during the winter season; such a dependence, although in a rigorous climate to some extent necessary, yet it constantly tends to lessen the powers of life below the standard of good health. It has been proved by a great number of experiments, amounting to many thousands, upon domestic animals, and from experience of universal extent in the human race, that heat continued for a length of time renders the system feeble and incapable of resisting the effects of cold. Indeed, all healthy and agreeable sensations are destroyed by this cause, and the helpless individual that has lived in a heated atmosphere suffers from every change of

temperature, however trifling it may be, and a breath of air but little cooler than that to which he is accustomed becomes a cause of disease.

The best, and indeed only method of removing this excess of susceptibility is by exercise in the open air. An individual who has been long habituated to the enervating heat of a warm apartment, must seek for relief from the effects that it produces, in an atmosphere the temperature of which is below that to which he has been accustomed. It may at first be difficult to withstand the shock of the cold; the attempt must therefore be cautiously made for a short time, and must be extended at each attempt by remaining longer in the cold. A steady and determined perseverance in this course will ultimately be attended with success, and relieve many a delicate individual from the strong propensity to colds, coughs, catarrhs, etc., which so constantly occur during the winter season.

In order to withstand the cold and to prevent its injurious effects upon the lungs, the dress ought to be abundant and composed of warm materials. This is the most natural

means of preserving animal heat, and much of the evils produced by cold to the pulmonary system might be prevented by guarding the skin against it. The body ought to be always preserved comfortably warm by this means, for the effects of cold are often communicated to the lungs by the skin. Those who wear plenty of clothes in a cold room or in the open air in winter will escape many attacks of disease, for it will be found that the mucous membrane lining the nose, throat, and lungs, will thus be enabled to resist the changes of temperature.

In all attempts to harden the body and enable it to resist cold, the use of plenty of warm clothing should never be omitted, upon going out into the external air, for it is through the skin principally, as was just remarked, that the cold acts upon the lungs. There are many instances when the action is direct, occurring in such as are extremely delicate, but there are many others in whom the action of cold is indirect, affecting the skin in the first instance; this is the case of those whose health is better established, and doubtless is the only mode by which persons in good health are affected with catarrhs, etc., on being exposed to the cold.

When a person passes rapidly from a heated place, to weather much colder, and he is in ordinary health and well clothed, the skin remaining warm, the lungs rarely experience any inconvenience from the cold air. A disagreeable sensation from cold is always to be regarded as indicating a tendency, however slight, to disease; this is usually felt in the skin, rarely in the lungs, and if the former is well protected the latter rarely suffer.

These remarks upon the comparative sensibility of the lungs and skin and the mode whereby animal heat is best maintained, are applicable to a cool temperature within doors as well as to vicissitudes without. It was recommended, when it is advisable to maintain a uniform temperature in the house, to keep it between 50° and 55°; this, however, will generally be found too cool for comfort when there is no exercise taken, and the additional warmth of a parlor fire will be sought. But if rooms are occupied when there is no fire, additional clothing will be needed, and will be found abundantly sufficient to protect the system from the effects of cold while sitting quietly writing or reading; as

the lungs will never suffer directly from such a temperature. This fact may be proved while sleeping, for a temperature much colder than this may be breathed without once producing cough, while the body is covered with abundance of bed-clothes; but let these be removed, and a chilliness will be felt, and cough is very likely to follow.

Among the causes of local diseases of the lungs is mechanical irritation arising from dust, etc., principally from certain necessary occupations. It is obvious that the only effectual mode of preventing the sad and fatal effects of this cause is the change of the business, and an entire removal from the place where the dust or particles load the air. When this cannot be done, the mouth and nose should be covered with a cloth that will allow of breathing, but which is thick enough to prevent the passage of the fine particles which affect the bronchial tubes. A wetted sponge may be also used for the same purpose, placed before the mouth. Some advantage may be obtained by workmen, by the direction of the wind, or by allowing a current of air to pass freely by them.

