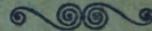


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Exercise
for
Pulmonary
Invalids.



CHARLES DENISON, A. M., M. D.



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ANNEX

Section, ~~RESPIRATORY~~

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EXERCISE

FOR

PULMONARY INVALIDS

BY
CHARLES DENISON, A.M., M.D.
DENVER, COLORADO

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Read before the Congress of Medico-Climatology of World's Fair Congress Auxiliary, June 1, 1893, and printed in response to a resolution of the same : : : : : :
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EXERCISE FOR PULMONARY INVALIDS.

I BELIEVE it was Artemus Ward who proposed to get up a new life company to insure people only while they were "in bed." He had looked into the matter extensively, and found that most everybody died in bed, so he concluded that was a dangerous place.

As usual with this genius, there was some wisdom in his wit, for sedentary life and respiratory inactivity are undoubtedly largely explanatory of the preference tuberculosis shows for the pulmonary organs. Why is it that consumption is so often "of the lungs," and not—at first, at least—of the rest of the body?

1. Is it because of the non-use of certain portions of the lungs, the apices (tops) particularly, in chest-bent clerks and flat-chested people of sedentary occupations?

2. Does consumption come by preference in the lungs, because the circulation of blood there, in the capillaries, is normally five times as rapid as in the periphery of the body, and therefore any stagnation of this movement, made proportionally worse by any lessened excretion elsewhere, as in the skin, liver, bowels, and kidneys, must result in unnatural conditions inimical to the health of those delicate parts? Is it true that imperfect circulation has so much to do with the pretubercular state as the above conclusion would seem to indicate?

3. Is it because catarrhal conditions in the pulmonary air cells and bronchial tubes, caused by colds, influenzas, or lung engorgements, when not thrown off by good lung ventilation, furnish specially favorable culture beds for the multiplication of tuberculosis germs?

4. Is it because the ordinary breathings of sedentary people only remove a tenth at a time of the air the lungs contain, and those portions in the lung apices and periphery, farthest from the large tubes, are so little disturbed that they become vitiated and retroactive in the self-poisoning process through which the individual passes?

5. Is it because the bacillus of tubercle needs some such vitiated climate, be it the stagnant, imprisoned air or the chemically changed secretions, in order to multiply most prolifically, until it is even possible to find, as we have done, a thousand germs to a small fly speck of sputum?

6. Is it because, as I have conceived it possible, that bacillary growth and reproduction are sooner inaugurated by the process of alternating rarefaction and condensation in these bacilli-laden air cells, a process synchronous with and due to the respiratory acts—inspiration and expiration? That is, that the septic juices which precede the germs, or the spores of the germs themselves, are churned into a quicker existence, perhaps somewhat as butter is made by the agitation of cream.

7. Or is it, as for all that I know I may be responsible for supposing, that the pulmonary air cells are the natural dumping-off places, where through the agency of the leucocytes, nature intends to do the cleansing of the blood of such impurities as these invading bacilli? These leucocytes (or white blood corpuscles) are known to be able to carry the bacilli of tuberculosis (embraced within their delicate bodies) through the attenuated alveolar (air cell) walls. Therefore, as the contents of these air cells in active tuberculosis are seen by the microscope to be made up almost wholly of these two, leucocytes and germs, is it not reasonable to infer that these carriers and scavengers of the body brought the bacilli there?

8. Or finally, does consumption by preference come in the lungs because this course is natural in the delicate meshes of the pulmonary structure, so wonderfully endowed with capillary vessels and glandular tissue? Because directly where the interchange from heavy venous to light arterial blood takes place (the process of hematosis (blood making) in intervascular and intertubular spaces) nature finds the best places to arrest the invading bacilli by her own protecting agencies? Among these agencies are the leucocytes, whose "policeman function" enables them to arrest, and then to build fibroid (new tissue) encasements around, the invading enemy.

Nature, ever bountiful in her provisions, and generously replying to the unsatisfied demands of continued irritation, undoubtedly overdoes this pasting in and shutting out of these bacilli, until whole lobules and lobes become involved in this extradition process. Thus those suburban regions of the lungs, naturally suited for the purpose, become the burying ground of these conquered (?) bacilli. This is in accord with post-mortems, where the lungs' apices, periphery, and peribronchial spaces are found to be crowded with these bacilli-filled prison vaults, and incapsulated products. This process is often seen to be advanced even to the total annihilation of the respiratory function; so that the affected portion of lung is, even during the life of the person, only a little better than dead.

Settle this question why tuberculosis attacks by preference the lungs as you will, whether you answer in the affirmative one or all of these eight questions, or consider these explanations as variously applicable to different cases, you must come to the decision that it is *natural elimination* which is interfered with, and it is *healthful respiration* which is wanted. It is action as opposed to stagnation. It is prevention of any further mischief which is the cure. It is cleansing as

opposed to bacillary life. The time and opportunity for *rest*, as in the repair of disabled machinery, is not granted to the respiratory organs, especially not now when they are charged with a double function, that of supplying oxygen to the blood and of purifying the system of these bacillary and septic foes. The germs, when not incapsulated and so restrained or prevented from growth, multiply in geometrical progression, perhaps quicker when harbored in the warm and constantly moving lung than when quiet elsewhere.

If it were not for this, to the individual, unconscious opposition on the part of nature, humanity would be shortly blotted out from the face of the globe by this infinitesimal enemy, which Robert Koch discovered.

In this fight of life against lives, it is one against billions, maybe; but intelligence is, or ought to be, on the side of *the one*. To that one great possibilities of muscular and respiratory power are granted, indicative of healthful resistance and elimination.

