CURABILITY

OF

PULMONARY CONSUMPTION.

BY

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NEW YORK:
PRINTED BY C. A. ALVORD,
15 VANDEWATER STREET.
1866.

To Rev. T. A. Eaton

Dear Sir:—

Accompanying this, you will find a paper prepared for a work upon "Mechanical or Conservative Surgery," now in the hands of the printer.

The facts there presented are of importance to any community. It is for the purpose of engaging your influence and co-operation in establishing an hospital for the treatment of those suffering from pulmonary consumption that I address you.

If, after an examination of the article to which this note refers, you are favorably impressed, have the kindness to present it to your benevolent friends. The success of various institutions for ameliorating the condition and the sufferings of humanity, leads me to hope for your influence in organizing a charity which is very urgently demanded, and which could not fail of being of the first importance in this community. The thousands that are suffering from this disease call imperiously upon the benevolent to aid in every effort that promises them relief.

Very respectfully yours,

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New York.

PHTHISIS PULMONALIS.

It is with some hesitation that we attempt giving our views of this disease. This arises, not from any want of confidence in the principles upon which we base the treatment, or in the results that follow; these rest upon an experience of many years, and are not to be readily shaken. It is rather because we are aware that any innovator in our profession is looked upon with distrust; he is considered a fit mark for all his brethren to bestow that class of feelings upon of which they are not lavish toward their friends. He is exposed to all the fault-findings of all the fault-finders in the profession. An honest criticism, from a seeker after truth, should be courted, and no lover of truth would object to it; it is, in fact, for the accomplishment of the same purpose sought by the criticised; with such laborers we would cheerfully co-operate.

There is, perhaps, no disease which claims its victims from our households, in which the public are so ready to catch at any course of treatment which *promises* success, as in the one under consideration. There is scarcely a family, but has some member or some friend who is a subject of painful solicitude on account of the premonitory symptoms, or the actual access of this disease. Yet, if a member of the profession advances new opinions, particularly if they take a more favorable view of its amenability to treatment, they are not only discredited, but the author is looked upon with suspicion, his motives are questioned, and there is a lurking mistrust that it is but a bait to catch those who are hoping against hope.

On the other hand, a man may write volumes upon the subject, with the full approbation of the profession, and with credit to himself, provided his efforts extend no further than endeavors to illuminate the old, the venerable path our fathers trod. Why is this? Not because medical men are of all men the most obtuse, as well as the most obstinate, or that they are not as desirous of curing this dis-

ease as the patient or his friends, but because they feel and are convinced that, when this disease has once taken possession, it goes not out until the spark of life goes with it.

The radical change which has been effected by our investigations in the treatment of diseases of the joints—a class of cases that formerly ranked with the profession next to phthisis, as to curability, also a similar change in the treatment of deformities, as well as other affections that come within the province of surgery—necessarily impairs our confidence in the perfection of our science, and compels us to believe that much which is at present received as truth, will be found in the future, at least open to criticism. It is one step in advance toward perceiving the necessity of seeking for more knowledge upon a subject, when we doubt the present received opinions, and it is a good mode of investigating *any* disease, but particularly one within the domain of surgery, to enter upon its study as though this were the first case of the kind, without even a reference to books or opinions.

Let me not be understood as discarding or undervaluing the literature or the labors of our profession. Far from it: we would simply endeavor to make every man an independent thinker and investigator. We would also suggest that every man, after he has read all within his reach upon any disease, and has thoroughly *digested* it, use this knowledge to *aid* him in his investigations, not to *decide* his opinions. There will necessarily be many things that we must take upon trust, as no one can examine minutely upon all points.

We would *discourage* the habit in our profession of taking *so much upon trust.* Let no one receive the opinions of others as decisive upon phenomena that are before him, unless, after close examination, he is unable to form an opinion, or his conclusions agree with those of others. Every man should be able to give a *reason* for his opinions, rather than an *authority.*

Before entering upon the discussion of the subject, there are several considerations that should be thoroughly examined.

It may at first appear incongruous to bring forward, in a work devoted to "mechanical surgery," a subject which has heretofore been considered exclusively within the domain of physic; but we trust it will be discovered in the sequel that this view is erroneous; that our best and most reliable resources for the cure of this disease are to be found under the head of mechanical remedies.

It has been for some time a well-settled opinion, that a low state of the vital energies is that condition of the system most favorable for the development of tubercle. It is also an established fact, though one not so well known as the former, that, other things being equal, *an animal digests and assimilates food just in proportion to the quantity of air he respires.* If these propositions are admitted, then it follows that if we have *diminished respiration, we must have diminished assimilation*, consequently a condition of the vital powers favorable to the development of tubercle. Again, if a depressed state of the powers of life favors the formation of tubercle, it follows that an exalted state of vitality becomes a serious, if not a fatal, obstacle to their development, and, if they are present, it not only prevents their degeneration, but actually necessitates their absorption.