With respect to the fine dust from the combustion of anthracite, nothing can be used to prevent its injurious effect so often experienced by those who have delicate lungs. A fire of wood or of bituminous coal must be substituted, while there is a large opening to the chimney, to allow the smoke freely to escape.

When considering the causes of the various diseases of the respiratory organs, that of an improper use of the voice by many public speakers, was mentioned as a very common source of affections of the throat. The method of preventing the diseases from this cause, is very simple. It consists in filling the lungs at proper intervals while speaking, with a sufficient quantity of air to supply the lungs, that the organs of voice may not be taxed with a double amount of duty when this supply is exhausted. Teachers of vocal music always direct their pupils to "take breath" at certain parts of the exercise, that there may always be a sufficient amount of air in the only reservoir—the lungs—and thereby prevent the throat from being excessively and unnaturally exerted: for such exertion will always be made when there is a

deficiency. Clergymen who use but little exertion in speaking, should never neglect this rule, to make up for the absence of the instinctive respiration which takes place where much muscular exertion accompanies extraordinary vocal efforts, whereby the lungs are kept constantly filled. Actors, auctioneers, etc., are rarely, if ever, troubled with affections of the throat, instinctive and involuntary movements of the chest, from constant exertion, furnishing the required amount of air for all demands of the vocal organs. No such instructions are needed for such persons, for no voluntary interference for proper respiration, is necessary for them.

Constitutional Disease.—The prevention of the disease of the lungs arising from constitutional causes, or *Pulmonary consumption*, next demands our attention.

Pulmonary consumption being sometimes excited into action, after remaining for a long time latent, by those agents which produce a local affection, the remarks already made in relation to such diseases, are, in every respect, applicable to those depending on constitutional predisposition.

It has been seen, when treating of the uses

of the lungs, and the causes of pulmonary diseases, what an important influence a free, full, and profound respiration exerts upon the whole system; and that the lungs can never be disproportionately less than the other parts of the body, and perform their part imperfectly, without the individual experiencing general debility, and sooner or later the invasion of a disease, which, for want of timely knowledge and proper interference, becomes usually fatal in its termination. A contracted form of the chest gives evidence of an imperfect development of the lungs, or of their partial contraction from previous disease, and is always attended with imperfectly formed blood, and its attendants, a badly nourished body, debility, constant chilliness, etc. It is obvious that the only mode of remedying this evil is by employing such measures as would tend to develope and expand the chest and lungs, and to bring them to their full power of action.

It is well known that the more an organ is exercised within the bounds of its legitimate use, the more will it be developed, and the better will it be prepared to discharge its proper functions. The perfections of the

limbs of a professional dancer, and the wonderful movements and delicate accuracy of the fingers of the artisan or musician, are familiar examples of a state of perfection from habitual use. In these and similar instances, a full development of the function of the member accompanies the physical development of all its parts. It may also be considered as an axiom, that the more perfect an organ is in its development, the less is it liable to disease. These principles are fully applicable to the lungs, and a disposition to disease may often be averted by their judicious use in assisting them in the development of their parts.

There are two methods of accomplishing this object: that of voluntary inspiration, or efforts systematically and periodically made; and involuntary or instinctive, such as occurs during active muscular exercise.

Voluntary Respiration.—A very simple, and at the same time a very effectual mode of developing the parts concerned in the important function of respiration, is the practice of inflating the lungs daily, by a full inspiration, and then allowing the air inspired to return slowly by compressing the lips. The

air cells will thereby be completely filled, and slowly emptied, and thus their gradual enlargement will be effected. This should be done at stated periods, morning and evening, while the clothes are loose. Six inspirations each time, if persevered in for a few weeks, will render the effort an agreeable one, from the sensation which the exercise of the full power to respire always produces. The patient should first assume an erect posture by placing the back, shoulders, and head, firmly against the wall of the apartment. I have known the chest of one who had every appearance of incipient consumption, expand under this process so as to be decidedly appreciable by a tailor's measure in a month, and a year's perseverance in this course has produced a visible alteration in the form and size of the chest, giving the individual that sturdy appearance which is the usual attendant upon a complete development of the lungs.