It is a man's *living cell*, his own vitality—his selective and eliminative forces—which must be "toned up" to a natural and healthful standard. Then bacilli cannot find a home in him. This is the function of *exercise*—especially with reference to the respiratory organs—to see and to feel that all one's powers are "up to par," that every muscle and fiber which tend to make up a full-chested, symmetrical man, are daily brought into play.

Let it be distinctly understood that in recommending exercise for invalids acute and active inflammatory conditions of the lungs are excluded. I am referring particularly to the after effects of such accidents as these, and to the faulty states incident to or productive of the slow encroachments of pulmonary tuberculosis. High fevers have a cause, perhaps previously undetected, and, of course, demand rest and soothing treatment. Pneumonias and pleurisies have

to be fought by the aid of enforced rest to the respiratory organs; and pulmonary hemorrhage can sometimes be mechanically stopped. It is, indeed, "an ill wind that blows nobody any good," and hemorrhage from the lungs has proved "a blessing in disguise" to many a young man, including the writer hereof, by temporarily throwing him off his feet, and giving him an opportunity to seasonably and fully appreciate that there was a latent demand in his system for a change in his environment and physical activities.

Exercise as compared with other preventive and remedial treatments for phthisis.

Even before a bacillary cause of consumption was understood, it was generally recognized by medical men that the affected human organism must be helped to *itself* throw off the disease. There has been no defensible excuse given for the nonsensical and crazy idea of sending consumptives to live down in the natural cave in Kentucky, that they might have the benefit (?) of an *equable temperature*; nor of the almost equally hazardous plan of housing patients in dark rooms, without any ventilation, for fear of a *draft*. The value of an active life out of doors, associated with generous diet, has always been recognized by the best medical men. But the objects of food specially suited to combat tuberculosis—such as the Salisbury meat diet, fats and oils, with or without stimulants—find an exact agreement with the effects of systematic and adapted exercise. Through the former there is a generous and proper supply to meet an unnatural waste, and through the latter a competent circulation and a muscular tone to keep up a normal elimination. It must be, indeed, a peculiar accident which will result in nature's harboring tuberculosis in a *physically* perfect human being. But accidents will come, and perfection to meet them is very seldom or never found. For this reason are we doctors! When we come to consider remedial meas-

ures under the head of *medicines*, we have to acknowledge that the most of them that are any good are of the same nature—appropriate foods either for the wasting tissues or for the depraved nervous force. Such are cod-liver and petroleum oils, hypophosphites, and some mineral tonics.

As to drugs, how unsatisfactory they are! To be sure, we can neutralize excessive fermentation and aid digestion. We can also aid elimination in different ways, as, for instance, by large hot water flushings of the bowels when indicated, as is often the case, by the use of mercurial and other inunctions and of oxygen inhalations. However, these are all substitutes for what ought rather to be accomplished by systematic hygienic care of the body, with *exercise* as a leading feature.

As to saturating the system with antiseptics so thoroughly that the tubercular bacilli may *not* be permitted to live and thrive while the human being harboring them *may*, the thing is probably impossible. It is to my mind doubtful if creosote, one of the latest fads in medical lore, has more effect upon the invading bacillus than to neutralize his ptomaines—the septic results of his already having existed. This, if it were not for upsetting the digestion, is, of course, salutary. It is better to accept the inevitable, and to trust to the individual *cell* of the man, strengthened by symmetrical development, to the end that a healthful and vigorous respiratory and circulatory system is maintained.

Quite as important is the possibility of substituting exercise for certain other methods of treatment, known or believed to favor the natural incapsulation, and so quietus, of the bacilli. I refer to the hypodermic use of such combinations as the cantharidates or chlorides of different bases—as the double-chloride of gold, or of iodine also (on the Shirley Gibbs plan). The hardening and shrinkage of tissues around tuber-

cular infected spots in the lungs, which seem to be the temporary local effect of such methods, is like the effect of appropriate exercise, and like the results seen of exaggerated respiratory activity in high altitudes.

The importance of exercise is not lessened, but increased, when we come to consider the use of Professor Köch's tuberculin, or of either Kleb's or Hunter's modification of it. Here to a new healing propensity, not unlike, but in exaggeration of, that already described as due to the chlorides of gold, etc., is added a natural stimulus—*an immunity effort on the part of nature*, which is the most wonderful discovery in recent medical history.

A complete understanding of this process has not been reached, but a close clinical observation of its effects, along natural lines, brings *exercise* to the front as an invaluable aid to this natural method of cure. This is most reasonable; for while we do not know the per cent of tubercle bacilli which are killed by this process of immunization, the shrinkage of the affected lung tissues probably leaves the germs in the intervening or included spaces. These spaces must then be more or less open in the spongy lung, because of the shrinkage mentioned. It is suicidal to do this much and then stop, or by forced inactivity of the respiratory apparatus to allow these germs to remain in conditions undoubtedly more favorable than before for reinfection and reproduction.

Exercise, commensurate with these specific effects, is the *sine qua non* of success. Hence, one important reason why better results have been achieved with tuberculin in high altitudes than at sea level, especially more than in any hospital practice, is because in high altitude life there is an imperative and continued activity of the respiratory apparatus. There is to me a peculiar significance in the harmony of effects of altitude, hill-climbing, and tuberculin

reaction upon slightly affected areas of lung tissue. The dryer, harsher, louder, and more tubular breath-sounds locally distinguished during the first few weeks are quite similar under all three of these conditions. During his recent visit to Colorado, I was pleased to hear Dr. C. Theodore Williams, of London, say, as we were examining a patient who had been assiduously climbing hills at eight thousand feet elevation, that he had frequently noticed (in the altitude cure) the character of respiratory sounds heard in this case, which I had called his attention to as being similar to the tuberculin reaction sound.