From the foregoing conclusions, it is evident that much of our reliance for means of counteracting or curing phthisis must be upon a large amount of air-cells or lung, and, what is of equal importance, an ability to use them. Air-cells are of no use in the animal economy unless they perform their functions; if they are collapsed, or confined in a cavity so small that only a fractional portion of them can be brought into healthy exercise, then they are of no more consideration for the function of respiration than so much muscle.

The Creator has given us (and undoubtedly for a wise purpose) two lungs; these he has subdivided into lobes; an injury of one side of the chest, a punctured wound for instance, does not affect or impair the function of the other, but life can be sustained with one lung only. We infer from the fact that one lung is separated from the other, that the

Almighty designed either lung to be of itself sufficient to support life under such accidental circumstances. We see in other instances, where organs are double, that either can perform all the functions usually effected by both when acting together. This is true of the eye, the ear, the brain, &c., &c.; therefore we cannot avoid the conclusion that, with a *well-developed chest, man has twice the volume of lungs necessary to support life.*

This is frequently demonstrated in the case of punctured wounds of the chest, and, in some instances, where the use of one lung has been destroyed by disease.

We have mentioned, as a well-established fact, that diminished vitality renders the system susceptible and predisposes to the development of tubercle; we would add that it also encourages and aids the ulcerative process. If this proposition is granted, we must at the same time admit its converse.

We have also stated that, other things being equal, animals digest and assimilate food in proportion to their respiration.

We have shown that the Creator has given man, for special reasons, duplicate lungs, or double the amount of air cells necessary to sustain life, *provided* the cavities or laboratories in which they do their work are of such ample dimensions that they are not hindered or interrupted in accomplishing results equal to their full capacity.

If these propositions are correct, we perceive no element in the foundation, no reason to prevent our asserting that we have a *sure and broad basis* upon which to build *hopes of the curability of phthisis.*

It now remains to be considered whether the cavity of the chest *can* be enlarged to the requisite dimensions; and if so, *will* the lungs be enlarged, or the air-cells expanded or multiplied in proportion, or sufficiently so to fill it?

In another place we have demonstrated *how*, and under *what* circumstances, the soft tissues *can* be elongated to any reasonable length; therefore, if the diminished size of the chest is dependent upon this cause, we have entirely within our control the means of remedying it.

As a general description, the chest may be said to be the space enclosed by the ribs and their coverings, the sternum, and the diaphragm. The ribs unite with the spinal column by an articular surface, a point from which motion extends through their whole length. The first or upper one stands nearly at a right angle with the spine and admits of but slight motion; below this they gradually increase in length, while at the same time they turn downward more and more, bringing their sternal ends together with that bone (to which a portion of them are directly attached), near to the spinal column, when the air is expelled from the lungs; at the same time the diaphragm which is attached to the margin of the lower ribs is thrust up by the contents of the abdominal cavity, they being compressed by the contraction of the abdominal muscles.

In this condition we have the cavity of the chest reduced to its smallest capacity, consequently most of the air is expelled from the lungs, leaving the air-cells in a collapsed state. To enlarge the cavity of the chest and thereby allow the air to inflate the lungs, the muscles contract, drawing upward the free end of the ribs (the other being articulated with the spinal column), while at the same time each rib rotates upon its ends, forcing the sternum farther from the spine, thus increasing the cavity inclosed by them. During this movement of the ribs, the diaphragm contracts, bringing its fibers straight and increasing the cavity yet more, by lowering its base. This is, briefly, the mechanical process by which a vacuum is produced in the chest, the only entrance to which is through the trachea and bronchea to the lungs. The lungs lying pendant in this cavity, the air rushes in to fill the vacuum, and inflates them to the capacity of the chest. All this is, in one sense, simply a mechanical operation, similar to the production of a vacuum in a pair of bellows or an air-pump.

We have thus explained respiration as a mechanical process, that the reader may the more readily see and appreciate the necessity of a large chest (or cavity), in order that an individual may respire a large amount of air. This cavity is as essential to a full inspiration as a

large volume of lungs, for the latter can accomplish nothing unless the cavity that contains them will admit of their full expansion.

But this is not all—there is another consideration of equal importance. A man may possess a large chest, naturally, taking its external dimensions, and yet be able to inhale but a small quantity of air. His chest resembles a large pair of bellows, with the handles confined so as to permit them to open but a short distance. It must be remembered that the amount of air respired depends upon the *vacuum* produced at each inspiration, so that it is evident we may possess a large chest and yet not be able to inhale as much air as a person with a chest smaller, yet admitting of free expansion. This fact should not be lost sight of, as it accounts for some persons succumbing to phthisis who are said originally to have possessed large chests.