The lungs thus expanded, will, as has already been stated, be enabled to expose to the renovating influence of the oxygen of the air a larger quantity of blood, and the blood be thereby prepared to carry on the process of nutrition throughout the system,

in the place of an imperfect elaboration arising from its being imperfectly formed. Instead of albumen abounding in the system, the effect of a full respiration is established, exhibited in the formation of a more elaborate animal substance, and the body thereby maintained in its healthy condition, and no deposits of the material which characterizes scrofula or pulmonary consumption can exist.

Besides the effect upon the system generally, that of the removal also of an extreme susceptibility and delicacy of the lungs, and thereby preventing their becoming easily influenced by the usual temporary causes that produce inflammation in them, is one of the most striking results of a systematic perseverance in exercising the respiratory organs. I have known those who have uniformly been attacked with cough in the fall of the year for several years in succession, entirely relieved from this effect of a change of temperature, and to remain totally free during all seasons and on every change of weather, although constantly exposed to all the vicissitudes which occur in active life. In one individual the lungs were so quickly affected

by the cold air of a winter's night upon issuing from a warm room, and so contracted, that it was almost as difficult to breathe as in an attack of spasmodic asthma. After practising carefully and upon correct principles the inflation of the lungs for a few months, every vestige of this susceptibility to cold disappeared, and at the present time the most violent and cold north-west wind causes not the slightest feeling of his former complaint.

The inability to exercise a free inspiration when tightly clothed has been already mentioned, and it is only necessary to refer to it in this place, to show the importance of selecting the morning and evening when the body is loosely covered with clothes, as the most suitable time for exercising the lungs in the process of voluntary inflation. It is needless again to refer to the absolute necessity at all times of having the dress sufficiently loose to allow of the free movement of the chest, as a preventive of pulmonary consumption —tight lacing above all must be totally prohibited.

A word of caution is perhaps necessary to prevent an excessive and improper filling of the lungs beyond the ability of the patient

to practise inflation. Under ordinary circumstances, five or six inspirations made as above directed daily, morning and evening, cautiously and properly used, will be sufficient to effect the object designed, and even this it may be necessary to limit, that the results may be safely and surely obtained.

Involuntary or Instinctive Respiration.—This is to be accomplished by suitable exercise taken always if possible in the free air. The exercise usually prescribed is occasional—perhaps a short walk or a ride in pleasant weather, and strict confinement during the interval. Unremitting exercise, even to toil, and rough riding is the only kind from which benefit in the way of prevention can be expected. If the body is well covered with clothes, the state of the weather ought not to be an object of constant dread; although very severe or wet weather it is but prudent to avoid, but gradually endeavoring by an accumulation of vital energy to overcome its effects. None need apprehend suffering from exercise and exposure taken judiciously and within his power; it is only the extremely feeble in the last stage of consumption that are unable to

bear exertion; and it not unfrequently happens that such as are much debilitated find their strength improve in proportion to the efforts used.

The best method of ascertaining the abilities of the body to bear exercise is by taking it systematically and at regular periods. No occasional efforts will answer, it must be done statedly and always, if possible, with an object in view that the mind may be at the same time properly occupied, which itself will prevent the sensation of fatigue and debility. This must have been noticed by most persons when engaged in athletic games; an amount of exercise is endured, which if taken without the interest and excitement attendant on such amusements, would be absolutely impossible to endure from the excessive fatigue.

Of all kinds of exercise walking is the most natural and most easily regulated, besides being that which every individual can use. In order to use it beneficially for the proper exercise of all the muscles, and the expansion of the chest, it ought to be taken with the shoulders braced backward so as to enable the chest to be fully expanded, and

this posture, with a long step, will bring into action nearly all the muscles of the body. That this is the proper attitude for walking appears from the natural desire that students and such mechanics as are occupied in a stooping posture, have for relieving themselves by a walk after confinement; all the organs of the body being thereby placed in their most natural positions, and relieved from all constraints. The student especially ought to seek

"The rural walk,
O'er hills, through valleys, and by rivers' brink"

as a relief for constant mental exercise, and constrained and bent position of the body, so apt to produce injurious effects upon the vital organs.