All the most valuable attributes of climate in the cure of consumption—the sunshine and dryness, the lessened atmospheric pressure and electric stimulation—are in their results in perfect accord with exercise. The peculiar dry air of interior elevated sections has the same effect, through a more rapid lung action, favoring the abstraction of heat and moisture from the fevered and catarrhal lung; the rarefied air and electric tension are in themselves most important stimulators of respiratory gymnastics. The mountain configuration of most high places invites to hill-climbing, and the increased radiation of heat due to rarefaction and dryness is a natural incentive to, or substitute for, exercise. These agencies are to be preferred because they are natural; and besides the enforced observation of artificial rules is less imperative in high altitudes.

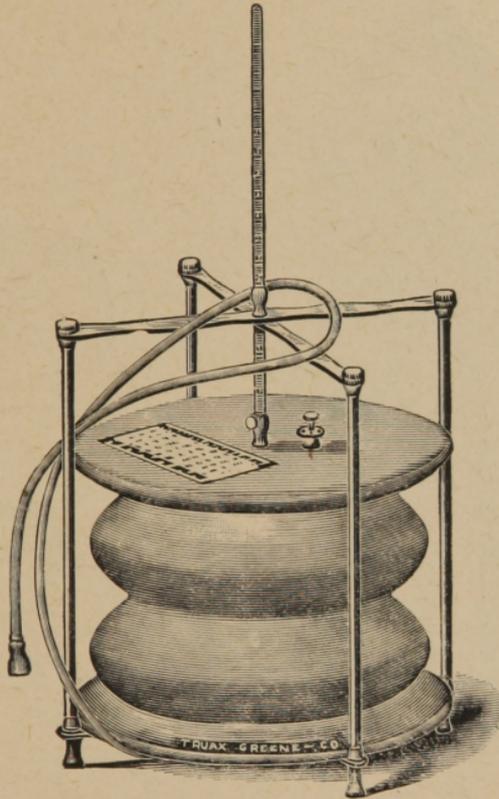
The practice of inhaling medicines properly comes under the head of respiratory exercise. So much so, that I very much doubt if the atomized antiseptics, or whatever is inhaled, have the good effect ascribed to them; but rather the effect is due to the respiratory gymnastics necessitated in the process of inhalation. The truth is, except in the upper air tract, the medicaments do not ordinarily reach the infected portions. The fibroid process of healing, in other words, the in-

capsulation of tubercle, which is the most prominent feature of the natural arrest of chronicity of lung tuberculosis, tends to close or shut off the affected portions from the inhaled air. In this protecting policy the whole lung is more or less implicated, and the inspired remedy goes with the inhaled air to the unaffected lung on the other side. For this reason a great deal of the inhalation treatment, so popular with certain specialists, is utterly useless; or, by irritating sound lung areas is positively harmful. For this reason the utility of the "Howe tube" is explained, which the Rev. Dr. Buckley, of *The Christian Advocate*, has done so much to popularize, because of the good it did him. The principle involved is the secret of a peculiarly successful form of respiratory gymnastics. The idea is to inhale freely and fully, but to exhale with effort and with restraint or some obstruction to the out-going air. Thus the density of the expansive air within the thorax is so much increased that it will work its way into areas of lung where otherwise some air cells would be unused but for this prolonged effort.

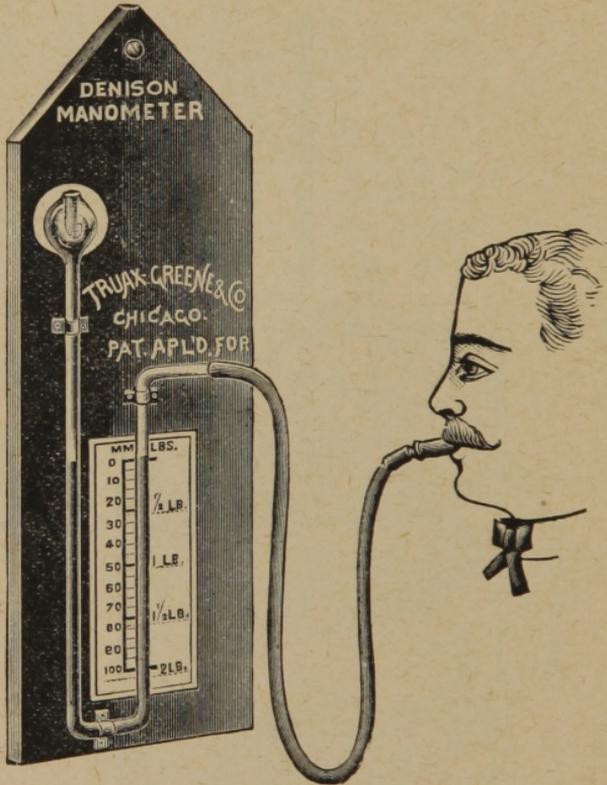
Again, some congestion or infiltration might still remain in out-of-the-way lung spaces, were it not for the *push* given to the blood circulation by the increased pressure of this pulmonary air, thus (during this forced expiratory effort) thrown into marked contrast to the rarefaction existing there during inspiration. This process of breathing is much like the natural stimulus of altitude. If assiduously practiced, it is an invaluable exercise. But it is unnecessary to resort to any secret or extensive apparatus, except that to some people mystery enhances any good they are to receive. A large toothpick, three fourths to five sixths plugged at the outer end, or a small glass pipette or dropping tube, with nozzle large enough to just about take in the head of a pin, will answer the purpose quite well. Breathing

out long breaths through this is a good exercise, and one which may be advantageously combined with the inhalation of such antiseptic or healing vapors as are not hurtful to the healthy lung. My own plan has been to use the Cutler's Inhaler for *inhalation*, because of its convenience to be carried in the pocket, and the pipette for exhalation. For this inhaler we may substitute, if desired, an inexpensive glass tube with a light sponge in the center for receiving the antiseptic.