A large chest, from long *disuse of its full power of expansion, may be so confined by a shortening of its ligaments, muscles, and other soft tissues, that it cannot be expanded to any thing near its full extent.*

This is in accordance with a law we have elsewhere explained; it will be seen by this, that a man, who by nature is furnished with a large respiratory apparatus, can, by only a partial use of it, gradually bring it down to the smallest compass, a point even below that of a small chest which can be fully expanded. This is another and important element to be taken into consideration in the treatment of phthisis. We must possess relatively not only a large chest and a large volume of lungs, but they should be kept in a condition in which they can be expanded to their fullest capacity.

From what has been said, it is evident that the best and most effectual method of enlarging the chest, and thereby the lungs, becomes a consideration of the highest importance. The processes that have been recommended for this purpose are innumerable, and as varied as their inventors. The principle upon which we propose to effect it was published in the American Medical Monthly, March,

1858, and is based upon the physiological and anatomical conditions involved in the act of respiration. It will be remembered that respiration is an involuntary act; it is performed and governed by nerves and muscles that are without our control; an animal cannot destroy his life by simply refraining from breathing, however strong his will or determined his resolution; there comes a time beyond which he cannot prevent the act of respiration, whatever may be his efforts to the contrary; therefore we say that it is without his control.

We caution the reader to keep this fact in mind, for it has a decided bearing in devising plans for enlarging the chest and increasing the volume of lungs. It is evident that, if respiration be an *involuntary* act, we must, in whatever we do, conform to the laws that govern it; our *voluntary* efforts to increase the amount of air respired should conform to the laws that govern the *involuntary* act, or there comes a strife, a clashing of effort, between the two; but the latter is sure to be victorious, and, like most victors, it suffers more or less exhaustion by the struggle. To test this, let any one force himself to breathe at a different order of time from what is natural for him at the time of the experiment—no matter whether it is faster or slower than is the standard for him. He will find, after a few respirations, that the process is not an harmonious one; that there is a conflict of effort, and this conflict exhausts him. As we are aiming, in our treatment of this disease, to increase the vital powers, we should avoid any process by which the individual is prostrated; although he may have taken in more air than usual, and although he has been successful in increasing the respiration, he has done it at the expense of a loss of vitality, rather than a gain. The plan of drawing a full inspiration, retaining it, and by its rarification expanding the air-cells, is not only open to the objection that it interferes and exhausts, but the person is, as it were, without the benefit of air during the time the air is retained in the lungs *beyond* the usual time of an *involuntary* respiration, as air will take up but such a proportion of carbon, however long it may be retained. The breathing

through a tube, where the aperture is smaller than the orifice of the larynx, thereby obliging the person to make an extra muscular effort, has the same objection. Inhaling through a tube, in which the *inspiration* is free, but where the *expiration* is obstructed by a valve, is supposed to enlarge the lungs, by forcing the air into every air-cell by the violent efforts in compressing the chest to expel the air. By these plans, the air is retained beyond its capacity for effecting any healthful change in the blood; beside, it interferes with the natural time for inspiring and expiring, which interference, we have shown, fatigues and exhausts.

Passing by many other plans of this character, for developing the chest, all of which are open to the same objections, we come to what are termed gymnastic exercises, for this purpose. Before entering upon an examination of these, we will review, so far as is necessary to elucidate our plan, the anatomy of the muscles, &c., connected with the act of respiration in these exercises. All the muscles that go to the arm are muscles that are brought more or less into use during *voluntary respiration;* they arise from the ribs or parts adjacent, and, when used in voluntary respiration, contract from the shoulder, this being held by muscles that pass from it to the neck. The clavicle, like a sweep, holds the head of the humerus away from the chest, while the cervical muscles draw it upward. In this position the muscles going to the arm contract, and draw the ribs upward, as in the act of *involuntary inspiration.* When the *shoulder* is the fixed point during the contraction of these muscles, *the chest is free*, and can be enlarged to the full extent the ligaments will admit.