Habitually walking in the open air preserves a free and healthy circulation of the blood, and maintains a proper heat in the body; thereby enabling to withstand the chilliness so apt to occur in delicate persons in winter, and which prevents them from engaging in any occupation except in the house.

As a means of cure for incipient pulmo-

nary disease a remarkable instance came under the notice of the writer a few years since. When on an excursion in the country, a party was made up to ascend a mountain, which became to all except one individual, a toilsome and fatiguing undertaking. While every other one was obliged to stop frequently to rest, this individual exhibited scarcely any more fatigue than would have been experienced upon level ground. Upon remarking his exemption from the general panting and fatigue presented by the rest of the wearied travellers, he imparted a very interesting and important fact when detailing the reasons for his exemption. It was, briefly, that a few years previous he had experienced most of the symptoms of forming consumption, attended with frequent, but slight spitting of blood. Finding but little relief from various means used in his treatment, he adopted that of violent and fatiguing walks, and especially that of ascending hills. All his untoward symptoms disappeared, he increased in strength, and at the time when these facts were communicated was a hearty, ruddy, and robust man. Although in this instance excessive exertion

was attended with the best success, it is by no means intended to recommend to the invalid a similar excess of exercise at first. The risk encountered was great, a rupture of a blood-vessel might have ensued in his weak state; the principle, however, was correct, and escaping the danger which attended the experiment, of which he was ignorant, he obtained all the benefits he expected. Exercise should not be used beyond its proper amount—it has its dose like any other remedial agent, suited to the constitution and present condition of the patient, and cannot be exceeded without danger.

Running, leaping, or any other exercise that is attended with a sudden movement of the body, ought not to be used by the invalid. All professed runners have been short-lived, as the running footmen of former days, few ever arriving at the thirty-fifth year. Habitual walkers, on the contrary, are remarkable for their longevity. Mr. Josiah Walter, late of Connecticut, in his 99th year, attributed the health and vigor he enjoyed to his "having always preferred walking to riding on horseback or in a carriage."

It is almost unnecessary to urge exercise as a means of health to young children; but it may not be so obvious that the well-being of the individual, both physically and mentally, in after life, depends upon the amount of vigorous exercise taken during the period of growth. Most of the men who have been distinguished for their manly size and intellectual vigor, appear to have been accustomed to very violent exercise and feats of strength, even in early youth. The most gigantic mind has been connected with a fully developed body, brought about by early exercise and great strength, for which the individual has been at the early period of life alone remarkable. And if the history of such persons could be traced to their occupations in youth, more than one Adam Clark, priding himself upon nothing more than his ability "to roll a great stone up a hill," would be found. If such were the occupations in early youth there would not be found among studious persons

> "The languid eye; the cheek
> Deserted of its bloom; the flaccid, shrunk,
> And withered muscle; and the vapid soul."

Of various gymnastic exercises, there is a choice suited to the physical capacity of dif-

ferent individuals. Tennis, bowls, or quoits, require much muscular power, and too much exertion for the invalid; they may be used upon an entire recovery, when it is necessary to preserve the health already gained. The same remark will apply to all gymnastic exercises, and none ought to be used that is attended with positive debility and fatigue.

In winter during bad weather, it may perhaps be difficult if not impossible to use exercise in the open air, and it becomes necessary to resort to some mode whereby it can be taken within doors. It should, however, be borne in mind that there can be no substitute for that taken in the open air, and all such means as dumb-bells, pulley-swings, etc., are but to be used when nothing else can be resorted to. The best exercises indoors, are battledore, parlor ball, graces for the more delicate, and the turning lathe and ordinary carpenter's work for those that are more robust. Whatever of this kind is undertaken it ought never to be as a task, but always blended with amusement or some positive object.

As a close and ill-ventilated habitation, or apartment, is productive of the most serious

consequences through the medium of the lungs, it is imperiously necessary that proper measures should be adopted to effect a suitable ventilation. This is more needed, perhaps, in our sleeping apartments, in which we pass so much of our time, and which are most usually less adapted for the purpose of free respiration than any others in the house. Often many persons are crowded in one room, and what is worse, a small apartment or closet is the only place used in which to put the bed.