How do we know there is a lack of ventilation of the blood and air in the lungs? The foregoing reference to the fibroid tendency in affected lung tissue furnishes an answer, and shows the great utility of recording the semicircumferential movements of the two sides of the chest. They are so seldom alike in lung disease that it is of great advantage in diagnosis to note that rare circumstance. The explanation comes by noticing the difference of these two movements, under forced inspiration and expiration, when comparing the records of the spirometer and manometer. These instruments respectively tell, for the first named, the capacity, in cubic inches, of air exhaled, and for the second, the strength of an individual's pulmonary organs, by the pounds pressure or millimeters of mercury force (*mm.*) shown in an extreme expulsive effort. My aim has been to bring these instruments to points of such excellence and cheapness that everyone, layman and physician alike, may use them. The accompanying cuts, furnished by Messrs. Charles Truax Greene & Company, of Chicago, are fair illustrations of the results of efforts made. As adjuncts to respiratory gymnastics they are of great value; the manometer being a means of lung development of no small account. Its habitual use shows a steady and positive improvement in the strength of the lung tissue. Emphysematous persons, much affected, should not use it save for purposes of diag-



nosis. The manometer may record an excess of the normal force, while the spirometrical record is less than one half what it should be, say, for a healthy man. This is probably because of pleuritic or one-sided fibroid shrinkage, due to disease. The inference is that the lungs have in a measure healed and gained the strength manifested even in their closed up condition. This is a compromise between health and disease, though nearer the former than the latter,



with which exercise has very much to do. In fact, there would be no such arrest and reestablishment of vigor except through the agency of respiratory gymnastics.

Therefore the means of measuring and judging of one's respiratory capacity and strength are of great importance. If much deficiency or inequality of movement of the two lungs is found, it is much better for a young man to go to a good diagnostician and have his respiratory organs overhauled, than to wait

until he has to do so because of actual or progressive disease. Too often it happens that the lassitude and inability to exercise, which is incident to disease, becomes constitutional, so to speak, and a habit of laziness gives feeble will-power to carry out any system of healthful respiratory exercise whatever.

We thus come to recognize the great need of some incentive, either of pleasure or duty, to the end that the whole of the respiratory organs may be systematically used. The writer once, on a declamation day, received the characteristic commendation of that most excellent college president, the late Mark Hopkins, of Williams: "The young man has a good conception of what he wants to do."

I wish I could impart a "good conception of what he wants to do," in the way of exercise, to each one of the thousands of young men and young women whose sallow complexions, feeble circulation, short breathings, round shoulders, and flat chests, betoken the depraved blood state which is already marking some portion of their lungs as the seat of the future bacillary battle ground. Let me make it a personal matter with each one who, because of past, existing, or approaching respiratory disease, needs light or medium gymnastics, as opposed to heavy or severe gymnasium work. The object sought is a normal man, in all his physical makeup, and not individual feats of dexterity or muscular strength. For such a one I will formulate certain rules and forms of exercise best adapted for prevention of chest weakness, or for a chronic invalid's or convalescent's needs. These are not claimed to be exhaustive, but good-at-home substitutes for more elaborate systems, or for out-of-door activities.

Of course daily constitutional walks, hill-climbing, horseback riding (with which for good effects bicycling can hardly compete, because of the usual stooping attitude of the rider), tennis, ball playing, rowing, hunting, and fishing, are all most excellent forms of exercise,

to be preferred by those for whom they are severally suited and safe, because of the interest excited and mental relaxation resulting. But for the systematic home building up and strengthening of the weakened respiratory apparatus, these rules are submitted for individual practice, with this distinct proviso: that doubtful or unsuitable conditions, feverish or irritable cases are always to be referred to the patient's physician for his choice of procedure. In fact, the forms of exercise are purposely graduated to enable the attending physician to determine how far a given person should proceed in a given time.

RULE I. *Cultivate regularity* in the care of your body; regularity, without so much precision as to be tiresome, in eating, sleeping, exercise, bathing, and the daily movement of the bowels. This for some people is a cardinal requisite of good health. Let it be remembered that "procrastination is the thief" of vigor and vitality as well as "of time;" and the languor, indigestion, with or without constipation of the bowels, which are the usual precursors of chronic pulmonary ills, all favor mental irresolution and irresponsibility, which are in no small degree to be overcome by *regularity*.

