THE THERAPEUTICS OF ACTIVITY

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Francis Grant.

The Therapeutics of Activity

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of
ACTIVITY

By

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INTRODUCTION.

This book is not a plea for practical gymnastics. It is assumed at the outset that the reader at least believes in exercise even though he may not practice it. Our problem is not to consider in detail how, when and why exercise should be practiced, because these questions should be considered in the philosophy of exercise, and this subject alone would fill several volumes.

This book is intended primarily for the classes of the Chicago College of Osteopathy, but it will serve as a help to anyone who may desire safe, though not overexhaustive, information on the subject of Medical and Hygienic Gymnastics. Originality is not claimed in making this book. With our complete libraries of literature on this subject, anyone coming out at this day with the claim that he has invented a new system of physical culture proves himself to be a faker, or he demonstrates his lack of information on the subject. With the exception of a few ideas developed, or perhaps, re-discovered by the writer, this book is largely a collection of data set forth in a new way.

The writer has drawn mostly from Swedish authors, for the Swedes, guided by the teachings of P. H. Ling, have developed the best system of gymnastics. Theirs is the most scientific, in fact, judging from the writer's study and experience, it is the only scientific system of Medical and Hygienic Gymnastics worthy the name. Our German friends may affirm that their system is entitled to consideration, and so it is, but, from the standpoint of health promotion, the palm is to Ling's system.

In comparing the Swedish and the German systems, it is well to remember what their founders had in mind. Guts-Muth, the real father of modern gymnastics, in his writings at the latter part of the 18th century, had Jahn, the father of German, and Ling, the father of Swedish gymnastics as pupils. Among his writings, Guts-Muth states that he has two aims in his work: "(1) Work in the garb of youthful play, and (2) a system of exercise having bodily perfection as the aim." The first appealed to Jahn and the second to Ling. Jahn founded the modern German system which is particularly noted for its variety of stunts and amusing features, but having nothing about it that is aimed primarily to correct the defects and promote the health of its adherents. Ling developed his system with the primary object of promoting bodily perfection in all who practiced it. So that, while amusement and skill are the aims of the German system, health, control and bodily perfection are the aims of the Swedish. The German system contains more of the rhythmic type of gymnastics. Drills with wands, clubs and dumb-bells and free-standing drills set to music, are among its characteristic features. In the Swedish system, no music is employed except to encourage athletes in performing difficult feats. The characteristic features of this system are that all gymnastic movements are practiced without music and each movement is performed at the instructor's command.

This book is a slight departure from the usual textbook on gymnastic instruction. The aim is to enable the reader to care for himself. There are no commands given, as is usually done in books for teachers. Only descriptions of movements and their underlying principles and applications are presented. The commands appear as an appendix at the back of the book.

It is one of the writer's objects to give the necessary material in plain enough language to enable the average individual, after a careful reading of these pages, to perceive at a glance just what defects any person shows and just what exercises he should practice to overcome them. A further aim is to enable anyone to know what exercises are best to preserve health and how they should be practiced.

It does not require a very keen appreciation of the ideal physique to enable one to conceive the advantages of such an endowment. It requires no great perceptive faculty to become conscious of the fact that very few normal physiques are to be found nowadays. The very fat or very thin, the awkward, loose-jointed or stiff, muscle-bound, the drooping-head, round-shouldered, flat-chested, scrawny individuals are everywhere seen, and few are not aware of their existence. In fact, if anyone is not conscious of these common defects it is because they are so common as to be overlooked. These facts are a strong plea for systematic exercise.

No system of healing is complete without including exercise as an adjunct, and no school except the Swedish gymnastic school has made a deep enough study of this subject. There are laws governing gymnastics which cannot be discovered in a few moments' consideration. These laws have been discovered after many years of experimenting and earnest research. Exercises have been arranged according to these laws. There are certain conditions which will succumb to nothing but exercise. Orthopedics may correct certain defects, osteopathy may adjust most conditions, but a proper state of perfection cannot be maintained except by exercise properly chosen and practiced. What particular exercise is best in each case is an important thing to know.

Exercise should have its place in every school of healing. It is one of the most important restorers and preservers of health. Along with proper food, air, bathing, clothing and other phases of personal hygiene it is an important prophylactic measure. Exercise, in the writer's estimation, is the most useful adjunct to osteopathy.

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CHAPTER I.

Basic Principles of Gymnastics.

The fundamental laws of gymnastics have been most clearly expounded in this country by Baron Nils Posse. The subject matter of this chapter is largely based upon notes on General Kinesiology taken at the Posse Gymnasium while I was student there.

There are so many movements possible to the human body that any system worthy the name should include only those that are useful and beneficial. All useless, doubtful or injurious movements should be eliminated. The experience of many years of experimentation has been carefully recorded and is available for reference in arranging gymnastics.

Baron Posse has applied the term General Kinesiology to the study of all forms of movements, gymnastic or otherwise. For our purpose, only bodily movements shall be considered. In various parts of the world, for a long time, men interested in physical development have experimented more or less extensively with bodily movements. The results upon those practicing them have been noted, and movements have been classified according to their true gymnastic bearing, or they have been rejected with good reason. The Swedish gymnastic school, founded by P. H. Ling, has done most in this respect and the results of their work will always influence good gymnastic teaching.

The aim of General Kinesiology as a science is to purify gymnastics by suppressing all useless or injurious movements, games or sports; to sift gymnas-

tics by choosing only the beneficial fro mall possible bodily movements; to enrich gymnastics by adding useful and beneficial movements; and to make known new discoveries by bringing them before the public through lectures and publications.

General Kinesiology applies to all systems of gymnastics but each system has a special kinesiology of its own. Special Kinesiology considers the mechanics, effects, limitations and classifications of each movement. For a full consideration of the special kinesiology of Swedish gymnastics, the reader is referred to Posse's "Special Kinesiology of Educational Gymnastics." The most important features of General Kinesiology will serve our purpose.

In the mechanics of exercise under the classification of physics there are important gymnastic laws based upon various forms of energy.

Penetrating energy is an important force whose governing law applies in gymnastics. Dr. Draper has explained that the power of energy increases as the square of the rate at which the velocity increases. For instance, given a train of cars traveling at 30 miles an hour, when all power is shut off it will, of its own momentum, travel a certain distance. Let the same train, under the same condition, travel 60 miles an hour, if the power in the engine is shut off, it will, of its own momentum, travel four times as far as in the first case. Treble the speed and when power is shut off it will travel nine times as far as in the first case, and so on. Applying this law to gymnastics it becomes clear why speed means so much in such a feat as running broad jump. In arm extension sideways, the more speed is put into the extension the greater the expansive and broadening effect on the chest and shoulders. Increasing the speed of sideways flexion increases the difficulty of the movement.

Reciprocating motion is so much like penetrating energy that it might be included with it. If a rubber ball is thrown on the floor at a certain rate of speed it will rebound to a certain height. If it is thrown with twice the force it will bound four times the height that it did in the first case. This law is to be considered in the "take-off" in high jumping and vaulting In running broad jump the greater the combination of reciprocating force and penetrating energy the better the results.

Centrifugal force is a power which must not be ignored in gymnastics. That power manifested in the tendency of a body to fly off at a tangent when swung in a circle is centrifugal force. Centrifugal force increases at the same rate as penetrating energy or reciprocating force. A common practice among country boys which illustrates this force is to poke a stick into an apple and by a long upward and forward sweep of the stick, cause the apple to fly off at great speed, and to a greater distance than one could throw. Another practice is to tie a stone or horse-chestnut to a string and swing it rapidly in a circle and then let go of the string; the object travels a considerable distance.

By centrifugal force we may affect the circulation of the blood. Swinging the arms rapidly in a circle will make the fingers tingle because of the blood forced into them. To stand with the feet apart, arms at shoulder height at the sides, and twist the trunk rapidly from side to side will drive the blood into the hands and arms. Rapid trunk flexion sideways will cause the blood to rush to the chest and head.

The law of centrifugal force explains why one develops dizziness or headache from rapid trunk flexion backward and forward alternately, as is so commonly done by those who do not know, or do not care to observe, the laws of gymnastics. A movement commonly

practiced is that of describing a circle with the head and trunk by flexing forward, then to the left, backward, to the right and forward again several times. In Y. M. C. A. classes I have often witnessed such performances, and when the pupils complained that they were dizzy, the instructor invariably affirmed that in time they would get used to doing these movements without such results. As if repeated violation could offset a natural law.

The law of centrifugal force is illustrated in the way circus riders incline inwardly to counteract the force. In running around a corner one must lean inwardly or decrease the speed because of this force. The saucer or bowl race track of motorcycle and auto races is built with this force in mind.

The law of centrifugal force is strongly manifested in certain medical gymnastic procedures. For instance, rapid circumduction of a limb will draw more than a normal amount of blood to it.

In relation to the laws of leverage and gravity, progression in gymnastics is made by lessening the base, or lengthening the lever, or by both. By lessening the base we mean shortening the base in the direction of action. For example, take sideways flexion of the trunk. The easiest way to perform this movement is with the feet apart. Up to a certain point, the farther apart the feet, the easier the movement. The closer the feet are to each other, the shorter the base in the direction of action and the more difficult the movement becomes.

Lengthening the lever, or raising the center of gravity means to perform the same movement first with the arms at the sides, then on the hips, at shoulder height, or extended upward. It is clear that bending the trunk sideways with the arms extended upward is harder than with them on the hips. The higher the

arms the longer the lever and, because raising the arms raises the mass of weight, the higher the center of gravity, and the narrower the base, the less stable the body; hence the reason why shortening the base and lengthening the lever, or raising the center of gravity, makes for progression. Any or all of these forces brought into play require more control to preserve equilibrium.

The stability of a body standing on end depends upon the size of its base and height of its center of gravity. The human body is subject to the same laws as any inanimate body. In standing position, the base of a man is bounded by the balls of the feet and the heels and the line joining these. Given healthy muscles, the longer the feet and, up to a certain point, the farther apart they are spread the more stable it is; and the shorter the feet and the closer they are held together the less stable. For stability the line of gravity must be kept within the boundary of the base. If one carries a weight he has to incline the body in a direction opposite to the weight to keep the line of gravity over the base.

The bony structure would naturally make the body more stable in the transverse direction, but the masses of muscle are so arranged that the body is stronger and better balanced in the sagittal direction. Regardless of the strength and arrangement of muscles, however, the rule prevails that stability depends principally upon the relation between the base and the altitude of its center of gravity, increasing as the base increases and decreasing as the altitude of the center of gravity increases. So to make movements easy we make the base broader and keep the center of gravity low: to make a movement more difficult we increase the effort to preserve equilibrium by decreasing the base and raising the center of gravity.

When in good standing position, with the head erect, chin drawn in, chest well forward over the balls of the feet, the line of gravity in the human body passes in front of the cervical and upper dorsal vertebrae, thus causing the need of stronger muscles at the back than front of the spine. These muscles, called erectors of the spine, keep the body from falling forward. The line of gravity passes behind the hips and knee joints, explaining the need of stronger muscles at the front than back of the thighs. It then crosses the legs, passes in front of the ankle and through the arch of the foot.

The line of gravity represents the path of the downward pull on the body and the erectors of the spine, extensors of the thigh and the calf muscles represent a force sufficient to counteract this downward pull of gravity as well as antagonize the flexors of the body. The constant force of gravity tends to exhaust the erectors of the body, and they gradually give up to it. The flexors of the body working with gravity make the erectors work harder. In time these forces are triumphant as is shown in that "old man's stoop," in which the head is bowed forward, the shoulders droop and the knees are partly flexed.

The "old man's stoop" is a good example of what everyone tends to unless his occupation is such as to counteract it. In gymnastic work it is best to extend the flexor muscles of the body which work with gravity, and to practice movements that will strengthen the erector muscles generally.

When the muscles contract they draw their extremities nearer to each other. In doing this the movable end moves toward the fixed end. The fixed end of a muscle is called the origin, the movable end, the insertion.

In the body the origin of any muscle is at the end

having the steadiest anchorage. For instance, the muscles that elevate the ribs have their origin along the cervical vertebrae and back of the head. Each internal intercostal elevates the next lower rib when the ribs are fixed from the top. From the spine, neck, back of head and clavicle originate the muscles which are inserted into the upper arm and around the shoulder. From the upper arm originate the muscles which are inserted into the forearm and move it, and so on. Thus, at every contraction the looser end moves most. But, besides the downward pull of gravity, through this very force of the muscles that causes its two ends to draw together, there is a constant, though slight, tendency for the fixed end to give way a little and move toward the insertion end. The most firmly knit body is but flesh and bone and every action by it leaves its reaction upon it. Therefore do we find that the tendency of the body is to give up to gravity and to this downward pull on motion of the movable parts. To counteract this tendency it is well in gymnastics to make the loose ends become the fixed ends. This is usually done on apparatus. Ordinarily, flexing the arm would cause the hand to slightly move the shoulder downward. In gymnastics, chinning on the bar would cause the shoulders to move toward the hands and the resulting effect would be to lift the ribs and shoulders and ease the work of the erectors of the spine.

It is easily perceived that movements, the chief effect of which is to counteract the force of gravity by strengthening the erectors and stretching the flexors of the body, are valuable both as corrective and preventive forces. To extend the flexors of the trunk, backward bending, especially of the upper spine, is beneficial. To cultivate the contractibility of the muscles which antagonize gravity, no class of movements

surpasses the balance movements of the Swedish System. Everyone of this class of movements requires good general control of the muscles, especially the erectors. Every movement is done with one or both feet on the floor, thus requiring no external apparatus or aid. The body itself, placed in various attitudes, is made the means of progression.

One of the first and most commonly practiced of balance movements is heel elevation. As one rises on the toes the center of gravity moves forward, and the muscles of the back must contract harder to keep from falling forward. Standing on tiptoe with the trunk erect requires a high degree of control, in itself, but the movement is made more difficult, and its effect is felt more powerfully if one rises on the toes quickly. The more speed one puts into the movement the stronger the tendency to fall forward, because of penetrating energy. With great speed in the movement the muscles of the back must contract harder to keep the trunk erect.

In coming down from toe standing, one should lower the heels slowly, because a quick lowering of the heels would jar the spine and also tend to counteract the good effects already gained by the elevation. Therefore to get the greatest benefit from this movement, rise on the toes quickly, the quicker the better, and then lower the heels slowly.

To further elucidate the effects of balance movements upon the extensors of the body as a step in advance of heel elevation, place the hands on the hips, rise on the toes, or to be specific, on the balls of the feet, and hold this position without disturbing the good posture of any part of the body; while holding this position, twist the head to left and right, keeping the chin in, chest high, and moving only the head. This

movement requires a high degree of control and illustrates the effect of balance movements.

GYMNASTIC OSTEOLOGY.

Upon examination we find the shape and structure of the bones to be perfectly adapted to their purpose. The composition of the bones, through the arrangement of the gelatinous and mineral matter, gives them great tenacity. All long bones are built on the hollow tube principle, thus combining strength, elasticity and lightness. Most short bones which have to sustain great weight, as the bones of the feet, and the epiphises of long bones, where the pressure is borne from various angles when the joints are flexed, are constructed on the oblique beam principle, as in steel bridge structure which combine the greatest strength with the least amount of material.

The spine may be considered as a bone, with a shaft and two extremities. The series of central foramina may be regarded as the medullary canal found in all long bones. The shape, viewed from the side, is like the letter S. This, combined with the intervertebral cartilages, and the mobility and flexibility afforded by the segmentation, allows the greatest elasticity, strength and protection against jars and falls. The head and sacrum may be regarded as the extremities. The transverse and spinous processes of the vertebrae serve as a net work of protection and as a means of muscular attachments. The normal curves in the spine should be very slight. Where these curves are abnormally marked, or where there is a lateral curvature, special exercises are necessary.

In the young, the shape of any limb, or bone, may be changed, in time, by special exercises. The chapter on corrective gymnastics will elucidate this statement. The shape of the legs changes from time to time ac-

cording to occupation. A person who habitually carries great weights is apt to become knock-kneed, from constantly bringing the knees together for steadier base. One who has ridden horseback from childhood shows an outward curve from the hips to the feet, involving the entire bony structure of the legs. Too much jumping will bow the legs.

In general, we may say that moderate exercise increases circulation and therefore growth and repair of the bones. Excessive exercise, by using up food material in production of energy, retards growth in the young and weakens the bones of older persons, by resorption of osseous tissue, thus causing a softening. This fact, while unfavorable in this sense, serves as a guide in procedure to prevent drying up of tissues and hardening of the arteries in the aged. Moderate exercise, combined with rational diet and other hygienic measures, is the best method of keeping physically young.

In children, changes from cartilage to bone are incomplete; the bones contain a large amount of animal matter so that their shape is easily changed by exercise. Jumping from heights may displace or distort children's bones and cause abnormal ossification. With the aged, because the bones are so brittle, jumping is dangerous. But if an aged person has kept up moderate exercise from youth he is not easily injured by moderate jumping.

ARTHROLOGY.

Arthrology is a study of the articulations to find the possibility, limit and variety of motion. The limits of motion are regulated by bones, ligaments and muscles. Voluntary movements are limited by the extensibility of antagonistic muscles. Involuntary movements are limited first by ligaments or check bands

which are fastened, at least partly, outside the axis of motion.

Moderate exercise will retain the mobility of the joints. Lack of exercise will produce immobility. Excessive exercise will lessen mobility by causing absorption of synovial fluid to go on more rapidly than secretion. This is often manifested by a crackling or grating sound termed crepitis.

GYMNASTIC MYOLOGY.

Myology, strictly speaking, is a description of the muscles. In gymnastics it is a study of their functions and a guide to progression from gentle to strong movements.

Movements are voluntary and involuntary. Voluntary movements are controlled by the will. Even reflex and automatic movements are under direct or indirect control of the will. Involuntary movements are those under control of the sympathetic nervous system, such as the heart's action, respiration, peristalsis, etc. The will may, and often does, effect these involuntary movements, especially that of respiration, and sometimes the heart's action, but these go on just the same whether or not the will is influencing them.

Where good contractility and extensibility exists in a muscle it has elasticity. The more elasticity a muscle has the better its condition. The best and finest trained muscles have most elasticity, and in order to preserve this quality they must be periodically exercised.

In a muscular movement all the muscles acting together pulling in one direction, to produce the movement, are called synergists. The muscles opposing these are called their antagonists. For perfect control in action, the synergists and antagonists must be perfectly balanced and under complete control of the will.

Synergists may be either flexors or extensors. The idea is that we must determine the motion and then think of the muscles producing this as its synergists, their opponents as antagonists. So, if we think of arm flexion, the synergists of this motion are the flexors of the arm, the extensors of the arm are the antagonists. If we think of arm extension it is the extensors that are the synergists and the flexors are the antagonists.

We may in the same way speak of the synergists and antagonists of gravity. In standing position gravity is constantly pulling downward, giving the body a tendency to flex and collapse. The flexor muscles that work with gravity may be called its synergists, and the extensors or erectors of the body which pull against the flexors and gravity, are its antagonists. In good gymnastics, therefore, it is well to develop the antagonists, and extend the synergists of gravity.

Experiment has proven that those muscles contract best which extend most before contracting. Muscular tissue has intrinsic elasticity which gives it a power of recoil like an elastic band. Add all of this power possible to natural voluntary contraction and the force produced is much greater. Therefore the rule follows that the greatest contraction is possible after the origin and insertion of the muscles have been forced furthest apart. This explains the logic of leaning back and carrying the arm as far back as possible before throwing, or to carry the foot as far back as possible before kicking. The greater the extension given the muscle, the more forcibly it can contract.

The so-called slow-leg movement of the Swedish System is one of the most useful and least understood types. An example (Illus. 1), is to stand with one heel resting on a chair, the knee of the supported leg kept straight and while in this position, bend forward as far as pain will permit. The pain will be felt down

the back of the supported leg. This pain is the result of extreme muscular extension. As the muscles are extended the blood-vessels as well as the other tissues are extended also, and a peculiar condition arises. As the tissues are extended, the diameters of the vessels remain the same, so that, while their lengths are greater and their diameters no less, their capacity increases and thus a volume of blood greater than normal is drawn to them. We get a *vis-a-fronte,* or suction force, which draws the blood onward and relieves the strain on the heart. The effect of this movement is to reduce the strain on the heart after a hard muscular exertion of some kind.

A question may arise as to the truth of the statement that the vessels retain their normal diameters, though their lengths increase. The highest points in the back of the leg are the buttock, middle of the thigh and the swelling of the calf muscle. As the body bends forward, the skin and superficial facia are made tense, and the greater the extension the straighter becomes the line marked by the skin so that, as this is aligning itself with the highest points along the back of the thigh and leg, the hollows or natural depressions at the knee and just below the buttock are obliterated, or caused to be filled with blood, because as the skin is elevated here a suction force causes a retention of blood and a distension of deeper tissues that sucks in more blood. There is a negative pressure on the larger vessels that forces them to at least retain their normal sizes and thus, their lengths increased, the lumens not decreased, and the increase of blood in the capillaries at the points of suction, causes the flow of blood to the leg.

The name "slow-leg movement" is a misnomer. What the Swedish gymnasts really meant by this term is a movement that will produce vascular expansion.

In this class are included movements that simply cause an easier flow of blood by straightening the path of the vessels. Lying in bed, with the arms out from the shoulders will straighten the axillary arteries and their branches and reduce the natural resistance sufficiently to relieve a very weak heart.

The definition of this type of movement is: "A movement in which the passive extension produced is greater than the active contraction required to perform the movement." Most vascular expansion movements are performed by fixing the leg or legs in such a position that a mass of muscles will be put on a powerful stretch as the trunk is bent forward. The fact that most of these are performed to effect chiefly the leg muscles has caused them to be erroneously called slow-leg movements. This name is what confused our American physiologists when they attempted to refute the claims of the Swedes.

Hough has written a refutation of the Swedish day's order which has served as ammunition for a number of other misinformed critics, in which his chief bone of contention is the "slow-leg movement" question. He proceeded to test the efficacy of the slow-leg movement by interpreting it according to its name, and, of course, his premises being wrong, his conclusions must be. He made his subjects run and perform various exertions, and noted how long a time elapsed before the heart beat became normal of its own accord. Then, after the subjects repeated their muscular exertion he had them perform such movements as alternate slow flexion of the legs, and slow placing of the feet forward and sideways, and discovered no difference in the heart's re-adjustments, between allowing it to become normal of its own accord or by use of these *slow movements of the legs.* All this simply shows that he did not understand what the

Swedes had in mind when they mentioned slow-leg movements, and he tried to disprove the Swedish system before attempting to understand it, and his work has served to mislead many who do not care to look further into this system than Hough's critical essay.

Dr. Sargent has said that the Swedish day's order is of no more importance in gymnastics than the arrangement of food's in a menu. In the next chapter we shall explain the reasonableness of the day's order. Dr. R. T. McKenzie in his recent book, "Exercise in Education and Medicine," attempts to score a point against Swedish gymnastics, in favor of American (?) gymnastics, by quoting Hough's findings. He accepts Hough's statements, looks no further, and adds to the list of misinformed, and, unconsciously, misleading teachers of gymnastics. These facts do not hurt Swedish gymnastics, but mislead many, and delay the popularity and support, in this country, that this system deserves.

Respiratory movements are employed to reduce a too rapid heart beat. It is well to consider these with slow-leg movements and determine when each respective class is to be employed. If the heart is beating rapidly as the result of a long run or any exercise of endurance, it is because of an accumulation of carbon dioxide in the system and the heart rate is increased through the system's endeavor to rid itself of the poison, therefore an abundance of oxygen is needed and respiratory movements should be employed to supply this. Where the heart's rate is increased after a brief but violent exertion, it is the result of the increased blood pressure caused by holding the breath, and temporary damming up of the blood in the muscles. In such a case, slow-leg movements are indicated to normalize the heart rate.

Such a vascular expansion movement as described

above, or what is called long sitting, that is, sitting with the knees straight, and bending the trunk forward as far as possible will often produce a suction of blood to the legs sufficient to cause a lack of blood in the thorax, relieving the heart, or reducing the amount of blood in the head to such an extent as to promote sleep. Many individuals have been enabled to enjoy a night's rest after a few repetitions of this movement when all other procedures failed. This type of movement is a useful adjunct to any natural treatment for the type of insomnia due to cerebral congestion or mental over-activity.

The general elasticity of the body is improved and preserved by such activities as running, jumping and vaulting, since these require elasticity for correct execution. These also develop co-ordination of the eye and the muscles. The eye grasps the situation at a glance and the muscles follow up by almost automatically performing the required movements. This co-ordination of sight and muscle action might be termed muscular timing. In general, with reference to sports and games it might be said that the fundamental rule is, that, within proper bounds, any form of activity requiring elasticity for its execution will develop elasticity in the participant; that requiring skill will develop skill; that requiring grace will develop grace; that requiring strength will develop strength, that requiring agility will develop agility, etc.

For progression in gymnastics, voluntary contraction of muscles is divided into excentric, concentric and static. Excentric contraction is where the muscles are in contraction but giving up to the force. Concentric contraction is where the muscles are in contraction and overcoming the resistance. In static contraction the muscles are in contraction but holding a position. Examples of each are as follows: If one is

unable to pull up on a horizontal bar and is helped up to flexed arm position, then tries to control the descent, that is, tries to keep the arms flexed but is forced to give up to the weight of his body, the muscles of the arms are contracting hard but gradually lengthening out, we have excentric contraction. An example of concentric contraction is where one is able to pull up to bent arms. In the same type of exercise, an example of static contraction is illustrated where one is strong enough not only to pull up to bent arms, but hold the body weight at any position of arm flexion. These three forms of contraction are given in order of difficulty and should usually come in that order in difficult feats in gymnastics. From the relation of these three forms of contraction we get the law that: "In gymnastics no position should be used as a commencement position for any movement until it has been mastered as the final position of some previously practiced movement."

Healthy working of muscles needs healthy state of body generally. Good food and fresh air, accompanied with other hygienic measures, will supply the most favorable conditions for muscular growth and repair.

The muscles should not be subjected to continuous pressure, as this interferes with the free flow of blood and lymph, and also prevents their free contraction. Corsets, belts, round garters and all tight bands are unhealthy. Given a free blood and lymph flow, muscular tissue is kept in best condition by exercise. If a muscle is exercised periodically with sufficient rest, if subnormal, it will grow in size, and, when normal in size, it will develop finer grain. As the quality of the fibres improves, their motor irritability will increase and there will result a closer affiliation between the muscle and brain. But, if exercise is overdone, and if insufficient rest is obtained, the muscles will waste

away, become atrophied, and, in extreme cases, paralyzed.

For contraction muscles depend primarily upon oxygen. During contraction, muscular tissue draws oxygen from the lymph much as a burning match draws oxygen from the air. The haemoglobin of the blood gives up its supply of oxygen to the lymph fluid, and the various kinds of cells, being bathed in lymph almost as fish in water, draw on this oxygen supply as they need it. Of course, the cells must be nourished in order to function and the nourishment is procured from the blood. Given their proper nourishment, muscles function according to their oxygen supply. If oxygen is not supplied rapidly enough, fatigue sets in. Fatigue is due to lack of oxygen and an accumulation of carbon dioxide and other poisonous by-products of muscular contraction. When one exercises too much or overworks his muscles in any way the by-products of muscular contraction may accumulate too fast and he will get all the bad and none of the good results of exercise.

The muscles in the living human body never reach the stage of absolute fatigue. Absolute fatigue may be illustrated by experiment. If a muscle of a living animal is isolated and an electric current is run through it, it produces contraction. When the muscle fails to contract under this stimulus a stronger current will again produce contraction, and so on, until a point is reached where the strongest current cannot cause the muscle to contract. Such a muscle is completely worn out. When the muscle in the normal living body is approaching the danger point of fatigue, pain sets in and the muscle must rest. The strongest will cannot cause a painfully tired muscle to contract. Fatigue is a danger signal which indicates the first stage of exhaustion and must be heeded. But the well-trained,

well-nourished muscle, which gets a plentiful supply of oxygen knows no fatigue. The sluggish, lazy and fat individual, who allows his muscular fibres to degenerate into fat, knows little else than fatigue upon least exertion. In such an individual the actual size of the muscles is less than a slender person, for, though the fat makes his muscles look larger, the fact is that much fat has taken the place of red fibre, and this condition interferes with free muscular action, hence, there is less chance for a free exchange of tissue. So that, while absolute fatigue, resulting from overwork, may never occur in a human being, a state of semi-fatigue, due to insufficient work, is very common.

Overwork and violent athletics may affect the heart. The heart muscles may wear out faster than they can be repaired. In such a case, as the fibres decrease, the walls grow thinner, and the heart cavities dilate. The valves do not change as the heart's size increases. The openings increase correspondingly as the walls dilate, but the valves, retaining their size, soon prove insufficient to close the outlets, and at diastole, some of the blood flows back. This is called regurgitation and is recognized by the so-called murmur. Besides this backward flow at diastole, the thinned flabby walls cannot contract hard enough to entirely overcome the natural, elastic resistance of the arteries, and we find low blood pressure. When the heart is incompetent, owing to thinned walls, or valvular leaks, or both, the pulse is hastened, because nature tries to compensate by making up through speed what it lacks in strength. With a dilated, or athletic heart, the pulse is usually high and the pressure low.

The heart muscle can be developed as any other muscle. To overcome its incompetency one should resort to such procedures as kneading of the muscles,

circumduction of the extremities, and respiratory movements. These will relieve by performing a large part of the heart's work. When the heart muscle has had a chance to recuperate, one should apply easy resistive movements of the extremities. In Chapter IV the outline of procedure is explained in detail. The principle suffices here. As progress is made in treatment, the pulse rate is reduced and the pressure gradually raised until both are constantly normal.

Muscular growth depends upon work alternated by rest (and rest sometimes means a change of work), or by massage. Nothing, not even sleep, will restore an exhausted muscle as quickly and completely as massage. Five minutes of thorough kneading given to an exhausted muscle will enable one to repeat what has exhausted it. Experiments have been tried repeatedly to test the truth of this statement, and always, it has been borne out in fact. The test is to repeat lifting a given weight until the muscles are thoroughly exhausted, then rest five minutes and try to repeat. Never has a subject been able to repeat his first performance after the rest. But, where lifting is followed by five minutes' massage of the exhausted muscles, he can repeat, and, in some cases subjects have surpassed their records. In Chapter III is given a summary of the latest findings in this line.

Co-ordination may be classified as voluntary and involuntary. The voluntary type is under control of the will and the involuntary includes the awkward and unnecessary movements that often accompany any effort. Good gymnastics tend to improve voluntary and overcome the involuntary. Voluntary co-ordination exists when one has such control that he can easily localize effort to any given region of the body at the exclusion of other parts. When one lacks the power of isolation he has involuntary co-ordination.

Voluntary co-ordination has been called active repose. That is, when a movement is to be isolated to any given region, the rest of the body is kept from moving by active control. It requires mental effort to keep a part still which would otherwise fall into some kind of motion as the active parts move.

As an example of active repose take arm flinging upward. The body should be kept in good fundamental standing position with the chest well forward and head erect, while the arms are being flung forward upward, the rest of the body, from the head to the feet should be perfectly still. In this case we have active repose of all but the arms. The least swaying of the body or head is an example of involuntary co-ordination, or inco-ordination.

Grace, perfect control, or exactness of form in gymnastics depend upon one's ability to retain muscles or parts in statical activity, that is, to maintain a correct starting position while the active parts perform the movement.

Next to health, the object of gymnastics is to suppress all useless and awkward movements and develop good control. Useless movements are a waste of energy. By developing good co-ordination and isolation one becomes more and more able to concentrate on the parts used and, in time, the least voluntary stimulus will suffice to give the greatest result. Therefore, the aim of educational gymnastics is to cultivate complete control of the powers already present, rather than to produce more muscular force.

Animal Dynamics.

Heat in the body is kept up by metabolism. Energy is furnished by food, air, and oxidation processes. The energy is partly converted into mechanical work and partly transformed into heat.

One indispensable condition of movement in the body is heat. The problem as to how the muscles are related to heat is not very well understood. But it is well known that there is a close connection between the amount of heat expended and the amount of work performed. Everyone has heard the phrase "warming up to a thing." No athlete can perform at his best if he feels chilled. Outdoor records are equaled or broken only in warm weather. Warm weather is favorable to any bodily exertion. Heat creates in a muscle an aptitude for coming more quickly into action.

Heat always accompanies oxidation. In the living tissues oxidation is going on even while they are at rest, so that heat is ever present. The more active the organ the hotter it becomes. In the body as a whole heat is chiefly produced by transforming energy into mechanical work. The part of the body that is most active usually has the highest temperature; this is true of muscle, digestive organs or brain tissue. But the general bodily temperature is constant at about 98.2 F. If sub or supranormal for any length of time it is an indication of disease. Therefore, during great muscular activity the heat produced has to be gotten rid of and the normal temperature is preserved principally through the process of evaporation of perspiration. Other processes which aid in bodily heat regulation are conduction, convection and radiation.

Conduction takes place whenever heat is transferred directly from one mass to another with which it is in contact. A good example of this is heating a flat-iron on a stove, the heat from the stove is directly communicated to the iron, and then from one particle of the iron to another. Some objects are poorer conductors of heat than others. Air is a very poor conductor, that is why certain fabrics worn next to the skin

which are porous and contain much air in their meshes retain bodily heat better than others.

Convection takes place when a warm body is placed in a fluid, as water. Heat is conducted from the warm body to the surrounding layer of fluid, but this warmed layer moves off and makes way for a cooler layer which is in turn warmed, until the warmth of the body is used up or has warmed the fluid. Still air does not cool the body readily, but moving air, or wind, causes a rapid fall in temperature.

Radiation of heat is what takes place from the sun to the earth. Any warm body may radiate heat to surrounding cooler bodies. While this process is slight from the human body, it at least deserves mention.

Evaporation of perspiration is the most familiar process of cooling the body. What takes place is not clear to all. Place ether on the finger and blow a steady current of dry air upon it and you will have a feeling of cold on the skin as the liquid is evaporated. It has been shown that while evaporating a fluid borrows heat of the surrounding surface. Therefore what cools one is the evaporation and not the secretion of sweat.

During exercise or vigorous work, or when one is surrounded by hot atmosphere, perspiration takes place much more rapidly than during rest. If one is in a hot room, perspiration is the only means by which the body can equalize and preserve its temperature. If the pores are closed by dirt, or if anything, such as a rubber garment, for instance, checks evaporation, bodily heat soon rises, and in some cases this becomes dangerous. Many people reported to have died from the intense heat of summer, really died of an unclean skin. When the skin is clogged, and evaporation is checked, the lungs are strongly taxed, because the elimination of moisture through them is

greatly increased and breathing becomes laborious. The power of endurance is greatly lowered, if the skin is unclean.

To summarize we might say that the skin should be kept clean; exercise should be practiced in a cool atmosphere; little and loose clothing should be worn during exercise. A bath should follow the exercise and thicker clothing put on.

EXERCISE AND RESPIRATION.

To the body, the most essential element is oxygen. During activity the amount of oxygen burnt up is so much greater than at rest that, next to pure air, good respiration is most important. Good respiration, according to Ling, is the basis of gymnastics. Unless you can breathe well your physical work is bound to be reduced for lack of endurance. The physical powers will increase with improved respiratory power.