A bedroom should be large and lofty, and so constructed with windows and doors opposite as to allow of being freely ventilated during the day. This is of so great importance to health generally that it should never be neglected, except when the weather is wet.

A very pernicious practice in arranging sleeping apartments is, to have a bedstead for small children with its bed and bedclothes placed beneath another during the day ; the accumulations of bad air from perspiration while sleeping, and the complete want of all ventilation, are productive of the most serious consequences to children, who need, du-

ring that most important period of life—the period of growth—all the requisites for proper nutrition of the body. For the same reason, a room occupied during the day ought not to be used as a sleeping apartment, as perfect cleanliness and free ventilation cannot be preserved, while the air becomes constantly more vitiated.

By referring to the chapter on the causes of pulmonary diseases, the remarks there found upon the deleterious influences of bad and confined air will render it unnecessary to say more in this place upon the importance of breathing a pure and cool air.

The temperature of a bedroom is of considerable importance; it should never be increased by a fire in it, except in cases of sickness. The temperature ought never to exceed 50°, and ought to be maintained by means already mentioned, but never, if possible, by a fire in the room itself.

While the weather is not unusually severe, the habit of dressing and undressing without a fire will be found to be salutary, as there will be less susceptibility to atmospherical changes, than when the opposite custom of

burning a bright and warm fire in the bedroom is adopted.

In the coldest of weather there is no occasion for a fire in the bedroom where the individual is in bed ; for suitable warmth can always be obtained by a sufficient quantity of bed clothes, and no inconvenience will ever be felt by breathing cold air if this be properly attended to, as almost every one must have experienced when the breath has frozen on the clothes around him, while sleeping quietly and without any irritation of the lungs.

Among the evils of a fire in the bedroom is the consumption of oxygen to very great extent, and if the doors are kept closed, and there is also an imperfect draught in the chimney, a great deterioration in the air takes place. Even burning a candle or a lamp for several hours in a close room where there are several persons sleeping, assists greatly in the consumption of oxygen ; when used, it should always be placed in the fireplace.

Plants ought never to be kept in a sleeping apartment, for in addition to the odor from many of them, which on some persons

produces a powerful impression upon the nervous system, the proportion of oxygen is changed by them.

Where persons have a decidedly consumptive tendency a generous nourishing diet and sometimes even a stimulating diet are required. There are, however, so many complications of different degrees attending the disease both in its incipiency and when it is completely established, that no positive rule applicable to all cases can be laid down; the judicious physician alone can make the necessary discriminations.

VII.

TREATMENT OF PULMONARY DISEASES BY INHALATIONS.

The use of remedies in aerial form is singularly adapted to affections of those organs which are anatomically and physiologically adapted to the contact of air. The delicate structure of the lungs and air passages causes them to respond instantly to any impression made upon them by substances introduced through the medium of the air. The comparative purity of the air is, for the most part, instantly detected by some portion of the respiratory organs in ordinary respiration, and the presence of deleterious particles, or of such a state of atmosphere as imparts a feeling of refreshment and vigor to them, are evidences of the instantaneous effects produced for evil or for good.

Persons exposed to chemical fumes experience more or less irritation in the throat and lungs, and such as are for the first time brought into an atmosphere loaded with such emanations have instantly an excitement and

cough produced, of a very distressing character. That of chlorine in bleaching establishments, nitrous and sulphurous acid vapors in chemical factories, produce an immediate impression on the bronchial tubes, and a tickling and harassing cough, according to the greater or less amount of vapor diffused through the air.

Workmen also in cutlery establishments, or where there is much dust floating, always show the effects of such an atmosphere on the lungs, and have usually coughs of a very serious character.

The effects of effluvia from various vegetable substances, and the aroma of flowers in causing an attack of asthma, or the fumes and fine powder of ipecacuanha when breathed, have already been referred to, and are only mentioned in this place as affording evidences of the instantaneous impressions received by the delicate membrane lining every part of the air passages.