RULE II. *Look after the condition of your body's surface*, that the skin is clean, and therefore active, perspiration normal, and hands and feet warm. The morning *rub down* is a good thing. To those, and they are not few, to whom daily plunge or tub baths with soap are unsuited, because of too great abstraction of bodily heat and lessening of the protective influence of a naturally oily skin, to such the *rub down* is particularly useful. It is all right for cleanliness, but its chief object is rather the resulting *reaction*. The warmth, glow, and exhilaration of this reaction after a bath is the criterion as to its length and coldness. To some, the most feeble, it may be enough to bathe above the waist in the morning on rising and below

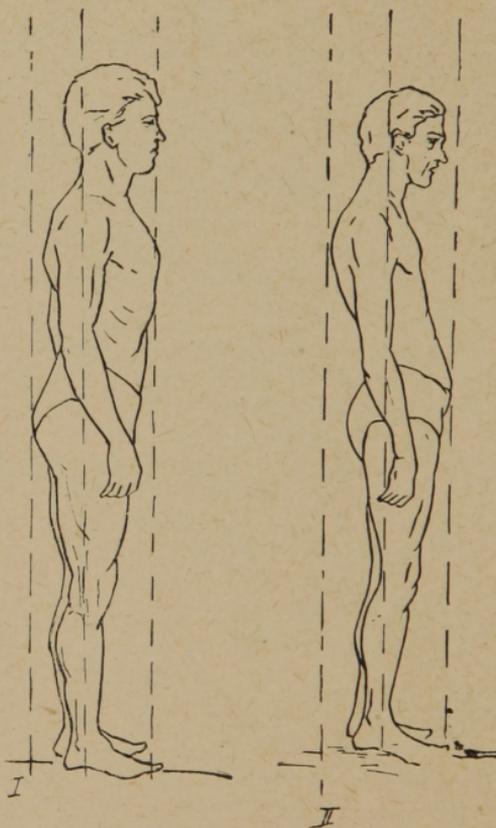
the waist on retiring at night, and to splash quickly the surface with tepid or cold water with the hand or wet towel for half a minute, and then vigorously rub with a crash towel from three to five minutes. Others, not so delicate, can stand in a bath tub and squeeze a large sponge dipped in plain cold water on the back, and (after quickly going over the body) give themselves the towel rubbing. This is an excellent thing for anyone to do, even if perspiring from exercise, provided the resulting reaction comes quickly, as it almost always will.

RULE III. *Live as much as possible in the open air.* Let your exercise be carried on out there, or with windows open if in the house. The more outdoor activity you have, the less gymnastic work will be required. Get as much sleep as possible (nine or more hours) during the night time, in a well ventilated room; and a half hour nap at noon is also excellent. Do not worry, but take life easy (as the Irishman has it, "If ye can't be aisy, take it aisy as ye can").

RULE IV. *Think about your chest position many times a day.* Whether sitting, standing, walking, or riding, *get into position.* This requires thought and will, till correct breathing becomes automatic. The accompanying cuts, from Checkley (Nos. 1 and 2) show the correct and incorrect chest positions.

NOTE.—When the bowels are torpid, and hands and feet cold, the sipping of a glass of water as hot as can be swallowed an hour before breakfast is of much benefit; and so, especially if any sign of rectal weakness exists, are profuse flushings of the lower bowel with hot water once to three times a week.

I have usually directed patients to take these enemata lying down before retiring at night, from a fountain syringe, and holding from one to three quarts of the hot water in the bowel for twenty minutes if possible.

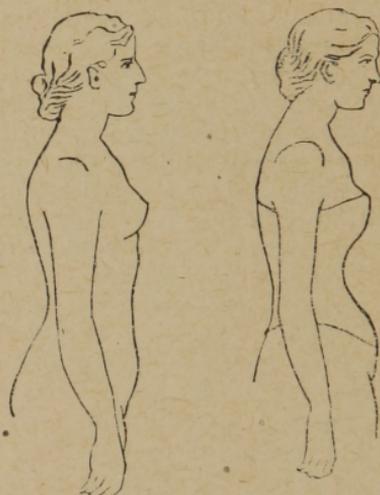


The correct position is, head *up* and chest *in*; chest *expanded* front, and shoulders *back* and *down*, the neck being *back* far enough to press against the collar. If you stand this way when your upper garments are being fitted, your clothes will not be a hindrance to right respiration, as sometimes happens. In this correct position, frequently practice breathing by long continued inspirations, as you draw in your abdomen, swell out the sides of your chest, and protrude you

sternum. Night and morning, while your chest is thus inflated, practice briskly rubbing the chest from the sternum backward with the palms of the hands.

RULE V. *Do not let the conventionalities of society prevent your free and natural respiratory movements.* The clothes should not constrain the chest or any part of the body. This advice is of most value to the ladies. Ordinarily, a woman with her corsets on cannot properly perform the valuable exercises here described. She is *usually* deceived as to the amount of pressure exerted by these *vices*, so evenly adjusted to her pliable frame. She is *positively* deceived as to the support the corset is supposed to give toward holding up the trunk of the body. It is simply the acquired weakness of back and side muscles, caused probably by long use of the corset, which she feels it relieves. Had she properly used these muscles, the delusion would have been unnecessary (?).

The accompanying cuts show the natural and correct female form without corset, and the deformed chest with corset. It takes a great deal of effort and self-control on the part of a young woman to prevent the corset having this effect. Some women have had the good sense to put two towels lengthwise underneath their corsets when their dresses were being fitted, so as to save for themselves that much more breathing space. Doctors have preached, though unsuccessfully, about the constriction and crowding upward of the liver and stomach, and downward of the abdominal and pelvic organs, due to tight lacing; but, with reference to exercise, the chief effect to be lamented is the unnatural variation or partial annulment of respiration. The summit respiration is exaggerated, and the inferior costal or diaphragmatic movement prevented. There is a wonderful amount of good in the systematic practice of these exercises to those women, especially the younger ones, who perchance appreciate the import of the foregoing, and are will-