Exercise induces respiration. Even standing position compared with lying position shows a difference in favor of the former. Increased respiration induces more rapid lung circulation, and the exchange of gases is increased. Every great muscular effort is involuntarily preceded by an inhalation. This is to supply an abundance of oxygen and it is also an automatic way of fixing the bones of the thorax that the muscles attached to them may have a firmer anchorage for contraction.

In "Parkes' Practical Hygiene," Dr. Edward Smith's experiments are interesting. According to Posse: "He found that if the quantity of air inhaled in the lying position was taken as a unit, that inhaled at sitting position was 1.18; in standing position, 1.33; walking one mile an hour, 1.90; walking four miles an hour, 5.00; and walking six miles an hour, 7.00, etc. Or, in other words, if a man at rest inhales 480 cubic

inches of air per minute, while walking four miles an hour he inhales 2,400 cubic inches, and while running six miles an hour, 3,360 cubic inches. The carbon dioxide exhaled is increased in proportion."

At ordinary inhalation the inspiratory muscles, especially the diaphragm, contract, the chest capacity increases and the air is sucked into the lungs. In ordinary exhalation the same muscles relax, allow a recoil of the air cells, and the air is forced out. Under ordinary circumstances respiration is an automatic mechanical action. When the oxygen supply is low, carbon dioxide in the blood stimulates the respiratory center in the medulla to action.

Vital capacity is determined by the amount of air one can forcibly draw into the lungs after emptying them. During forced inhalation the ordinary inspiratory muscles, and a few others contract forcibly to elevate the ribs and completely contract the diaphragm. In forced exhalation while the inspiratory muscles relax, the expiratory muscles contract forcibly, depressing the ribs and decreasing the chest capacity.

There is but one correct type of respiration for both men and women; that which includes the entire chest. We have the advocates of the diaphragmatic or abdominal type of respiration. Their claim usually is that this type, through the motion of the diaphragm, acts upon the viscera, giving them internal massage and, by producing an oscillation of the intestines, aids digestion and promotes excretion. There is truth in this and their claim rests on fair foundation. But they forget, in their eagerness to defend this type that the costal type has most points in its favor. The apices of the lungs are not there merely for ornament. The first function of respiration is to supply oxygen and purify the blood, not massage the viscera. There is

really no need of bulging out the abdomen at inspiration to exercise the diaphragm. The diaphragm automatically contracts as the first act of respiration, so that if an effort is made to fill the apices of the lungs by lifting the ribs, the bases of the lungs must fill first, unless interfered with by tight garments. Air, like all gases and fluids, follows the line of least resistance. The straightest and easiest path for air to follow into the lungs is downward to the lower lobes. To pass upward to the upper lobes and apices it has to make a sharp turn at the point where the trachea branches upward. Furthermore, cold air cannot rise above warm air. The incoming air is cooler than that already in the lungs, and, therefore, a special effort is required to expand the upper lungs while little or no effort will fill the lower lungs.

The best way to acquire normal respiration is to center all efforts toward developing the type which one lacks and then, the combination of the two will give the most beneficial results, because it will employ the entire thorax and promote oxidation to its utmost possibility. Respiration is absolutely essential to metabolism. By supplying oxygen it hastens assimilation of food and elimination of waste matter. Absence of oxygen even for a few minutes will cause death. Vitality is largely dependent upon the ability to exchange carbon dioxide for oxygen. As the ability depends upon the amount of surface over which the blood can be spread in the lungs, and as this amount of surface is determined by the expansiveness of infundibuli or air cells, the importance of full, free respiration becomes apparent. The difference between the chest capacity at inhalation and exhalation determines the expansion of the air cells. The greater this difference the better the respiration. Therefore, the more supple the chest the stronger

the inspiratory muscles; and the more elastic the expiratory muscles the better. The great importance of proper respiration was recognized by Ling when he laid down the following law: "Any exercise that compresses the chest or interferes with free respiration must be discarded." In the choice of movements in the Ling system this law is always kept in mind.

An exercise that causes a pupil to hold his breath is contra-indicated. Even if the exercise is correct from the standpoint of anatomy, physiology, and psychology, if the pupil cannot do it without holding his breath it should be postponed until he has developed to a point where he can do it perfectly. This rule seems extreme, but all general rules are extreme in relation to special cases.

The posture of the body during the performance of any movement largely determines its effect. No matter what exercise one practices, if he does not preserve a correct posture the exercise will in time prove more injurious than beneficial. The posture of the chest is especially important. To keep the chest in proper posture the head must be kept erect with the chin drawn in, and the shoulders well back. Any movement which requires, or in which is maintained, a good posture of the chest will have a good effect. Since the posture of the chest means so much for general effect, every movement must be outlined with relation to its effect upon chest development. As Ling has said: "Every correctly executed movement is in a measure a movement for chest development."

The postures of the head and chest are interdependent. There are muscles attached to the head, neck and upper ribs that establish a very close relation between these parts. If one's occupation causes him to stoop over, or causes the chin to protrude, the consequent relaxation of the sterno-cleido-mastoid allows

the sternum to descend and depress the upper ribs. At forward flexion of the neck the fixation of the scaleni muscles is removed and the upper ribs are no longer kept elevated. Thus the chest, over the apices of the lungs is diminished in capacity and the air cells of this region are compressed. If this condition continues for a long time, that is, if it is repeated with sufficient frequency, the clavicular region of the chest will gradually flatten, its muscles will shorten and, finally, no amount of voluntary effort will suffice to expand it.

As the sternum and upper ribs descend, all the lower ribs and the rest of the respiratory apparatus is allowed to settle, and at length, the appearance of the chest at inhalation becomes very much as it should at exhalation. This general settling down affects all the internal organs, so that not only are the lungs handicapped from lack of space, but the heart and large blood vessels are impeded in their functions. The depressed condition of the ribs and sternum also means a lowering of the upper attachment of the abdominal muscles. These muscles, because their extremities are brought nearer together, are easily bulged out by the intestines, and being thus deprived of their support, the abdominal viscera sag, and all this superinduced pressure predisposes to optoses and hernia. In women, the bearning down of the viscera often produces falling of the womb.

With a depressed thorax the respiratory function becomes deficient and oxygen is not supplied rapidly enough to meet bodily needs. The system, thus deprived of oxygen, can at best function at very low ebb. The law that action is the first condition of life is very manifest in the human body, for if the activity of any portion of it permanently decreases it will grow more and more incapable of performing its function. Thus, when the chest contracts, not only do its muscles

shorten and make it still more rigid, but the tissues and air-cells gradually undergo a change of structure from want of expansion and recoil and they finally atrophy and become subject to disease.

To preserve healthy lungs we must make them work, and by doing this we improve general health as well. To accomplish this purpose we resort to exercises that will extend the expiratory muscles and thus supple the chest; next, that will strengthen the inspiratory muscles and expand the chest in every diameter; and lastly, procedures that will cause greater activity of the lungs. Arch flexions, heaving and shoulder blade movements will supple, expand, and correct the posture of the chest and respiratory movements, running or any exercise in moderation that will increase the need for respiration will benefit the lungs by activity.

Exercise and Circulation.

The forces that keep the blood flowing through the body are the contraction of the heart; the elasticity of the walls of the arteries, the force of capillarity, and the contraction of the voluntary muscles upon the veins. The veins contain valves which compel the blood to flow only in the direction of the heart. There is no backward flow. Centrifugal forces and gravity may forcibly effect the flow of blood. Swinging on the rings or holding onto a merry-go-round going at great speed, with the feet describing the largest circle, will cause a rush of blood to them that is sometimes sufficient to cause anaemic dizziness or faint. Resting the foot above the level of the head will produce a drainage of it through force of gravity.

The effect of exercise on circulation is two-fold. As a muscle contracts it presses on the capillaries and squeezes out some of the blood, while it acts as a

stopper to the blood in the veins behind it. Since blood in the veins can only flow in one direction, the effect of muscular contraction is to dam it up temporarily, especially if the muscle is held contracted for some time, the heart is consequently forced to pump harder, but often without success. The law to be learned is that short, frequent contractions will hasten circulation in the muscle, while a muscle kept contracted a long time will offer resistance to the heart. As to the effect of prolonged contraction, we must consider how great a bulk of muscle is under contraction and how long the contraction is continued. Tug-of-war, because it employs all the muscles in hard and long continued contraction, can never prove beneficial to circulation and health. The best that can be said of this type of sport is that some people may be so strong as not to be injured by it. But the majority had better avoid it.

Another force that produces an increased amount of blood to the region of a contracting muscle is vasodilation. The muscle cells, as they expand, take up more than an ordinary quantity of blood. Thus does a contracting muscle present an interesting set of phenomena. Each muscle cell seems bent upon performing its own individual function. In response to nerve stimulus each cell swells up and gives out sarcolactic acid, carbon dioxide and other by-products. It takes nourishment from the blood and oxygen from the lymph. The cell may be said to contract upon stimulus without knowing why it does it, and this contraction is the result of its chemical work, that is, the work which produces carbon dioxide, and sarcolactic acid. The combined swelling or shortening of all its cells is what causes a muscle to contract.

The pulse is increased by muscular contraction partly by the resistance it has to overcome and partly

by the need of arterial blood. The pulse rate is increased by an abnormal amount of carbon dioxide in the blood, just as it grows more rapid at the presence of any poison in the system. Nearly every toxic condition causes an increased heart beat. The increase in heart beat seems to be nature's method of self-defense against poisons. Heart stimulants are poisons, always. Normally carbon dioxide stimulates the heart beat, because more oxygen is necessary. This increased heart beat hastens circulation and respiration, more oxygen is absorbed and assimilated, and there is a more rapid exchange of tissues. Therefore, to make a part grow exercise it properly. Any active part, whether muscle, organ or brain, needs an increased amount of blood rich in oxygen.

Sometimes we find present a high pulse rate with low pressure. This usually indicates an incompetency of the valves to close properly. That is, as a result of heavy athletics or hard work, the heart has been enlarged rapidly, but the valves did not enlarge proportionately and at the systole they fail to completely close up the passage and part of the blood flows back. In case of regurgitation the heart may compensate by pumping faster than normal, that is, it makes up by speed what it lacks in efficiency. So, where the sphygmomanometer test shows high pulse rate with normal average pressure, even though a murmur exists, there is little to fear if the subject will follow proper gymnastic procedures. The heart may be gradually built up as any muscle. But, if the valvular lesion is due to infectious or contagious disease sequalae, gymnastic procedures are limited to the passive in usefulness. Where there is high pressure and normal or slow pulse, we have hardened arteries. Where there is low pressure and high pulse we have a lack of compensation in the heart and the condition

is serious. It means that the subject is approaching a stage of heart failure. The proper line of procedure for this condition is explained in Chapter IV.

In gymnastics it is possible to equalize circulation by general and specific procedures. In a well balanced gymnastic program the exercises for general effect precede and pave the way for those of localization of special effect. Those who need gymnastics the most are young people and sedentary workers of any age. The time of young people, who are or should be at school, and of sedentary workers, is taken up with brain work, therefore lessons are begun with the leg movements which may be simple but require attention. These will draw blood to the legs, relieve the congestion in the head, and change the mental activity from the intellectual to the motor centers.

Movements of extension are most important. Many of the blood vessels, besides pointing upward and compelling the blood to rise against gravity, are bent at acute angles. The blood, as any liquid, flows best in a straight line, because the straighter the channel the less the resistance caused by friction. In our daily routine we naturally and ordinarily flex our joints much more than we extend them. A flexed joint means bent arteries and veins. Extending them makes blood flow easier. Therefore movements of extension should occupy a prominent position in a gymnastic program. A bed patient with a weak heart may often gain relief by lying on the back, the arms straight out at the sides, to straighten the axillary arteries.

Vascular expansion movements may be overdone. They should only be employed when their need is indicated. The normal heart must have compensatory resistance. Great peripheral resistance may strain it, therefore heavy and long continued strains are bad. Vascular expansion movements practiced when not

needed may reduce the heart's natural resistance to the point of danger. The heart's condition, properly interpreted, indicates the kind of movements it needs.

Respiration and circulation are closely related. Thoracic aspiration is an aid to circulation. It occurs at deep inhalation. The capillaries and infundibuli in the lungs are separated by common walls. Through these thin walls the exchange of gases takes place by osmosis. It is readily seen that if the infundibuli are expanded by deep inhalation the distension of their walls means an equal distension of the capillary walls, and therefore an increased capacity for blood in their capillaries. This, therefore, causes a suction force on the blood to the lungs and, if exhalation is not too rapid, the re-adjustment is such as to aid the flow from the right ventricle, and it will not retard the flow to the left aurical. A rapid exhalation is liable to cause lung congestion and interfere with pulmonary circulation. Hence, to aid the heart, inhalation should be a little more rapid than exhalation. The frequency of respiration is reflexly regulated according to the need. Respiratory exercises may be active or passive. Types of the passive kind are given in Chapter III.

Their effects are as the general rule governing all passive movements. Passive movements aid circulation and as a rule drain a part. Active movements cause an afflux and flush a part. To flush a part, therefore, give active movements; to drain it, give passive movements, and at the same time, active movements to some distal part.

Exercise and Metabolism.

Exercise rightly regulated causes a rapid and healthy exchange of tissue. It promotes growth by increasing the process of assimilation and causes a more rapid excretion of old tissue. An active muscle is

always more richly supplied with blood than one at rest. Up to a certain point the more active a part the more alive and normal it is. Where activity becomes too great, destruction of tissue exceeds its reconstruction and loss of weight results. The constructive process is known as anabolism; the destructive, as katabolism.

Exercise improves the condition of the blood. More oxygen is used during activity than in rest, but a greater quantity is being supplied. Oxygen follows the law of supply and demand. The tissues in activity use up more oxygen, the blood is relieved of its latent supply more rapidly, and takes away more carbon dioxide and other poisons. The lungs, skin and kidneys rid the system of these poisons more rapidly and the need of more oxygen creates more rapid respiration. The blood being thus enriched with oxygen stimulates all the glands, organs and tissues to greater activity, so that every function is stimulated and the organism is refreshed. Unless there is a rapid process of metabolism created by activity, deep respiratory exercises are useless. The exchange of tissue should be first hastened, then respiratory exercises are useful.

Exercise increasing metabolism, not only creates a need for more oxygen, but also creates a need for more food. The tissues changing rapidly need to be renewed. The blood is hastily relieved of its nourishing principles, and this fact is manifested by an increased appetite. This means, better digestion and excretion; more food enjoyed and assimilated. Exercise, therefore, will tend to render one normal; if too fat, the weight is reduced; if too thin more flesh is taken on.

When one is inactive for a long time the system grows sluggish. The muscle fibers are flabby or undergo fatty degeneration, many of the fibers changing completely to fat. The liver is likely to get torpid

from slow circulation and enlarged from overwork. The kidneys are overburdened because they are forced to take on the duties of the skin and lungs, as well as their own. The intestines are usually sluggish, peristalsis is slow, excretion slow, constipation common. In this condition the lower bowels may be the source of auto-intoxication, for the bowels being incapable of ridding themselves of fecal matter with proper dispatch, gases and toxic principles are rapidly formed and some absorbed into the blood stream. With this general state of inactivity the entire system gets clogged up and nature finds relief through cleansing diseases as boils, carbuncles, pneumonia, or typhoid fever. A general state of sluggishness usually shows itself by frequent headaches, blurred vision, the blues, lack of snap and energy and then comes a breakdown.

Well regulated exercise, combined with good food, bathing, appropriate dress, and the best possible environment, will prevent many of our common ills and save many a doctor's bill. Exercise tends to bring about a perfect equilibrium of functions, which is not merely an absence of disease, but radiant health.

One means of aiding digestion is to hasten general metabolism. But locally, it may be aided by hastening portal circulation. This can be done by exercises that react directly upon the liver and portal veins. Trunk rotation and sideways flexions as well as abdominal and respiratory exercises accomplish this purpose. Trunk sideways flexions are especially beneficial, because, as one bends to the right, the liver is compressed forcing the blood out of it and at the same time the portal and intestinal veins are extended and their path straightened, making flow through them more rapid. Bending to the left causes an expansion of the liver, producing a suction force, and, at the same time, a slight compressing of the intestinal veins, thus is a

force pump action produced, hastening circulation through the intestines and liver and stimulating the entire digestive and excretory functions. Trunk rotation and abdominal exercises are supplementary to sideways flexion. They tone up the natural waist region, raise the viscera, and serve as a natural support. Respiratory exercises not only oxiginate the blood, but form a suction force on the inferior vena cava, which drains the liver.

The same exercises are useful and specific in preventing obesity or reducing weight. Fat begins to deposit first at either side of the lumbar spine. When a person begins to grow fat his waist line is the first part to show it. Sideways bending tones up the quadratus lumborum muscles and prevents fat. If one is already over stout, general exercise, with a reduction of farinacious foods, and an increase of eliminative foods as fruits and vegetables, with the specific application of lateral trunk movements, abdominal and respiratory exercises will reduce him to normal. Practicing this class of movements is also useful to prevent optoses. The stomach and intestines should be held up by the abdominal muscles. These, when in proper tonic condition, form nature's corset, keep the viscera up where they belong, and give the natural waist line. The normal physique shows that the depth of the chest is greater than the abdominal depth. Any other relation is not normal. Where the abdominal muscles are not tonic, the viscera are allowed to sag, and, sooner or later, the intestines and the stomach descend and various forms of digestive disturbances result. A readjustment of conditions by toning up the abdominal muscles will relieve most forms of indigestion.

Corsets are bad for several reasons. They pinch the waist and reduce the natural corset, or abdominal muscles, to flabby, fatty degenerate layers. They com-

press the lower thorax, weakening the respiratory function by interfering with natural expansion of the lower lung area. They squeeze the liver, sometimes to the point of causing a false lobe that extends several inches lower than it should. Below the narrowest portion of the corset the intestines are pressed downward instead of being sustained or forced upward, causing pelvic disturbances of all sorts. The modern corset is made to measure and does not compress the waist as much as the old styles used to, but there is not a corset on the market which does not limit the freedom of the waist muscles.

It is generally known, but worthy of repetition, that exercise should never immediately follow a meal. It may precede a meal, but should never be taken sooner than two hours after, for best results. The digestive organs need a rich supply of blood while functioning as vigorously as they do after a meal, and to create a demand elsewhere will give rise to disagreeable or serious complications. Exercise not only interferes with digestion, if taken too soon, but a full stomach itself interferes with freedom of activity. Many animals sleep after a full meal, and this is a safer and more physiological practice than the oft recommended walk.

EXERCISE AND NEURITION.

The relation of brain and muscle is of the highest importance, and our study cannot be complete until this phase of the subject is considered. A well-muscled physique under poor control is not as important as a moderately muscled physique under perfect control. At our stage of civilization brain means more than brawn. Quality not quantity counts in most things. Brawn should be under absolute control of brain to be at a premium.

The ideal of physical education is a harmoniously developed physique to serve as a tool under perfect control of the will. But the brain itself is in a measure dependent upon muscle for perfect balance and health. There is a normal relation that must exist for harmony. To negate the physique as wholly unimportant and to endeavor to make "divine mind" transcend all, regardless of the needs of the purely physical, is unsound. To endeavor to merely develop a massive muscular system, as many "enlarge-your-arm-one-inch-in-one-month" fakers advertise to do, and thus exercise to "keep up and get more" muscle, rather than train the muscle to serve the mind, is wasteful.

What is most needed in our day is good health, and physical efficiency for endurance, stick-to-it-iveness and concentration. How best to develop these qualities is the question of importance.

Muscular power and endurance are created by normal activity. Efficiency is developed as this power is brought under control. Strong muscles, to be of service must "respond readily to volition for power, speed, agility, gentleness, or repose."

The first object of physical education is to develop control of the forces already present. To acquire great strength is of secondary importance. The average individual has more than sufficient power latent within him if he only knew how to make it serve him. There is a limit, not only to absolute force, but to the need of the force possible to every one, but there is no limit to the possibilities of developing control of powers present or to be acquired, and good control is always of advantage.

To remain healthy, nerve tissue must be used, not abused. Activity means health to any tissue or organ. Our present life tends to develop sensory more than motor irritability. Inactive motor nerves undergo

degenerative processes and while this occurs, the sensory nerves grow more irritable. One-sided occupations, such as typewriting, are among the first to show the effects of unbalanced ennervation of the body. Nervous prostration is a total unbalance of ennervation. The common term "nerves," meaningless in itself, signifies various degrees of unbalance between the motor and sensory nerves and the brain. Balanced activity normalizes and renders more efficient the motor nerves and makes the sensory less irritable. A little daily practice of educational gymnastics is the best preventive measure to any form of nervousness.

Unless a movement compels concentration for its execution it is not educational. It may be beneficial to health, by promoting more rapid circulation and metabolism, but it is not educational in the sense that brings the brain and muscle into closer relation. Every movement of educational value has a definite beginning and ending, with one or more intermediate positions, and each distinct part must be executed perfectly for best results. When a movement has been mastered, repetition of it has little educational value. One should then proceed to a more complex one.

The nervous energy required to produce a new movement is at first great, but in time it becomes almost nil. A child learning to walk has great difficulty. At first, all his facilities are concentrated upon balancing alone. The least pause in his alertness of attention on what he is doing will cause him to lose his balance and fall. But constant effort soon enables him to get around without requiring his entire attention. As this progress is outwardly manifest there is a specific change going on within. The first mental control of balancing and walking was directed from the brain. But as each controlling impulse travelled down to the legs it left an impression in the motor cells of

the spinal cord. As progress set in, more distinct impressions were made on the cord, and less mental control was required until finally, willing to walk was sufficient and the motor centers of the cord controlled the required motion. After walking has become automatic, it is no longer developing. One can then travel for miles and his mind may be occupied with anything and everything but walking. No man would think of developing his mind by resorting to the easiest primary grade books, yet we hear physical educators affirm that the best exercise is walking because it requires least thought.

Americans oppose Swedish gymnastics, affirming that they are too dry. This is simply another way of saying that thinking is disagreeable. It is the kind of mental functioning that accounts for the fact that in this country, we read nine books of fiction to one of a scientific nature. It is said that the Japanese read nine of scientific nature to one of fiction. After a thorough investigation of all systems of gymnastics, the Japanese have adopted the Swedish system. The real "yellow peril" that a few jingoes love to dilate on, is our laziness in mental effort.

The automatic drill, set to music, so in favor with the average American educator, is not educational. When a drill has become automatic and set to a given piece of music the individual fits himself to the set movements and rhythm, and instead of the gymnastics answering his needs he is altering himself to fit the drill. While serving in the militia, some years ago, the company was taught a rifle drill that was very easily mastered, and set to the then popular tune of "Mamie." After practicing the drill for a few weeks it became so automatic that, ever since then, every time I hear a strain from "Mamie," I involuntarily start

to recall the drill. Such drill work is not more educational than the popular two-step or waltz.

In good gymnastics we practice an elementary movement until it becomes automatic, then the next and next of the same class. A well rounded program for each lesson, with each movement adjusted to the needs of the individual, will require his concentration; it will exercise his entire physique and refresh him. An automatic drill will tire the body without relieving the mind. In controlled gymnastics the mental worker gains rest by the change of activity in the brain.

Gymnastics requiring concentration react on the brain by increasing its growth. While the motor centers are active more blood is drawn to them, exchange of tissue takes place more rapidly, nerve cells are more rapidly developed from need, and there results a closer affiliation between muscle, nerve and brain. The best brain possible is dependent upon a good muscular foundation. Brain tissue, according to the laws of evolution, followed muscular growth. Muscle came first, and nervous tissue afterward as a result of need. In man the brain has reached a higher development than what is simply sufficient to serve muscle, but both are still interdependent. Those whose time is entirely taken up with mental pursuits develop a puny physique which nature soon snuffs off. One does not fit into our physical world unless his physique is at least adequate to his brain. The muscles depend upon the brain for control, but degeneration of the muscles at least means destruction to their controlling brain areas.

Progression in gymnastics from the standpoint of control is made by first using those that require the least amount of mental effort and gradually changing to forms that require greater concentration. Symmetrical movements, that is, movements in which both sides of the body do the same thing, come first. It is

easier to get control of the arms or legs if both sides have the same work to do, because volition from one side of the brain sends a little impulse to the same side of the body, no energy is wasted when both sides work equally.

Unilateral movements are next in order. Where one side works while the other is resting, concentration or localization of effort is developed. The part of the body that is active requires mental control and at the same time the rest of the body is kept perfectly still. Therefore, while one small portion of the body works, there is retention of position in the rest of the body.

When control has reached that stage of efficiency that enables one to perform a unilateral movement perfectly, the next step is to introduce bilateral exercises. In this type both arms or legs are exercised simultaneously, but for different movements. In this case each lobe of the brain is active for a different movement. This type of movement is useful to develop equal power in each half of the brain.

A symmetrical exercise may be illustrated by extending both arms sideways simultaneously. A unilateral movement is illustrated by extending one arm sideways, then, while it is kept at bend position, the other is extended. Extending one arm upward and, at the same time, the other one sideways, is an example of bilateral work.

As proficiency is acquired in the more difficult types of exercises, by following the same law for the legs as the arms, and by combining both leg and arm movements, one at length attains a standard of control in which the muscles and the brain are so in tune that to will an action is almost identical with doing it. One then possesses what is called muscular sense, which means that in whatever position he is placed, whatever condition surrounds him, from a social gathering to a

train wreck he preserves his presence of mind. This muscular control gives one a full realization of consciousness of his power, which might be termed consciousness of self as contrasted to self-consciousness. Such a degree of self-control gives one power to more easily govern his passions and appetites and paves the way to the highest degree of physical and moral courage.

It is worth while following closely a system of progressive gymnastics that will gradually develop one's powers and in the end give him complete mastery of himself. The constant practice of mere tricks and stunts through play or spectacular gymnastics, tends to develop self-consciousness at first, and self-conceit later on, when the stunt is mastered.

There is morality in physical education which must not be overlooked. It is determined by one's motive. If one practices gymnastics simply to reduce his weight, or to increase his appetite that he may enjoy his food more, or plays games for the sake of victory, he will never realize the pleasure and long enduring benefit of the person who exercises to make his physical body a responsive tool to his mind in order that he may become more efficient to serve the world in his best capacity.

There is another side to the study of exercise and neurition. The constant effort to perform movements that require mental control will develop a close affiliation between the brain and the muscles. And the closer the brain and muscles are related to each other, the more readily will either affect the other. The underlying law in Delsarte's system was based on the hypothesis that posture produces feeling. It is also true that feeling produces posture. The skulking attitude of the murderer who is conscious of suspicion and the hang-dog look of the guilty or the timid are

examples of feeling producing posture. The actor, to really impersonate and act out one of these conditions must assume the fitting attitude in order to feel the passion or state of mind and make his acting natural. Therefore we find that posture tends to produce a corresponding feeling, and feeling is manifested by posture. Where one tries to conceal his feeling by assuming a posture different than his feelings would produce, his false posture is exaggerated.

There is an inter-relation between the sensory and motor nerves. Lack of use of the motor nerves, that is, lack of sufficient activity, causes their degeneration, and at the same time the sensory nerves increase in irritability. When the sensory nerves are hypersensitive as a result of the under-use of the motor nerves we find a condition of nervousness. Neurasthenics, of various degree, are usually those who lead a sedentary life which requires great mental and little physical activity. Where perfect harmony exists between the sensory and motor nerves we find all the functions normal. The sympathetic nervous system is dependent in a large measure upon the harmony between the sensory and motor nerves.

PERIODICITY.

To be of lasting value exercise should be repeated regularly. To endeavor to put all exercise possible into a few hours or days each year, as many do on their summer vacation, and then laze around the balance of the year, doing only what is absolutely required by one's daily work is worse than useless. It is useless because it has no developing effect. And it is worse than useless because it will render the muscles very sore and may serve as the exciting cause for more serious developments. Exercise may be considered in the same light as suggestive therapy. That is, the oft

repeated practice of any set or series of movements will tend to mold the parts exercised according to the nature of the movements, and the posture held while practicing them. Lessons should follow each other frequently enough for the effects of one to last until another is taken. The regularly repeated exercises will create a nutritive change in the muscles, producing new cells and refining the fibres.

Unless exercise is kept up through life, even though one's early years were very active, the muscles and motor nerves will undergo a form of fatty degeneration. The muscles may for a time retain their rounded shape, but microscopic examination shows fat distributed among the muscle fibres or replacing them completely. The motor nerves, from lack of use become less and less responsive to stimuli and as a result we find a condition of awkwardness, poor endurance and loss of strength. and frequently auto-intoxication.

A repetition is not only advisable of the lessons but of the movements themselves. A movement should be repeated until it is mastered, then go on to the next of the same class. But some movements never cease to be beneficial. For instance, arm flinging upward, or sideways, is always beneficial as antagonistic to the tendency of gravity and daily toil to droop the shoulders. Gravity is constantly pulling down on the shoulders, and most occupations force one to use the pectoral muscles in a stooped position. The effect is to compress the chest and round and droop the shoulders. These arm flingings keep the chest muscles extended and supple the thorax.

For effect in development each movement should be repeated at least three or four times to each side. This will allow each side to contract and relax alternately and it will also tend to equalize strength and skill. Since the first stimulus sent out from the brain

has the best effect on development it is well to begin each movement to the weaker side. In class work, we first do them to the left, because in this way we reach the majority's weaker side first.

For best result exercise, according to one's needs, should be practiced every day, preferably, the first thing in the morning, for it has the effect of toning one up and, as it were, set him for the day. Twice a week is the least often one should exercise. Less frequently will only make the muscles sore and the effect of each lesson is nearly lost before the next one is taken. The length of time for each lesson should be regulated by the individual's need. An exercise of 15 minutes each morning is better than two one hour lessons per week.

INDIVIDUALITY.

The mechanics, physiology and psychology of exercise all have their influence on the individual. No two persons are exactly alike, so exercise must be modified to suit each one. In general it may be said that all underlying rules apply to every one alike, but the methods of applying these rules vary according to each case. The laws which govern physiological functions are necessarily the same in all, yet in their application they must be modified by individual differences. What follows as an absolute effect in the majority may be absent in the minority and vice-versa. What benefits one may injure another. For instance, to supple the chest, elevate the ribs, and increase the respiratory power, arch flexions are best for the majority, because the majority of people have a tendency to droop forward in the upper dorsal spine, depressing the front of the ribs and sterum and fixing the thorax. Bending backward at the upper spine and arching the chest will tend to correct this condition and improve the respira-

tory capacity. But, in exceptional cases, where the dorsal spine bends forward instead of backward and the ribs are fixed, the practice of arch flexions will render a bad matter worse. The chapter on corrective gymnastics goes extensively into the application of general laws to individual cases.

Suffice it to say here that in making out a program of exercises we should measure the individual by himself. Particular attention must be paid to one's strong and weak points and special procedures should be introduced to strengthen the weak parts, along with the general program to promote harmony of all organs, brain and muscles.

PHILOSOPHY OF EXERCISE.

Exercises should be chosen to fill the needs of the body. In relation to the muscles themselves the aim should be to develop a condition of perfect elasticity. Where one's muscles are soft and flabby, making him loose jointed, to correct this defect the gymnastic work must contain many exercises requiring muscle tensing, as antagonistic movements. If one's muscles are overtense, giving him a condition designated as "muscle bound," he needs exercises of extension and of a limbering nature. When the muscles are properly developed in good tonic condition, the body and limbs show a well rounded surface with gentle swelling where they naturally should be. There should never exist a state in which any part of the body looks like a relief map or wash board. Such a condition shows an unbalanced development. If perfect elasticity exists in the muscles, one can perform with equal facility difficult feats requiring great strength, or balancing feats, or feats of agility and extension requiring great control and extensibility. It is when perfect elasticity

exists that the body serves as an efficient servant to the will.

Gymnastic progression is to be considered from several standpoints. The basis of progression is two-fold. First, from the standpoint of nervous irritability progression is made from the simplest movements, that is, those that require least concentration and control to the most complex. Secondly, from the standpoint of muscular irritability progression is made from easy to strong movements. The first and most important law of progression is from the standpoint of control. The limit of progression possible from the muscular standpoint is soon attained in any individual. No one can ever get far beyond a certain limit of force, but few ever attain a limit of skill. Therefore progression from the standpoint of irritability of nerves is limitless, but from that of muscle it is soon limited.

Progression is of three kinds: First, from exercise to exercise of the same lesson. For the best results exercise should follow each other in a regular order, the day's order, given in the next chapter, explains why a certain definite order is important. Secondly, progression is made from lesson to lesson by introducing new movements of each type appearing in the day's order, as soon as the preceding have been mastered. One should not go from one exercise to another merely for the sake of variety, but rather, for the sake of control. Progression is made from a third standpoint, by introducing games or gymnastic play with young children, gradually changing to specific, concentrated educational gymnastics until full growth is nearly attained when it becomes safe to allow competitive sports and games. Of course, games and play are valuable at all ages, but the emphasis is to be placed upon educational gymnastics, for preventive

and corrective purposes at the proper period. Therefore it may be said that progression is from general to special to general. This is true from the third standpoint. It is true of the day's order, in which the first and last groups are general in effect, while the exercises of the middle one are selected for specific effects. Lessons are quite general at first, but soon become very specific, if the laws of progression are closely followed, and then, when good control has been attained, for every type of movement they become general in that more playful work is introduced.

From a more specific standpoint in reference to the same class of movements there are many methods of progression in gymnastics. The simplest, crudest and most useless type of progression is exampled in dead weight lifting where a little is added each day to the dumb or bar-bell, and in time one gets an enormous bulk of muscle which is of little use except to perform their daily stunts. This method is sometimes called the Milo system, after the Greek, Milo, who, it is said, began carrying a calf across the arena at Olympia every day, and as the calf gained in weight Milo's strength and dexterity increased accordingly until at one of the Olympiads, Milo carried a full-grown ox across the arena. This type of progression is the muscular type which goes from easy to strong.

Progression is made, (1) by duration, that is, increasing the number of times for each movement; (2) by series, that is, by combining two or more simple movements into a series, as, arm extension forward, upward, sideways and backward; (3) by statical action, that is, by placing the body into some attitude which is to be retained while some active movement is performed; (4) by change of rhythm, that is, when a movement done to count, and at a regular rhythm has been mastered, it is practiced by changing the rate

of speed for all, or various parts of the motion; (5) by changing the length of the lever, as for instance, in sideways bending where the movement is first done with the arms at the sides, then on the hips, then arms at shoulder height, then extended upward; (6) by shortening the base in the direction of action, as in the same movement just instanced, i.e., sideways bending, first with the feet apart, then together, then heels and toes together, etc.; (7) by increasing the weight, that is, by using dumb-bells of increasing weight; (8) by changing the velocity, increasing it in those done most easily at slow or moderate speed, and decreasing it in those done most easily by speed; (9) by going from excentric to concentric to static, for instance, if lying leg elevation is difficult, we begin by flexing the knee, extending the leg upward and then lowering it slowly; this is excentric contraction; later when sufficient strength is acquired, the leg is elevated with the knee straight; this is concentric contraction. When the movement becomes easy in concentric contraction, the legs are kept off the floor and abducted and adducted, or put through a swimming motion. The muscles which keep the legs from the floor while the movement is in practice are in static contraction. (10) In different types of movement progression is made by changing the moment of weight. In balance movements, for instance, we consider the relation the final position of a movement bears to the line of gravity, as well as its complexity. If we compare heel elevation with toe standing as its final position to standing on one foot with one knee flexed upward, or hip flexed with leg extended forward, the effect on the line of gravity is obvious, for such a change in the mass of weight will carry the line of gravity forward. This places extra work on the back muscles to keep the trunk erect, besides severely taxing the abdominal mus-

cles. It is a good example of the highest type of progression which is made by causing movements to require more and more co-ordination.