Some of these impressions are of an agreeable and salutary nature, such as the vapor of turpentine; and workmen in India rubber factories, the emanations of which are analogous to the particles of turpentine vapor,

are, as I am informed by a well known manufacturer* of this article, remarkably free from pulmonary diseases.

A sojourn in the pine forests, in some forms of chronic bronchitis, is described by those who have used this mode of treatment, as affording a decidedly agreeable and refreshing feeling in the warmth and vigor that it imparts; while the air of a green-house and that loaded with moisture, as is experienced at sea, is so grateful in some forms of the disease, while equal relief is afforded in another form by the dry air of a mountainous region.

From the extreme delicacy, therefore, of the lungs, and their susceptibility to sudden impressions when active substances are breathed, it is obvious that remedies applied to them through the medium of the air, by inhalation, would be more likely to be speedily followed by their appropriate results, than if applied in the usual method, which requires them to travel through the entire circulation before reaching the part to be influenced. Not only the surface of the air tubes, but the

* Mr. Charles Goodyear.

extreme minute sacs of the air cells and the cavities of abscesses and ulcers, may thus in a moment be reached, and the remedies applied directly to the diseased surfaces. When the mucous membrane of the bronchial tubes needs stimulating, the remedies for effecting this object can be applied directly to the part, and the desired result obtained in far less time than by any other means. In cases of cough proceeding solely from irritation in a deep-seated part of the lungs, when it is desirable to relieve it by the use of an anodyne, it will be found that inspiration, by conveying the remedy to the seat of the disease, will most effectually afford relief, and that more permanently than if the anodyne were administered in the usual mode.

The long-continued use of expectorants by the stomach in certain chronic affections, especially of such as cause more or less nausea, do often produce, in addition to their specific effect, some unnecessary derangement in another organ, and much prostration of vital energy, which the patient may be but little able to sustain. A persevering use of nauseating remedies will cause great derangement in the digestive organs, and thus

complicate, to a great extent, the original malady. All these effects may often be avoided by a proper use of inhaling remedies.

Fumigation.—Fumigation, or inhaling the smoke and vapor of certain substances, has, from time to time, been commended; but the careless and rough manner in which it has been performed, and the want of discrimination in the diseases for which it has been recommended, has caused it to be, at present, almost entirely neglected. Indeed, *fumigation* can scarcely be applicable to diseases of the lungs; the structure of which is so delicate that the minute particles, of which smoke is composed, finding their way into the air cells, become a source of irritation to the lungs. In smoking tobacco or stramonium for asthma, the unburnt particles accompany the essential oil of the plant, in the form of smoke, and not unfrequently defeat the object desired. So, also, the fumigation of tar—the mode of preparation recommended by Sir Alexander Crichton, by the direct application of heat—extricates also the products of imperfect combustion. In some affections of the lungs, great relief has been experi-

enced; but in some forms of the same disease, complete disappointment has ensued, resulting from the cause already mentioned, connected with a want of sufficient care in examining the precise condition of the lungs.

The neglect of a proper discrimination in the disease has led to repeated failures in the use of the means referred to. Thus fumigation with tar has been used in "consumption." There can scarcely be anything more indefinite than this term to convey an idea of the state of the lungs. Some persons with "consumption" may have so active an inflammation of a portion of the lungs or air passages as to render the remedy altogether inapplicable. So with asthma; if a suitable and careful investigation be not made, the fumes of tobacco may be ignorantly applied in the congestive form, and not in the spasmodic. The smoke of rosin has been advised for chronic cough; but if the actual condition of the mucous membrane of the air tubes is that of inflammation in any degree, it will greatly aggravate all the symptoms. Indeed, fumigations are applicable to but few conditions of these parts, but all the appropriate remedies can be breathed into the

lungs through the medium of watery vapor without producing any of the evils of an extraneous substance.

Vapor of water.—As water is freely formed in the lungs, and as they are always bedewed with its vapor, it is obvious that this is the most natural substance that can be placed in contact with them. It is, therefore, but following the indications of Nature to use it as a medium for applying the requisite remedies, and thus escape the hazard of employing irritating and uncongenial substances which must enter the lungs by smoking or fumigation.