We have said, that during *this* process of muscular action, the ribs are at liberty, and can be acted upon to enlarge the cavity of the chest; but suppose a man attempts to raise fifty pounds in each hand above his head, can he do it and leave his ribs free, or will he be compelled, in order to make the effort, to draw in his breath and retain it, thereby giving his ribs a support from the air inside, while the muscles of involuntary respiration hold them firmly in

this position? Let any one who is in doubt test it by making the experiment. What is true in this act is true, in a degree, of every other, where these muscles act upon the arm, moving it in any direction. In all such motions, the chest is more or less firmly fixed. When they are slight, requiring but a small amount of muscular power, they may be effected without any perceptible confinement; but always when the effort comes in any degree near the whole muscular power, the chest must be fixed, as a point *from* which these muscles can act. We see the effect of this fixing of the chest, in a man who attempts to expend his entire strength in lifting a heavy body, by the deepened color of the face, caused by holding his breath. The man splitting wood often holds his breath until he has expended his effort, when, in consequence of having retained the air in the lungs beyond the regular time allotted by the involuntary nerves and muscles, he expels it suddenly, and not unfrequently audibly.

All the muscles that go to the arm have two sets of nerves of motion. When the arm is to be moved, the chest is held motionless, while the muscles contract, drawing the arm toward the body. The chest is the fixed point *from* which the muscle contracts, but when these muscles are called upon to contract in the opposite direction, then the shoulder is the fixed point, and the chest is left free to be moved by the muscles.

We have endeavored, by repeating this two-fold action of these muscles and the condition of the parts to which they are attached during each of these processes, to fix it in the mind of the reader, that he may not lose sight of it when we come to use these facts in showing the true or philosophical method of developing the chest.

We are now prepared to make the inquiry, how can the chest be enlarged by any of those exercises, where the arm moves as it does in practicing with the dumb-bells, the club, or in rowing, pulling up weights, &c., &c., movements in which the chest is more or less firmly fixed, and therefore cannot be enlarged while so held. An effort, to be effectual in enlarging the chest, must take place when its walls are

unrestrained, when the power exerted will be expended upon it, while it is not trammeled by the contractions of any muscles that counteract its enlargement. This can be effected whenever we make the hands the fixed point, and draw the body toward them; the same effect upon the chest takes place also when the body is simply suspended by the arms.

In these positions, the weight of the body is suspended by the pectoral muscles, these acting upon the ribs, as in *voluntary inspiration*, drawing them up to the fullest extent their ligaments and other soft tissues will admit, and this without the fatigue or exhaustion consequent upon *voluntary* inspirations. A particular consideration in this process is, that it does not interfere in any way with the natural *involuntary* respiration; this goes on, as usual, without that interruption in time, or sense of fatigue experienced when the chest is expanded by a *voluntary* effort. By this process there is just as much more air enters and escapes from the lungs than during ordinary respiration, as the cavity of the chest will hold when enlarged by the entire weight of the body. The only expenditure of nerve or muscular force is through the hands, in holding upon the bar. To give some idea of the increase in the amount of air respired under this process, we will give the experiments of a committee appointed by the British Association, of London, to report upon the best method of restoring asphyxiated persons. In this report, made in 1862, the plan is called Dr. Sylvester's, but it is the same mode of expanding the chest we published in the American Medical Monthly, of this city, in March, 1858, and reprinted in a pamphlet form, it will be observed, over four years before this report. Dr. Sanderson, another member of the committee, constructed an instrument for measuring the amount of air entering the lungs during their experiments upon the dead subject. By Dr. M. Hall's "ready method," the quantity of air moved in and out of the lungs rarely reached nine cubic inches, and never exceeded fifteen; whereas, by the plan we proposed in March, 1858, published in the American Medical Monthly, of this city, viz.,

by making use of the arms to expand the chest, the quantity reached as high as *fifty cubic inches*, five and a half times as much as by Marshall Hall's plan. We think the most skeptical must be convinced that this was a large amount of air to introduce into the lungs of a dead subject by any process at all simulating natural respiration, and at the same time it must be evident, if this same force is applied to the living subject, and does not interfere in any way with the ordinary involuntary respiration, it must increase, to a very great extent, the amount of air respired —a difference, in most cases, as great as between that during disease and that quantity sufficient for the enjoyment of the most perfect health.

We have introduced the results of this experiment to show the effect of this mode of acting upon the chest to enlarge it. It is as though every fiber of muscle was a fine thread attached to the ribs through their length, and the draft upon them made in the direction and in the manner best calculated to bring them upward and outward, as in the act of inspiration, thus enlarging the cavity of the chest to the extent that the weight of the body would, were it suspended over a pulley to these threads (muscular fibers). It should be remembered that this is in addition to the ordinary respiration; the function of involuntary respiration goes on the same as though the ribs were not raised by this great weight. As we have shown, this non-interference with the natural inspiration is one of the essential requisites to any plan for developing the lungs, and that any other mode fatigues and exhausts the system.