Progression in individual cases is limited or conditioned by the age, intelligence, and sex of the subject. Objectively progression is limited by the time one has to devote to exercise, the space, conveniences, apparatus and the dress of the individual.

CHAPTER II.

Home Gymnastics.

The following list of exercises is arranged according to the principles of the Swedish System of Gymnastics. The guide in arranging them is Baron Nils Posse's "Handbook of School Gymnastics." The writer is familiar with Posse's work, having secured a diploma in Medical and Hygienic Gymnastics at the Posse Normal School of Gymnastics, Boston, Mass., in the spring of 1904.

The lessons in this series are typical of the progressive sequence in which Swedish gymnastics are arranged. The lessons were planned to meet the needs of the average. For best results one lesson should be practiced every day, doing every movement at least three times to either side. When one lesson has become easy, and every movement mastered, begin with the next, and so on until all are mastered. Then begin with the list of more advanced lessons that follow this series.

The system is more than a century old. It was founded by P. H. Ling in 1809. It has been experimented with and improved upon by his successors until it has evolved into the best single system now extant. It is not a complete system, though Ling had such an ideal in mind when he founded it. What it lacks is of a competitive and recreative nature. But, as a system to fill the needs of the body, to develop elasticity, control, good posture, grace, vital capacity and all-round health, it has no equal. All the leading nations of the world have adopted it for their schools.

Ling and his followers aimed to arrange a complete system of gymnastics that would comply with the laws of anatomy, physiology and psychology. They succeeded better than they realized. While the reasons given for some of the procedures adopted are not in accord with modern physiology and psychology, the principles are.

"The aim of educational gymnastics," writes Posse, "is to develop the body into a harmonious whole under perfect control of the will. It is not to produce a great bulk of muscle, but to cause that already present to respond readily to volition; to improve the functional activity of the body; and to counteract and correct tendencies to abnormal development, especially those resulting from 'the artificial life of civilization.'"

Progression takes place from exercise to exercise of the same lesson and from the movements of one lesson to those of another. The exercises have been arranged into ten divisions. In each division they are arranged progressively according to their difficulty and complexity, based upon the laws of mental control and all the physical laws of leverage, gravity and equilibrium. They are arranged and chosen according to their effects upon the body, judging from their action upon the part used and their reaction upon the organism. No exercise is retained in the system which is at all doubtful or injurious in its effects.

Regularity and good order gives us the best results in anything. Experience has proven this is true of gymnastics. In every good gymnastic lesson, the exercises follow each other in the same order. The Swedish system is famous for its "day's order." Progression in each day's order is two-fold: (a) in three groups from general to special to general and (b) from exercise to exercise as follows:

REGULAR DAY'S ORDER. *Introduction.*		DAY'S ORDER IN ABSENCE OF APPARATUS.
General	Arch-flexions.	1. Introductions.
	Heaving movements.	2. Trunk rotations.
	Balance movements.	3. Arch-flexions.
		4. Substitute heaving movements.
Special	Shoulder-blade movements.	5. Balance movements.
	Abdominal exercises.	6. Shoulder-blade movements.
	Lateral trunk movements.	7. Abdominal exercises.
		8. Trunk sideways flexions.
General	Slow leg movements.	9. Jumping.
	Leaping, Vaulting, etc.	10. Slow leg movements.
	Respirating exercises.	11. Respiratory exercises.

Such is the order followed in these lessons.

(1) Introductory exercises span the bridge from mental or intellectual to physical activity. They are simple exercises but, when done properly, cause the flow of blood from the intellectual to the motor centers of the brain. They are also given to prepare general control for harder exercises in the same lesson.

(2) Arch-flexions cultivate possibility of respiration by stretching the expiratory muscles. They supple the chest and correct drooping head.

(3) Heaving movements increase ability of respiration by strengthening the inspiratory muscles. Typical heaving movements are done on apparatus. But substitute heaving movements may be done in free-standing work. Besides their effects on the inspiratory muscles these movements develop the muscles of the arm, shoulder and back.

(4) Balance movements cultivate general equilibrium and control and help to attain good posture by their effects on the extensor muscles of the body. We are by nature prone to give up to the force of gravity and allow ourselves to stoop and droop as aged people. Balance movements counteract this.

(5) Shoulder-blade movements produce isolation and co-ordination of the shoulder region. They correct stoop and round shoulders. There are two classes:

those for expansion of the chest and those for localization of effect on the back shoulder muscles. The first class precedes and the second class follows marching or running.

(6) Abdominal exercises strengthen the muscles supporting the viscera, improve digestion and promote excretion.

(7) Lateral trunk movements develop the waist muscles; further the effects of abdominal exercises; quicken portal circulation and promote digestion.

(8) Slow leg movements are movements of passive vascular expansion which diminish blood pressure. They may be applied in any part of the lesson where this effect is needed.

(9) Leaping and vaulting, etc., develop elasticity, control, speed, courage, co-ordination.

(10) Respiratory exercises are movements of deep inhalation and exhalation in which the arms accompany the respiratory act. The position and direction in which the arms are employed determines largely their effect.

There is a law, which is axiomatic, that the body at rest tends to assume the posture it held during activity. This is important to remember. Therefore, a good posture should be maintained during all exercises. The posture itself is of as much importance as the exercises practiced. The position recommended with these lessons is as follows: The heels together; feet at right angles; knees straight; the chest well forward over the toes; shoulders drawn back, but not stiff; the head erect, chin drawn in; arms straight at the sides, hands drawn slightly backward along the thighs. Maintain this position free of stiffness throughout the lesson. Whenever any movement of the legs or arms is practiced, preserve the same rela-

tive position of the trunk, isolating the action to the parts used.

These little details make for control. Control and harmony should be your first aim next to health. Then work for power, skill and that which is ornamental. No amount of muscular development will give physical culture until such harmony exists between the mind and muscles that the latter responds readily to all shades of volition for speed, power, dexterity, skill or gentleness. Only then does one possess physical culture.

The following lessons lay the foundation for health and control. They are corrective, progressive and educational in their nature. They will tax the entire muscular system without straining or exhausting. For best results concentrate your attention upon each movement as you practice it. See how much you can get out of it. The more you watch the details the more perfectly you perform the movement and the more benefit you derive.

LESSON I.

Introduction.

1. Keeping the body in good posture, without moving the shoulders, turn the head forcibly from side to side. (Illus. 2.)

2. Observing the same rule as in the above, flex the neck to the left and then to the right. (Illus. 3.)

3. Hands on hips, fingers in front, thumbs behind, (1) rise on the toes quickly, (2) lower the heels slowly. In practicing the exercise, keep the weight forward over the balls of the feet so that as you rise on the toes you feel a tendency to fall forward. Counteract this by contracting the muscles of the back. (Illus. 4.)

4. Raise the arms sideways slowly to shoulder height and at the same time breathe in deeply. Lower them slowly as you breathe out. (Illus. 5.)

5. Hands on the hips, feet apart, turn the body to the left and then to the right as far as possible without bending the knees or moving the feet. (Illus. 6.)

6. (a) Hands on the hips, drop the head back and arch the chest. In practicing this movement localize the bending to the upper spine. (Endeavor to see the floor backward without bending at the waist). (Illus. 7.) One should always come up slowly from arch-flexion. If the body is raised too suddenly, dizziness results because the blood rushes to the head. (Vide: Centrifugal force, Chap. I.)

(b) Hands on the hips, bend forward from the hips, keeping the head up, shoulders back. (Endeavor to touch the chest to the floor and keep the eyes on the ceiling.) (Illus. 8.)

7. Arm extension upward and forward in four counts, keeping the body steady, moving just the arms. (1) Bend the arms upward, elbows close to sides, fingers curled onto shoulder, (2) stretch them upward, (3) bend them, (4) stretch them forward, etc. (Illus. 9.)

8. Hands on hips, (1) rise on the toes, (2) bend the knees half-way, (3) stretch the knees, (4) lower the heels. (Illus. 10.)

9. Alternate arm flinging upward, beginning with the left. Keeping the elbows straight, chest well out, head erect, (1) fling the left arm up, carrying it vertically forward-upward with force, (2) as you lower the left fling up the right, etc. Keep the body steady. Isolate the motion to the arms. (Illus. 11.)

10. Hands on hips, feet apart, bend as far as possible to the left and right. (Illus. 12.)

11. Raise the arms forward-upward, inhaling deep-

ly as they go up. As you lower them, sideways-backward, exhale slowly. (Illus. 13.)

LESSON II.

Introduction.

1. Bend the head backward. As you stretch it up, draw in the chin so as to produce a lifting of the ribs. (Illus. 14.)

2. Rise on the toes quickly. Lower the heels slowly.

3. Arms bent upward, (1) carry them sideways slowly as you inhale deeply, (2) as you flex them exhale.

4. Prepare to jump, (1) rise on the toes, (2) bend the knees half-way, (3) stretch the knees, (4) lower the heels.

5. Hands on hips. Left foot forward, toes turned out. The feet far enough apart to measure two foot lengths between the heels; weight between both feet. Twist the trunk to the left a few times. Repeat with the right foot forward, twisting body to the right. (Illus. 15.)

6. Repeat exercise 6 of Lesson I.

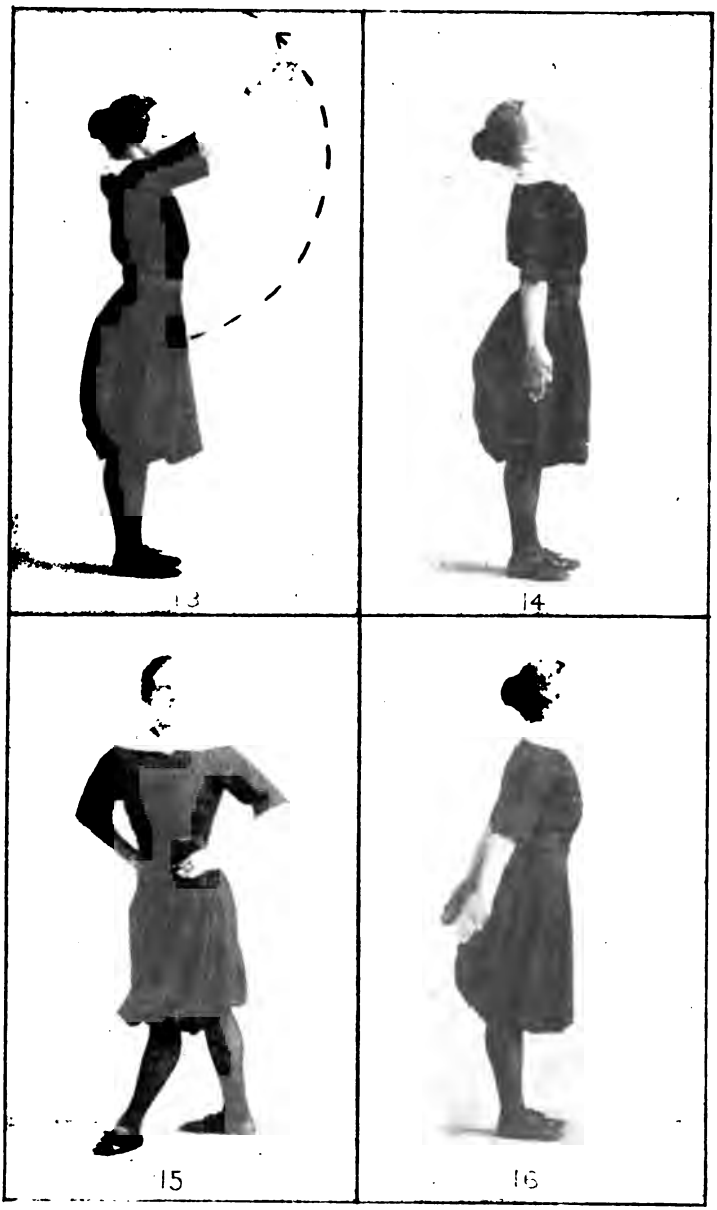
7. Arm extension sideways and backward in four counts. (1) Bend arms upward, (2) stretch them sideways forcibly, (3) bend them, (4) stretch them downward-backward forcibly, etc. [Illus. 5 for (2).] (Illus. 16.)

8. Hands on hips. Keeping the body steady, knees straight, raise the left leg backward as high as possible without inclining the body forward. As the leg is elevated point the toes downward. Repeat with the right. (Illus. 17.)

9. Arms extended upward, rise on the toes and reach upward. (Illus. 18.)

10. Run in place. (Illus. 19.) The arms are bent, fore-arm close to the chest; keep up on the toes.

11. Arms sideways, shoulder high. Turn the palms



upward forcibly a few times. To execute this movement correctly and get full benefit, make the rotation upward take place in the shoulder. You should feel a tension in the back muscles.

12. Lie on the back, arms extended back of the head. Flex the left knee up, extend it, and lower the leg slowly. Repeat with the right.

13. Hands on hips, bend the trunk as far as possible to both sides, without bending the knees. (As Illus. 12, with heels together.)

14. Upward jump in five counts. (1) Rise on the toes, (2) bend the knees, (3) fling the arms upward, spring from the floor and bring the arms back to the sides before landing. Land with the knees half-bent as in position (2) of prepare to jump, (4) stretch the knees, (5) lower the heels. Aim to get a good landing first. This will give control. (Illus. 20 shows the beginning of the jump and the position at landing. Illus. 21 shows the body in the air.)

15. Arms bent forward, elbows shoulder high, wrists straight, fingers straight. Fingers about four or five inches apart in front of chest. (Illus. 22.) This gives good starting position without compressing the chest. (1) Carry the forearms sideways slowly as you inhale deeply. (Illus. 5.) Bring them back forward as you exhale slowly.

LESSON III.

Introduction.

1. Hands on the hips; feet apart. Rise on the toes quickly. Lower the heels slowly.

2. Alternate arm extension upward. Bend the arms upward, (1) extend the left upward, (2) as you flex the left, extend the right upward. Put force in the extension. (Illus. 23.)

3. Arms bent forward as Ex. 14, Lesson II. (1) Carry them sideways as you inhale, (2) flex them as you exhale.

4. (a) Hands on hips; feet apart. Turn the trunk to the left, keeping the body turned, drop the head backward and arch the chest. (Illus. 24.) As you come up let the head come last, chin drawn in, so as to raise the ribs. Repeat with the trunk turned to the right.

(b) Hands on hips, feet apart. Bend forward from the hips.

5. Hands on hips, left foot forward, toes straight forward, weight between both feet, rise on the toes a few times, holding the position a few moments each time. Do not allow the feet to rotate sideways. This is a balance movement for control. (Illus. 25.)

6. Arms bent forward; fling them sideways forcibly to expand the chest.

7. Run in place.

8. Hands on hips, bend the body half-forward from the hips, keeping the head well up, shoulders back. While holding this posture, twist the head to the left and right. (Illus. 26.)

9. Lying on the back, arms extended back of the head, raise the left leg upward, knee straight. Repeat with the right. (Illus. 27.)

10. Hands on hips, feet close, i. e., heels and toes together. Bend as far as possible to the left and right. (Illus. 28.)

11. Hands on hips, rise on the toes. Keeping the heels off the floor, spring the feet apart and together a number of times. (Illus. 29.)

12. Raise the arms sideways-upward and at the same time breathe in deeply. (Illus. 30.) Lower them sideways-backward and at the same time breathe out.

LESSON IV.

Introduction.

1. Hands on hips, (1) place the left foot diagonally forward, that is, carrying it two foot lengths in its own direction, (2) bring it back to position, (3) carry the right foot out, (4) back to position.

2. Arms bent upward. (1) Carry them sideways slowly, palms turned up and breathe in as they go out. (2) Flex them as you breathe out.

3. Prepare to jump, in four counts. (As in Lesson II.)

4. (a) Hands on hips, turn body to the left; keeping it turned, bend backward. Repeat with body turned to the right. (As Illus. 25, with heels together.)

(b) Hands on hips. Bend forward from the hips.

5. Turn the trunk to the left. Arms bent upward. Stretch them sideways forcibly a few times. Repeat with the trunk turned to the right.

6. Hands on the hips. Rise on toes, as you lower the heels, raise the toes, as you lower the toes raise the heels, etc., alternately. Preserve a good posture of the trunk throughout.

7. Arms bent upward, extend them sideways forcibly, the palms turned up.

8. Run in place.

9. Arms shoulder high at the sides, feet apart, bend the trunk half-forward, keeping the arms in their relative position, head well up. Holding this position, twist the head to left and right. (Illus. 31.)

10. Rise on the toes, bend the knees all the way down, place the hands on the floor, fingers turned inward, about four or five inches apart. (Illus. 32.) Carry the left foot back and then the right, thus supporting the weight on the hands and toes. From

the head to the heels the body should be in a straight line. (Illus. 33.)

11. Hands on hips, the left foot forward, toes turned out. Bend the trunk to the left. With the right foot forward, bend to the right. (Illus. 34.)

12. Forward jump in five counts. (1) Rise on the toes, (2) bend the knees and carry the arms back preparatory to the spring (Illus. 35), (3) spring forward as you swing the arms forward and, just before landing, bring the arms to the sides, landing on the toes, the knees half-bent, (4) stretch the knees, (5) lower the heels.

13. Raise the arms sideways to shoulder height, at the same time rise on the toes and inhale deeply. (Illus. 36.) As you lower the arms and heels slowly exhale.

LESSON V.

Introduction.

1. Arms bent upward, stretch them sideways alternately, palms turned up.

2. Prepare to jump in four counts.

3. Arms shoulder high at sides, palms turned up, raise them upward as you rise on the toes and breathe in. (Illus. 37.) Lower them to shoulder height and at the same time lower the heels and breathe out.

4. Hands on hips, left foot forward, toes pointing straight forward. Twist the trunk to the left. (Illus. 38.) Repeat to the right with the right foot forward.

5. (a) Carry the left foot two foot lengths in its own direction, arms shoulder high at sides, turn the body to the left and bend backward, allowing the arms to sag slightly as the trunk is arched. (Illus. 39.) Bend backward a few times, then repeat the movement with the right foot forward, trunk turned to the right.

(b) Arms extended upward, feet apart, bend for-

ward from the hips. The head should be kept in line with the body, the arms in line with the ears. (Illus. 40.)

6. Arms bent upward, turn the body to the left. Keeping body turned, stretch the arms upward forcibly. Repeat with the body turned to the right.

7. Hands on hips, rise on the toes and hold position. While holding position turn the head to the left and right. (Illus. 41.)

8. Keeping the head erect, chest well forward, elbows straight, fling both arms upward forcibly. They should travel forward-upward.

9. Run in place.

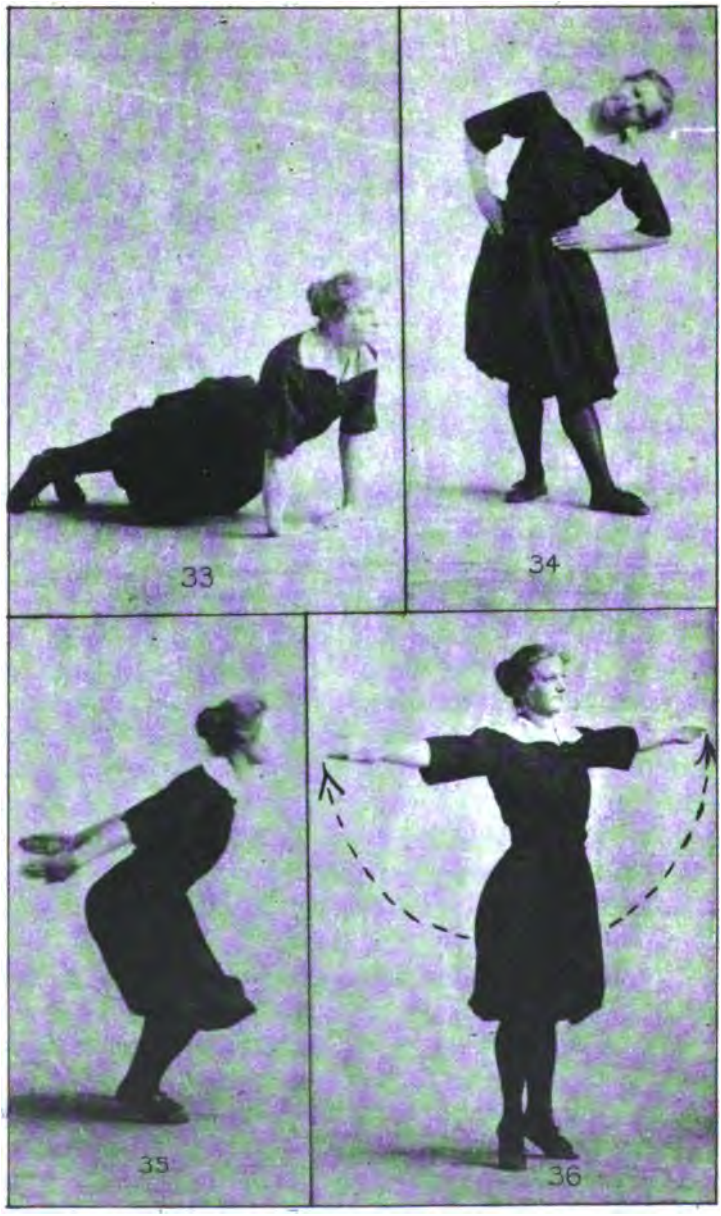
10. Arms shoulder high at sides. Bend the trunk half-forward from the hips. While holding this position turn the palms of the hands forward-upward forcibly. (As Illus. 48 with the heels together.)

11. Rise on the toes, bend the knees and place the hands on the floor, fingers turned inward. Spring the feet back so that the weight rests on the hands and toes. From head to heels the body should be in a straight line. Repeat a number of times, springing the feet forward and backward. As the feet are sprung forward, let the knees come outside the elbows.

12. Hands on hips, left foot forward, toes pointing forward, bend body to the left as far as possible. With the right foot forward, repeat to the right. (Illus. 42.)

13. Ninety degrees turning upward jump, in five counts. (1) Rise on the toes, (2) bend the knees, (3) fling the arms upward as you spring upward and turn so as to land facing to the left, knees half-bent and hands at the sides, (4) straighten the knees, (5) lower the heels. Repeat with turn to the right.

14. Raise the arms forward-upward, at the same time rise on the toes and breathe in deeply. Lower



the arms sideways-backward, at the same time lower the heels and breathe out. (Illus. 43.)

LESSON VI.

Introduction.

1. Raise the arms sideways-upward, at the same time rise on the toes and breathe in. Lower them sideways-backward, at the same time lower the heels and breathe out.

2. Arms bent forward. Arm swimming in three counts—(1) carry them forward, hands slightly everted, (2) fling them sideways forcibly, (3) flex them. 1 and 2 should be run together when the movement is mastered.

3. Prepare to jump, in four counts.

4. Arms shoulder high at sides, feet close. Twist body as far as possible to left and right. (Illus. 44.)

5. (a) Heels and toes together, carry the left foot forward, and keep the toes straight forward throughout the movement. Arms shoulder high at sides. Bend backward a few times. Repeat with the right foot forward. (Illus. 45.)

(b) Repeat (b), Exercise 5, Lesson V.

6. Arms bent upward, turn body to the left, keeping the body turned, extend the arms upward and forward in four counts. (1) Stretch them upward, (2) bend them, (3) stretch them forward, (4) bend them. Repeat with the body turned to the right.

7. Arms shoulder high at sides, rise on the toes; while holding this position turn the head to the left and right. (Illus. 46.)

8. In two counts, the left arm upward and the right arm sideways, stretch. (Illus. 47.) (1) Bend the arms upward, (2) stretch the left arm upward and at the same time stretch the right sideways. In the upstretched arm the palm is turned inward, in the other it

is downward. Change arms with count. (1) Arms flexed, (2) the right up and the left sideways, etc.

9. Run in place.

10. Arms sideways, shoulder high, feet apart. Bend half-forward from the hips. Holding this position, turn the palms upward forcibly a few times. (Illus. 48.)

11. Repeat exercise 11 of Lesson V.

12. Hands on hips, feet apart, turn body to the left. Keeping it turned, bend to the left. Repeat to the right with the body turned to the right. (Illus. 49.)

13. Sideways jump in five counts. (1) Rise on the toes, (2) bend the knees and carry the arms to the left (opposite to the side you jump). (3) Swing the arms forcibly toward the right as you spring to the right, and, before landing, bring the arms back to the sides, landing knees half-bent, (4) stretch the knees, (5) lower the heels. Repeat to the left.

14. Arms bent forward, carry them sideways slowly, at the same time place the left foot forward (inclining the body forward by raising the right heel), as you inhale deeply. (Illus. 50.) As you flex the arms, draw the foot back and, at the same time, exhale. Repeat, carrying the right foot forward.

LESSON VII.

1. Raise the arms forward-upward, at the same time rise on the toes and breathe in deeply. Lower them sideways-backward, at the same time lower the heels and breathe out.

Introduction.

2. Hands on hips, feet close. Foot placing forward with heel elevation, in eight counts. (1) Place the left foot forward, (2) rise on the toes (Illus. 51), (3) lower the heels, (4) bring the foot back, (5) right foot forward, etc.

3. Arms bent upward, stretch them sideways forcibly, palms turned up.

4. Arms shoulder high at sides, twist the body as far as possible to the left and right. (See Illus. 44.)

5. (a) Feet apart, arms shoulder high at sides, bend backward.

(b) Feet apart, arms extended upward, bend forward from the hips; from the hips to the fingers should be a straight line.

6. Fingers locked behind the head, keeping the elbows well back, head erect, chest out, rise on the toes a few times. Remain upon the toes a few moments each time. (Illus. 52.)

7. Arms bent forward, bend the body half-forward from the hips. While holding this position, fling the arms sideways forcibly.

8. Run in place, or up and down room.

9. Arms bent upward, feet apart, bend body half-forward from the hips. Holding this position, stretch the arms sideways and backward in four counts. (1) Stretch them sideways, (2) bend them, (3) stretch them downward-backward, keeping the shoulders back, (4) bend them, etc.

10. Assume stoop fall position described in Exercise 8, Lesson IV, body in one line from head to heels. Holding this position, turn the head to the left and right. (Illus. 53.)

11. Hands on hips, left foot forward. Turn the trunk to the left. Keep it turned while you bend sideways to the left. Repeat with the right foot forward, trunk turned to the right. (Illus. 54.)

12. Arms bent upward, turn the body to the left. Keep it turned. In four counts stretch the arms sideways and upward.

13. Hands on hips, left foot forward, rise on the

toes. Change feet by jumping upward, drawing the left foot back and the right forward, etc.

14. Arms bent upward, feet close, turn the trunk to the left. Keeping it turned, extend the arms sideways, palms turned up and at the same time breathe in. (Illus. 55.) As you flex them, breathe out. Repeat with the body turned to the right.

LESSON VIII.

1. Arms bent forward, feet close, turn the trunk to the left. Keeping the body turned, carry the arms sideways slowly and at the same time breathe in deeply. As you flex the arms breathe out. Repeat with the body turned to the right.

Introduction.

2. Hands on hip. Place the left foot crosswise forward, the left heel in line with the toes of the right foot, toes of both feet turned outward. (Illus. 56.) The body should be square forward regardless of position of the feet. Holding this position rise on toes a few times. (Illus. 57.) Repeat with the right foot crosswise forward.

3. Arms shoulder high at sides, turn the palms forward-upward forcibly a few times.

4. Arms shoulder high at sides, feet at right angles; carry the left foot diagonally forward, i. e., in its own direction. Holding this position, twist the body to the left. (Illus. 58.) Repeat to the right, right foot forward.

5. (a) Right foot forward, right hand on the hip, left arm extended upward. Bend the upper body backward. (Illus. 59.) Repeat with the right arm extended upward, left hand on hip and left foot forward.

(b) Arms extended upward, bend forward from the hips.

6. Arms bent upward, turn the body to the left; holding this position, extend arms sideways and then backward in four counts. Repeat, body turned to right.

7. Fingers locked behind head, feet apart. Rise on the toes and hold a few moments each time.

8. Arms straight forward, shoulder high, palms turned in. Lean the weight forward, chest prominent, head erect. Fling the arms sideways forcibly, turning the palms downward as they go out. (Illus. 60.)

9. Running or rope skipping.

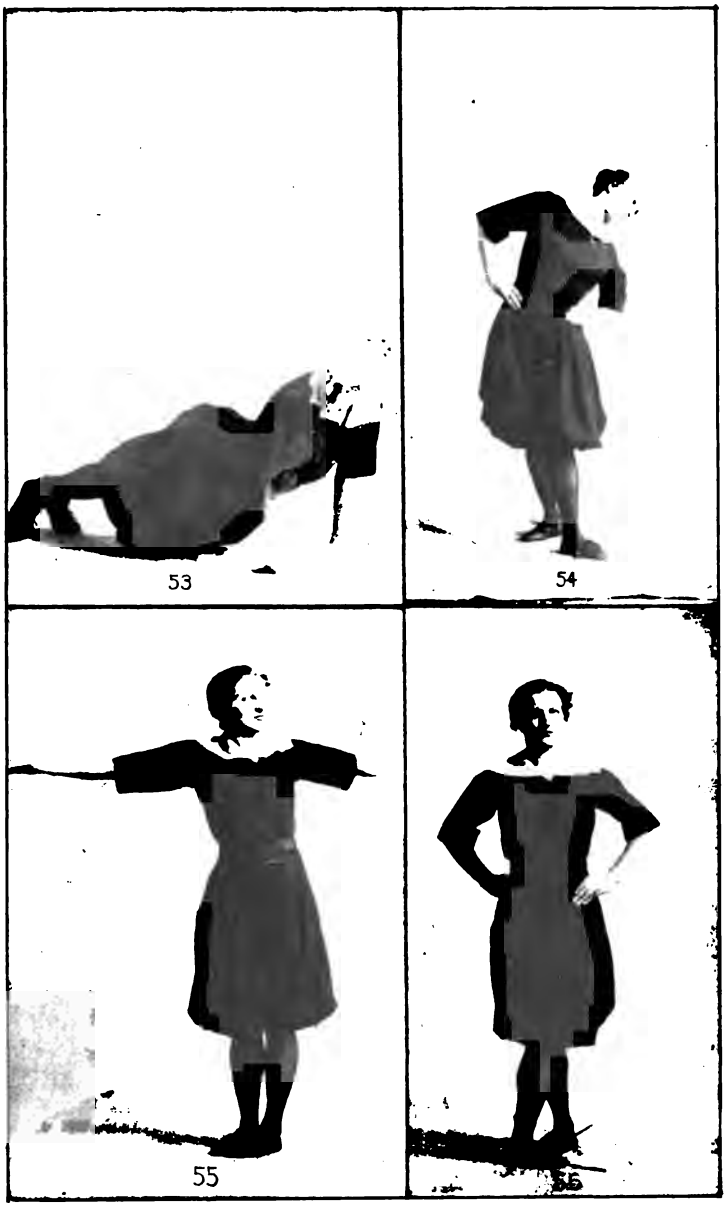
10. Arms bent forward, bend the trunk half-forward from the hips. Holding this position, fling the arms forward and sideways in a swimming motion.

11. Lie on the back, arms extended back along the floor, grasp some weight. Flex the knees up, straighten them and, keeping them straight, lower the legs slowly. (Illus. 61.)

12. Hands on hips, place the left foot diagonally forward as in Exercise 4 above. Turn trunk to the left. Keeping it turned, bend to the left as far as possible. (Illus. 62.) Repeat to the right, right foot forward, trunk turned to the right.

13. Arms flung sideways, upward jump, in five counts. (1) Rise on the toes, (2) bend the knees, (3) fling the arms sideways-upward as you spring up from the floor, bringing them back to the sides before landing on toes, knees half-bent, (4) straighten the knees, (5) lower the heels. (Illus. 63 shows the body after leaving the floor.)

14. Arms bent forward, as Exercise 1, feet apart, turn the trunk to the left. While keeping it turned, carry the arms sideways as you inhale. Flex them as you exhale. Repeat the movement with the trunk turned to the right.



LESSON IX.

1. Arms bent forward, carry them sideways slowly as you inhale deeply. Flex them as you exhale.

Introduction.

2. Arms bent upward. Stretch the left arm upward, palm turned in, and at the same time stretch the right arm sideways, palm turned down. In two counts change arms. At (1) bend the arms, at (2) right arm up and left sideways, etc. (Illus. 47, Lesson VI.)

3. Prepare to jump, in four counts.

4. Arms sideways, shoulder high; left foot forward, toes turned out. Twist the trunk to the left. (Illus. 64.) Repeat to the right with the right foot forward.

5. (a) Feet apart, left arm extended upward, right hand on the hip. Turn the body to the left. Keeping it turned, bend backward a few times. (Illus. 65.) Repeat, with the right arm up, left hand on the hip, the body turned to the right.

(b) Arms extended upward, bend forward from the hips.

6. Arms bent upward, turn the body to the left, stretch the arms forward and upward in four counts. Repeat, body turned to right.

7. Fingers locked behind the head, left foot forward, toes pointing forward. Rise on the toes and hold a few minutes. Keep the weight between both feet, do not rock forward and backward, but rise straight up. Repeat with the right foot forward. (Illus. 66.)

8. Arms shoulder high at sides. Fling them forward and sideways by starting with arms at sides, palms down. (1) Curl the fingers downward and flex the arm so that as the hand gets close to the body, the elbows close, the palm is turned upward, (Illus. 67),

and stretch the arms forcibly forward. (2) Reverse the movement, flexing slowly to the shoulders and extending forcibly sideways. Make the movement each way a continuous one.

9. Running or rope skipping.

10. Arms bent upward. Bend the body half-forward from the hips. Holding this position, practice the Arm Exercise 2 of this lesson.

11. Repeat Exercise 9 of Lesson VIII, except that the position of the arms is changed. In this lesson, lock the fingers behind the head, keeping the elbows from leaving the floor as you practice the leg lifting.

12. Hands on hips. Twist the trunk to the left. Keeping it turned, bend as far as possible to the left. Repeat to the right, trunk turned to the right.

13. Jump upward in five counts, flinging arms and legs sideways. (1) Rise on toes, (2) bend the knees, (3) spring upward, and as you leave the floor, fling arms sideways-upward, elbows straight, and legs sideways, knees straight, and bring the arms to the sides and heel together just before landing on toes, knees half-bent, (4) straighten the knees, (5) lower the heels. (Illus. 68 shows the body after leaving the floor.)

14. Feet close, turn body to the left. Raise arms forward-upward, at same time inhale deeply. Lower them sideways-backward, at same time exhale slowly.

LESSON X.

Introduction.

1. Arms bent upward. Carry them sideways slowly, palms turned up, and at the same time inhale deeply. As you flex them, exhale slowly.

2. Hands on hips, rise on toes. Holding this position, twist the head to the left and then to the right.

3. Hands on hips. Lunge diagonally forward, carrying the left foot in its own direction far enough to measure three foot lengths from heel to heel. In this position the body should be in a straight line from the head to the rear heel. Keep the rear heel on the floor. These details are important for control. Repeat to the right. (Illus. 69.)