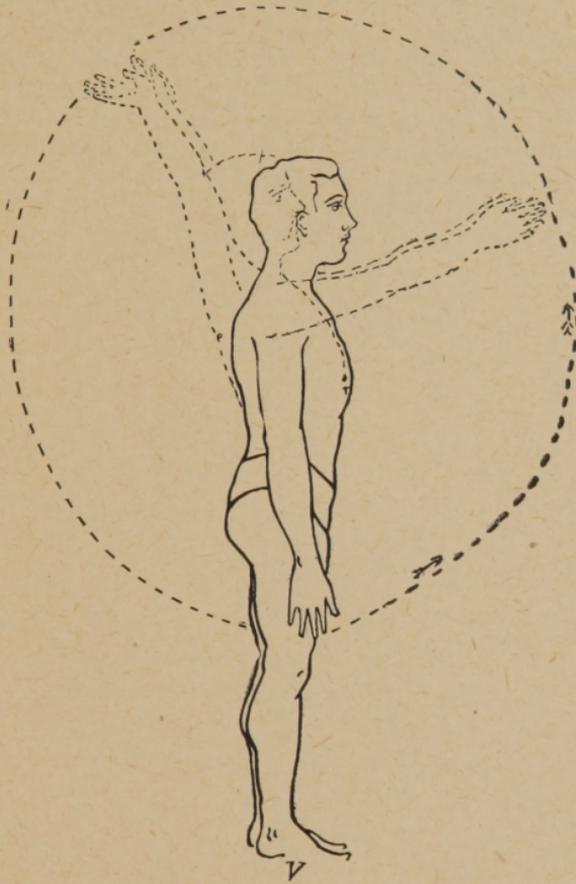
IV

III

ing to substitute a loose fitting corset waist for the usual corset ribbed with steel, whalebone, or their equivalents. Whether for males or females, the garments covering the trunk of the body should be loose fitting, and the covering next the skin is best of genuine wool of weight and texture to suit the season and individual needs.

Rule VI. *Practice front arm exercises and respirations combined*, with vigor and effort according to your strength and ability, for the space of three to ten minutes three to six times a day. The accompanying cut illustrates one of these—the third.

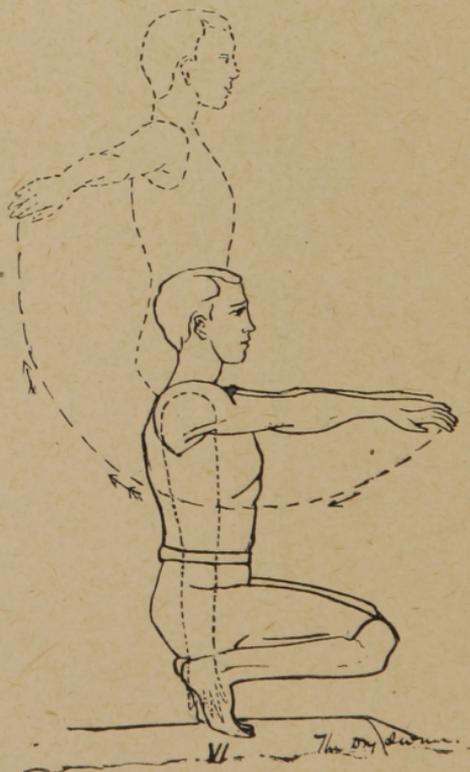
First: Stand in correct position (Rule IV) and fully inflate the lungs, as you slowly raise the arms from the sides to the vertical, touching thumbs or backs of hands over head, and exhale as the arms descend.



Second: Draw back arms from front horizontal, with palms up, until the elbows are as far back past the sides of the body as possible, the elbows being kept close to the body. Inflate as you draw arms back, exhale as you return to position. Repeat movement four to ten times. Last time, when elbows

are back, slap chest lightly and quickly fifteen to twenty times.

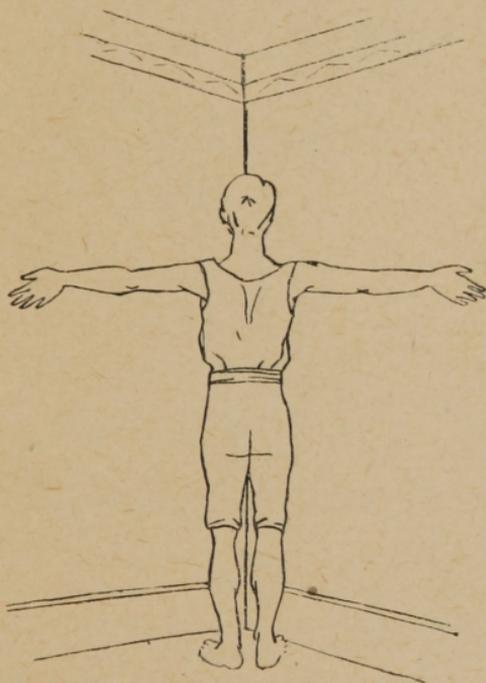
Third: (See cut No. 5.) *Get into position.* Slowly raise arms from side forward; fingers straight out, till palms meet in front of forehead, fully inflating the lungs all the while. Then hold the breath until the largest possible circles are completed by both arms moving symmetrically over backward to position. Then exhale and repeat four to ten times.



THE DRY SWIM.

Fourth. Position, arms straight down at sides; exhale all possible, as you go down to floor. Then, resting on toes, slowly inhale as you rise (see cut 6), and make large swimming circles, with arms stiff and palms out, to position. Repeat four to ten times.

Rule VII. According to your ability, and freedom from any acute conditions, substitute or add to the foregoing the fixed chest breathings.