Exercise during phthisis has been objected to by some authors, from a fear of exciting the action of the heart, and that, through this increased frequency, the lungs would become congested, and the liability to hemorrhage increased. By this plan of ours, the whole process is changed. In the first place, the action of the heart is not materially accelerated; in the next place, the volume of lungs is very much enlarged to receive the blood, so that probably the pressure upon them is less than when not under the extension. Again, the action of the heart is

rendered easier, inasmuch as the blood, as well as air, rushes into the lungs to fill the vacuum.

Instead, therefore, of its predisposing to hemorrhage, it actually prevents it. We see by this that not only the respiration is benefited by this process, but the circulation is made easier. It acts to increase the vigor of the heart, as a tonic whose primary effect is upon the circulation, or rather, it renders the labor of the heart less by diminishing the resistance.

The effect of this mode of expanding the chest is well illustrated by those subject to asthma. Most of those habitually subject to it have discovered that if they lean the head forward, resting it upon the hands on the back of a chair, leaving the chest suspended by the pectoral muscles, they can breathe much easier, and obtain, in this position, refreshing sleep. This relief is due entirely to the enlargement of the chest, by its weight hanging suspended by the pectoral muscles. If the position is changed, the respiration is impeded. It should be distinctly understood that this process of enlarging the chest by suspension from the arms calls for but a small outlay of nerve force; there are contractions only of the muscles of the hand, in holding on to the bar; beyond this, the weight of the body hangs upon the ligaments and muscles; even the contraction of the muscles of the hand we have often in a measure obviated, in persons that were very weak, by securing a band or handkerchief around the bar as close as the hand can be forced through it; this comes down upon the wrist; then the hand is placed upon the bar as before, yet without the effort to hold as when without the band around the wrist, the latter sustaining most of the weight.

It will be perceived that this plan gives the patient the benefit of full, free, and deep inspirations, with but a slight increase of nerve power, or exhaustion from the process; and the exercises can be continued for a number of minutes in succession, and then a short respite. There is a larger amount of air taken into the lungs at each inspiration than can possibly be done by the ordinary effort of *voluntary* inspiration.

If the patient feels equal to the task, the voluntary effort can be superadded. This can be done occasionally, but we should not advise its frequent repetition, particularly in the case of feeble subjects. It will scarcely be necessary to remind the reader that the air is forced into this vacuum by the weight of the atmosphere, which is computed to be fifteen pounds to the square inch, a force sufficient to open every permeable air cell to its full capacity. The immediate effect of this plan of increasing the amount of respiratory power is, that the individual takes from one to two hundred per cent. more air into the lungs without any interruption of the frequency, and without any sense of fatigue, except in the arms; and this more a feeling of extreme extension of the soft parts, than that of exhaustion. Were the only advantage derived, that from an increased respiration for one-half or even one-quarter of the time, it would be invaluable to a person dying, in consequence of the respiration being diminished below the necessities of the system. But this is but a part of the benefit, and that of a temporary character.

This process should be continued until the chest has become permanently enlarged, and the lungs have developed until they fill this capacious cavity. This is done on the principle we have elsewhere explained, viz.: that the soft tissues elongate by the addition of new material, when they are retained in a *tense state*. This condition stimulates the nutrient vessels, and the growth is much more rapid than would be supposed. Again, this exercise increases the power of the muscles of respiration. We stated in the commencement of this article that the power of digesting food and assimilating it was in proportion to the quantity of air respired, other things being equal. Can we expect a patient to increase the quantity of food taken, one or two hundred per cent., the proportion we have given as the ratio of increase in the respiration, by this process? And can we expect them to increase in flesh and strength accordingly? We hesitate giving the results we have seen, because they are too startling to be believed by the profession or public, with their present views of the incurability

of this disease. We have known a lady, feeble from disease of the lungs, gain ten pounds in weight in two weeks; and this was not a mere evanescent gain, but it continued until she had increased in weight twenty-eight pounds. This improvement was not confined to an increase of flesh merely; the muscular power, and the vitality of the whole system, was increased in proportion. This is not the result in a single case only, but is a general law. The result follows as certainly as the result follows any other law of the animal economy. We can rely upon it with as much confidence, and with as little fear of disappointment.

The profession will not mistake us. They will not suppose that, when the mesenteric glands are diseased so as to cut off all reception of nourishment from the alimentary canal, we expect, by increasing the respiration, the patient will gain flesh. We stated that, other things being equal, this result would follow.

Dr. M'Cormac, of Belfast, Ireland, in his work on Consumption, says "tuberculous scrofulous deposits, then, whether in the offspring of scrofulous consumptive parents, or the offspring of persons free from scrofulous, tuberculous disease, are alike; and in every case, owing to the insufficient, imperfect performance of the respiratory function, the carbon is retained—in other words, it is not discharged or sufficiently discharged from the blood in the lungs, and, finding no adequate outlet by the liver, skin, or other possible emunctories, being neither burnt off in the lungs, nor expended in the tissues, is deposited, mainly as a hydrocarbon, in the lungs and other organs, under the form of the bodies known by the designation of tubercles."