4. Arms shoulder high at sides. Left foot forward, toes of both feet pointing forward. Twist the trunk to the left. Repeat to the right, right foot forward. (See Illus. 92.)

5. (a) Arms bent upward, bend the trunk backward. While holding it bent, extend the arms sideways a few times. (Illus. 70.)

(b) Arms extended upward, flex the body forward from the hips.

6. Arms bent upward, elbows close to the body. Turn the trunk to the left. Holding it turned, extend the arms forward and sideways, in four counts. Repeat with body turned to the right.

7. Hands on hips. (1) Rise on the toes, (2) bend the knees down to sitting. Spread the knees as they go down, keep head erect, chest out. (3) Straighten the knees, (4) lower the heels. (Illus. 71.)

8. Arms bent upward, bend the body half-forward, extend the arms forward (Illus. 72), and, while holding this position, fling the arms sideways forcibly. Keep the body steady; move only the arms.

9. Running or rope skipping.

10. Arms bent upward; feet apart. Bend the body half-forward. Holding this position, practice the arm movement described in Exercise 2, Lesson IX.

11. Rise on the toes, bend the knees, place the hands on the floor, fingers turned in, about four or five

inches apart, elbows inside knees. With a spring carry the feet back far enough so that the body is straight from the heels to the head, weight borne by the hands and toes. Spring the feet forward, again, knees outside the elbows, etc. (See Illus. 33.)

12. Hands on hips; feet close, i. e., heels and toes together. Turn the trunk to the left Keeping it turned, bend to the left as far as possible. Repeat to the right, trunk turned to the right.

13. Half-step forward jump in four counts. (1) Step forward with left foot, (2) spring forward, flinging the arms forward at the same time and bringing them back to the sides to land on the toes, knees half-bent, head erect, (3) straighten the knees, (4) lower the heels. Repeat stepping forward with the right foot. The step and jump run together.

14. Feet close. Turn the trunk to the left. Keeping it turned, raise the arms sideways-upward, inhaling deeply as they go up. Lower them sideways-backward, exhaling as they come down. Repeat with trunk turned to the right.

LESSON XI.

1. Arms sideways, shoulder high, palms turned up. Raise them upward and at the same time inhale deeply. As you lower them to shoulder height, exhale slowly.

2. Practice Exercise 1, Lesson I.

Introduction.

3. Hands on hips. Lunge straight forward, carrying the left foot far enough to measure about three foot lengths from heel to heel. Body inclined forward in one line from heel to head. Rear foot squarely on the floor. Repeat with the right foot. (Illus. 73.)

4. Arms shoulder high at sides. Left foot forward, toes of both feet pointing forward. Twist the body to

the left as far as possible. Keep it turned while you flex and extend the arms sideways a few times. Repeat to the right, right foot forward. (Illus. 74.)

5. (a) Arms bent upward, feet apart, bend the trunk backward, and, while holding this position, extend the arms sideways a few times. (As Illus. 70, except that the feet are apart.)

(b) Arms extended upward, bend forward-downward from the hips. (Illus. 75.)

6. Feet apart, turn the trunk to the left. In eight counts, stretch the arms, forward, upward, sideways and backward. (1) Arms bent, elbows close to sides, (2) stretch them forward forcibly, (3) bend them, (4) upward forcibly, (5) bend, (6) sideways forcibly, (7) bend, (8) downward-backward forcibly, etc. Repeat with the body turned to the right.

7. Arms extended upward, feet apart. Rise on the toes a few times, remaining up a few moments and reaching upward. (Illus. 76.)

8. Arms shoulder high at sides, bend half-forward from the hips. While holding this position of the trunk, practice Exercise 8 of Lesson IX.

9. Running or rope skipping.

10. Arms bent upward, elbows close to sides. Bend half-forward from the hips. Holding this position, extend the arms sideways alternately, palms turned upward. (1) Extend the left sideways, (2) as you bend the left extend the right out, etc., putting force in the extension.

11. Hands on hips, rise on toes, bend knees and kneel. Keeping the body straight up, without sitting back onto the heels, incline the body back from the knees as far as possible. (Illus. 77.)

12. Hands on hips. Place the left foot upon a chair, knees straight. Bend to the right as far as possible. With the right foot up, bend to the left. (Illus. 78.)

13. Hands on hips. Rise on toes. Without allowing the heels to descend, and without bending the knees, leap forward by merely springing from the ankle.

14. Arms shoulder high at sides. Raise the shoulders up and back as you inhale, allow them to descend as you exhale. In this movement the hands do not describe a larger circle than the shoulders. This exercise is valuable to normalize the heart rate after a run.

LESSON XII.

Introduction.

1. Raise the arms forward-upword and at the same time breathe in deeply. Lower them sideways-backward while breathing out.

2. Without moving the body, fling the arms straight forward-upward alternately.

3. Hands on the hips, feet close, i. e., toes pointing straight forward. Lunge forward with the left foot, then with the right.

4. Kneel. Arms shoulder high at sides. Twist to the left and then to the right. Do not sit back on the heels, but keep straight at the hips. (Illus. 79.)

5. (a) Arms extended upward, place the left foot forward. Bend the trunk backward. (Illus. 80.) Repeat with the right foot forward.

(b) Arms extended upward, bend forward downward from the hips.

6. Arms bent upward, left foot forward, turn the body to the left, hold this position while extending the arms sideways a few times. Repeat with the right foot forward.

7. Arms extended upward, feet close, rise on the toes and reach upward. Repeat a few times.

8. Arms sideways, shoulder high, bend them half-forward, so that the elbows are at right angles. Keep-

ing the elbows shoulder high, fling the forearm upward a few times. Put the force in the upward fling. (Illus. 81.)

9. Running, hopping or rope-skipping.

10. Arms extended upward, feet apart. Bend the body half-forward, hold this position and bend and stretch the arms upward forcibly a few times.

11. Lying on the back, fingers locked behind the head, raise the legs upward alternately, first the left, then the right.

12. The left arm extended upward, right hand on the hip, feet apart. Bend to the right a few times, then changing the arms, bend to the left. (Illus. 82.)

13. Hands on the hips, raise the left leg back slightly, rise on the toes of the right foot (keeping head erect, shoulders well back), and leap forward by springing from the ankle joint merely, keeping the right knee straight. Repeat with other foot. (Illus. 83.)

14. Arms flexed forward, feet apart, turn the trunk to the left. Holding this position, carry the arms sideways slowly as you inhale deeply. As you flex the arms, exhale. Repeat a few times, then turn to the right and repeat.

LESSON XIII.

Introduction.

1. Raise the arms sideways to shoulder height, at the same time flex the knees halfway and inhale deeply. As you lower the arms and stretch the knees exhale slowly.

2. Arms shoulder high at sides, (1) gradually curl up the hand and arm so that as the hand is close to the body (the elbows close), the palm is turned upward, and stretch them forcibly forward, palms up. (2) Reverse the movement, flexing slowly

to the shoulders and extending forcibly sideways. (See Illus. 67.)

3. Prepare to jump, i. e., (1) rise on the toes, (2) bend the knees half-way, (3) stretch the knees, (4) lower the heels slowly.

4. Fingers locked behind the head, feet apart. Keeping the elbows well back, twist to the left and right. (Illus. 84.)

5. (a) Feet close, arms extended upward, carry the left foot forward. Keep the toes of both feet straight forward as you bend the trunk backward. Repeat with the right foot forward.

(b) Arms extended upward, turn the trunk to the left and bend forward. The same to the right. (Illus. 85).

6. Arms bent upward, left foot in front of right, toes pointing forward, turn body to left. While holding this position extend the arms upward forcibly. Repeat with right foot forward, trunk turned to the right.

7. Left foot in front of right as in above exercise. Arms extended upward, rise on the toes a few times, staying up a few moments each time. Repeat with right foot forward. Do not allow the feet to turn sideways. (Illus. 86.)

8. Arms bent upward, feet apart, bend body half-forward. Keeping head up, stretch the arms upward a few times.

9. Running, hopping or rope-skipping.

10. Arms extended upward, bend trunk forward half-way. Keeping the head up, moving arms in line with ears, lower them to shoulder height and raise them slowly a few times. (Illus. 87.)

11. Hands on hips, kneel on the left knee far enough back so that both knees are at right angles. Keeping

body in straight line from head to knee, incline backward as far as possible from the knee. Repeat with the weight on the right knee. (Illus. 88.)

12. Left arm up, right hand on hip, bend body to right as far as possible a few times. Repeat to left with arms reversed. (As Illus. 82, but feet together.)

13. In five counts upward jump with 180 degrees turn. (1) Rise on the toes, (2) bend the knees, (3) fling the arms upward and spring up, turning around a half-circle, and bringing the arms back at the sides before landing, with the knees half-bent, trunk erect, (4) stretch the knees, (5) lower the heels. Repeat with turn to the right.

14. Feet apart, turn to the left. Keeping the body turned, raise the arms sideways to shoulder height as you inhale deeply. As you lower the arms, exhale. Repeat, the body turned to the right.

LESSON XIV.

Introduction.

1. Arms shoulder high at sides, palms turned upward. Raise the arms and at the same time bend the knees and inhale deeply. As you lower the arms to shoulder height, stretch the knees and exhale.

2. Hands on hips. In series place the feet forward alternately and rise on the toes. (1) Place left foot forward, (2) rise on the toes, (3) lower the heels, (4) bring the foot back. Repeat with the right foot, etc. Keep the weight between both feet.

3. The left arm extended upward, the right arm at the side, palm turned up. Moving the arms together, lower the left to shoulder height as you raise the right upwardr (See Illus. 95.)

4. Lock the fingers behind the head, elbows well back, head erect. Rise on the toes and bend the knees

all the way down and kneel. Twist the body to the left and right. (Illus. 89.)

5. (a) Feet apart, arms extended upward, turn the trunk to the left and bend backward. (Illus. 90.) Repeat with the trunk turned to the right.

(b) Arms extended upward, feet apart, turn to the left and bend forward a few times. Repeat to the right. (Illus. 91.)

6. Arms bent upward, elbows close to sides. Toes pointing straight forward, place the left foot forward. Turn the trunk to the left. Holding this position, stretch the arms sideways forcibly a few times. Repeat with the right foot forward, trunk turned to the right. (Illus. 92.) (See Illus. 74 for arms bent.)

7. Hands on hips. Place the left foot forward. (1) Rise on the toes, (2) bend the knees outward, weight between both feet, trunk and head erect, (3) stretch the knees, (4) lower the heels. Repeat with the right foot forward. (Illus. 93.)

8. Feet apart, arms bent upward. Bend half-forward from the hips. Stretch the arms forward. Holding this position, fling the arms sideways forcibly. (Compare with Illus. 72.)

9. Running, hopping or rope-skipping.

10. Arms bent upward, bend half-forward from the hips. Stretch the left arm up and the right sideways, palm turned up. Practice the arm exercise described in Exercise 3, above, while holding this position. (Illus. 94.)

11. Sitting on the floor, hands on hips. Place a weight on the feet. Drop the body back and come up to sitting again. Keep the head back, shoulders back and chest out, and only drop half-way down. (Illus. 95.)

12. Left foot forward, toes of both feet pointing forward. Right arm extended upward, left hand on hip. Bend as far as possible to the left. (Illus. 96.)

Repeat to right, left arm up, right hand on hip, right foot forward.

13. Hands on hips, feet apart. Rise on toes. Spring up. Strike the heels together and spread them out again before landing. Keep it up, rapidly.

14. Arms bent upward, elbows close to sides, feet apart. Turn the trunk to the left. Holding this position, stretch the arms sideways slowly, palms turned up and inhale deeply as they go out. As you flex the arms exhale slowly. Repeat with the trunk turned to the right.

The following six programs are more advanced and they do not follow the laws of progression as closely as the preceding lessons. They are designed to meet the needs of advanced pupils who want more difficult work. Where it is feasible, apparatus may be introduced. If the pupil has access to a gymnasium, where he may use the apparatus indicated, better results will be obtained. These lessons will also be found useful to teachers who wish to give their classes advanced Swedish gymnastic lessons.

LESSON XV.

Introduction.

1. Head flexion backward. Also sideways.

2. Heel elevation.

3. Arms bent upward. Lunge forward as you extend the arms upward, first with the left, then the right foot. At the lunge, the body, from the rear heel to the fingers, should be in a straight line. (Illus. 97.)

4. Prepare to jump, (1) rise on the toes, (2) bend the knees, (3) stretch the knees, (4) lower the heels.

5. Elevate the arms sideways upward

as you rise on the toes and inhale. Lower the arms and heels slowly as you exhale.

I. (a) Standing with your back toward the wall, about two feet from it, extend the arms upward and bend the body backward until the hands rest against the wall. While in this position, without holding the breath, elevate the heels a few times. (Illus. 98.)

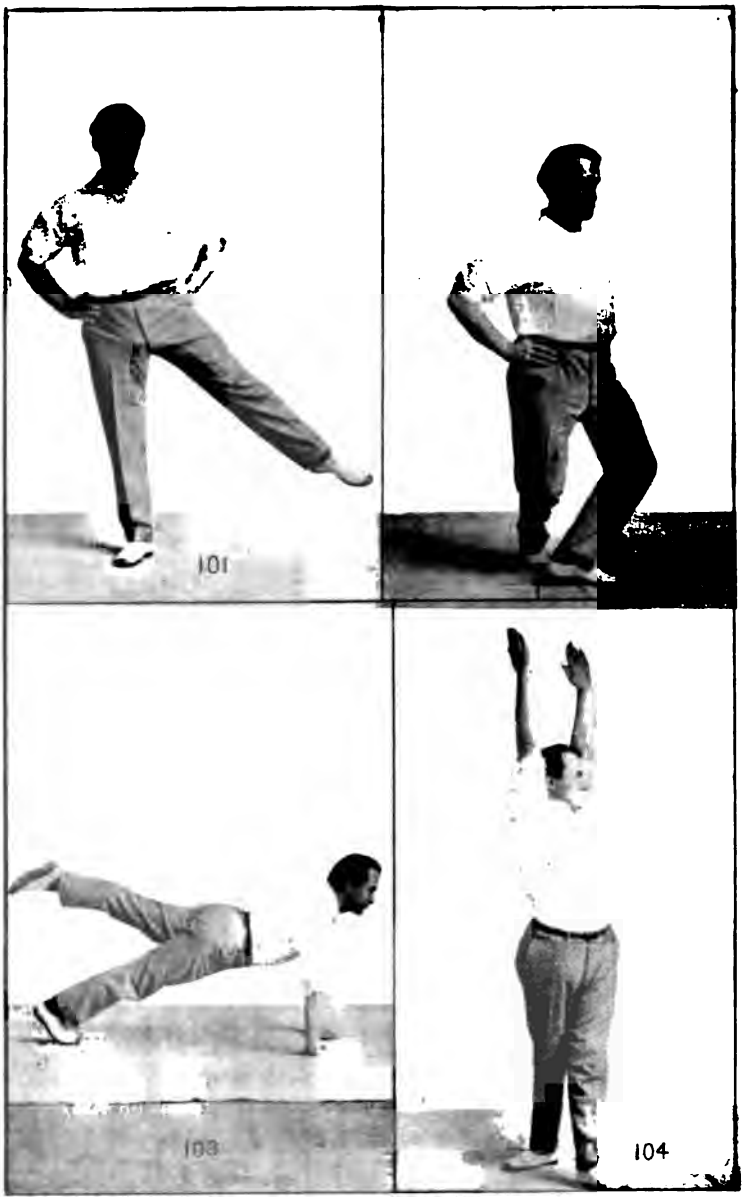
(b) Arms extended upward, feet apart, bend forward as far as possible without losing the relative position of the arms and head. (See Illus. 40.)

II. Practice "chinning" on a bar or trapeze. Preserve a good posture of the body while doing this. (Illus. 99.) Do not kick or swing the legs in the movement.

III. (a) Hands on the hips. Raise the left leg forward, knee straight, toes pointed. (Illus. 100.) Without in the least altering the body, carry the leg outward as far as possible (Illus. 101) and then backward, then, with slight knee flexion, carry it forward again. Repeat with the right leg.

(b) Hands on the hips, carry the left foot crosswise forward, that is, the heel of the left foot about one foot-length's distance in front and in line with the right foot, the toes of the left foot pointing diagonally to the left. Keeping the trunk squarely forward, (1) rise on the toes, (2) bend the knees (Illus. 102), (3) stretch the knees, (4) lower the heels. Repeat a few times, then practice it with the right foot crosswise forward.

IV. (a) Arms forward, palms turned in, fling them sideways forcibly, gradually turning the palms downward as they move sideways. The reason for turning the palms downward in all arm flingings sideways is so as to get the greatest possible expansion of the chest without pain. The pain referred to is felt between the shoulder-blades when the arms are flung sideways so



that the palms face forward as they get in line with the shoulders.

(b) Arms bent half-forward, elbows shoulder high. Fling the forearms upward, by rotating the upper arm, elbows kept steadily at shoulder height. (See Illus. 81, Movement 8, Lesson XII.)

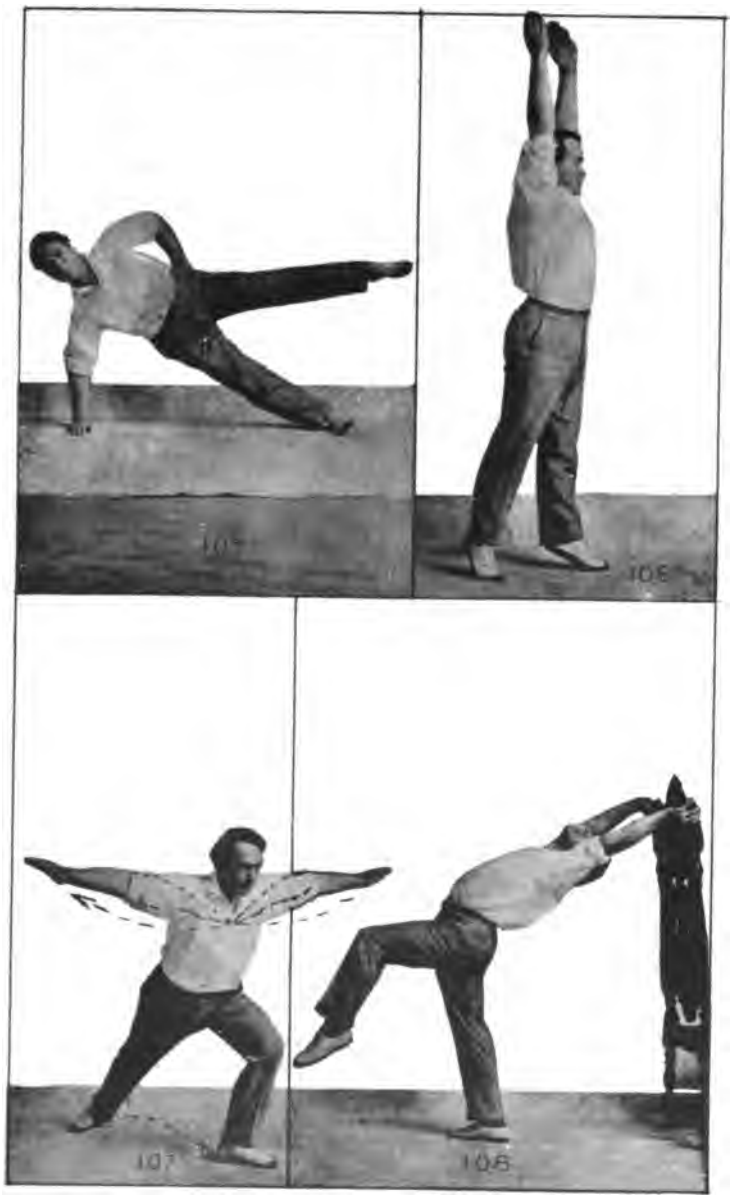
V. Marching and running, or the equivalent.

VI. Arms bent upward, bend the body half-forward from the hips. While holding this position, slowly extend the arms upward a few times. The body, from the hips to the head, should be in one line, and the hands should move in a line parallel with the ears, so that, when the arms are extended, there should be a straight line, or an arch backward, from the hips to the fingers.

VII. Rise on the toes, bend the knees, place the hands on the floor, fingers pointing inward, elbows inside the knees (Illus. 32); now kick the feet backward, keeping the body in a line from the head to the heels (Illus. 33). While holding this position, elevate the left and right leg alternately, keeping the knee straight and pointing the toes of the elevated leg. (Illus. 103.)

VIII. Arms extended upward, place the left foot forward. Rotate the trunk as far as possible to the left. (Illus. 104.) With the right foot forward, rotate to the right. Do not allow the arms to lose their relative position to the head as the trunk is rotated. There is a tendency to carry the right arm forward and the left arm backward, as the body is rotated to the left, and vice-versa.

IX. Rise on the toes, bend the knees, place the hands on the floor. Kick the feet backward; then turn the body to the right so that the weight is supported on the left hand and the outside of the left foot. The right hand is on the hip. While holding this position



elevate the right leg a few times, keeping the knee straight and toes pointed. (Illus. 105.)

Turn face downward, weight on the hands and toes; then, to the left, so that the weight is on the right hand and right foot. Left hand on hip. Repeat the leg elevation. Then turn forward, spring the feet forward and come up to position.

X. Arms extended upward, rise on the toes and reach upward. While holding this position walk slowly forward and backward. (Illus. 106.)

XI. (a) Practice vaults on the horse or buck.

(b) twice upward jump. (1) Rise on the toes, (2) bend the knees, (3) as you swing the arms upward spring up, bringing the arms to the sides before landing, knees half-bent, (4) repeat the jump, (5) stretch the knees, (6) lower the heels.

XII. Arms bent forward, elbows shoulder high, hands in front of the chest, fingers and wrists straight. (1) Carry the arms sideways as you step forward with the left foot and at the same time breathe in. Carry the chest well forward, head erect. (2) As you flex the arms and exhale, carry the right foot forward, etc. After repeating this for three or four steps, practice with stepping forward with the right foot as you inhale, and the left foot as you exhale.

LESSON XVI.

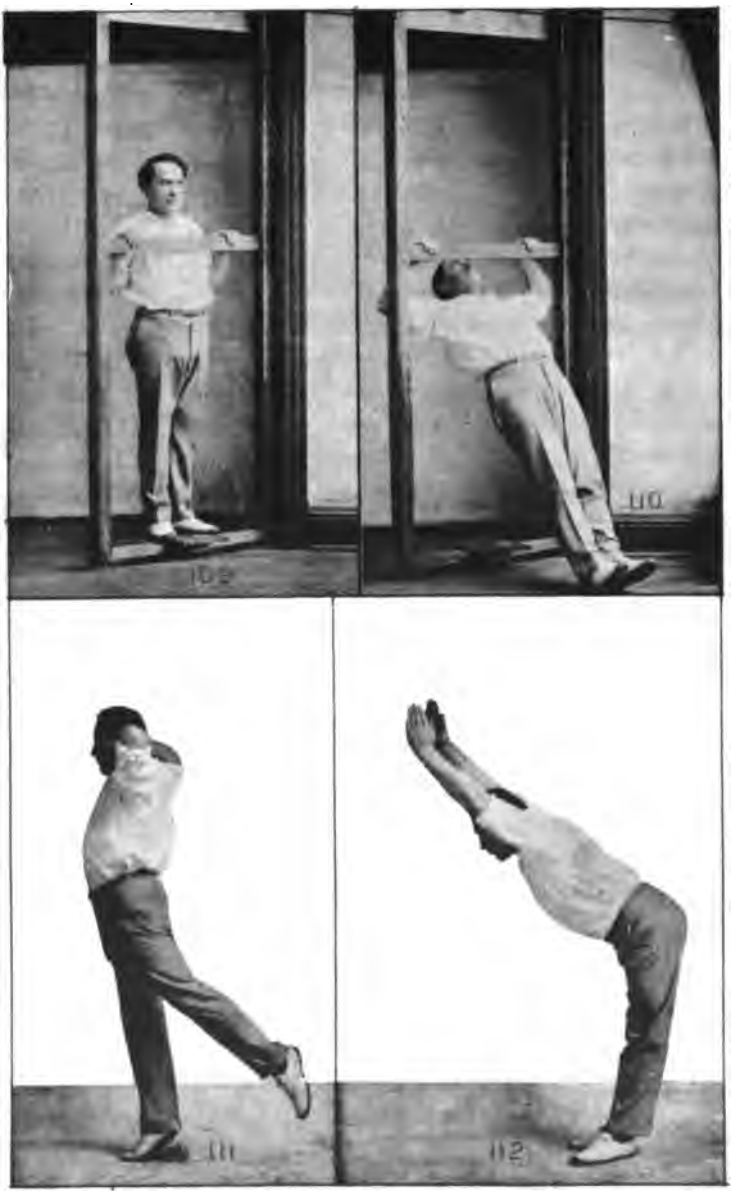
Introduction.

1. Fingers locked behind the head, raise the heels a few times. (Illus. 22.)

2. Arms bent forward, fling them sideways a few times as you lunge forward, first with the left, then the right foot. (Illus. 107.)

3. Prepare to jump. (See Exercise 4, Lesson II.)

4. Arms bent upward, extend them sideways forcibly, palms turned up.



5. Raise the arms forward-upward as you inhale. Lower them sideways-backward as you exhale.

I. (a) Back toward the wall, about two feet away from it, arms extended upward. Bend backward and rest the hands against the wall. While holding this position, flex the knees upward alternately, beginning with the left. The uplifted knee should flex at right angle, toes pointing down. (Illus. 108.)

(b) Arms extended upward, bend forward as far as possible without bending the knees or rounding the back.

II. (a) Traveling rings.

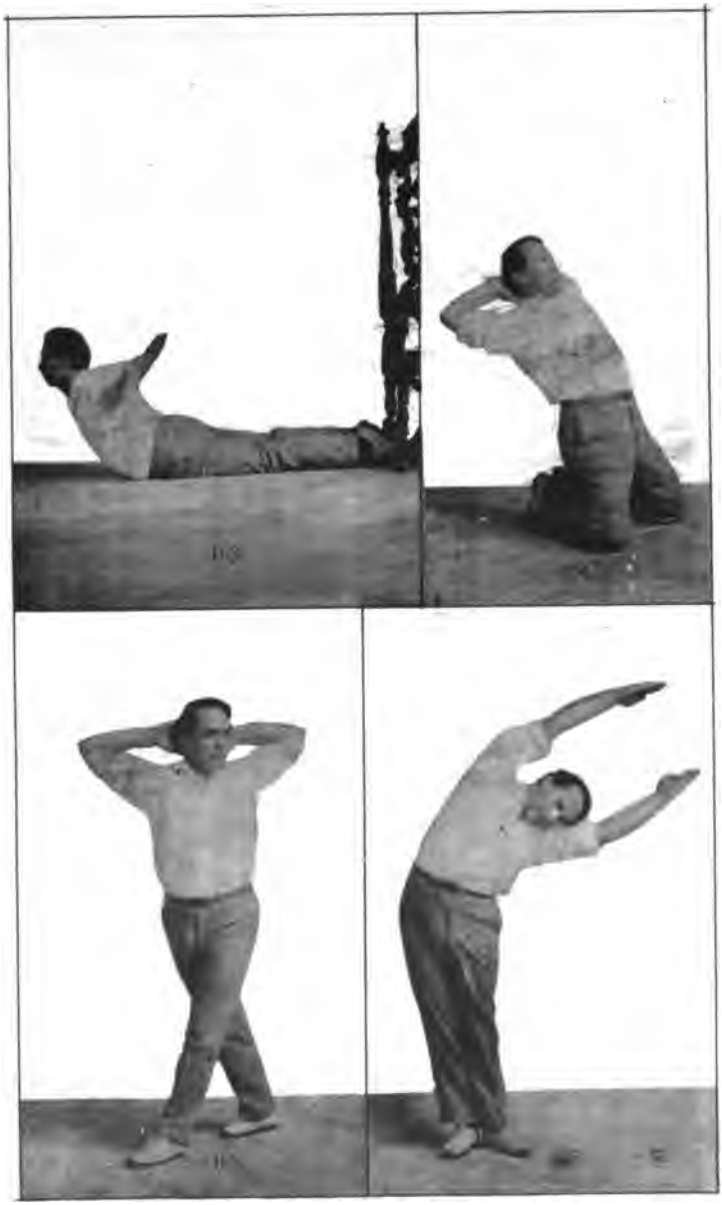
(b) Horizontal bar. Fall hanging, arm flexion. Have the bar about shoulder high, grasp it with the palms facing away from the body (Illus. 109), then spring the feet forward so that the weight rests on the heels (Illus. 110). While in this position, flex the arms. Do not allow the hips to sag, but keep the body in line from the heels to the head.

III. Lock the fingers behind the head; rise on the toes. While balancing on the toes, and without disturbing the posture of the body, raise the left and then the right leg backward alternately, keeping the knee straight and pointing the toes of the elevated foot. (Illus. 111.)

IV. Arms extended upward, bend forward from the hips; lower the arms forward to shoulder height. (See Illus. 72.) Fling them upward a few times. (Illus. 112.) Finish with the arms up before you straighten the trunk.

V. Marching and running or, with the hands on the hips, rise on the toes, bend the knees to sitting on the heels. In this position hop about.

VI. Lying face down with a weight on the feet, arms bent; arch the body upward, and, while holding



this position, extend the arms sideways forcibly, the palms turned up. (Illus. 113.)

VII. Fingers locked behind the head. Rise on the toes, bend the knees all the way down, kneel. In this position, without sitting back on the heels—that is, keeping a straight line from the knees to the head—incline the body backward from the knees. (Illus. 114.)

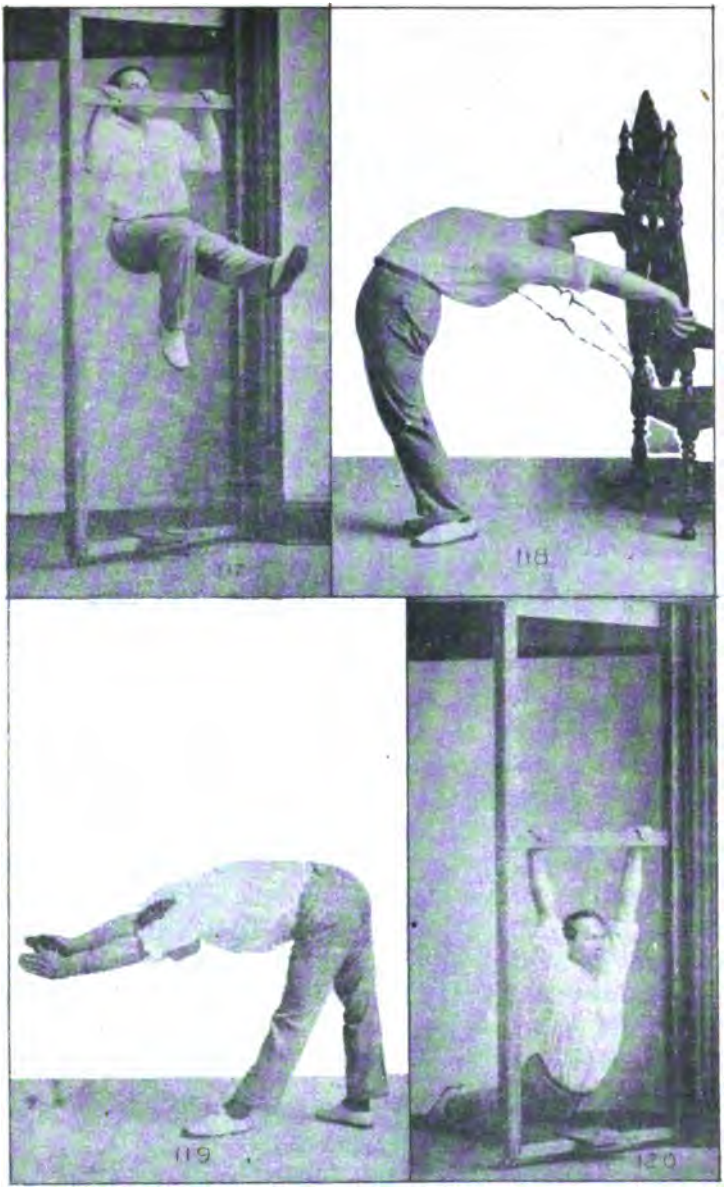
VIII. Fingers locked behind the head, feet pointing straight forward, carry the left foot forward about two foot lengths. Keeping the elbows well back, and the weight between both feet, turn the trunk as far as possible to the left. (Illus. 115.) With the right foot in front, turn to the right.

IX. Arms extended upward, bend to the right and then to the left, as far as possible, without bending the knees. (Illus. 116.)

X. Rope climbing, or hanging on the horizontal bar, bend the knees up to right angle. While holding them up, straighten them forward alternately. (Illus. 117.)

XI. Jump to opposite sides, in six counts. In jumping first to the right, then to the left proceed as follows: (1) Rise on the toes, (2) bend the knees and at the same time carry the arms to the left, (3) with a swing of the arms downward and to the right, spring to the right, (4) immediately upon landing, with the arms straight, to the right, swing them downward and to the left as you spring to the left, and just before landing, bring them to the sides to land with the knees half bent as in all landings. (5) Straighten the knees, and (6) lower the heels. Repeat, taking the first jump to the left, etc.

XII. Raise the arms sideways upward and at the same time raise the heels and inhale deeply. As you lower the arms and the heels slowly, exhale.



LESSON XVII.

Introduction.

1. Heel lifting.

2. Hands on the hips, elevate the legs sideways alternately, beginning with the left. Do not allow the body to incline to the side opposite the elevated leg. The trunk is kept erect by making a slight effort to elevate the opposite shoulder. (See Illus. 101.)

3. Arms bent forward. Fling them sideways as you lunge forward. (See Illus. 107.)

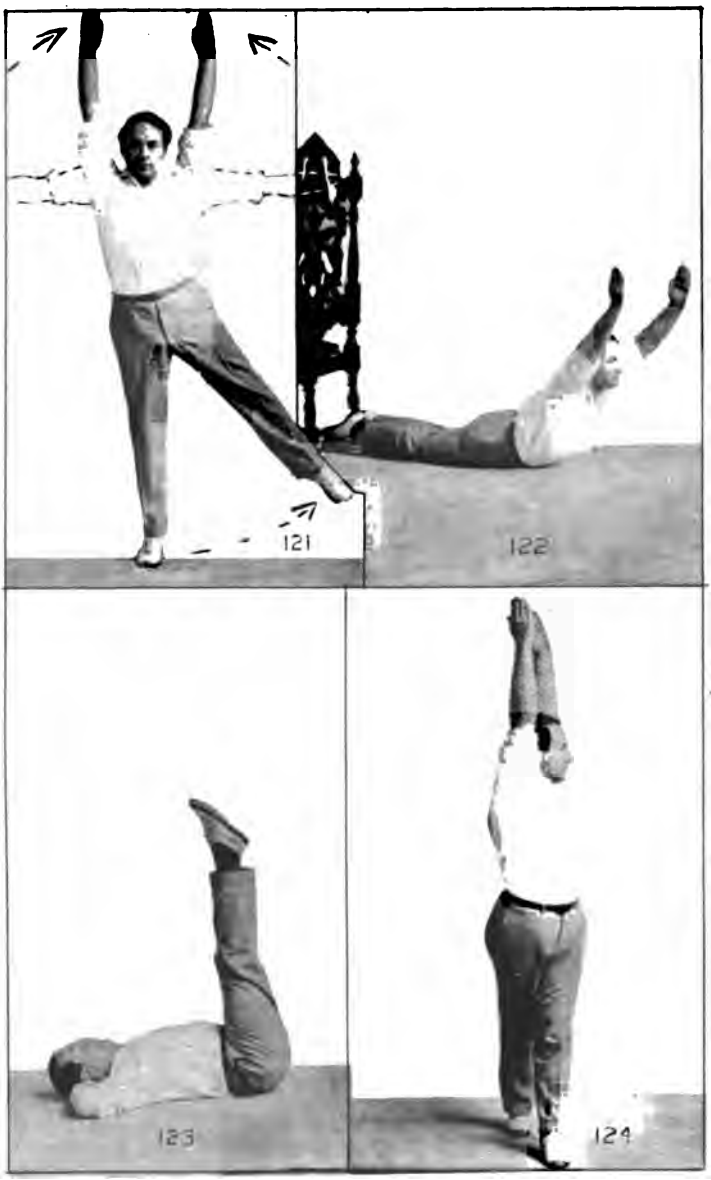
4. Raise the arms sideways to shoulder height and when they are almost up there, turn the palm forward-upward forcibly, and at the same time inhale deeply. Turn the palms downward and lower the arms slowly as you exhale.