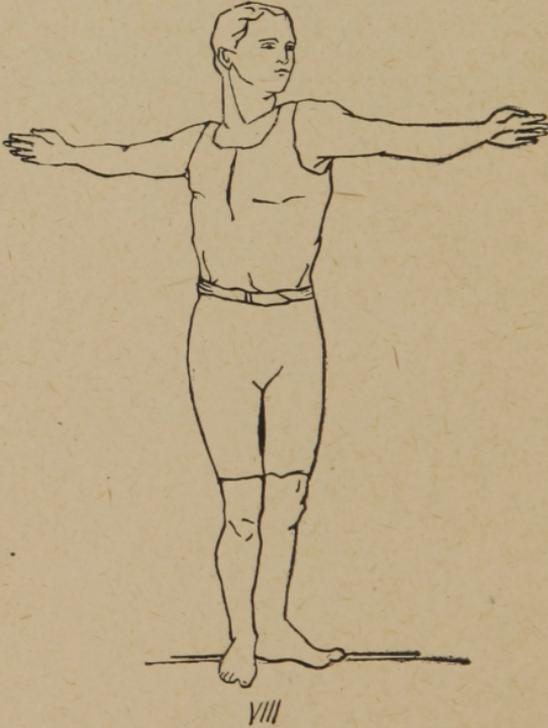


VII.

CORNER BREATHING EXERCISE.

A. Extend arms nearly to or above a horizontal at shoulders, and walk thus into the corner of the room; then breathe four to ten full breaths. Do no more

than you can accomplish without pain. The ability to get away in the corner with arms high will come by practice.



B. Inhale as arms are extended laterally from correct position, keep arms horizontal, and face and feet to the front, while arms and chest are swung quarter round: then with stiff knee swing body forward until extended fingers nearly or quite touch the floor. Return to position and exhale. Take another breath, and repeat with other arm forward. Alternate these movements four or ten times.

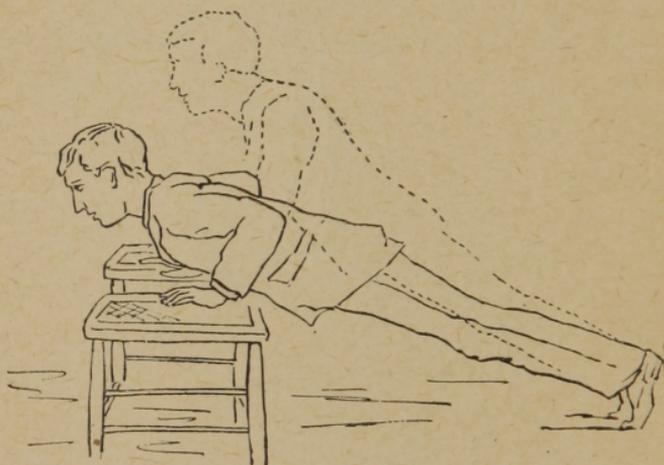


IX.

SWINGING CHEST EXERCISE.

C. Place two chairs about twenty inches apart, and with body stiff and straight rest on toes and hands, as shown in cut. When down between the chairs take four to ten full inspirations and expirations. Raise the body from the down position to the extended arms, and repeat according to strength and ability to do so, without too great fatigue.

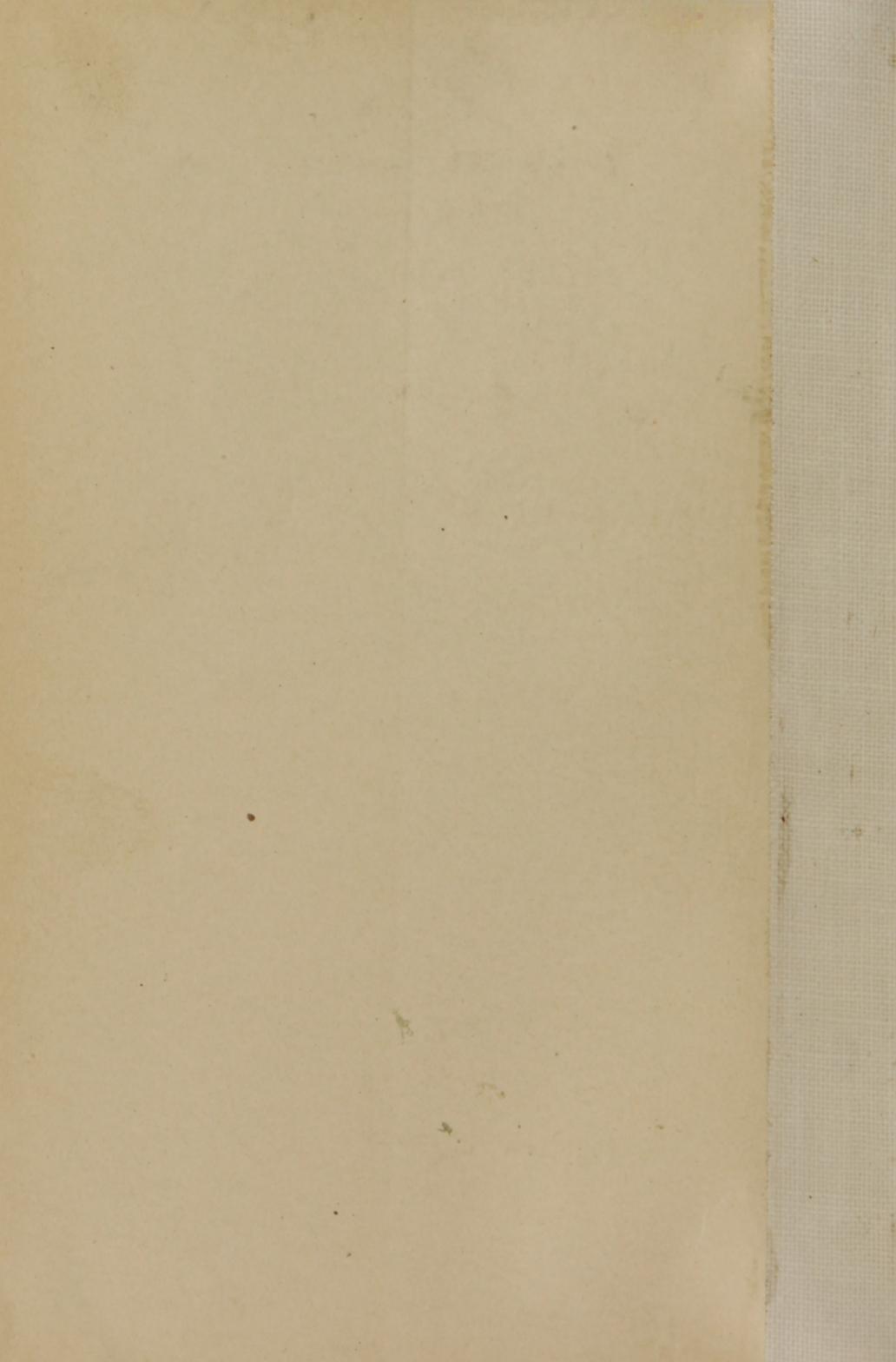
If such severe exercise by practice becomes a pleasure and not a strain to a given individual, it is one of the strongest proofs possible of his resisting power