He attributes this imperfect decarbonization of the blood to the impurity of the air we breathe in our places of business and pleasure, but more particularly in our ill-ventilated sleeping apartments.

It is undoubtedly true that much impure air is respired, and that the consequences are as deleterious as he supposes; consequently the subject deserves our highest consideration as a matter of hygiene. Yet we cannot think that all would escape phthisis, even should they never

breathe impure air, granting that Dr. M'Cormac's views of the cause are correct.

The habits and employments of a large proportion of the community are such, that they require but a small amount of air to supply the wants of their system: the student, the accountant, the vast majority of females, particularly those confined to the needle, persons of sedentary habits, or those afflicted with ennui, require but a small amount of air to supply the needs of the system under such circumstances; their respiration is slight, the chest is seldom if ever expanded to its full capacity; it is limited, day after day and month after month, to this semi-developed state, and the consequence is, that the chest follows that law of the animal economy which limits the nourishment of a part to its uses. If a ligament, ordinarily three inches in length, be limited to a space between its origin and insertion of two inches, it will not be reproduced, in the ordinary process of nourishment, to any greater length than the duty it has to perform demands. The thorax is no exception to this law; if the ribs remain confined for months to a motion of half their capacity, the muscles and ligaments conform to this altered condition; the result is, the chest *cannot* be expanded to the extent designed, but only to that within the limits to which it has been confined. As we have before stated, the lungs conform to the cavity in which they are located, or in other words, they conform to the amount of labor they are called upon to perform. When the thorax has long remained in this contracted state, one in which there is just sufficient volume of lungs to support life, while no increased demand is made upon them beyond ordinary respiration, the individual may enjoy good health, but limited to this scale of labor; under these conditions, should he be exposed to impure air, or should any difficulty with the lungs occur, then the system must suffer just in proportion as the lungs fail of performing their office. It would immediately be below the point of sustaining itself, and must, of necessity, sink under it.

The full development of the chest, by the means we have proposed, provides against such contingencies.

If the capacity of the thorax has been increased to that

extent that it contains a volume of lungs capable of performing double the service ordinarily required of them, then the extra quantity of air inhaled will be sufficient, when the individual is placed in an *impure* atmosphere, to furnish an amount of oxygen equal to the demands of the system; while in the other case, with a volume of lungs barely sufficient to supply the wants of the system when only a *pure* air is breathed, if placed in an unfavorable atmosphere, the body must necessarily yield under the deleterious influences of imperfectly aerated blood. Large lungs can be partially inflated and thus perform a small amount of labor, but a contracted chest and a limited quantity of lungs cannot supply the place of the former, when called upon for increased service by the demands of the system. There is, however, an effort made to accomplish this by increasing the frequency of the respiration, as the capacity of the lungs diminishes.

This view of respiration deserves and demands from the profession a more careful consideration than it has heretofore received.

Without a large chest and a corresponding volume of lungs, all our medication in phthisis will be but palliative; but when we, by proper training, develop in our youth the full capacity of the respiratory apparatus, then the system will be in a condition to respond, and we may anticipate with confidence the most happy results whenever medication becomes necessary.

As we stated at the commencement of this chapter, a diminished vitality favors tubercular development, therefore this condition should immediately receive the attention of the physician. Medicines that increase the appetite and the power to assimilate food are to be administered; but there will be found no drug to equal, for this purpose, the exercise we have been recommending. Avoid in phthisis all that class of articles termed expectorants; they not only increase the secretions, but they diminish the appetite.

The nit. argente, in combination with some extract, particularly the ext. nux vom., will be found to diminish the secretion, increase the appetite, and, if night sweats are present, this preparation will check them. It is not un-

frequently the case that persons with hectic fever will not tolerate tonics. If, however, they are conjoined with some form of opium, they will not disturb the system. Let me advise the practitioner to make the cough a secondary consideration. In so far as possible, treat the local disease of the lungs as though the same state of parts were upon the surface of the body. Who would ever suggest the giving of expectorants in the case of an ill-conditioned ulcer upon the surface? Put the system in the best possible condition to counteract this destructive tendency, and it will be found that the lungs will be amenable to the same law that governs superficial ulceration. When the chest is fully developed, if a sufficient amount of air-cells remain healthy, and the power of assimilation is at a healthy standard, then the ulceration of the lungs—like any superficial ulceration—will heal. There is no greater difficulty in healing a cavity in the lungs than one in a muscle, or in any other part, except that chronic diseases of the lungs occur in vitiated conditions of the system. Therefore, if we would heal a cavity in the lungs, we must bring the system to a healthy standard, and, as has before been stated, our chief dependence is upon developing the chest, and thereby the amount of healthy air-cells. This increases the power of assimilation, so that it is only the minor difficulties that we have to attend to, after the patient is put upon a system of exercise.