I. (a) Back toward the wall, standing two feet or more from it. Arms extended upward, bend backward and rest the hands against the wall. Travel downward by moving the hands alternately until you reach your limit; then travel upward and rise slowly. (Illus. 118.)

(b) Arms extended upward, left foot forward, bend forward as far as possible without bending the knees. (Illus. 119.) Repeat with the right foot forward.

II. Horizontal bar work. Anything the pupil enjoys, provided it does not compress the chest. A valuable exercise is to fix the bar at shoulder height, grasp it as in Exercise II, Lesson XVI., spring the feet forward to fall hanging as Illus. 109. Then, in one movement with a hard pull of the arms spring the feet back as far as possible to arch-hanging position. (Illus. 120.)

III. Arms shoulder high at the sides, palms turned



up; raise them to vertical and at the same time elevate the left leg sideways, and raise the heel of the right foot. (Illus. 121.) Balance in this position a few seconds then lower the arms to shoulder height, lower the left leg and right heel. Repeat the movement raising the right leg and left heel, etc.

IV. Hands on the hips, lunge sideways-forward to the left. The body should be in a straight line from the heel to the head. (See Illus. 69.) Holding this position, raise the arms forward. Fling them sideways forcibly a few times, the palms turning downward as the arms travel back.

V. Marching or running, or the equivalent.

VI. Lying face down with a weight on the feet, arms bent, arch the body up and hold this position while you extend the arms upward a few times. (Illus. 122.)

VII. Lying on the back, fingers locked behind the head, elbows kept resting on the floor, without bending the knees, raise the legs to vertical a few times, keeping the toes pointed. (Illus. 123.)

VIII. Heels and toes together, place the left foot forward, arms extended upward. Keeping the toes pointing straight forward, weight between both feet, turn as far as possible to the left. This movement requires good balancing power. There is a tendency to shift the toes from side to side to keep from falling, guard against this. (Illus. 124.) With the right foot forward, practice to the right.

IX. Arms bent upward, feet apart, bend the trunk to the left and when the trunk is bent nearly as far as possible, extend the arms upward. Flex the arms as the trunk is straightened. Repeat to the right, etc. Illustration 116 shows the trunk bent sideways, but the heels are together. In this movement the feet are

apart, and as the arms are extended the position of the body corresponds to the illustration.

X. Practice the dip on parallel bars, or between two chairs. (Illus. 125.)

XI. Various running high jumps; plain, with turns, and with arm flingings, landing as in the standing jumps.

XII. Arms bent forward, carry them sideways slowly as you take a half step sideways-forward, first to the left, then to the right alternately, and inhale deeply. As you step, raise the heels of the rear foot and exaggerate the chest expansion. (Illus. 126) shows the body at inhalation. (Illus. 22) shows the starting position.

LESSON XVIII.

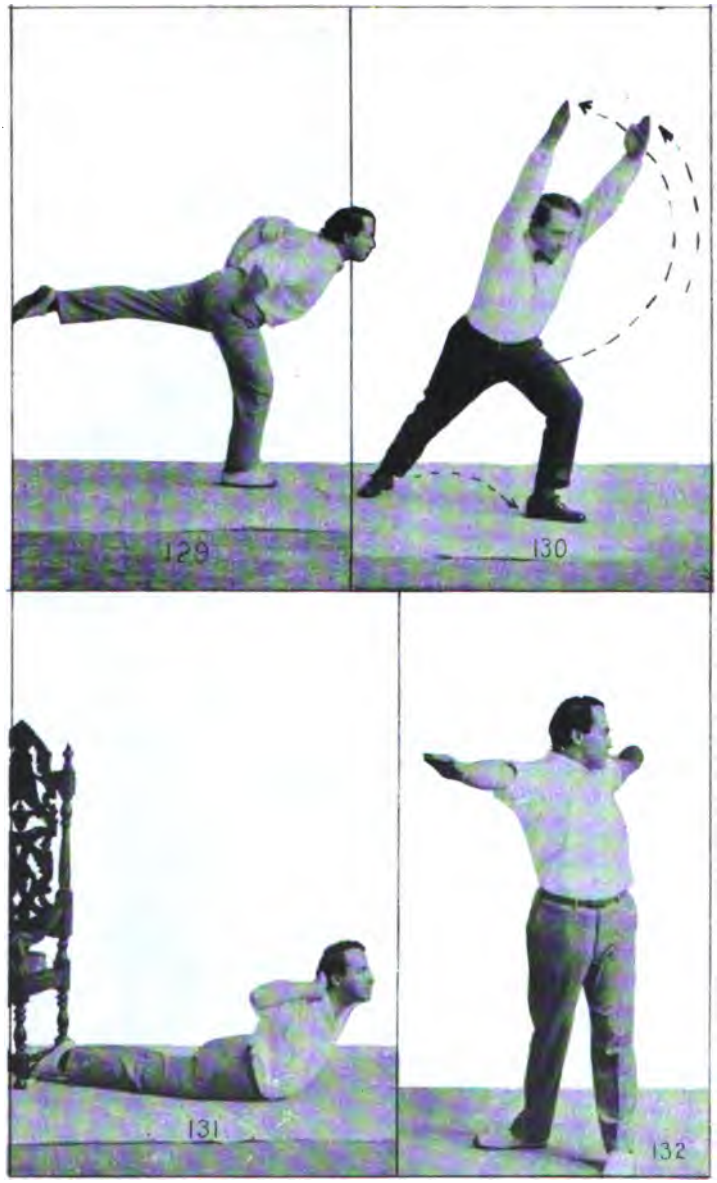
Introduction.

1. Raise the arms sideways and rise on the toes as you inhale. Lower the arms and heels slowly as you exhale.

2. Hands on hips, without bending the knee or disturbing the position of the body raise the left leg backward. Lower it, and raise the right leg. (Illus. 17.)

3. Various bilateral arm extensions. (1) Arms bent upward, (2) extend the left arm upward and at the same time the right sideways; the palm is inward in the upward arm and downward in the sideways one. (Illus. 47.) Change arms a few times, with count, at (1) bend them, at (2) extend the right upward and left sideways, etc.

Arms bent, extend the left upward and the right forward. Palms inward in both. Change in the same way as the above exercise. (Illus. 127.)



Arms bent, extend the left sideways, palm turned down and the right forward, palm inward. Change with count. (Illus. 128.)

4. Prepare to jump, in four counts.

I. Repeat Exercise I of Lesson XVII (a) and (b).

II. Flying rings: various swings and cut-offs.

III. Hands on the hips, raise the right leg backward and at the same time slightly flex the left knee and bend the body forward until it is horizontal or slightly arched from the head to the pointed toes of the left foot. (Illus. 129.) Hold a few seconds, then repeat on the right foot. This is called horizontal half standing position.

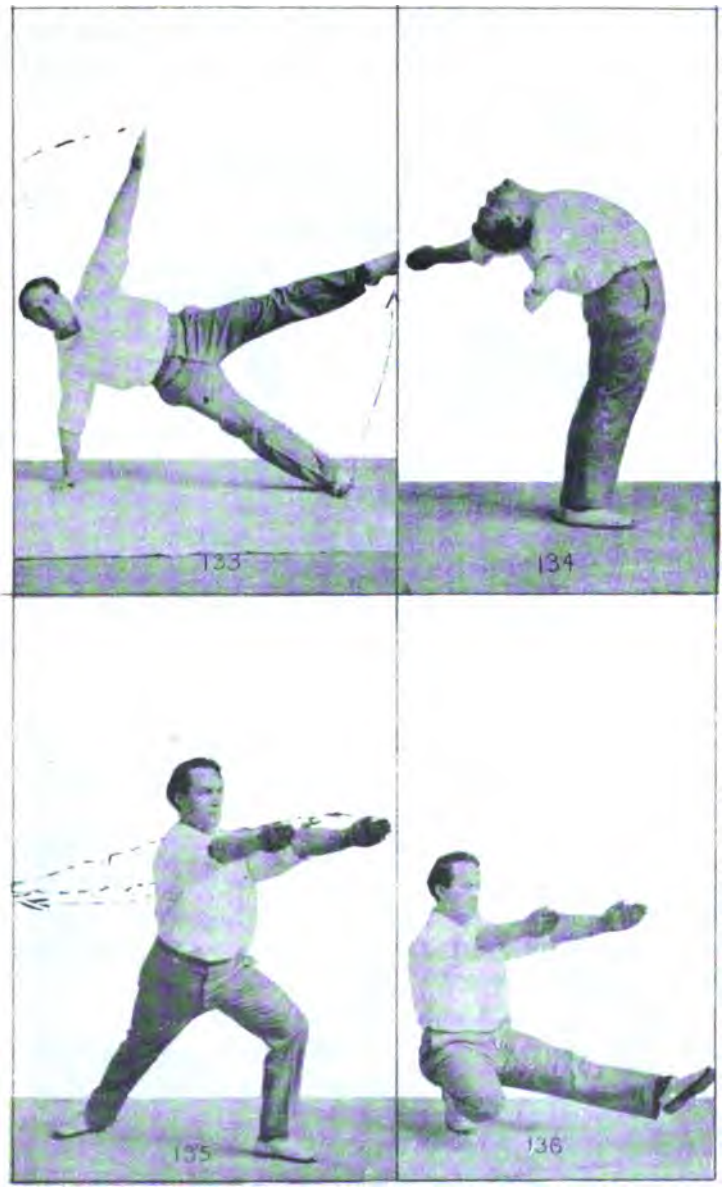
IV. Keeping the elbows and wrists straight, and without allowing the head to duck forward, fling the arms forward-upward forcibly as you lunge forward with the left foot. (Illus. 130.) Repeat with the right foot, and so on, alternately.

V. Marching and running, or the equivalent.

VI. Lying face down with a weight on the feet. Lock the fingers behind the head, keeping the elbows well back and the head up, arch the body up from the floor. (Illus. 131.)

VII. Take position explained and illustrated in Exercise 10, Lesson IV. This is called stoop fall position. Spring the feet forward and through the hands. To accomplish this lift up onto the fingers as the feet move forward.

VIII. Arms sideways at shoulder height, feet apart. Twist the trunk rapidly from side to side. (Illus. 132.) Keep the arms straight from the shoulders throughout the movement. There is a tendency for the left arm to come forward as you turn to the right, and for the right arm as you turn to the left.



Guard against this. This exercise is a splendid developer of "nature's corset."

IX. Take side fall position, explained and illustrated in Exercise IX, Lesson XV. As the weight is borne on the left hand and side of the left foot, extend the right arm upward, then, while holding this position, elevate the right arm and right leg. (Illus. 133.) Repeat the exercise from the right.

X. Work on the ladder. In absence of a ladder, hang on a horizontal bar and elevate both legs forward, knees straight, toes pointed. Hold them in this position a few seconds, and repeat. (See Illus. 147.)

XI. Ninety degrees upward jump, "Start." Practice the upward jump with the usual start: (1) rising on the toes, (2) bending the knees, and (3) springing up with a fling of the arms upward and a quarter turn to the left, thus landing facing left from where you started; (4) spring up again with a quarter turn, and so on a number of times. Then, practice jumping a series with turns to the right.

XII. Arms shoulder high at the sides, palms turned up. Elevate the arms as you rise on the toes and breathe in deeply. Lower the arms to shoulder height, as you lower the heels and breathe out.

LESSON XIX.

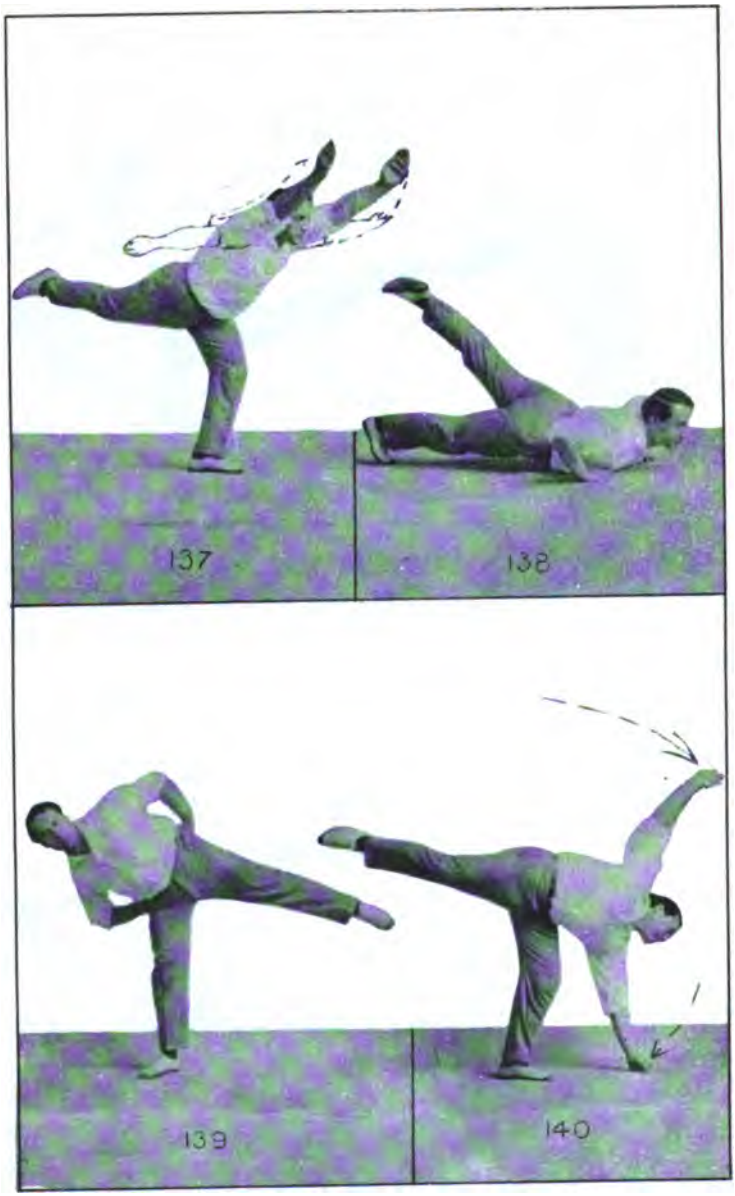
Introduction.

1. Raise the arms forward-upward and at the same time breathe in deeply. Lower them sideways-backward slowly as you breathe out.

2. Hands on the hips, raise the left leg sideways; then, the right, alternately. (Illus. 101.) Exercise II, Lesson XVII.

3. Arms swimming as described in Exercise 2, Lesson VI.

4. Horizontal half standing position,



Exercise III, Lesson XVII. (Illus. 129.)

I. (a) Arms bent upward, arch the trunk backward and, while holding it arched, extend the arms sideways forcibly a few times.

(b) Arms extended upward, bend forward to the floor without bending the knees. If possible touch the palms to the floor.

II. Horizontal bar, or flying ring work.

III. Arms bent forward, take horizontal half standing position on the left foot. While holding the position practice arm swimming. Repeat on the right foot.

IV. Hands on the hips, lunge sideways-forward to the left, that is, carrying the foot in its own direction three foot lengths. (Exercise 3, Lesson X, Illus. 69.) Turn the trunk to the left and raise the arms forward. While holding this position, fling the arms sideways forcibly. (Illus. 135.) Repeat in lunge position to the right.

V. Marching and running, or the equivalent. Low down dance is good if one is able. The arms are extended forward, the legs bent to squat. Kick the right foot forward, and change feet in one spring. Keep it up rapidly. (Illus. 136.)

VI. Arms bent upward, take horizontal half standing position. Extend the arms sideways, palms turned up. While holding this position, elevate the arms a few times. (Illus. 137.)

VII. Take stoop fall position. (Illus. 33.) Raise the left leg, keeping the knee straight and the toes pointed, as you flex the arms. (Illus. 138.) Lower the leg as you extend the arm, and repeat, raising the right leg, etc.

VIII. Feet close, that is, heels and toes together; arms out shoulder high at the sides. Twist the body rapidly from side to side without shifting the feet, and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observing the same rule about the arms as in Exercise VIII, Lesson XVIII.

IX. (a) Hands on the hips, flex the trunk to the left, raising the right leg at the same time. (Illus. 139.) The same to the right.

(b) Prepare for cart wheel: Arms out at the sides, bend to the left until the left hand rests on the floor the right leg elevated, and the right arm reaching over the head ready to bear the weight in complete turn. (Illus. 140.) Repeat to the right.

X. Horizontal lever. Rest the elbows against the front of the hip bones and gradually assume a horizontal position, head up, toes pointing. (Illus. 141.)

XI. (a) Various vaults on the horse.

(b) Sideways forward jump: Keeping the trunk forward, (1) step out with the left foot in the direction it is pointing and, (2) with a swing of the arms, leap in the same direction, landing in the usual way with the knees half bent and the hands at the sides, (3) straighten the knees and, (4) lower the heels. Repeat stepping out with the right foot.

XII. Raise the arms forward-upward and at the same time turn the trunk to the left and rise on toes as you breathe in deeply. As you lower the arms slowly, turn the trunk forward, lower the heels and breathe out. The same with turn to the right.

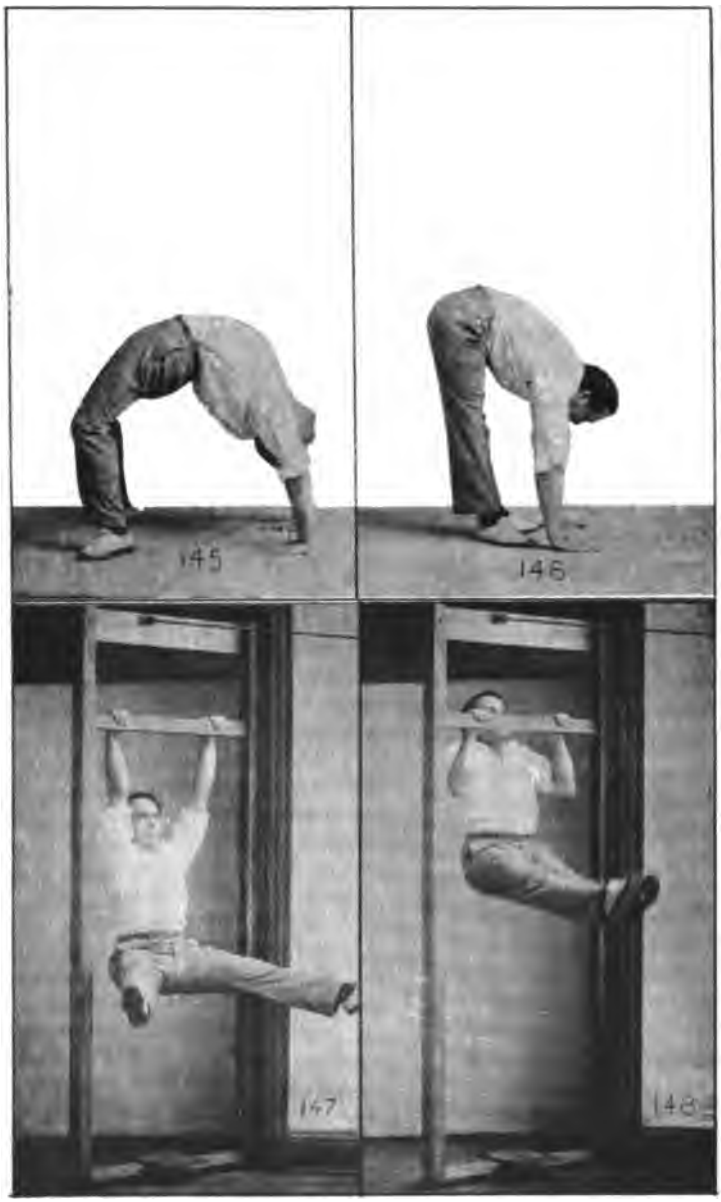
LESSON XX.

Introduction.

1. Head rotation and backward flexion (Exercise 1, Lesson I), also (Exercise 1, Lesson II).

2. Arms extended upward, feet apart (1) rise on the toes, (2) bend the knees (Illus. 142), (3) stretch the knees, (4) lower the heels.

3. Arms bent upward, lunge sideways-



forward to the left and at the same time extend the left arm upward and the right arm downward. (Illus. 143.) The body should be in a straight line from the rear heel (which is kept on the floor), to the upraised arm. Repeat to the right with the right arm up and left down, and so on.

4. Raise the arms forward-upward and at the same time rise on the toes as you breathe in. Lower them sideways backward as you lower the heels and breathe out.

I. (a) Fingers locked behind the head, feet apart, turn to the left. Keeping the body turned, bend backward a few times. Keep the elbows well back as you arch the upper spine backward. (Illus. 144.) Repeat with the trunk turned to the right.

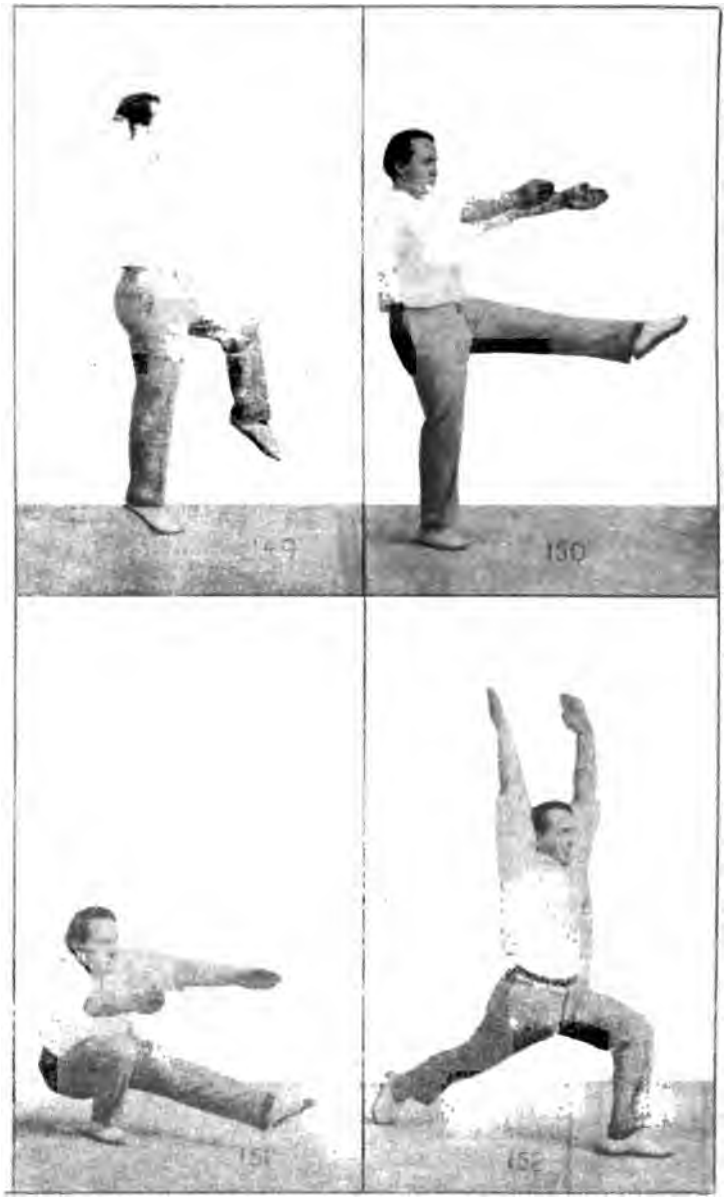
(b) Arms extended upward, turn to the left and bend to the floor a few times. Repeat with the trunk turned to the right.

Instead of the above arch-flexion, which is difficult enough, if one is able, he might practice the following:

(a') Arms extended upward, feet apart, bend backward, to the floor. With a slight spring of the fingers come up to position as slowly as possible. Repeat a few times. (Illus. 145.)

(b') Arms extended upward, bend forward to the floor, without bending the knees, touching the palms if possible. (Illus. 146.)

II. Hang on the horizontal bar and flex the legs forward at the hips. Knees straight, toes pointed. (Illus. 147.) While holding this position spread the legs apart, and bring them together again. Then, still holding the legs forward, flex the arms. Keeping the arms flexed, spread the legs apart and bring them to-



gether again. (Illus. 148.) Repeat as many times as possible.

III. (a) Fingers locked behind the head, rise on the toes, and, while holding this position, flex the knees alternately up to right angles. (Illus. 149.)

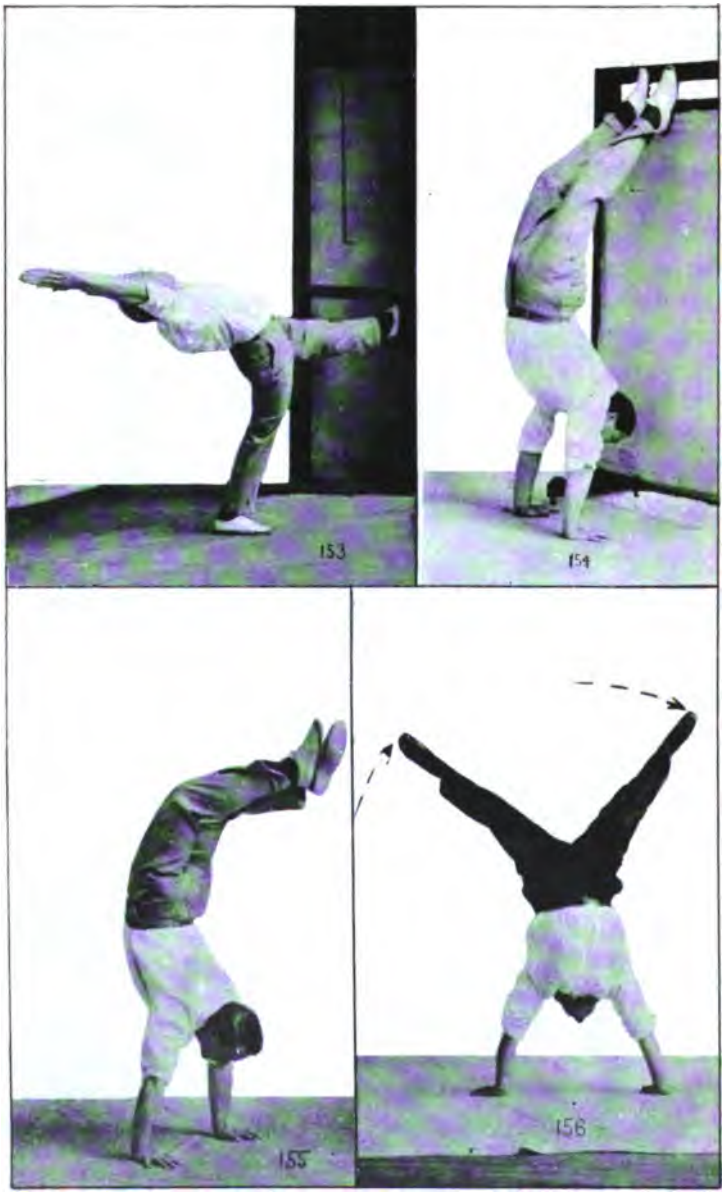
(b) Arms extended upward, take horizontal half standing position on the left foot. (Illus. 137.) Hold for a few seconds then, as you erect the trunk, carry the arms straight forward and, without touching the floor with the right foot elevate the right leg straight forward. (Illus. 150.) Preserving this posture of the arms, right leg and body, bend the left knee all the way down. (Illus. 151.) Extend the left leg and, from position pictured in illustration 150, go back to horizontal half standing position, and so on, in a continuous movement. Repeat on the right foot.

IV. Fling the arms forward-upward forcibly and at the same time take a lunge forward with the left foot far enough to rise on the toes of the right foot with the rear knee straight, the forward knee at right angle and the trunk erect. (Illus. 152.) In one count, change feet forward as you lower the arms and fling them upward again.

V. Running or, "low down dance," described in Exercise V, Lesson XIX.

VI. Lying face down, with a weight on the feet, the arms extended upward, arch the body upward and, while holding it arched, lower the arms to shoulder height and raise them again a few times. Illustration 137 shows the movement of the arms.

VII. (a) Stand about three feet away, facing a stall bar, or any place where you can hook one foot. The arms extended upward raise the left leg forward and hook the foot. Holding this position, bend the body backward to horizontal a few times. (Illus. 153.) Repeat with the right foot up.



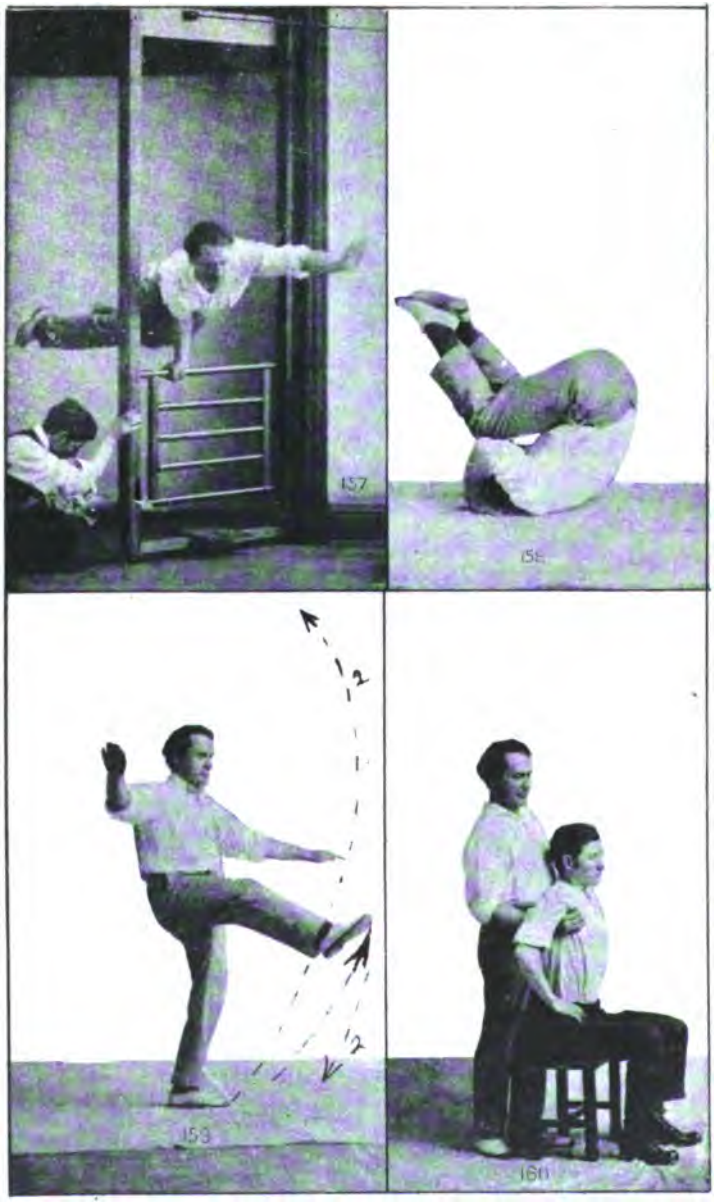
(b) Practice the hand balance, and, if possible, walk on the hands. To practice the hand balance, place the hands about two feet from the wall and swing the feet up, one leg getting a good swing before the foot of the other leaves the floor. The feet stopping against the wall will prevent you from falling over. While the feet are resting against the wall, stiffen the wrists and fingers so as to get the feet away from their support and balance a few seconds. (Illus. 154.) If one is able, this time in the lesson is proper for walking on the hands. (Illus. 155.)

VIII. Arms extended upward; preserving this posture of the arms, and without shifting the position of the feet or bending the knees, twist the trunk rapidly from side to side.

IX. Cart wheel. Following up (b) of Exercise IX, of the preceding lesson, with plenty of speed as you bend sideways, turn completely over, shifting the weight from the left foot to the left hand then to the right hand and right foot and up again. For perfect form the arms and legs should be kept straight. Practice first to the left, then to the right. (Illus. 156.)

X. Horizontal lever on one hand. To balance on the left hand, rest the left elbow against the crest of the hip bone, grasp the bar with both hands and gradually bring the body to horizontal, then extend the right arm in line with the body. Practice the same on the right hand. (Illus. 157.)

XI. Kip up. Lying on the back, the arms bent, palms turned forward, curl the legs over the head and rest the hands on the floor beside the head. (Illus. 158.) With a sudden kick upward, arch the body, very much as illustration 145, and push hard and suddenly against the floor to spring up. In the upward spring, with the final push of the hands, bend the knees and bring the feet under the buttocks.



XII. Practice various vaults on the horse, with and without turns. In absence of a vaulting horse, practice the hitch kick. In the hitch kick with the left foot, get the lift by swinging up the right leg as you spring from the left, and, while the body is in the air, kick as high as possible by bringing up the left foot and at the same time pulling down the right. (Illus. 159.) From the kick you land on the right foot.

To kick with the right foot begin by swinging up the left leg, and so on.

XIII. Raise the arms sideways to shoulder height, turning the palms forward-upward (rising on the toes just as the arms are almost turned), and inhale deeply at the same time. Gradually turn the palms downward as you lower the arms and heels, and exhale.

Medical Gymnastics

CHAPTER III.

Medical Gymnastics.

"Medical Gymnastics," says Baron Posse, "means systematic exercise of the muscles and other tissues for therapeutic purposes. While no distinct line can be drawn between hygienic and medical gymnastics, it will however be found that a majority of the medico-gymnastic procedures differ from ordinary gymnastics even though these are used as auxiliaries in special cases." Perhaps as clear a line of demarcation as can be drawn might be indicated in the statement that any movement, passive or active, prescribed or practiced for corrective or curative purposes would come in the category of medical gymnastics; while any movement, or procedure, practiced simply to promote or maintain health in the individual would be classified as hygienic. Therefore, the purpose for which a movement is employed determines whether it is medical or hygienic.

Medical gymnastics includes, besides auxiliary gymnastic procedures, all massage procedures. These are friction, kneading, circumduction, pressure, percussion and vibration; all of which may be regarded as passive exercise of the muscles. Massage makes it possible for the average healthy person to keep in good state of health without exertion, if he has recourse to treatment periodically as many do. Since the muscles must must be used to be healthy, and since many people are lazy or indifferent in this respect, the masseur has a fruitful field before him. But the financial is the least important feature of massage.