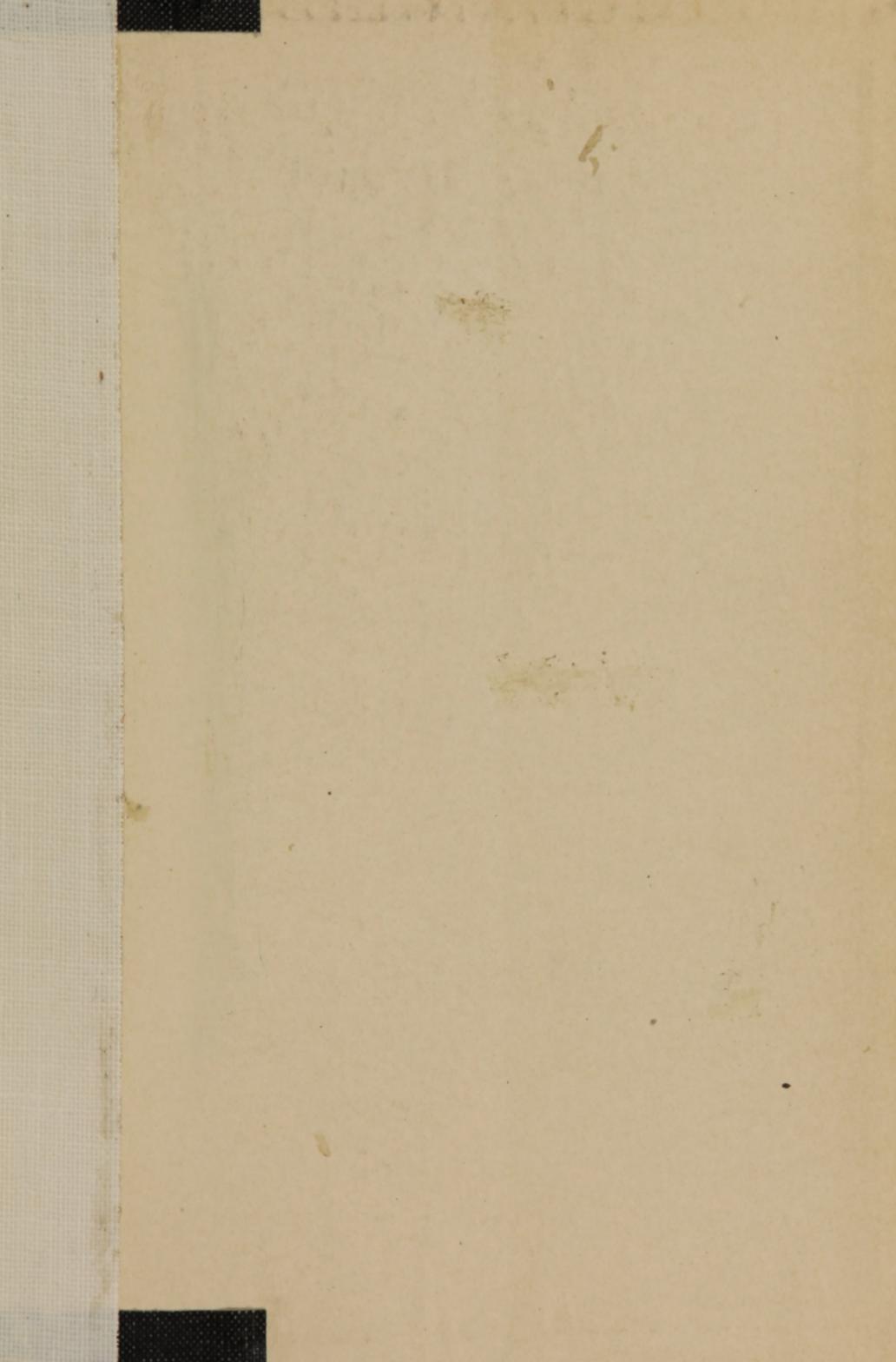


X.

DOWN BETWEEN CHAIRS.

to pulmonary disease. They should be—the last especially—gradually reached by weeks' or months' practice of milder forms. If possible to combine them with the climbing of hills or frequent excursions to the mountains, the results will be so much the more salutary. As Professor R. J. Roberts, of Boston, says: "As a man breathes, so he lives. To half breathe is only to half live. So he must slowly and carefully develop his breathing powers."







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