This exercise is not to be a pastime—an occasional recreation—a matter of amusement; but a labor, into which all the energies are thrown—labor and effort, such as a man makes when his life is in *immediate* danger. It should not be relinquished when a little weary; but the energies should be goaded to the last extremity. This applies more particularly to feeble persons, when they first commence the exercise; as they advance, it becomes easier. The more feeble the patient, the more urgent the need of the advantages to be derived from it. The practitioner must enjoin it upon the friends to encourage the patient by every means in their power to make the effort. We often find the mistaken kindness of friends a greater obstacle to overcome than the indisposition of the patient. The latter

generally experiences so much relief to the breathing while exercising, that they are disposed to renew it frequently; while the friends are apt to think they "should rest more, that it is too laborious," &c. It is best to be governed by the clock—so many minutes to rest, and so many minutes to exercise. At first, if the patient is feeble, place him in a warm room, under the swing, on a high chair, so as to save, as much as possible, the labor of rising. As he improves, remove the swing to a *cold room*—even in winter; but the patient must not be idle a moment, and should leave for a warm room as soon as he is through exercising.

The more feeble and exhausted the patient is by the disease, the more urgent the necessity for effort. He is in the condition of the man in the water—exhausted, yet able, by words of encouragement, to hold out a little longer until relief is afforded. The moments are as precious and as pregnant with life or death in the one case as in the other. If the patient feels an appetite for food between the hours of the regular meals, it may be gratified; but the palate should not be mistaken for the appetite, neither should it be indulged at the expense of the regular meals. Patients are not unfrequently fed upon dainties, thereby excluding substantial food. In no case should food be allowed between meals, or dainties, such as fruit, &c., &c., be furnished, if it detracts from the appetite at the regular periods for taking food. These periods should be punctually observed, for the reason that the gastric and other fluids will be secreted at such times from habit, if the period is preserved with regularity.

It is not well to compel a patient always to eat a particular article of food, because certain articles are supposed to contain a larger amount of nutriment than others. An adult patient can eat whatever the *appetite craves*, or he feels will relish. It is the *appetite* that is to be consulted, and is to be the judge, and not the palate. A little wine with the food often promotes digestion.

The inquiry naturally arises, how much time should be spent in exercising? or rather it should be, what propor tion of the time should be occupied in exercising? This will depend, at first, upon the strength of the patient.

The more feeble, of course the less time he can exercise. At first, for a few days, he may only be able to hold on to the bar for one or two minutes; but it can be renewed again in five or ten minutes. This time can be gradually increased, and the interval proportionately shortened.

Hitherto we have spoken of the treatment as applicable only to confirmed phthisis. It is always better to *prevent* than to *cure* a disease, and in no instance is this more manifest than in the one under consideration. Every family has, to a certain extent, within its power to guard against, not only this, but all those diseases arising from diminished vitality. Every child should be made to exercise on this principle, viz.: making the hands the fixed point, suspending the body from them; under all circumstances leaving the weight hanging upon the pectoral and other muscles attached to the arm and scapula. In this position, the weight of the body must necessarily expand the chest to the fullest extent its ligaments will permit, while at the same time the ribs are not restrained by any of the muscles, but are at liberty and can be drawn up, as in the act of voluntary respiration. The parts to be affected by this exercise can be so, much more rapidly in the young subject than in the middle-aged, inasmuch as the growth is much more rapid in youth. Yet age is not a fatal barrier to the good effects of the treatment.

The question may very naturally be asked, What proportion of the ordinary cases of phthisis we should expect to cure or benefit by this mode of treatment?

The answer to this inquiry depends upon the same considerations that govern the results, when my mode of treatment is adopted in joint-diseases.

It was formerly more general than at present; but even now there are many in the profession who say that our plan of treating joint-diseases is only applicable to the last stages, after a considerable amount of destruction has been effected; or who will assert that, if the patient is not cured by the process in a given number of months, he never will be cured by it, &c., &c. All this interferes with a result that otherwise would be attained. We say, if a patient with the ordinary diseases of joints is from the commence-

ment treated by our plan of "continued elastic extension," he should recover with a good joint, provided the treatment is continued, together with other appropriate remedies. When this mode of treatment becomes appreciated by the profession at its full value, this result will follow.

In like manner, when the treatment of phthisis we here propose commences with the disease, and is pursued uninterruptedly, we have every reason to expect that every case will recover. When the treatment is used as a prophylactic, every case will be prevented.