Massage is extremely useful on many cases, especially where there is soreness or inflammation, as in sprained ankle, lumbago, or over-exhausted muscles. It is true that massage is in many respects but a general procedure, as compared to the specific procedures of osteopathy. But it is also true that massage becomes a useful adjunct to much osteopathic treatment, under the term, manipulation. It is usually employed in relaxing muscles previous to lesion setting.

"Through the Middle Ages, massage was followed by the monks in the monasteries, and by priests, who had the reputation of healing diseases by the laying on of hands. Ling became interested in this method of healing as a result of having rheumatism in his shoulder. He began fencing and his ailment grew better. He continued to fence and in a short time the rheumatism had disappeared. Although he was not a physician, Ling had a knowledge of anatomy and physiology, and he at once started his investigations which were to be of such benefit to mankind." Strange to say, although he claims to have based most of his work upon the physiology of a century ago, yet, with the new discoveries and rapid development of this science, his system, though in most particulars unaltered, is still in accord with the physiology of today.

Before considering the details of each division of massage, it might be well to consider briefly some of the latest findings in this science.

Graham, in "Recent Developments in Massage," tells of Mosso and Maggiora of Turin, who carried on several experiments and report, among other findings, their observation of the fatigue curves of the right and left middle fingers. The test understands the maximum voluntary flexion every two seconds, with a weight of three kilos. Records were taken at 8 and 11 a. m. and 2 and 5 p. m. without massage. On the

following day, under the same conditions, as the day previous, except that a friction and kneading of three minutes preceded the lifting, the average results proved that the muscles could do twice the work after massage.

Maggiora also proved that an extension of the period of massage did not improve the results. Five minutes seems the maximum period of massage for best results. Friction and precussion gave almost the same results; but kneading gave better results than these two, while alternating all three gave the best results of all.

It has been the writer's experience that massage is the most useful procedure in connection with athletes; or as a preparatory measure to heavy work of any kind. The rub-down of the average trainer accomplishes very little. But a scientific application of massage will bring excellent results: results that are impossible otherwise.

If a part is cold, extreme care should be taken before making a strenuous effort with it. Massage—that is, circumduction—should be used to draw the blood to it, and then warm it up to the proper state by exercise. The best procedures, if time permits, are kneading and circumduction.

During contraction of a muscle the cells swell, and at relaxation they contract again. During this process, a rapid exchange of tissue takes place, thus promoting metabolism. Properly regulated action will increase the number of muscle cells, and the general system is benefited. But, in violent work, there is such a rapid breakdown of tissue that the waste material accumulates more rapidly than it can be gotten rid of, therefore soreness sets in. In such a case, and there are few conditions more common, there is not a more efficient procedure than proper massage.

Where a part is depleted, from fasting, malnutrition, over-exertion, or during convalescence, massage is one of the best procedures. But in such cases, for best results, massage requires manual dexterity. And this can only be acquired by practice. Massage will promote nutrition, and hasten restoration in depleted parts. Even though the patient has taken no food, still a proper application of massage will temporarily restore normal strength.

Massage affects the blood flow primarily. Its effect upon the nerves are not so marked. Maggiora found that if the brachial artery is shut off, so as to produce a local anemia, the finger can contract eleven times. After a massage of three minutes, with the current still shut off, the finger could contract nine times. While in the normal state the finger contracted 265 times. Thus proving the need of free blood supply.

It has been long recognized that massage improves muscle tone, postpones the onset of fatigue, or hastens recovery from it, and relieves pain. To prepare an athlete for a contest, a general massage treatment is unequaled in its effect. While still a student of the Posse Gymnasium, during a gymnastic exhibition, one of the pupils found that his arms felt so weak that he could not perform his feats. We took him to another room where we thoroughly kneaded his arms for about five minutes, with the result that the athlete excelled his previous performances.

After a hard contest, or feat of some kind, or after a heavy day's work a few minutes kneading of the effected muscles will enable the subject to repeat or continue his performance.

Massage is a form of passive exercise, as already said, but it is better than the active kind in that it feeds the muscular tissue, and at the same time produces less fatigue or waste of nervous flow or tearing

down of tissue. It increases the number of red and white corpuscles, removes peripheral resistance, hastens the blood flow and thus stimulates the circulation, nutrition and excretion. It is not as specific as osteopathy in these last three respects, but is is a very valuable adjunct.

PASSIVE PROCEDURES.

Friction: Very little need be said about friction. Friction simply means a rubbing or stroking of a part with one or both hands, together or alternately, in the direction of the venous blood flow, or along the path of a nerve. Graham says that "the manner in which a carpenter uses his plane represents this to-and-fro movement very well." The pressure should not be so great as to chafe the skin. Where friction has to be prolonged as in severe sprain, or "house-maid's knee," cocoa-butter or vaseline should be used.

The effect of friction is very soothing. The skin temperature is raised; effusions and exudations are pushed along in the capillaries; the brain and cord are mildly stimulated; ordinarily, the cutaneous nerves are soothed, but in pathologic conditions, as neurasthenia, these nerves are irritated.

Friction may be used as a finishing up of kneading, or as a primary procedure to lead up to kneading, which is deeper in its effect. This applies particularly in such cases as sprains and various inflammations.

Kneading: Proper kneading is done so that the pressure is given in the direction of the venous current. Begin nearest the heart in whatever member or region of the body you are kneading and press the tissues heart-ward. Give two or three squeezes and then move the hand about half its width, away from the heart, giving a new series of rotary squeezings and then moving the hand again. Thus one works away

from the heart but at each manipulation squeezes toward it. The hand should not glide over the skin but, rather, move the skin and surface tissues over the deeper ones. As much tissues as the hand will hold or as the tissues will permit, should be grasped. On large surfaces, as the back and chest, the flesh cannot be picked up, but the flat of the hand is used to press the flesh on the bones in a rotary motion. On the arms and legs, the hands may be used simultaneously or alternately, each grasping all the tissue possible between the heel of the hand and the cushions of the fingers. The thumb acts as a fifth finger, rather than in opposition to them. Wherever possible the flesh is stretched from the bone and moved in as large a circle as possible without gliding on the skin, the squeezing coming as it moves heart-ward.

The chief effect of kneading is not on the arteries and large veins where the flow is rapid, but on the capillaries where the flow is very slow. By beginning nearest the heart, the capillaries are emptied in one region and as the hand is moved away and presses from below a double force works to empty the tissue. There is a suction force above and a pressure from below. Traveling down a limb in this way, the hand overlapping the portion already kneaded each time it is moved, will bring about quicker and more complete results than the old method of beginning at the extremities and moving toward the heart.

In giving a *general treatment* to get the best results in the quickest time, treat as follows: Left arm, left leg, right arm, right leg, chest, abdomen, back, and last, the neck and head. In each part give whatever procedures are necessary.

In treating the arms, begin at the shoulder, and travel to the fingers, the pressure being upward while the hands move downward. The same rule holds for

the legs. Whatever part or region is to be drained of its old blood and supplied with new, the pressure should always be applied first nearest its outlet.

The part kneaded determines the portion of the hand used. On large surfaces the entire hand or hands are used flat, pressing against the bones. Sometimes both hands are employed separately, moving simultaneously, or alternately. Or, to exert more pressure, one hand may be used to press the other. As the hands are used in this way, wherever possible, the tissues should be picked up and given the circular squeeze. For example, in kneading the chest, with the flat of the hand or the cushions of the fingers, as the swollen portion of the pectoral muscle is gone over it should be picked up and treated as the muscles of the arms or legs.

Without going into minute detail the general rule is to fit the hand to the part treated. On large surfaces, the entire hand, on smaller, the cushions of the fingers and heel of the hand, on smaller still, the ball of the thumb against one or more fingers; on the face, about the eyes, and regions where no flesh can be picked up the pressure is applied gently with the tips of the fingers. Therefore, if one knows the general direction of the venous flow, fits the hand to the part treated, being careful not to glide on the skin, he has the essentials of good kneading.

In kneading the abdomen, for constipation, the general rule of kneading holds good, that is, to start near the outlet. The principle is very much the same as in emptying a thin rubber tube filled with putty. The best way is not to begin at the distal end from the outlet and attempt to move the entire column at once, but, begin a short distance from the outlet and squeeze out a small portion of the mass. Then, move back and squeeze a little more, and so on, until the entire mass

has been moved, section by section. One begins at the sigmoid flexure and, with a circular motion, presses the bolus toward the rectum. Press two or three times in one spot then move away. The pressure is kept up in the direction of the rectum but the hands gradually travel back from the sigmoid flexure up the descending, transverse and ascending colons. Much special kneading is necessary at the region of the caecum as well as at the sigmoid flexure. Impaction is very common in these parts as a result of chronic constipation. Many a patient has been operated on for appendicitis when his only trouble was a caecum inflamed from impaction.

Kneading of the small intestines is neither as important nor difficult as that of the large intestine. It is given to stimulate peristalsis rather than to mechanically empty this region. There are two methods of applying it. One is to press transversely with the hand in a back and forth motion, that is, with the operator standing at the patient's right side, the heel of the hand would press the small intestines from the right side toward the left, and then, as the hand is pulled back, the fingers are dug deeply to the left of the small intestines and draw them toward the right. The second method is to describe a circle with the edge of the hand along the margin of the small intestinal area, pressing toward the umbilicus with whatever part of the hand is touching. As this kneading is applied one describes as large a circle as possible with the hand, so that the heel of the hand, then the outside edge of the thumb, the finger tips and the ulna side of the hand successively press the intestines in a concentric circle.

Circumduction is commonly called rolling of a joint. Posse's definition is quite explicit: "Some part of the body describes with a longitudinal axis, the surface of

an imaginary cone, the base of which is at the free end of the part moved, and the apex at the joint in which the movement takes place. Circumduction can be active or passive."

In giving passive circumduction one hand steadies the moving joint while the other grasps near the next. The speed is less for a large than for a small limb. The circle should be as large as the joint permits or as its effects demand. The duration is limited by the sensation of resistance. When applied, as in stiff joints, to promote freedom of action, it is slow. When applied to reduce the blood supply in a part it is comparatively slow. The act of slowly describing a large circle with a limb alternately stretches and contracts the blood vessels and then hastens the circulation away from it. But rapid circumduction, through centrifugal force, holds or draws blood to a part.

Circumduction, it may be said, produces about the same results as kneading, only it affects the deeper and larger vessels to a stronger degree. It promotes absorption of nourishment from the blood, renders more pliable the tendons, ligaments and fasciae, removes articular adhesions, makes the cartilages thinner, and, when prolonged, it induces relaxation of attention and acts as a hypnotic.

It may thus be used as a soporific; as a regulator of circulation; as a substitute for, or as preparatory to, kneading.

Active circumduction, that is, where the pupil or patient executes a circumductory movement unassisted, has different effects than passive. It retards the venous circulation in the moving part, because of the active muscular contraction around the articulations. The flow to the active part increases according to the speed of motion. The cerebral influence to the part increases. The heart's action is accelerated through

increased arterial resistance. The prolonged movement will produce hyperemia in the active part. Thus, its effect is the reverse of passive circumduction.

Nothing in medical gymnastics on *nerve pressure* would add to the repertoire of the osteopath, therefore we shall omit a discussion on this subject. All superficial nerves are accessible for either stimulation or inhibition. To inhibit pain, gradually increase your pressure on the nerve center or trunk and then hold firmly for perhaps fifteen to thirty seconds, then gradually reduce the pressure. To suddenly apply and remove deep pressure has the effect of stimulation, and increases rather than soothes pain. To stimulate a nerve center or trunk apply intermittent or vibratory pressure.

Percussion, commonly called hacking, is very general in its effect, and deserves little consideration. It is divided into digital, ulna, palmar and fistic. The digital type is given with the tips of the fingers, on the head and sternum. Short percussion has the effect of stimulation on the nerves, produces constriction of the blood vessels, and tends to loosen phlegm and mucous in bronchitis. Therefore, digital percussion of the head would tend to reduce congestion; of the chest, it would promote expulsion of catarrhal accumulations. Prolonged percussion produces vaso-dilation and has a soothing or inhibitory effect on the nerves.

In every type of percussion the wrist is loose, and the hand kept quite limp, so that the effect may be penetrating without bruising. In applying the digital type, the wrist is loose and the tips of the fingers are struck smartly against the part treated. In the ulna type, the wrist is loose, and the fingers are spread apart and slightly flexed and the outside edge of the little finger strikes the part treated. As the little finger strikes, the others simultaneously close up on

it to increase the penetrating impact, with a dry, bony sound. Ulna percussion is particularly useful when applied in thoracic troubles, and along paralyzed or weak nerve paths. Palmar percussion is a form of slapping with the wrist held loose. Its only use in osteopathy is in conjunction with ulna percussion of the chest. It is applied at the lateral costal region to promote coughing and expectoration. Fistic percussion is given by striking the palmar side of the closed fist, with the wrist held loose, over the sacral area. It is applied to a patient who is in knee-chest position, when treating retroversion uteri. As the right hand percusses the left hand is employed at the abdomen to give a traction to the patient's viscera away from the pelvis.

Vibration: In medical gymnastics vibration is usually applied manually, but osteopaths who use vibration, with very few exceptions, use the electric vibrator. The advantages of the medical gymnastic method lie in the fact that the hand can be better adapted to a given surface than the applicator of a vibrator.

In favor of the mechanical vibrator, it can be said that the vibration, though not so fine, is more even, and it can be prolonged indefinitely. The operator, when giving manual vibration, becomes easily exhausted and, when he has treated a few cases, his vibration becomes irregular and less effective. This cannot be charged against mechanical vibration.

The effects of vibration are to promote metabolism, increase mobility in a part, break up adhesions, change neurition and increase venous circulation. It stimulates paralyzed parts, acts as a counter-irritant and promotes resorption or repair. Short vibration tends to stimulate both the nerves and local blood circulation by producing vaso-constriction. Prolonged vibration has the opposite effect.

ACTIVE MOVEMENTS.

All movements, as already stated, which are performed by the operator, without any effort on the part of the patient, are passive. But if the patient performs, or mentally tries to perform, a movement, it is active. A patient, as for instance, a paralytic, may strive harder than a healthy person to perform a given movement without getting any response in his muscles, but the fact that he wills it makes the movement active. This statement may seem paradoxical, but it is nevertheless true. All active movements begin and end in the brain. You may say, that some active movements originate in the spinal cord, that is true. Such movements are active, but remember also that such are reflex or automatic movements. The active movement under discussion is the kind which the patient makes a conscious mental effort to perform. So that, as in the case of the paralytic, even though his muscles do not respond to the will, still, the fact that he wills a movement makes it active. This feature is particularly important in the treatment of paralysis. If the operator takes hold of the part, and tells the paralytic to perform a certain movement and, while the patient is mentally striving to perform it, he performs it for him, the result is to gradually re-establish a relation between the brain and the muscle. Whether one re-establishes a new nerve path, or restores a deranged nerve, is not clear, but it has been the writer's experience that when this principle is followed in treating paralytics, greater improvement results than by any other method. Movements which the patient makes a conscious effort to perform but which, owing to his incapacity, have to be performed by the operator, are called assistive.

In the assistive movement we have the conscious

mental effort in the mind, and the response in the shape of the movement, even though performed by an outside power. Besides the assistive movement, we have the single and the resistive.

Besides these three divisions, active movements are further divided into excentric and concentric, and, in respect to the single, the static type. These forms of movements, from the contraction standpoint, have been explained in Chapter I.

Under medical gymnastics then, we have the passive and the active movements. The active movements and their subdivisions have been given. But a word or two may be added in regard to the single and the resistive types. The single is where the patient, or pupil, performs the entire movement without any outside help or resistance. All educational or free standing gymnastics, such as those explained in Chapter II, are examples of this type. The resistive type is the most important in medical gymnastics. In these movements the operator guides, and at the same time resists the effort of the patient. The amount of force or resistance used is regulated by the strength of the patient. They should always begin and end gently, and they should be smooth and even. In applying a course of treatments where resistive movements are indicated, it generally follows that these movements are at first excentric, then, concentric. In many cases they are concentric from the beginning; mild at first, then, increasing gently in force.

The general effects of active movements are to increase cerebration, promote or re-establish co-ordination, increase voluntary control, and promote motor, and lessen sensory irritability. On the circulation, their effect is to increase blood pressure and heart beat. They improve metabolism by rapidly tearing down old cells and promoting newer and fresher cell

life. That is why rational exercises so tend to rejuvenate all who practice them. They tend to harden fibrous tissue, render muscular tissue more efficient and healthy, lessen adipose tissue and promote general excretion. The local effect of an active movement is to increase the blood flow to the part used, promote nutrition, neurition and muscular sense.

In medical gymnastics, active movements are used to increase arterial circulation, increase nutritive activity, promote cerebro-motor activity and develop efficiency. In a local sense they are used to increase absorption and nutrition, cultivate motor ennervation, increase muscular strength, and restore absent movements.

In giving resistive movements Posse says: "that the resistance should always be applied at right angles to its lever (so that the lever of the weight does not change during the movement), as this gives a steadier movement, one more comfortable to the patient. The only change in the resistance should be one of pressure (weight), which is made to increase as the lever of the power grows (toward the middle of the movement). The resistance throughout should be so moderated as to give a movement of uniform velocity—slow rather than quick—and motions done in pushes and starts, or with so much resistance as to cause vibration should be discouraged, as neither is in accordance with the laws of normal muscular contraction and produce undesirable effects on muscle fibre and motor nerve, they usually being types of overwork. Moderate the resistance carefully according to the patient's strength, and remember that medical gymnastics are not combative exercises (wrestling) but that even a slight resistance is enough to increase the muscular activity with consequent effects over that of ordinary everyday life, or of single movements.

The purpose is to get some exaggeration in the effect of the active disorders, on the other hand, the resistance is often driven to the patient's utmost power (his nervous capacity inside the limits of normal fatigue), since it is then a question of getting the utmost pressure for displacement of bone, cartilage, etc."

There are many typical movements which might be described in detail, but it is not necessary to our purpose to do so. Before going into the application of general principles a word or two on the general divisions might be said. In resistive movements we have those of flexion and extension, elevation and depression, adduction and abduction, and rotation. Those of flexion and extension explain themselves. They should be given, in regular progression in force and complexity, according to the strength and need of the patient or pupil. For circulatory purposes in depleted conditions these movements should be applied first to the smaller joints, and later to the larger, until the trunk flexions and extensions can be practiced. In restoring movement or control of a part incapacitated by such ailments as paralysis, dislocation or fracture, begin the movements at the larger joints and progress to the smaller. The movements of elevation and depression are such as lifting of the arms or legs, or coming up to sitting from lying position, and these can be applied according to the needs. Those of adduction and abduction explain themselves, if the meaning of the word is understood, and as more will be said about these under corrective gymnastics, this will suffice here. The movements of rotation are such as turning of the arm to palm up or down, or turning the head or trunk from side to side against resistance.

All of these movements will be brought into application in the chapter on Corrective Gymnastics, and

it is well to say, that they are divided into such classes chiefly for convenience in study. In actual bed-side or office practice these names and classifications are forgotten, and movements are given according to each case. The thing to do is to consider carefully what muscles are weak and what strong and for what effect resistive movements are given (that is, whether for control, strength or circulatory effects), and then apply them accordingly.

RESPIRATORY EXERCISES.

There is one class of movements which should be considered by itself before taking up the application of medical gymnastics. Respiratory exercises are particularly important, because, as Ling explained, all gymnastic movements are in a sense, respiratory exercises.

If a movement tends in any way to impede or prevent free respiration it should be rejected or delayed until one has reached that stage of development which enables him to perform it without interfering with free respiration. No matter what exercise or work one is performing, he should seldom allow himself to assume an attitude which in any way compresses the chest and causes him to hold the breath.

Respiratory exercises are deep respiration accompanied by some movement of the arms, head, or arms and legs together, which will emphasize the expansion and increase the suppleness of the thorax. These are dvided into the assistive type, in which the operator does the expanding of the chest while the patient inhales; the single, as in educational or home gymnastics; and the resistive type, in which the pupil or operator offers some resistance to the movement performed to increase the chest expansion.

The effects of respiratory exercises are many. Most important is that they produce thoracic aspiration.

Thoracic aspiration, in plain words, means a suction force created in the thorax by the great expansion of the capillaries in the lungs. As the chest expands and the lungs become filled with air, the minute blood vessels are caused to expand also and their capacity is increased so that a greater amount than ordinary is drawn to them, and thus this suction force decreases the work of the heart. The general pressure in the veins is diminished, the contraction of the right ventricle is lessened and the blood passes onward as water in a force pump. At exhalation the reverse is true. Therefore, "by making inhalation comparatively rapid, its effects may be heightened; and by making the exhalation slow, its effect of retardation can be reduced to a minimum, so that the total effect of the respiratory movement will be diminution of blood pressure and acceleration of the venous circulation," and, at the same time, there will be a quickening of the lymphatic circulation. Oxygenation of the blood and general elimination are increased.

Respiratory exercises should be applied for general effects on venous circulation. They should be used at the beginning, middle and end of a daily program, and in a treatment, they are often advisable after every other movement. These exercises are sometimes used especially to effect the portal circulation, the heart beat and to expand the air cells. Their effect on the portal circulation will bear explanation. Through assistive chest expansion the suction in the vena cava becomes five or six times as great as it is during ordinary respiration. This suction empties especially the hepatic veins, which are the nearest vessels flowing to the heart, and thus the flow through the liver is hastened.

In administering or practicing respiratory exercises it is well to remember that these movements

should follow the rhythm of the individual's respiration. Exhalation should always be slow, while inhalation is somewhat quickened. There should be a short pause after the exhalation, as occurs naturally. Overlooking this pause or prolonging the duration of the respiratory exercises will make the patient dizzy, owing to the rush of blood to the head.

The most important respiratory exercises will be explained as they apply to given cases in the next chapter.

CHAPTER IV.

Application of Medical Gymnastics in Osteopathy.

It would be a waste of time and an imposition upon the reader's patience to attempt to present the details of applied medical gymnastics in every form of disease where it is indicated. This has been done by a number of writers to whom the novice is referred. And for the healer of any school who has a knowledge of diseases and their treatment, it is useless to enter into the details of technique in each disease. Therefore, we shall consider the application of medical gymnastics in a general sense, and as they apply to classes of diseases. But in a few cases, where special explanation is advisable, it will be briefly given. As this book is intended primarily for osteopaths, treatment will be considered only in cases where the regular osteopathic treatment might be aided. I purposely omit all ailments and their treatments in which osteopathy cannot be improved upon; only bringing valuable adjuncts to osteopathic treatment.

Disorders of Circulation

Among diseases of the circulation, myocarditis and endocarditis can be benefited by passive procedures as kneading, circumduction, and respiratory movements which will hasten the return current. The treatment for endocarditis may be a little stronger than in myocarditis. While the heart is being relieved by the procedures that help it perform its work, easy resistive movements of the extremities may be applied, and

thus, the entire system, heart included, is gradually brought to normal.

Valvular heart troubles may be treated somewhat as myocarditis and endocarditis. A typical program following the osteopathic adjustment which will always help is as follows:

(1) Passive shoulder circumduction and respiration.
(2) Circumduction of the ankle joint.
(3) Kneading of the arms and legs.
(4) As (1).
(5) Circumduction of the hip joints.
(6) Circumduction of the shoulder joints.
(7) As (1).
(8) Abdominal kneading.
(9) Resistive foot and wrist flexion and extension.
(10) Heart vibration.
(11) As (1).

Such a program might be repeated at each treatment. Progress consists of increase in force of the resistive movements of the smaller joints, gradually leading up to resistive movements of the larger joints. In treating heart cases it is well to warn the patient against raising the arms above shoulder height. All procedures or exercises which call for arm elevation while the patient is sitting or standing should be avoided for a time at least.

In *fatty infiltration* of the *heart,* progressive educational gymnastic work is useful. Sometimes the course of treatment might begin by such a program as in valvular heart trouble, and gradually lead up to single exercises as explained in Chapter II.

In *arteriosclerosis,* friction, kneading, light resistive movements of extension, such foods and procedures as promote elimination through the skin and kidney are helpful.

In *varicose veins,* elevate the part and give special kneading, then keep a flannel bandage on between treatments. At night, cold pack is beneficial.

While discussing circulatory conditions it might be well to sum up a few of the general principles that are worth remembering. Movements of any part of the body will usually increase the circulation toward and within it. We can decrease the amount of blood in a part by giving passive movement here and an active movement at a distal part. Muscular contraction alternately extends and shortens the blood vessels, forming a suction, and it thus hastens the circulation, especially in the veins. As a rule, active movements increase both the circulation and heart action, while passive movements increase the circulation and at the same time reduce the action of the heart.

By increasing the blood supply to any part, whether muscular, glandular, nervous or bony, we get increased nutrition. By hastening the venous circulation waste matter is hurried away to the excretory organs. All active movements are stimulants to muscular, bony and other tissues and increase their growth and quality.

Movements stimulate absorption and hasten endosmosis, diffusion and filtration. The osteopath can promote all of them through the vasomotor system. But absorption cannot be induced beyond a certain point. The law of demand and supply settles this question. While the osteopathic procedures may bring about a supply to the tissues, they cannot correspondingly increase the demand. But the increase of waste caused by muscular action, and the expenditure of the blood elements thus promoted, must be replaced by material from the digestive organs. Hence, the connection between the muscular action and absorption is direct. Therefore, exercise increases appetite, aids

digestion, by stimulating the secretions necessary to the process of digestion, and it also increases defecation and general excretion.

It is true that the condition and functioning of the nerves have much to do with the condition of the body. But it is also true that if they lack sufficient exercise, the nerves soon begin to degenerate and grow irritable and abnormally sensitive.

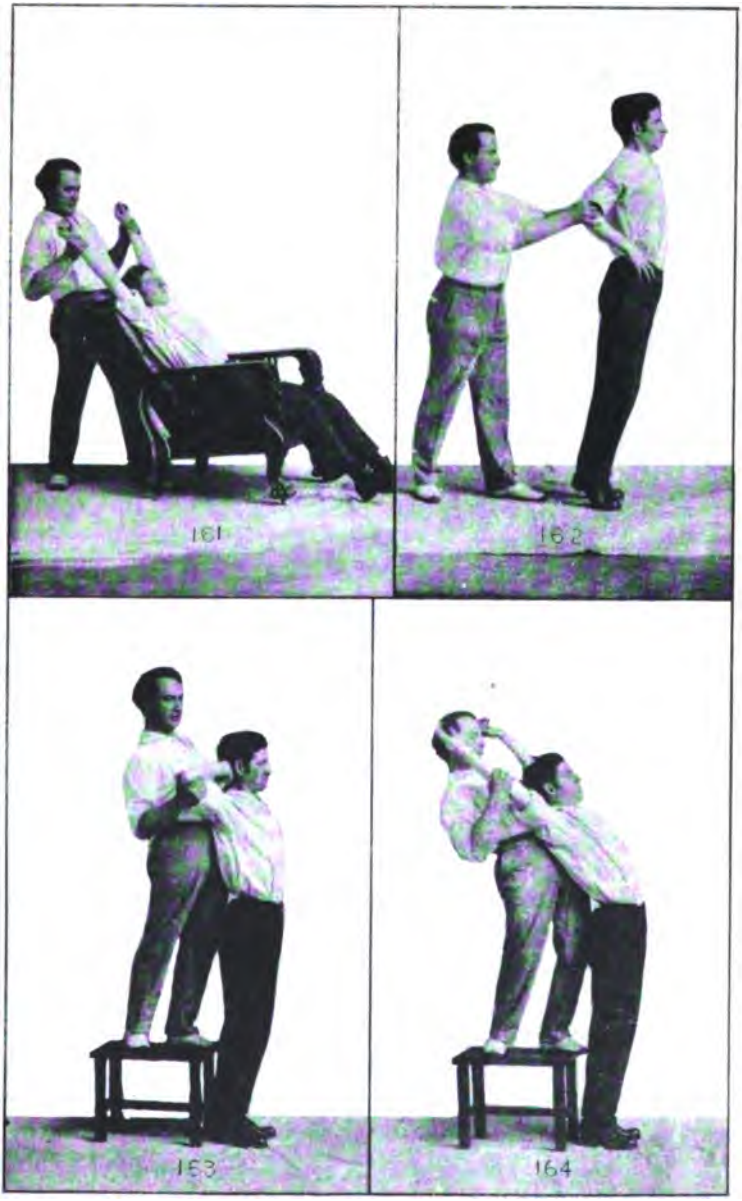
DISORDERS OF RESPIRATION.

Before entering into a discussion of specific ailments, let us consider a few typical respiratory exercises.

(1) Wing sitting shoulder circumduction with respiration (Illus. 160). The operator stands back of the patient who is sitting on a stool and, grasping the latter's axilla, he lifts the shoulders up and back, while the patient inhales deeply; then, as he releases his hold, and the shoulders are allowed to resume normal, the patient exhales slowly. In this exercise the patient should be thoroughly relaxed. This movement is good for a tired patient, or for one who has a weak heart. Or it is commonly used wherever any of the effects of passive respiration are needed. The effect of this movement may be increased by the operator leaning back and forcing his hip against the patient's shoulders, thus creating a strong expansion of the chest.

(2) Rest sitting shoulder circumduction is the same as wing sitting, except that the patient's hands are locked back of the head and the elbows kept well back. This movement is stronger in its effect than the preceding and, in heart cases, or any depleted condition, it should not be applied except to increase the force of the former.

(3) Reclining two arm elevation. The patient is reclining, or lying with arms loose at the sides. The operator grasps his hands and lifts his arms forward-



upward and stretches them up and back at the end of the movement. The patient inhales deeply during this movement. As the patient exhales, the operator carries his arms down along the couch or bed to first position. In this movement the arms of the patient travel about the same path as in illustration (161), but he is passive, while the operator puts him through it.

This movement, and all like it, tend to supple and expand the chest, stretch the chest muscles and, the forced inspiration not only produces thoracic aspiration, thus aiding the circulation, but the vacuum caused in the chest by the forced expansion and the general lifting of the upper intestinal organs also tends to lift the viscera and relieve pressure on the pelvic organs. This movement is valuable in uterine anteversion. The more horizontal the body in this movement the stronger the effect on the viscera.

(4) Wing standing heel elevation with chest expansion. (Illus. 162.) In this movement the patient stands in good posture, with the hands on the hips. The operator stands behind him and grasps his elbows. Then, he commands the patient to rise on the toes and inhale and, as the patient does so, he forces the elbows together from behind, thus producing great chest expansion. As the patient exhales and lowers his heels the operator releases his pressure. This movement is useful in producing chest expansion, correcting round shoulders, and for general chest development.

(5) Rest standing chest expansion is another movement of the same class as the last. (Illus. 163.) The operator stands on a stool close to and behind the patient. He braces his body back of the patient's shoulders and grasps his arms below the axilla. Then, as the patient inhales, he forces the arms up and back, at the same time pushing forward with his body, thus producing strong chest expansion and, in a stronger

degree, all the effects of wing standing shoulder circumduction. This movement might be made still stronger by lifting the patient's arms up overhead and lifting him up almost off the floor as the operator leans back. (Illus. 164.) For general chest development and shoulder correction, this is a powerful exercise. Many variations of this movement can be given. Instead of standing, the patient might sit, while the operator stands behind him, and thus produces the expansion.

(6) Stretch grasp standing chest expansion. (Illus. 165.) The patient grasps a bar or trapeze overhead and, as he inhales, the operator pulls, or pushes, him forward (apply the force first between the lower part of the scapulae), until he is forced to rise onto the toes. As the operator releases the pressure the patient exhales. This is a powerful movement, which exaggerates all the effects of those described above. To increase the strength of this movement, the operator might push until the patient's feet leave the floor (Illus. 166), thus giving an extreme powerful respiratory and expansive movement. For general chest and lung devolpment in advanced pupils, or in patient's who can stand violent work, this class of movements is indicated.

The above movements are merely types illustrating the various classes in quality and force. They can be varied to suit the patient's need. Progress can be made through repetition, by the force applied by the operator, or by the change in the position of the arms and body in applying them.

Another type of movements, which is given for expulsion of mucous and phlegm rather than for the general effects aimed at in the above, may be illustrated.

(7) Standing arm elevation sideways, with chest percussion. (Illus. 167.) The operator stands in front

of the patient and, as the latter raises his arms sideways to shoulder height and inhales, he percusses lightly over the sternal area. As the patient exhales, he may place his hands at the sides of the patient's thorax and vibrate or shake them. This usually loosens the phlegm in lung troubles, such as bronchitis, and gives rise to a cough that soon rids the patient of much waste material. Even in cases where consumption is threatened such a treatment might help. But of course, in advanced cases, where there is danger of hemorrhage, and in any serious lung condition, such a movement is contra-indicated.

This same movement may be increased in its effect by the operator placing his hands just back of the patient's axilla, inside his arms, and, as the patient inhales, he gives a palmar percussion down along the lower ribs and forward to the sternum where he winds up with ulnar percussion up the sternum. Then, as the patient exhales he applies vibration with his hands at the lateral costal area.

This movement can be made still stronger by the patient raising his arms up overhead instead of only to shoulder height. Or, any of the above movements can be made stronger by the aid of an assistant who will do the operator's work while the latter guides and percusses or vibrates.

So much for description of movements. The reader ought to be able to develop others now, or alter them into harder or easier ones according to his needs.

In *rhinitis,* all osteopaths use friction along the facial veins to promote good drainage from the head. Vibration over the frontal area and deep respiratory exercises should also be used.

In such ailments as *laryngitis, pharyngitis, tonsilitis* etc., thorough kneading of the neck muscles, to relax them and free the circulation, along with proper

osteopathic adjustment will aid materially in removing the trouble. Vibration applied over the inflamed area is very soothing and helpful. In kneading the neck, stand at the head of the patient, who is lying on the back, place the fingers under and along the back of the neck, then lift his head up and away from the body, so that its weight is borne by the hands. Thus you give a stretching of the neck and at the same time the thumbs are busy kneading the front of the neck and throat. A rolling downward pressure with the fingers may accompany the downward pressure of the thumbs. Or, while kneading in this way, you may at the same time stretch the neck from side to side. Set whatever lesions exist, and then lift the ribs.

In *pleurisy,* kneading and vibration help to relieve the patient by their soothing effect.

In *deformity* resulting *from pleurisy,* that is, where one side of the chest shows a depressed or contracted condition, special respiratory exercises to expand the depressed side and thus create a balanced condition, should be prescribed. There are many possibilities here to the medical gymnast which the "ten finger" osteopath cannot do much with. As a type of possible respiratory movements, supposing the right upper costals to be depressed, let the patient turn to the right, then bend the head backward and slightly to the left and at the same time let him extend the arms sideways, palms turned up, inhaling deeply as the arms are extended. As the arms are flexed let him exhale. (Illus. 168.)

Another exercise of this type would be to place the left hand on the hip, the right hand back of the head, the body turned to the right, and the head bent as in the above movement. While holding this position, with the mind fixed on expanding the depressed area, let him breathe deeply a few times. (Illus. 169.) Several

others can be worked out in this way. (See one-sided chest defects, Chapter V.)