Whatever remedies are to be used by breathing, ought to be evaporated in connexion with water, and if the remedy selected be the appropriate one, no unpleasant effects can ever occur from the presence in the lungs of fine mechanical particles, existing in the form of the dust or smoke of burning substances. The chemical irritation, also, of empyreumatic oil, will also be avoided, the heat being fully controlled and limited by the impossibility of heating the water beyond a certain degree of temperature, which is not sufficient to effect the formation of this oil.

It is not intended to record the detail of cases, but simply to give the results of many years' experience in the use of such remedies as have been found of decided efficiency, and *always administered in connexion with the vapor of water.*

The vapor of water can be used with advantage in cases of simple catarrh in its first stage, indicated by pain over the eyebrows, soreness and dryness of the throat, attended with a slight fever. There are many persons who are subject to attacks of this kind; they are usually delicate, and are extremely liable to "take cold" upon the slightest change of temperature. They always experience more or less debility, such as is universally felt during the prevalence of influenza. There is nothing in the whole collection of Materia Medica, in such cases, so efficacious as the inhalation of the vapor of water. It should be inhaled from a large basin, so as to pass through the nose and mouth at the same time.

In the forming stage of influenza, the same course will often arrest the symptoms and give immediate relief. But the disease is sometimes so violent in its invasion that

other active measures will often be required. In common catarrh, however, not depending on epidemic influence, and mild cases of influenza, immediate relief is for the most part experienced. In acute bronchitis, also, where the violence of the inflammation has been, in a measure, subdued, and the skin has become relaxed, the efficacy of inhaling the vapor of water is exhibited in a surprisingly short time, as I have repeatedly witnessed. In this affection, and in all, when it is intended chiefly to reach the more remote parts of the air passages, it ought to be breathed from a proper inhaler, made of glass or porcelain: either of these is better than metal. It is especially useful when the inflamed membrane is still dry, and the expectoration scanty. A large quantity of vapor is given off from the lungs in health, amounting to more than one pound in twenty-four hours. When this process is to any extent arrested, as is the case in inflammation of these parts, much distress and pain necessarily ensue; and for its restoration, I know of nothing so speedy as that of the application of warm vapor to the inflamed surface, which acts much in the manner of a tepid or warm bath

to the skin. It is necessary to remark that, as in the former instance, it is not so beneficial in robust persons as in those who are more delicate, and on this account ought not to be used to the exclusion of other measures.

Stimulating inhalations are highly useful to excite the debilitated part, in chronic bronchitis. These may consist of the vapor of balsam of copaiba, Canada balsam, Venice turpentine, and that of the fir. In all debilitated states of the air passages, especially in old persons, this course is attended with most admirable results. Although all these substances have properties in common, there is something peculiar in each, which renders a selection necessary—only to be determined by a cautious use and watching of their effects. A small quantity of either of these articles may be placed in a vessel of boiling water; the vapor of which, when sufficiently cooled, may be inhaled in the usual manner. To avoid the fatigue of repeated inhalations, the water may be evaporated from a large vessel, so as to fill the room. Tar, which is the product of burning the cones of the pine, comes under this head. It is more particularly applicable to phthisis, of which I shall

presently speak. Benzoin is an important remedy for chronic bronchitis. Unless great caution is used, it is apt to create coughing. It had better be inhaled from a large vessel, and not from an inhaler, for by diluting it, it will cause much less irritation. Balsam of Tolu is another article which is very efficacious in those cases which require an active stimulant; the vapor of this substance may be drawn into the lungs through an inhaler, as it is not as likely to irritate the lungs as Benzoin. The excessive discharge of a thin fluid in debilitated or aged persons will often be arrested by the use of this species of vapor in the proportion of half an ounce to half a pint of water, slowly evaporated by a spirit lamp.