This may excite incredulity in the minds of most readers. It is but a few years since the results in the treatment of joint-diseases, now known to be attainable, were looked upon in the same light.

If the reader will follow the train of reasoning with which we commenced this subject, we cannot see how he can fail to be convinced.

We stated that tubercular deposit was the result of diminished vitality (this term is used in its broadest sense); that, other things being equal, persons digested and assimilated food in proportion to their respiration; that the Creator had given us (when the chest was developed to its fullest capacity) double the amount of lung or air-cells necessary to support life; that the capacity of the chest *can* be increased by exercise, and that the lungs will enlarge correspondingly. If these statements be true, how can we avoid the conclusion that phthisis is as much, if not more, decidedly within our control than most other diseases?

It is easy to give cases that corroborate any theory, and this has made the profession very skeptical in regard to new remedies or new theories. We can say we have as strong testimony, drawn from our own experience in the treatment of the disease, that phthisis is curable, as we have of the efficacy of our treatment in diseases of the joints. We have one fact capable of being investigated, that to our mind proves more than any array of cases, as the diagnosis in them might be erroneous, however honest the examiner; but it would be incredible to assert that a practitioner in general practice, in the center of New Eng-

land, where phthisis is so common, should not have had a case of phthisis in thirteen years. Yet we can prove from the records of the town and from living witnesses that for thirteen years we had not one case of phthisis, commencing and terminating fatally, in the families upon which we attended.

It is obvious to our mind why this disease has been so irremediable. In every case of phthisis the causes have been operating for months, perhaps years, that eventually culminate in confirmed phthisis. This is the ordinary course. Sometimes it follows lung fever or some acute disease, when this produces the effect suddenly. The cause, we say, has been operating for months, that brings the person at last under the care of the physician. On examination, he finds not only tubercle, but tubercle softened, or perhaps cavities. Now, if the patient is cured of all the disease that *now* exists, what does it do for the condition that existed before the tubercular development? Does it remove the cause that brought the patient into that state in which he required treatment?

In ascites, we can remove the fluid; but does that save the patient? Certainly not. We must go back of *these results;* they but follow as a sequence of causes that have long been in operation. In cases of phthisis, it is generally a deficiency of useful air-cells; and unless we bring into use a sufficient number of these to fully perform this function, so requisite to health, we shall gain but a temporary advantage by medication. By restoring a full supply of air-cells, we not only restore *this function*, but we increase the power of assimilation in the same proportion. By this we gain a double advantage. The patient should be encouraged by every means within our power, consistent with truth; yet if the case is to be speedily fatal, the fact should not be withheld from him. Do not be anxious to get your patient out to "take the air," or to "ride out to make him feel better." The exercise proposed is worth more than *all* things else. The most ready way of arranging the apparatus for exercising is to make a triangle, one of whose sides will be formed by a wooden bar of convenient size for the hands of the patient, and 3½ or 4 feet long; the rope that forms the other two sides of

the triangle to be secured at each end of the bar, and fastened to the ceiling by its middle. We have found a hook made from ¾-inch iron, with a coarse screw cut upon its shank, the most convenient; this can be put in the timber overhead without marring the wall, and it is not so liable to be drawn out as one that is driven into the wood like a nail. The higher the walls, the longer will be the rope; consequently the swing will admit of freer motion, allowing a more general exercise to the body, as well as a greater variety to the action of the muscles. This may be advantageous to one who has acquired considerable muscular strength; but at first, simple suspension from the bar is all that is desirable. It should never be lost sight of, however, that the primary object is to enlarge the chest, and not to develop all of the muscles of the body. It is generally sufficient for a man that he possess a well-developed chest; other portions of the body will follow, as his business or pleasure may demand.

It is an absolute waste of time and material for the man who labors exclusively with his brain, to spend not only his time, but a portion of his nutriment, in developing large muscles; as all the nourishment that goes for this purpose is so much lost to the brain. A large chest enables the literary man to digest and assimilate a good supply of food; and as his pursuits do not require a large arm or leg, to cultivate them is to waste his nutriment upon parts that are subordinate in his vocation; while the brain—the portion of the system with which he labors—is deprived of just so much nutriment as he expends upon the muscles. This will be understood as applying to the full use, in either case, of all the nutriment supplied the system.

The views advanced in this chapter have been accumulating for thirty years, and the application of the principles has *never failed of producing results more or less favorable*. Therefore we consider them based on a sure foundation. It is difficult to make views that are mechanical in their application fully understood by the profession; we therefore entreat them to make full trial of our plans before they discard them—even though the why and wherefore may not be thoroughly understood.