For *bronchitis,* thorough kneading of the chest muscles, with digital percussion over the sternum and general chest vibration, will be found helpful. Respiratory exercises with percussion are indicated here.

In *emphysema,* give percussion over the entire thorax and resistive arm adduction. Resistive arm adduction means to resist while the patient draws the arms forward, keeping the elbows straight, starting from the position with the arms out at the sides. This will tend to contract the chest muscles and thus indirectly force the lungs to normal by constricting the chest.

Tuberculosis of the *lungs* is one of those diseases that every school of healing claims the best cure for, but if you come down to elementals, you will find that all resort to about the same forces in successfully treating it. The prevention of tuberculosis is more important than its cure. The successful cure, in cases that are not too far advanced, consists in placing the patient in an environment where he will get an abundance of fresh air, good food, water, bathing and outdoor life generally. But even though these forces prevent or cure such trouble, there should be added a course in educational gymnastics and osteopathy such as would establish proper adjustment and develop the respiratory mechanism. There is nothing so effective in preventing tuberculosis as good power of respiration, which means supple, well developed chest and shoulders. It seems needless to repeat here that all respiration should be done through the nose. Chest percussion and vibration, and such exercises as trunk rotation and sideways flexion that directly effect the digestive organs, are all beneficial. Therefore, a general course in health culture in all its aspects is indi-

cated in the consumptive constitution. In children who show a tendency to consumption because of a narrow or phthisical thorax, an early start should be made to correct this defect and prevent the disease. Besides sunshine, fresh air, outdoor activity and plenty of vegetables in the food, corrective exercise to broaden the chest should be used. The outline given for consumptives in Chapter IX should be followed.

In advanced cases of consumption, where outdoor life and vigorous activity are too violent, the passive procedures of medical gymnastics with mild resistive exercises, are indicated. It is useless to outline the specific procedures that might be used, for the reader can easily scheme out the proper ones. The aim should be not to work about the lungs too much because of danger of hemorrhage, but to draw the blood away from this inflamed area by circumduction and resistive movements of the legs. Let the lungs regulate themselves after everything possible has been done to remove obstacles. Placing a weak patient on the back so that the ribs are held elevated will cause the apices of the lungs to work normally and, as recovery sets in, progression in procedures is indicated.

DISORDERS OF DIGESTION.

The chief cause of these disorders is improper food, or incompatible food combinations. Many healers seem to take no cognizance of this important fact and though they claim that they watch the patient's dietary still they proceed with their treatment in a way that indicates that they only consider the condition of the digestive organs themselves as important in their treatment. Many physicians suffer of indigestion and constipation, yet they treat others for the very things they suffer of themselves, paying almost no attention to the food question.

The simple rules, of thorough mastication, little or no drink at meals, plenty of vegetable foods to balance the dietary and thus furnish the essential salts, simple food combinations, reduction in quantity of starchy foods, and observance of such laws of compatibility of foods as seldom to allow starches and acids or starches and sugars to be eaten at the same meal, and of eating one's fill of only one or two compatible dishes, such rules are seldom observed.

Granted that the dietary is attended to properly, there should be no digestive trouble present, unless there are maladjustments that come within the osteopathic province. If all seems right and yet there is a sluggishness in the digestive function, such movements as trunk rotation, sideways flexion, abdominal exercises, respiratory exercises, outdoor activity, games, etc., are very helpful.

In *enteralgia,* or intestinal cramps, let the patient lean forward, the arms hanging loose and relaxed, and knead the abdomen, inhibit sub-sternally, give vibration, and active trunk circumduction. Such respiratory exercises as passive shoulder circumduction are beneficial.

In *constipation,* laxative foods, as figs, prunes, green onions, celery, or raw salads, are indicated. The patient should make an entire meal of such foods. If necessary, several meals of just such foods are helpful. Many live exclusively on raw foods and if they take them in proper combinations and proportion only benefits result. But most people like rich combinations of cooked foods and constipation is perhaps the most common ailment known.

Deep abdominal kneading, trunk movements, rotation and sideways flexion, abdominal exercises, jumping, active games, etc., with proper diet are indicated. If this does not bring results, and if osteopathy is

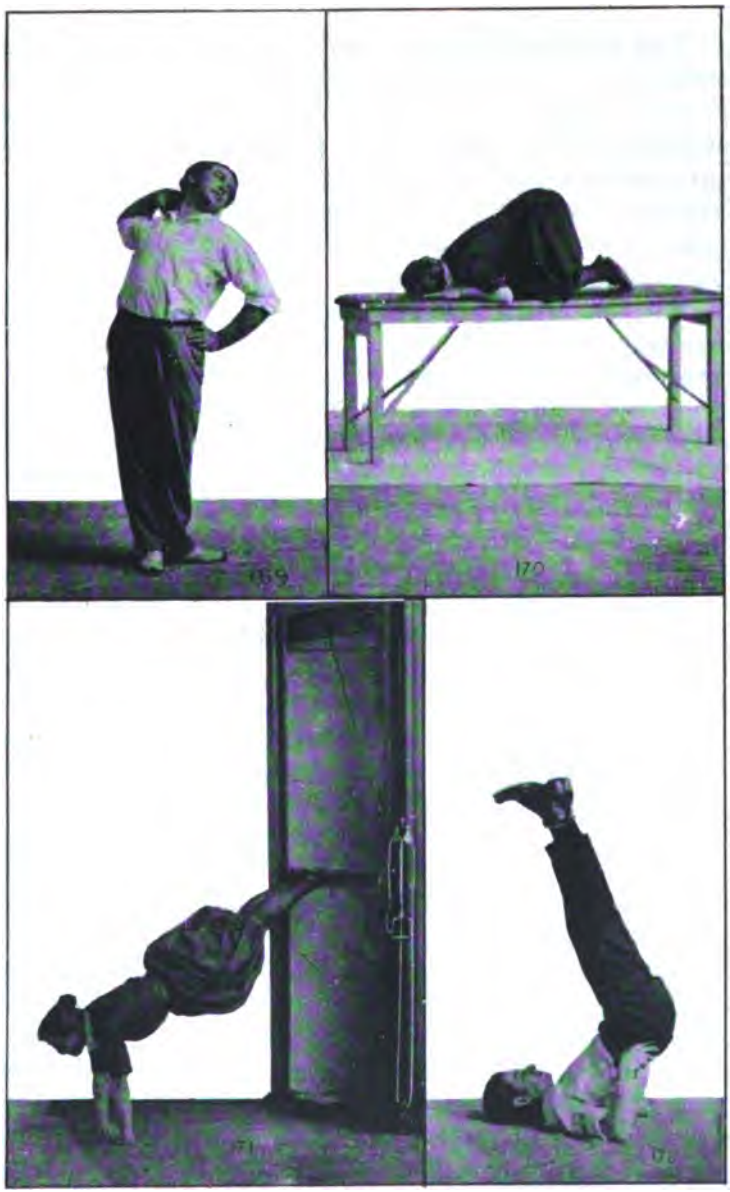
slow, a very valuable procedure consists in lying on the back, with the pelvis raised, then inject about a quart or more of warm water and, as it passes in, knead the abdomen deeply for a few minutes so as to mix well and soften the bolus. Such a procedure is more effective and less potent of evil results than salts, or copious enemas.

In *prolapsis* of the *rectum*, place the patient in knee-chest position (Illus. 170) and give strong sacral percussion. Give percussion in incline stoop fall position. (Illus. 171.) If the patient is strong enough give him back, neck and elbow stand (Illus. 172), with various leg exercises. Also give lying on the back, arms extended, grasping some object, and in this position let him practice various leg elevations, such as are explained in Chapter VI. Vibration of the perineum and rectal vibration are helpful. To give rectal vibration insert a rectal applicator and vibrate while the patient is in back, neck and elbow position, or in incline lying position. The cold sitz bath to finish this treatment, or taken at night before retiring, is a valuable adjunct.

In *hemorrhoids*, fasting, gradual evacuation of bowels, internal rectal kneading, perineal vibration and sitz bath will help any treatment or constitute an effective treatment in themselves. What was said about food in constipation applies here.

DISORDERS OF NEURITION.

Neuresthenia can be divided into two types, (1) that of *spinal* origin, (2) that of *cerebral* origin. The first type means an exhausted physique that requires rest and restorative procedures. In this type the treatment should consist largely of rest, soothing massage, with the proper osteopathic procedures, and the treatment should gradually be worked up to active gymnastics.



The cerebral type is found in those whose daily occupation requires a great deal of mental and little physical work. The motor nerves may even have undergone fatty degeneration while the sensory nerves have increased in irritability. In the cerebral type the treatment from the beginning includes educational gymnastics. Such work as outlined in Chapter II illustrates the line of procedure.

Sciatica is an ailment which osteopathy can successfully treat. All the soothing procedures in the treatment of this ailment have been known to medical gymnasts. The setting of lumbar and hip lesions is what osteopathy has added to this treatment. The setting of the innominate or lumbar lesions does not always relieve the pain at once. To aid in this respect, foot and hip extension, slow leg movements, deep kneading and inhibition are the soothing procedures.

In *neuritis,* in conjunction with osteopathic adjustment, kneading and passive extension of the muscles and nerves is always beneficial. A peculiarity of neuritis is that activity will relieve while rest of the part will increase the pain. In this respect neuritis may be easily differentiated from rheumatism.

Paralyses of *central origin* can be but little benefited by medical gymnastics. Those of *superficial,* or *spinal origin,* may be greatly aided. Proceed with your treatment by kneading, circumduction, percussion and vibration, and then give assistive and later resistive movements of the weak parts. If there is any voluntary motion of the fingers or toes possible the cells are not entirely destroyed and a new nerve path may be developed or the old one restored. But it takes time and perseverance. Though the patient cannot move a part in a given direction, through partial or complete atrophy, still the connection between the brain and motor nerves may be improved by properly

applied assistive movements. Suppose the flexors of the forearm to be paralyzed, the arm will remain straight, owing to the inability of the flexors to counteract the normal tonic contraction of the extensors. In this case, if the patient is told to flex the arm, and he makes a voluntary effort to do so, the fact that he wills it makes it an active movement, though the arm remains unflexed. Now, with this process going on in the patient's brain, if the operator flexes the arm for him, through his assistance there is produced an active movement. There is the stimulus sent forth from the brain and the response in the arm, and thus, there gradually grows the normal connection between the center and the periphery. This rule holds good with any part of the body which should normally be under control of the will.

Chorea, or *St. Vitus' dance,* is greatly benefited by educational gymnastics, because these establish proper voluntary control of the muscles and thus create a condition under which the individual can inhibit his muscles from the wasting, meaningless jerks. Not much gymnastic work should be given at first, as the patient is easily exhausted. There is so much nervous energy wasted through the uncontrolled movements that little is left for directed effort. It is well at first to give movements of muscular isolation.

Epilepsy is an affliction that few forms of treatment can help. During an epileptic fit little can be done except to loosen the clothing, allow a free supply of fresh air and bring forces into play that will keep the patient from injuring himself. Forcing the edge of a folded towel or stout piece of rubber or wood between the teeth will keep him from gnawing the tongue or lips, and keeping the head low and turned to one side to permit the saliva and phlegm to pass

out and thus prevent choking, are procedures that always apply.

Between attacks is the time to bring proper treatment to bear. The first and most important thing is to reduce the amount of food consumed, and to regulate the diet with a view to supplying necessary elements in their proper proportion. Properly applied gymnastics to develop control will be found invaluable in this condition. Competitive sports, and every form of exciting exertion, should be eliminated. The combined application of water, sun and air baths, diet, exercise and osteopathy will give the very best results.

Infantile paralysis can be greatly aided during the reconstruction period. Gentle kneading and percussion, leading gradually to resistive movements, combined with the necessary osteopathic procedures will be found most efficacious. Find out what movements are difficult and gradually develop the muscles so as to restore control of these movements. It may be possible to develop new cell areas and thus restore proper nerve control of atrophied parts by assistive movements described in the treatment of paralysis. In your treatment begin at the central and work toward the peripheral end of a limb or part. For instance, suppose the legs are paralyzed, begin at the hip joints with assistive exercise, then resistive. As soon as it is controlled to any degree, begin with the knee, etc.

Whether we should expect complete restoration of motion after an attack of infantile paralysis is a question whose answer largely depends upon the extent of the paralysis. Light cases will be fully repaired, but extreme cases will never fully recover even after years of treatment, though they may show marked improvement for a time. Whatever the degree of paralysis, whether the prognosis is good or bad, and by whatever method the patient is treated, medical gym-

nastics is always indicated, for, even if the patient does not improve, such treatment will prevent further degeneration.

Locomotor Ataxia is an affliction difficult to cure under any system, but nothing equals the combination of medical gymnastics and osteopathy. Where the case is so advanced as to be beyond recovery, properly applied treatment will at least delay progress of the disease and prolong life. But if there is any substance left to work on, the proper combination of medical gymnastics, by assistive, single and resistive movements will restore normal muscular control. It is well to teach the patient to regain his muscular control by such procedures as walking between a pair of rails for support, later with canes, and, as soon as possible, give educational gymnastics. Frenkel's system of treatment for locomotor ataxia, which has proven so efficient, is based upon the progressive gymnastic idea.

In advance cases the treatment follows the same general laws as in paralysis. Begin with the larger joints and assist in the simplest movements until a slight degree of control appears, then resist as far as the patient can go and assist further. As soon as the patient has acquired sufficient control to begin work by himself, prescribe exercises that he is to practice every day. (See Chapter IX.) In prescribing home exercises advise the patient to practice movements that require more concentration than ordinary movements of daily life.

A peculiarity about the treatment of locomotor ataxia is that progress is very rapid for three or four weeks and then there is a pause in progress, during which treatment does not seem effective. This pause lasts about two weeks, when progress again becomes comparatively rapid. This should be made plain

to the patient so that he will not become discouraged when progress ceases temporarily.

Occupational neuroses, as the very words indicate, are not due so much to a misplaced vertebra, or to an abnormal dietary, as to the one-sided muscular exertion necessitated by one's occupation. Such neuroses are the result of long continued overuse of a few muscles, and a partial or complete underuse and neglect of their antagonists. Lesion setting will accomplish little if antagonistic muscular exercise is not given. To inhibit osteopathically, or to inject morphine may relieve the pain, but the cure lies in creating normal balance between the over-used muscles and their antagonists. Such exercises as resistive extension of the fingers and thumb, all together against an elastic band, or, one at a time, against specific resistive movements, will restore harmony. Study to find out just which muscles are affected and, by isolating the action of their antagonists, restore equilibrium.

Hysteria is an unbalanced mental condition which could be materially benefited by properly regulated educational gymnastics. Where harmony exists between the body and the mind such a condition as hysteria is impossible. One of the quickest ways of restoring harmony, where it does not exist, is to appeal to the mind through the physical.

Cephalgia, or sick-headache, can be relieved by friction downward along the facial and cervical veins (scraping the fingers through the hair from the forehead to the occiput) and slow head circumduction. These procedures will be found helpful and, though palliative in nature, should be included with the osteopathic adjustment.

Fractures should be treated by gentle kneading from the second or third week after the accident happened. Complete restoration of movement as well as

knitting of the bone can best be effected in this way. To attempt to restore motion before the bone is completely knitted would be dangerous. But gentle kneading will aid in the osseous reconstruction. The bandages and splints should be removed for the treatment and replaced after as much as possible of the exudation has been removed and good circulation restored. As soon as the bone is set, that is, at about the third or fourth week, gentle passive movement can be safely given; then, assistive, single and resistive, according to the patient's strength and needs.

Knead and percuss the flabby muscles. Be sure of the axes of motion and the joints' limitations before attempting active movements. Make use of a lubricant in treating the skin, and stretch it as much as the patient can stand, so as to break up all adhesions and thus hasten complete restoration of motion.

Kneading is the best procedure to remove venous congestions and edema, but one should stop at enough. In fact, it is better to do too little than too much, for too much kneading may delay, or even prevent the healing process.

Dislocations should be treated by massage. After the dislocated joint has been reduced, the tenderness can be best removed by kneading and slow circumduction.

Sprains. The sooner a sprain is treated the better. If treatment can be applied immediately after the sprain occurred there will result but little inconvenience from it. It is well, if convenient, to first bare the joint and allow a stream of cold water to run on it. If the patient cannot stand the stream directly over the sprain, have him place the joint in a vessel of water and allow the water to flow into the vessel in a steady stream from several minutes up to half an hour. While the part is under water it is well to grasp it

and give gentle squeezing of the swelling toward the venous flow.

After bathing the joint in cold water give plenty of massage to reduce the swelling as much as possible. In your massage use a lubricant to save the skin, because a thorough treatment requires much deep kneading over a small area and it is easy to bore through the skin unless the lubricant is used. In the case of an ankle sprain, start with gentle friction upward, beginning at the spot below the swelling and stroking upward, several inches. Then, beginning at about the middle of the leg, knead deeply, pressure upward, and work down to the seat of the trouble, over which the kneading must be very gentle at first. Gradually increase the force of the kneading over the swelling until it is strong enough to remove the exudation and thus reduce the swelling. After treating the part bandage it tightly and at night apply a cold pack. Apply the pack tightly. Allow the ankle to rest in the pack for perhaps 24 hours, then treat it again. But there is no reason why such a sprain should not be treated more frequently. It is often possible to restore an ankle fully within a day or two by two or three treatments each day.

From the beginning, give passive movement, and if not too painful, resistive movement to the sprained part. In applying circumduction do not carry the foot inside the median line for the structures on the outer side of the ankle have been stretched or ruptured by the sprain and they need no further stretching. Encourage the patient to use the ankle a great deal despite the pain. Let him walk as soon as he is able to stand, even if he requires the use of canes. Encourage all forms of activity of the ankle except the statical. After the second day, even in the most severe type of sprain, the part should be used. The average sprain

can be healed in from four to seven days. In the hip or shoulder more time is required. With proper treatment, no joint need remain stiff as the result of a sprain. If a sprained part is left to itself, or is treated by the old method of isolation, it will grow stiff and remain so for a long time. In many cases joints are stiffened for life as a result of improperly treated sprains.

In a *strain* of the muscles, ligaments, or tendons, kneading for ten or fifteen-minute periods will soon restore the part. A strain is usually accompanied by an osseous lesion which osteopathy can reduce. But kneading should be resorted to for the strained tissues.

Synovitis is best handled by rest and kneading of the part. It usually occurs in a tendon that has been overtaxed and what it needs most is rest from the straining work and a good blood supply such as kneading will create. The application of a cold pack, at night, is also helpful.

Bursitis, or "house-maid's knee," is inflammation of the bursa of the patella, with a fluid deposit about the joint. Deep kneading with percussion and immobilization for a time will be found helpful. At times the application of splints or elastic bandage is indicated for a continued pressure to keep out the fluid. Dashing cold water on the knee after kneading will also aid recovery.

Rheumatism may be benefited by kneading and vibration, as well as by osteopathy, but for permanent results, for the real cure, the diet has to be attended to. It is the writer's opinion based upon the experience of several years' practical demonstration that proper diet and exercise combined will do more toward eradicating and preventing rheumatism than all other so-called cures. Proper exercise means muscular movement based upon the needs of the individual.

Proper diet means the consumption of plenty of green vegetables and fruits. Most people do not eat enough of these foods to supply the essential organic salts to keep the blood normal. Never a day passes but that some green vegetable, as lettuce, spinach, celery, onions, cabbage, should be eaten. The more of these are eaten raw the better. Everyone needs them. No one who gets a sufficiency of these foods will suffer from inflammatory or articular rheumatism.

Arthritis deformans may be removed, or much benefited, by proper diet along with local massage, wet packs, and constitutional osteopathic treatment. In smaller joints give principally passive procedures. In shrunken joints, graduated resistive movements are indicated. To break up adhesions, or lax contractures, mechanical vibration is a valuable adjunct. While the muscles are under forced extension, or the mobility of the joints is being restored, prolonged vibration is indicated.

In gout, constitutional treatment, regulated diet and educational gymnastics are indicated.

Uterine disorders can be helped by properly applied internal massage. This is a special form of treatment that is fully described by other writers and hardly belongs in a book for general reading. But a few medical gymnastic procedures should be mentioned here.

In *amenorrhea,* knee standing, resistive trunk rotation; that is, the patient is kneeling (knees apart for a firm base), hands on the hips, and, as she twists the trunk to the left and then to the right, the operator offers resistance at the shoulders. (Illus. 173.) The effect of this movement is to strongly tax the muscles of the abdominal and pelvic regions and thus draw the blood there.

Sacral percussion is given with the fist closed, the

wrist kept loose. The blows are struck over the entire sacral area from above downward. The right hand is used to give the percussion, and the left hand is placed at the abdomen just above the pubes, where it supports the viscera. While the operator is giving the percussion the patient is in stoop standing, the hands grasping some support. (Illus. 174.) In case of *posterior uterine displacement with amenorrhea,* place the patient in knee-chest position, and percuss with the right hand from the coccygeal end of the sacrum to the lumbar. (Illus. 175.) Vibration over the pubic area, kept up for a few minutes will flush the pelvis. Massage of the thighs, the ovarian and fallopian tube areas should be given. If all of these fail, internal massage should be employed.

For *dysmenorrhea,* or painful menstruation, a combination of internal massage, osteopathy and gymnastic procedures to correct uterine displacements can hardly be surpassed.

Menorrhagia or *metorrhagia,* may be benefited by osteopathic adjustment, and internal massage. So with catarrh of the uterus. In this last case, besides the above treatment, the diet should be looked into. More of green vegetables and fruits and less of starchy foods should be consumed.

To correct *retroversion,* or *flexion,* of the uterus, give sacral percussion with the patient in knee-chest position. Throughout the osteopathic treatment have the patient in prone lying position with the pelvis elevated. While in this incline prone lying position percussion and vibration on the sacrum are valuable. Stoop fall, or horizontal stoop fall, with alternate leg elevation are beneficial. (Illus. 176.)

For *anteversion,* or *flexion,* have the patient lie on her back on an incline plane, the feet several inches higher than the head, the knees half bent to relax the

abdomen. Give gentle friction, kneading and vibration upward over the pubic area. Then give strong lifting of the viscera, forcing the intestinal and pelvic organs upward. Give resistive knee abduction and adduction. Have the patient grasp the table overhead and raise the legs several times. The patient still in this position, give strong respiratory exercise. While she inhales, raise the arms up and back, and as she exhales bring them back to position. In some cases, internal massage is also indicated.

In *prolapsis uteri,* patient lying on incline, feet elevated, replace the uterus, adjust the innominates and spine, and give resistive adduction of the knees and legs. Also foot, or knee grasp, side fall, leg adduction. (Illus. 177.) Instruct the patient to practice these exercises at home. Lying on the back and raising the legs to strengthen the abdominal muscles is also helpful. The home exercises should be preceded by knee chest position for a few minutes.

CHAPTER V.

Corrective Gymnastics.

Principles of Corrective Gymnastics.

Corrective gymnastics means gymnastics practiced to correct anatomical defects or deformities. Hygienic gymnastics are practiced primarily for health. Properly regulated hygienic gymnastics are always corrective in the sense that no movement is practiced which is doubtful or injurious in its effects.

According to sound gymnastic principles, the posture of the body during any exercise is considered of extreme importance in its relation to the results desired. There is a saying, an axiom, in fact, that the body at rest always tends to maintain the position it held during activity. Therefore, during exercise one should assume and preserve as nearly as possible throughout the exercise, the habitual posture of the body he would like to cultivate. To hasten the bringing about of this condition it is well during exercise to assume such a position as will hold the body in the posture opposite to that which it habitually assumes. By keeping this principle in mind one may transform almost any useful exercise into a corrective movement.

There are two ways of applying corrective gymnastics: one is by the individual himself, through his own efforts with or without apparatus; the other, by the properly applied movements resisted or exaggerated by the operator. Everyone who has given the matter a thought is conscious of his own defects, and if he will exercise with the idea in mind of develop-

ing the opposite condition to that of his defect, he can do a great deal for himself. In fact, whether one does the work himself, or through the guidance and aid of the medical gymnast, the major part of his success depends upon his own determination to succeed. With determination, the best results can be gained by resorting to daily individual effort and periodical aid from the medical gymnast.

In considering the principles of corrective gymnastics let us review briefly the anatomical mechanism involved. Every muscle or group of muscles pulling in one direction has an opposing muscle or group pulling in the opposite direction. When the individual's health is normal and the muscles are in perfect adjustment and proper tonicity, the position of the part they control will be normal. The adjustment of the bones is important, but the bones are really passive factors, and the normal position of a part is maintained by its bony structure if the muscles controlling this structure are in tonic state.

If the muscles lack this tonic state we find some defect in their antagonistic relation. One muscle, or set of muscles, is stronger or weaker than its antagonist and there is an unbalance, or shortening of the stronger and lengthening of the weaker side. Such deformities as result from this unbalance usually prove serious with the individual, although the ultimate result is so remote from the original cause that their relation is overlooked. But the damage is done just the same.

Among the deformities commonly found as a result of this unbalance are round-shoulders, drooping-head, drooping-shoulders, lateral curvature of the spine, sway-back, bow-legs, knock-knees, pigeon-toes and others. These deformities cannot always be traced directly to an unbalanced antagonistic muscular rela-

tionship. But wherever we find these deformities, whether they result from the cause given or from another, or from a dozen others, an unbalanced antagonistic relation exists between the muscles. That is, the muscles on the concave side of the deformity are shortened and those on the convex side are lengthened. Sometimes, after the bony structure has become set in its deformity, the muscles on the concave side are not only shortened, but they are also flabby, atrophied, or changed to fibrous tissue from lack of use, while those on the convex side, because of their overuse in simply supporting a part, are not only lengthened but hypertrophied as well. A thorough examination of a bad case of round-shoulders or scoliosis will bear out this fact.

As to the causes of these conditions, many might be mentioned, but we shall limit ourselves to general principles rather than specific cases. The osteopath needs little persuasion to be convinced of one of the most common, though up to within the last few years, least understood of causes. That is, the contraction of any muscle or group of muscles caused by the inflamed condition of the nerves controlling it. These nerves may be inflamed through various causes, but chiefly through some sub-luxation or mal-adjustment of the bones. Re-adjusting this part would have removed the inflammation and restored the muscles to normal tonicity. But, after this condition has obtained for a few years, simply re-setting the vertebra will not correct the deformity. Re-adjusting of the bones with re-establishing of the proper antagonistic relation between the muscles controlling the part will bring better results than either method used singly. The muscles must be restored to normal in order for a part to remain in proper adjustment after treatment.

The result of one-sided work is to create a lack of

equilibrium in the anatomy of the individual. This lack of equilibrium results in deformity, and the deformity affects health or the resistive power of the body directly. The most important rule in correcting defects is that we should endeavor to contract the relaxed and relax the contracted. Note which muscles are weak and which strong, and strengthen the weak until they balance their antagonists. In a general sense, if one is in doubt as to how to proceed, he should not what movements he is most awkward in and practice those particularly; for we are weakest in the movements we need most, and the movements that are easiest to us are the ones least needed. By proceeding in this way one will create normal elasticity, restore structural balance, correct defects and promote health.

Applied Corrective Gymnastics.

DROOPING HEAD.

This condition indicates that the muscles on the back of the neck are extended, allowing the head to hang forward. The side neck muscles (sterno-cleido-mastoids), attached to the sternum, clavicle and mastoid process of the occipital bone, are also relaxed, because as the head drops forward, the extremities of these muscles are brought nearer each other and this allows the sternum and the sternal ends of the ribs to drop. Therefore, flat chest and drooping head usually go together. To establish proper carriage of the head and chest, the muscles at the back of the neck must keep the head well back. The muscles at the sides and front of the neck attached to the chin must contract and keep the chin in. This fixes the upper attachment of the sterno-cleido-mastoid muscles far enough back for it to properly support the sternum.

Drooping head is often the result of occupation

which causes the head to be bent forward most of the time. Mental depression, bashfulness, will frequently cause one to droop the head forward with that familiar hang-dog expression.

To correct drooping head we must strengthen the muscles of the neck, especially erectors of the head. We must cultivate in the patient a consciousness of correct carriage of the head. This means more than the mere exercise indicated in such a case. It means developing courage, optimism, and pride in the personal appearance dependent upon posture. There are many books on the subject of success and optimism that would assist.

Among the special exercises indicated are resistive neck extension. This is done in standing (Illus. 178); stoop standing (Illus. 179); and reach grasp stoop standing (Illus. 180). Forward lying neck extension (Illus. 181) is also valuable.

In each of the above the operator offers resistance.

Where the pupil has to depend upon himself, the following exercises are valuable:

1. Head flexion backward. See Exercise 1, Lesson II. (Illus. 14.)

2. Hands on the hips, bend the trunk forward from the hips, keeping the head high. While holding this position rotate the head to left and right.

3. Stand about a foot from the wall, facing away from it, lean backward and rest the head against it. Keep the arms at the side or on the hips. Now allow the body to sag a little, and spring up to erect by a sudden contraction of the muscles of the back of the neck.

ROUND-SHOULDERS.

Strictly speaking, round-shoulders mean a condition in which the chest muscles (transverse fibres of

the pectoralis and deltoid) are over-contracted and the posterior shoulder muscles (transverse fibres of the trapezius, supraspinatus, teres minor and posterior fibres of the deltoid) are relaxed and the shoulders are drawn forward, but not downward. Round-shoulders seldom occur alone. It is usually accompanied by drooping-shoulders and drooping-head, and these conditions must be overcome separately by their specific procedures.

As specific exercises to correct round-shoulders, the following will be found effective:

I. Without apparatus or external resistance.

1. Arms forward, shoulder high, palms in. Fling them sideways forcibly, turning the palms downward as they move back. Isolate the exercise to the shoulders, by keeping the chest forward, head erect and chin drawn in during the exercise. See Exercise IV (a), Lesson XV.

2. Body bent half-forward from the hips, arms forward as Exercise 1; practice the same arm movement. See Exercise 8, Lesson VIII, Illus. 60.

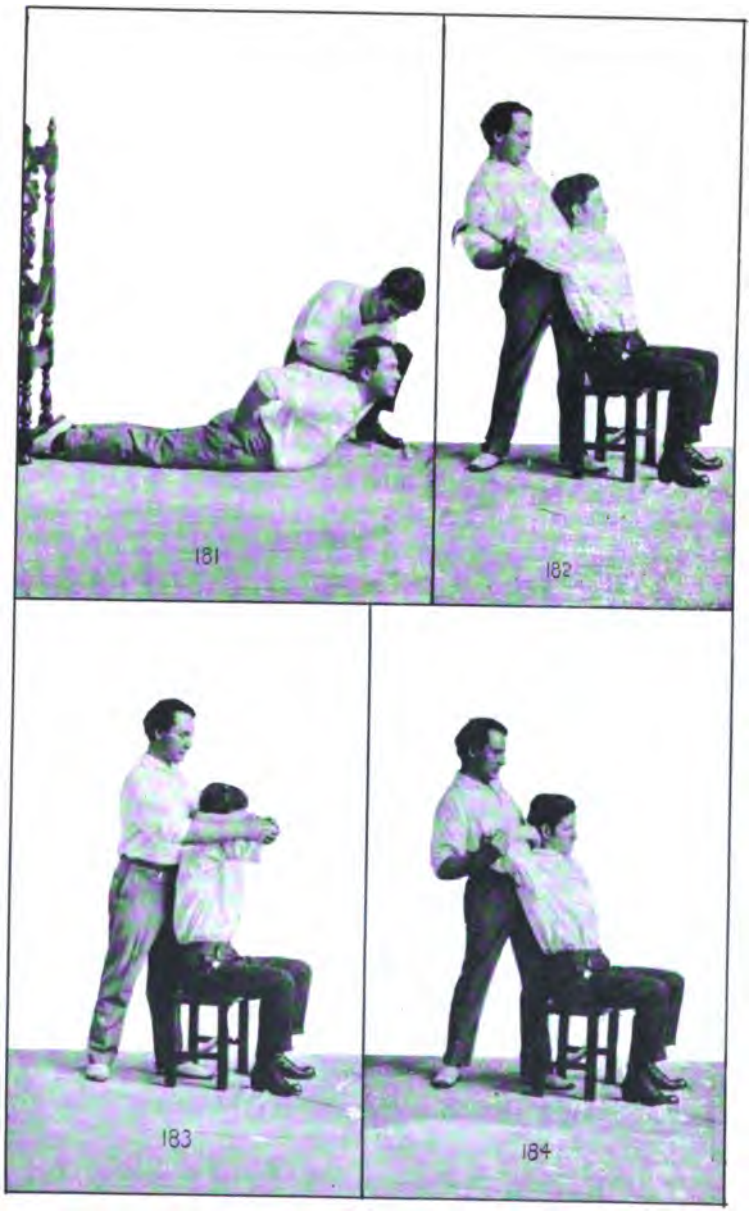
3. Lying face down with a weight on the feet, bend the arms forward and practice arm swimming.

4. Arms bent forward, carry them sideways slowly as you inhale deeply. As the arms travel back with this inhalation carry them as if pressing against something to emphasize the bulging forward of the chest.

5. Arms bent forward, fling them sideways forcibly as you lunge forward, first with the left and then the right foot. Exercise 2, Lesson XVI, Illus. 107.

II. Resistive.

1. Patient sitting on a stool, the operator standing behind him. Patient's arm forward from the shoulders. The operator offers resistance as the patient carries them sideways, and when the patient has carried his arms as far back as he can, the operator pulls



them back as far as the pain in the stretched muscles will permit (Illus. 182). The patient's chin should be kept drawn in during this exercise. The resistance offered by the operator need not be great. This is no wrestling match. Only enough resistance is necessary to exercise the posterior shoulder muscles.

2. Patient sitting on a stool, fingers locked behind the head, elbows forward; head erect and chin in throughout the exercise. The operator stands behind and offers resistance as the patient carries the elbows back and then forces them back to hyperextension of the pectoral muscles. (Illus. 183 and 184.)

3. The patient standing, fingers locked behind the head. Operator stands behind him, on a stool if necessary, and resists as the patient carries the elbows back, then leans back and pulls the patient over his chest. (Illus. 185.)

4. Patient takes long lunge backward so that the forward knee is bent at right angle, the rear knee straight and the weight of the rear leg is supported on the toes. While balancing in this position, arm extended forward, the patient abducts the arms against the operator's resistance. (Illus. 186.)