This relaxed state of the membrane lining the lungs sometimes requires the use of astringent and tonic vapors. For this purpose, tannin, oak bark, pure green tea, cinchona bark, each has been in its turn successful in affording relief. A few drops of sulphuric acid, added to a decoction of cinchona bark, have appeared to add greatly to its tonic powers.

Vinegar is an excellent stimulant where it

is required to excite expectoration, and to soften the tough mucus that may have collected in the air passages. It is necessary that pure distilled vinegar should be used, as common vinegar is apt to contain sulphuric acid.

Inhaling the vapor of stramonium is highly useful in allaying the paroxysms of spasmodic asthma; so, also, that of tobacco. Both these substances should be used with great care. The advantage of combining medicinal vapors with water is in no case more apparent than in the use of tobacco; for, besides the smoke which passes into the lungs, in ordinary smoking, an empyreumatic oil, which is an active poison, also passes with it; whereas the proper active part of the plant, the nicotia and a volatile oil, alone enter the lungs with the aqueous vapor. The employment of tobacco requires a great deal of caution, especially in those who have not been accustomed to its use.

There is not an uncommon affection in young females; it exists without evidence of any disease, and appears to be purely a nervous cough without any distinct disease. Inhalations of the vapor of hops, or the extract

of hops, will often afford relief; and occasionally, it will be necessary to use the conium, or stramonium; but under whatever treatment, it is too frequently a very obstinate, but not a dangerous affection.

In sore throat great relief is obtained by inhaling the vapor of water, hops, vinegar, and camomile. Whatever other measures are adopted, these should not be neglected.

Pulmonary Consumption.—The detail of the nature and progress of this formidable disease has already been given. In accordance with the design of this treatise, I will confine myself to the statement of such substances as have been found useful in the form of vapor, in curing the disease and in alleviating the distress which accompanies it in its various stages. Balsam of Peru, Balsam of Tolu, storax, benzoin, and myrrh, stimulate the parts of the lungs which are the seat of the ulcers; and they are, therefore, only useful in cases of great prostration, and where there is little inflammation in the affected part. For the same condition of the affected part, tar is useful. For a less amount of stimulation, the vapor from squills, or elecampagne, will be found useful. In violent and

distressing coughs, sedative inhalations will be required, as the conium, or stramonium, the latter infused in ether, fifteen drops to half a drachm of which may be inhaled twice or thrice a day. Iodine is, also, in some cases, beneficial; but from the extreme irritating nature of its vapor, it requires to be combined with an anodyne, as the conium, and then to be used with great caution. The tincture of the iodide of potass, and the tincture of conium, may be combined, and about two drachms of the former, and twenty drops of the latter, used for inhalation. I have used the vapor of alcohol with most beneficial effects in confirmed phthisis. Indeed, it has been followed by more decidedly good results than any other remedy that I have employed in the treatment of this formidable disease. The patient should be made to breathe alcoholic vapor from an inhaler, or the atmosphere that immediately surrounds him may be impregnated with the vapor, by swathing the upper part of the chest with a soft towel, kept moist by any alcoholic fluid, found to be the most agreeable. The warmth of the body is sufficient to evaporate the necessary quantity of

alcohol. The latter is the mode which I have adopted, when the patient is quite debilitated and requires to be surrounded with vapor. A most hopeless case of consumption occurred a few years since, in a man who had previously lost two brothers with the same disease, and was treated as the last resource by alcoholic vapor. Perfect recovery followed, and he is now in the enjoyment of vigorous health.

In the application of remedies, it is almost unnecessary to state that the precise condition of the lungs ought to be ascertained as accurately as possible, by all the means which modern science has placed in our hands; for it is upon a knowledge of the facts thus ascertained that the proper application and ultimate success depend.

Whenever the symptoms are aggravated and the disease increased by the employment of inhaling remedies, an error has been made in the diagnosis, or it is so complicated as to make an application that is suited to the affection in its simple state inapplicable to its complicated condition; indeed the most watchful care is necessary in all affections of the lungs, for there is no organ equally liable

to so great a variety of derangements, often existing also at the same time. A careful testing of their susceptibility must always be used, by commencing with remedies of the mildest and least irritating character.