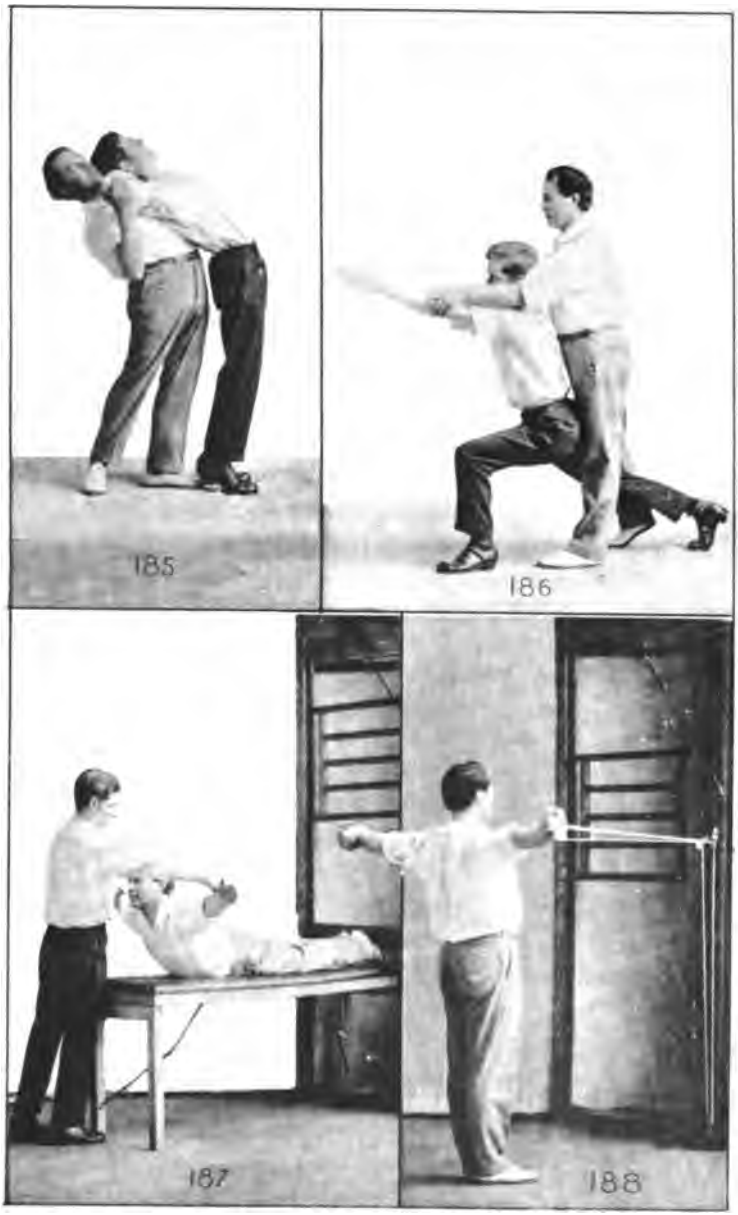
5. Lying face down with a weight on the feet, the patient arches the body upward, raises the arms forward and abducts the arms against resistance offered by the operator. (Illus. 187.)

III. With Apparatus.

1. While faciug a chest weight or elastic exerciser, the patient abducts the arms against the machine's resistance. (Illus. 188.)

2. Patient takes fall hang position and flexes the arms, keeping the elbows well out. Exercise II (b), Lesson XVI., Illus. 109 and 110.

3. Rowing, especially if the elbows are kept up as high as possible, is corrective of round-shoulders.



4. Standing in a swing and "pumping up" is also corrective of this defect.

DROOPING-SHOULDERS

Drooping-shoulders usually accompany round-shoulders, but the muscles involved are different. In drooping-shoulders the lower of oblique fibres of the pectoralis major, the pectoralis minor and, to a certain extent, the coraco-brachialis muscles are at fault. They are shortened, often through over-development from such as parallel-bar work, and their antagonists, the posterior fibres of the deltoid, the lower oblique fibres of the trapezius and to some extent the latissimus dorsi, are weak and over-extended, thus allowing the shoulders to droop forward.

To overcome this condition we must employ such movements as cause forcible contraction of the posterior over-extended muscles and forcible, or passive, extension of the anterior shortened muscles.

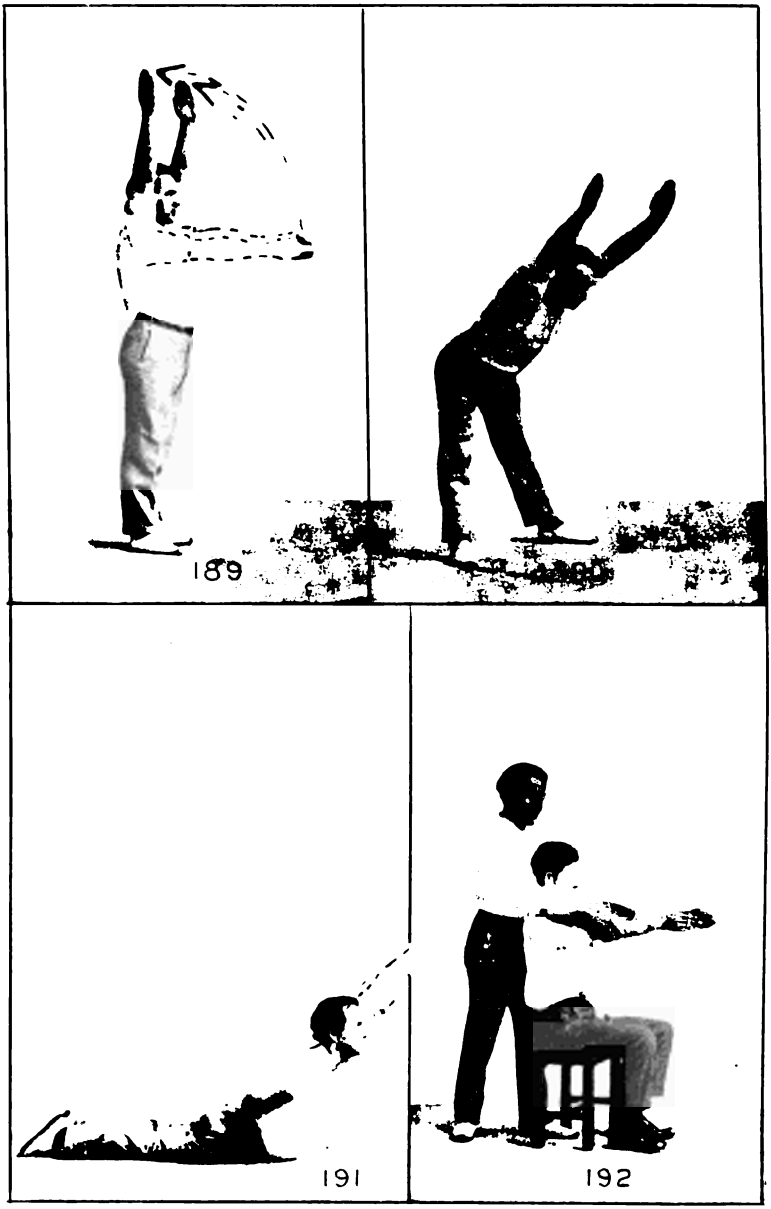
I. Without apparatus or external resistance.

1. Alternate arm flinging forward-upward. Exercise 9, Lesson I, Illus. 11.

2. Arms forward from the shoulders, palms turned in. Keeping the chest well forward, head erect, chin in, weight on the balls of the feet, and, without moving any part of the body but the arms, fling them upward forcibly. Lower them slowly to shoulder height and repeat the fling a few times. (Illus. 189.)

3. Arms shoulder high at sides, turn the palms forward-upward forcibly. This exercise should not be merely a turning of the palm by rotating the forearm, but a rotation from the shoulder. When done properly the muscles behind the shoulders and down the back to the waist are contracted forcibly with the upward turn of the palm.

4. Arms bent upward, bend the trunk half-forward



from the hips. While holding this position extend the arms sideways, palms turned up. Illustration 48, with the heels together.

5. Arms shoulder high at sides, bend half-forward from the hips, and while holding this position turn the palms forward-upward forcibly. Follow the directions given for Exercise 3 of this series. Illustration 48 shows the position of the trunk, arms and hands when the palms are turned upward.

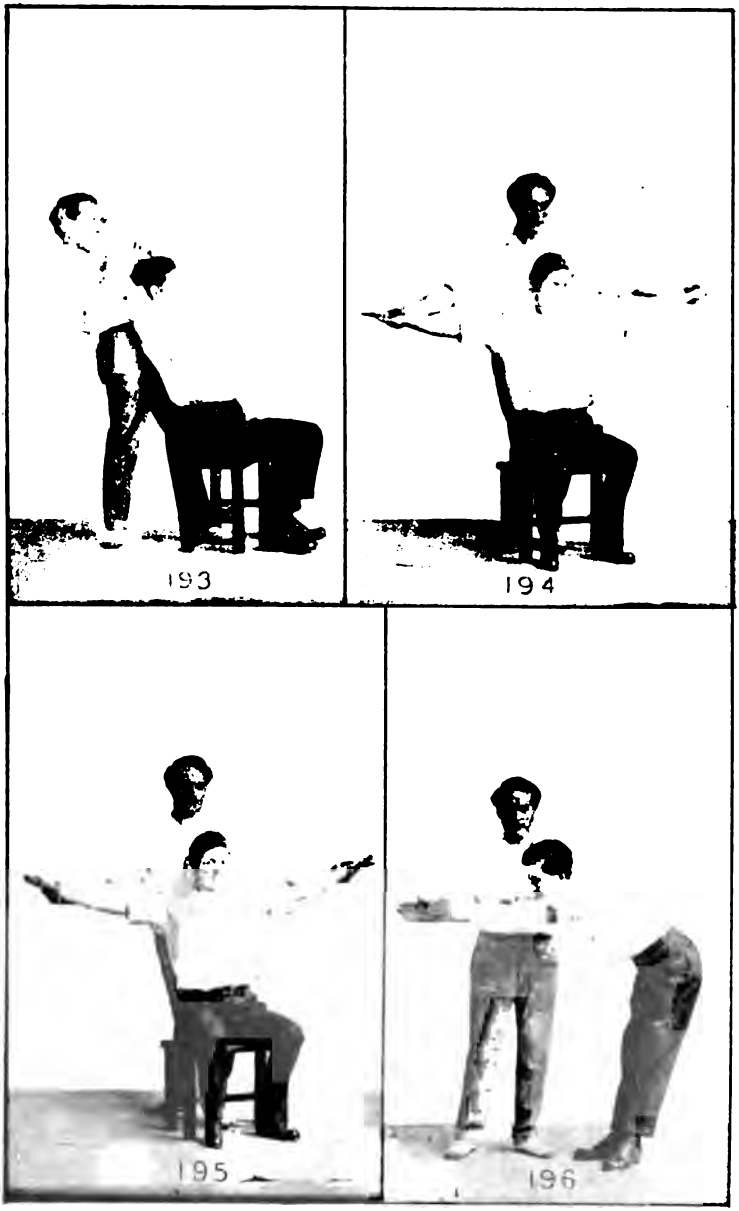
6. Arms shoulder high at sides, palms turned up, feet apart, trunk bent half-forward from the hips. (Illus. 48.) Preserving a good posture of the head, and carrying the arms in line with the ears, or back of them if possible, elevate them a few times. (Illus. 190.)

7. Lying face down with a weight on the feet, arms bent upward, arch the trunk upward, more from the shoulder and head region than from the waist and, while holding this position, extend the arms upward a few times. (Illus. 191.)

II. Resistive.

1. The patient sitting, or standing, with his arms straight forward. The operator, standing behind him, reaches forward, grasps his arms above the elbows (Illus. 192) and offers resistance as the patient elevates the arms, and when the patient has gone as high as he can the operator forces the arms back to hyper-extension of the chest muscles. (Illus. 193.)

2. Patient sitting, arms out at the sides. The operator stands behind and takes hold of the patient's hands, fingers at the palms, thumbs over the backs of the hands. (Illus. 194.) As the patient turns the palms forward-upward, the operator offers resistance and when the patient has gone as far as he can the operator shifts his hold, bringing the thumbs in the patient's palms, fingers at the backs of the hands,

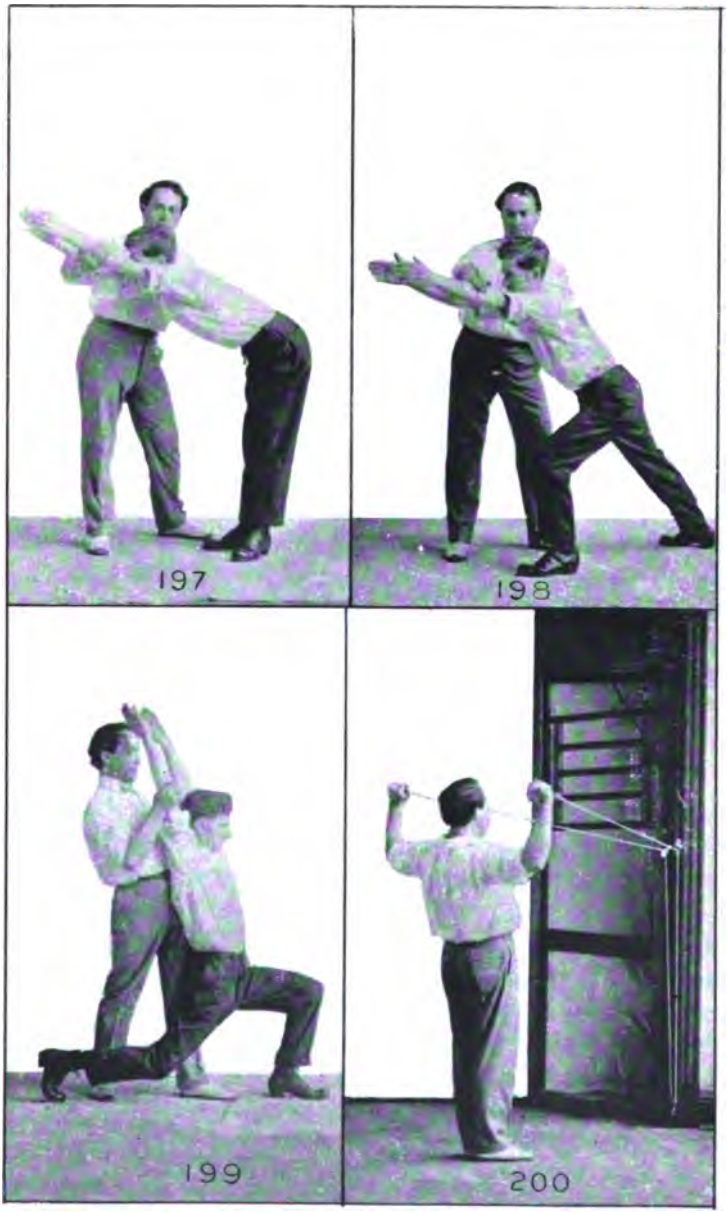


and twists the patient's arms a little further. (Illus. 195.) In this movement the patient should preserve a good posture of the trunk and head, and perform the arm rotation by employing the muscles of the shoulders and back. See explanation to Exercise 11, Lesson II.

3. The patient stands with the trunk bent half-forward from the hips, arms forward from the shoulders. The operator stands to one side, places one hand lightly over the patient's inter-scapular region, and the other arm is held over and across the patient's arms. (Illus. 196.) As the patient elevates his arms the operator offers slight resistance. When the patient has elevated his arms as high as he can the operator shifts his resisting arm to the under side of the patient's arms and, while bearing down at the inter-scapular area, he forces the arms upward to hyperextension. (Illus. 197.) In this exercise the patient must preserve a good posture of the trunk and head. The position requires control and the operator should not make his resistance so strong as to cause the patient to assume a faulty posture.

4. The patient lunges forward with the left foot, the body is inclined in line with the backward leg. The arms forward as in the above exercise. The operator standing on one side offers resistance as the patient elevates the arms, following the observations on the above exercise. (Illus. 198.) This movement should be repeated with the right foot forward.

5. The patient takes a lunge backward sufficiently far to rest the weight on the toes of the rear foot, the rear knee straight, the knee and hip of the forward leg bent at right angles. The trunk is erect and the head kept high and erect throughout the exercise. The arms are forward from the shoulders. The operator stands behind and offers resistance as the patient



elevates his arms, carrying them back to hyper-extension of the chest muscles. (Illus. 199.) Repeat the movement a few times with the right foot backward. The patient must preserve good balance in this movement.

III. With apparatus.

1. While exercising with the chest weights or elastic exerciser, stand facing the machine and elevate the arms forward-upward.

2. Stand facing the exerciser, arms half-bent forward, carry the forearms to half-bent upward position. (Illus. 200.)

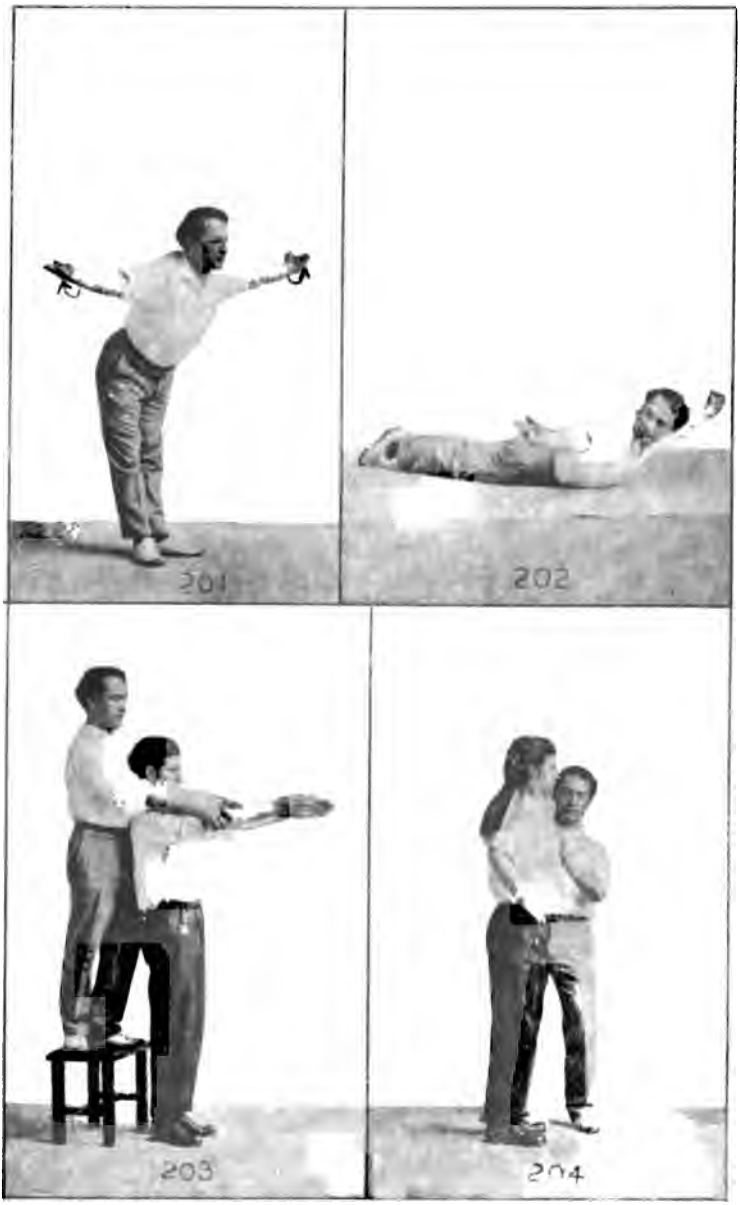
3. Arch hanging position; hold for a few minutes. (Illus. 122.)

4. Flinging a medicine ball, or weights, over head is excellent for both drooping-shoulders and kyphosis. Standing with feet apart, weight in the hands, lean forward, swinging the weight between the legs, suddenly erect the trunk with a full swing of the arms and fling the weight backward over the head.

KYPHOSIS.

Kyphosis is a marked abnormal posterior curvature of the dorsal spine. The condition may be due to tuberculosis where gymnastics are contra-indicated. It may be due to rachitis where gymnastics will be useless unless a diet is followed which supplies the necessary bone-forming materials. It may be due to occupation requiring a stooping forward, or to ignorance of proper standing posture, or to laziness, etc. The last type is amenable to gymnastics, especially in the young. In grown up and old people the posture is hard to correct, though not always impossible.

Kyphosis should not be confused with round or drooping shoulders, though it usually accompanies these. It cannot be corrected so well by exercises for



these conditions as it can by special exercises that localize the action particularly to the deformed part.

Specifically, kyphosis is not a shoulder defect, but a condition in which the spine is bent backward, between the shoulder-blades, to an abnormal degree. The sternum is usually depressed and the ribs overlap at the front, though, in some cases, the sternum stands forward high and prominent and the ribs are elevated, giving the entire thorax a barrel-shaped, bulky appearance. The muscles, especially in the common type of kyphosis—that is, where the back is round and the chest depressed—are elongated at the back. They are thick and firm and have extensibility without much contractility or recoil. The habitual posture of the body has kept them on a stretch, causing them to bear the entire weight of the upper body in a state of static, excentric and negative contraction. The chest muscles are usually shortened from lack of stretching through antagonistic force. Or they may be flabby and weak from lack of use altogether.

To correct kyphosis the exercises given for drooping head are helpful. But there are a few special exercises that are more specific in their effects.

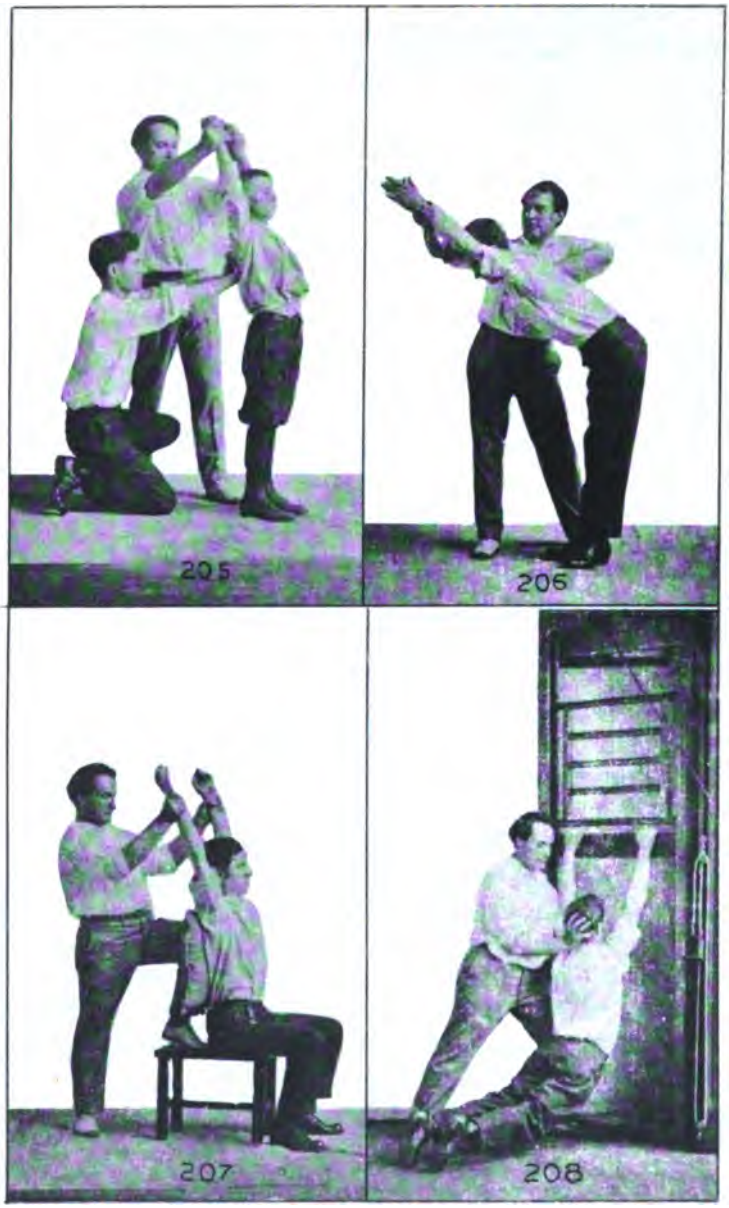
I. Exercises without apparatus or external resistance.

1. Flex the head backward as you inhale deeply. As Exercise 1, Lesson II, Illus. 14, with respiration.

2. Hands on the hips, trunk bent half-forward from the hips, keeping the chest as prominent as possible, head high, with chin drawn in, rotate the head from side to side. Exercise 8, Lesson III, Illus. 27.

3. Hands on the hips, arch the upper body backward. Exercise 6, Lesson I, Illus. 7.

4. Arms out at the sides, trunk bent half-forward from the hips; while holding this position, turn the palms forward-upward forcibly and at the same time



bend the head backward. (Illus. 201.) In turning the palms upward make the muscles of the shoulders and back work forcibly.

5. Lying face down, arms out at the sides. Elevate the head without arching the trunk upward from the hips. While keeping the head elevated rotate it from side to side, and at the same time turn the palms forward-upward.

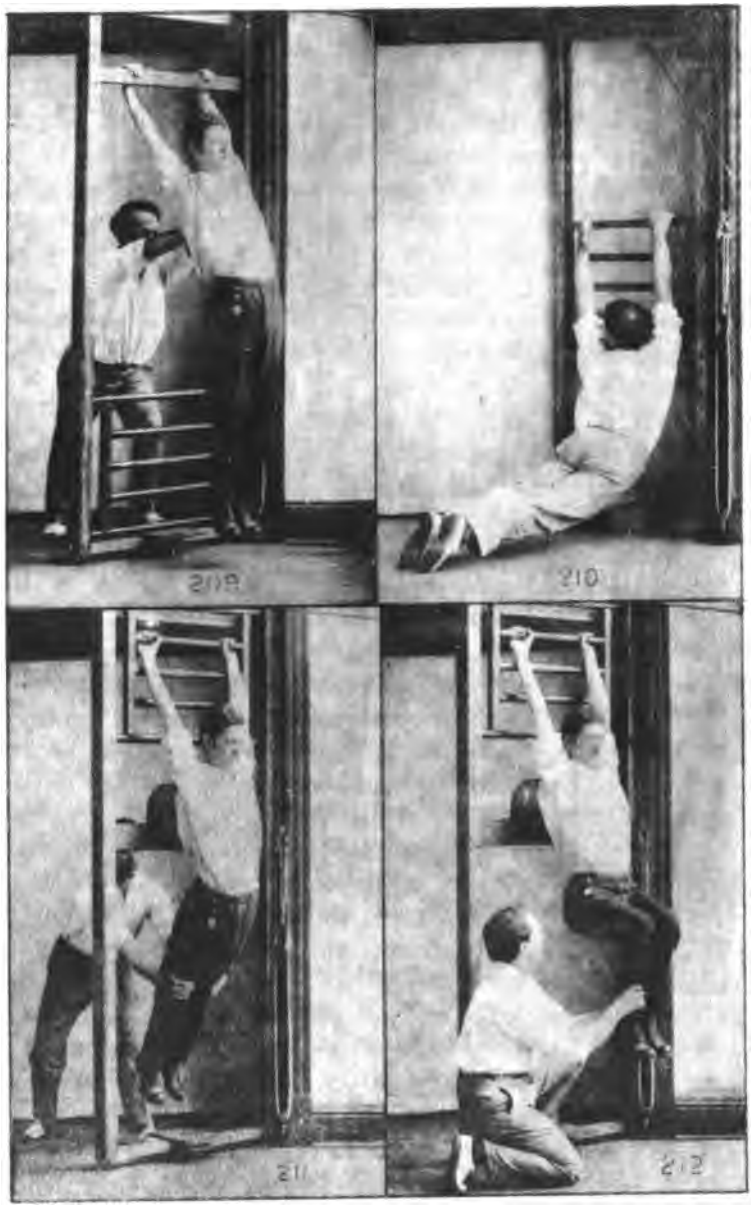
(1) As you rotate the head to the left turn the palms upward, (2) as you rotate it forward, turn the palms down again, (3) as you rotate it to the right turn the palms upward and (4) as you rotate it forward, turn them down again, etc. (Illus. 202.)

II. Exercises with assistance and resistance.

1. The patient's arms are forward from the shoulders, the operator stands behind and resists as the patient raises the arms and flexes the head backward. When the patient has carried the arms as far as possible the operator forces the patient's spine forward by lifting him over his chest as he pulls back on his arms. (Illus. 203.)

2. The patient standing with hands on the hips. The operator stands at the patient's left, facing toward him, and places his left hand at the patient's chest and the right hand behind his head. As the patient inhales deeply he flexes his head backward against the operator's resistance. (Illus. 204.) The operator's left hand is used merely to steady the movement and brace the patient, the right hand does most of the work. The patient's endeavor should be to flex the head and upper back forcibly and at the same time inhale to elevate the sternum.

3. In this movement the operator should have an assistant. The patient stands with the arms extended upward, the assistant assumes a firm position, one foot in front of the other behind the patient, and places



his hands, one over the other, at the crest of the patient's curve. The patient bends backward, and as he does so, the operator, who is standing in an advantageous position, behind or beside the assistant, grasps the patient's arms and presses them back. (Illus. 205.)

4. The patient stands with arms extended upward. As he flexes forward the operator, standing to his right, places his left hand at the curvature and presses downward, while his right arm is held across and above the patient's elbows where he forces the arms upward. (Illus. 206.)

5. The patient is sitting on a stool, the operator stands behind and places his knee against the patient's curvature. He then lifts the patient's arms up and back as he presses forward with his knee. It is advisable to place a pad between the knee and the patient's back. (Illus. 207.)

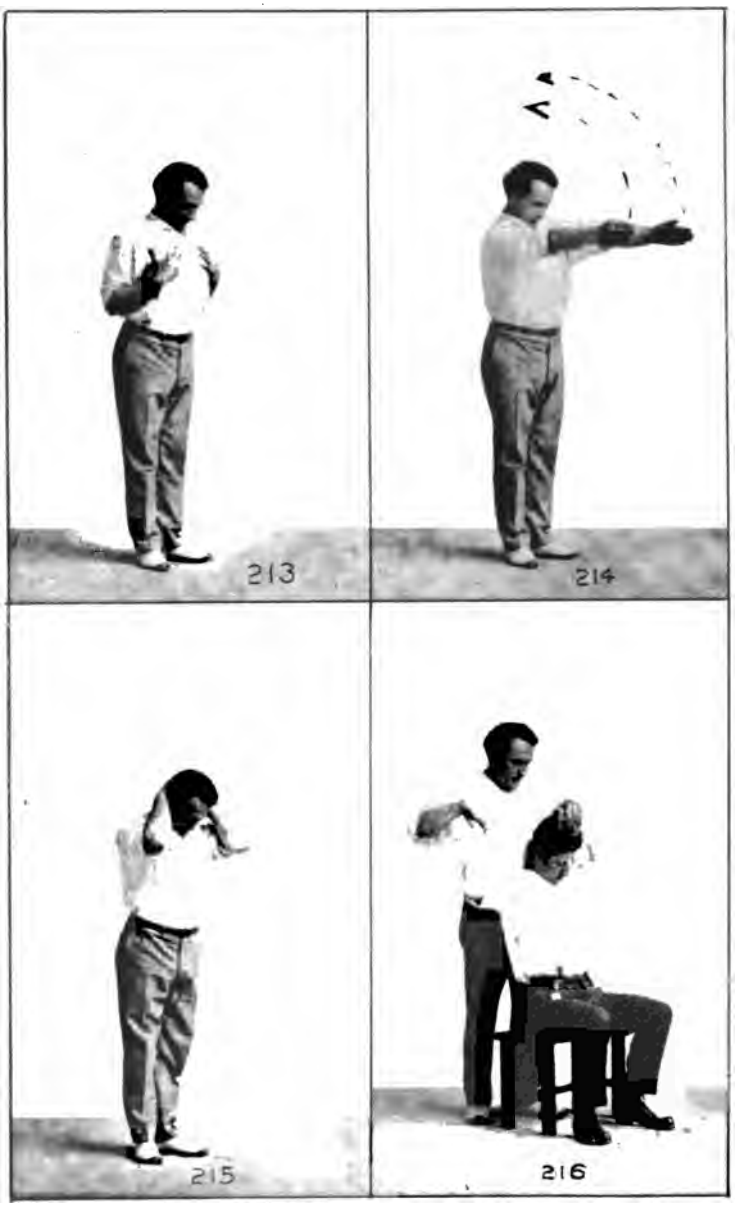
III. Exercises with apparatus.

1. Patient in arch-hanging position, the operator resists as he flexes the head backward. (Illus. 208.)

2. Patient stands with arms extended upward, grasping a bar overhead. The operator stands behind and forces the spine forward by pressing at the curvature. (Illus. 209.)

3. Patient in arch-hanging position, head held high, he elevates the arms alternately, with head rotation. As the left hand is lifted, the head is rotated to the left; as the right is lifted, the head is rotated to the right, etc. (Illus. 210.)

4. Patient hanging, face out, with a pad behind the curvature. The operator forces the body backward to increase the correcting effect. (Illus. 211.) If there is a lordosis condition accompanying the kyphosis, the patient should draw up the knees against resistance, or raise the legs forward to horizontal, while hanging. (Illus. 212.)



SHALLOW CHEST.

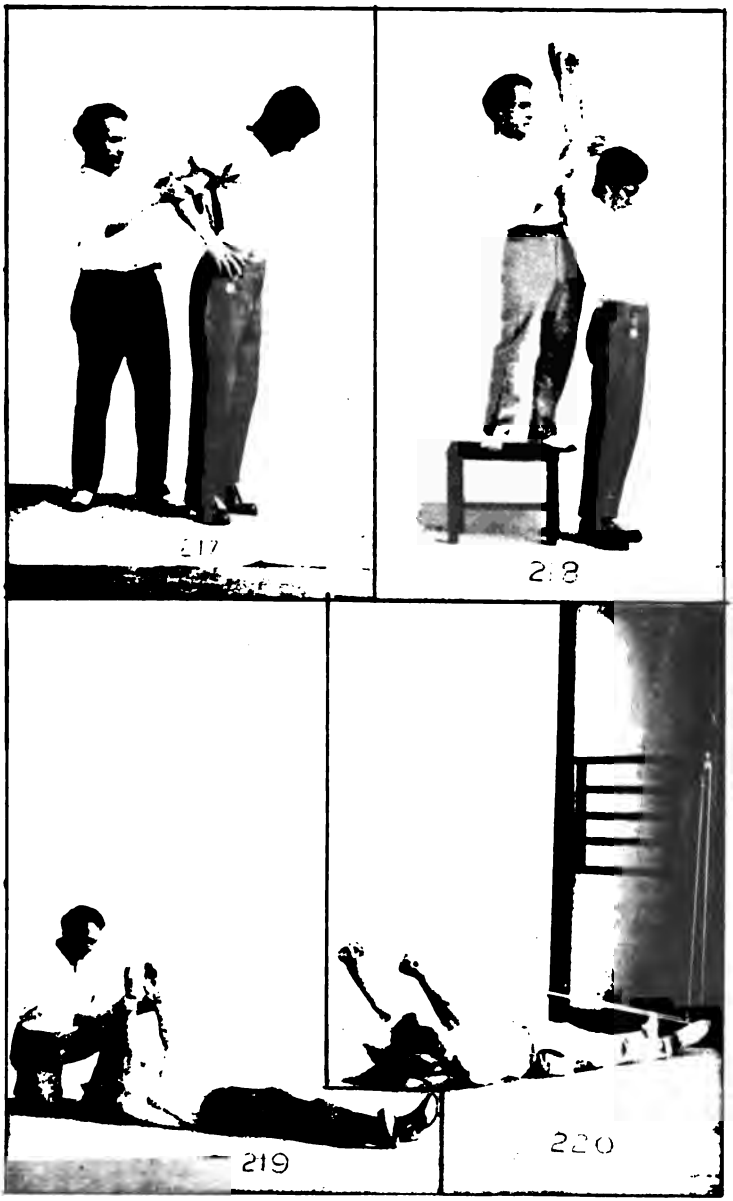
Shallow chest means a condition in which the antero-posterior diameter of the chest is abnormally short. The term "flat chest" does not necessarily mean shallow chest. In kyphosis, for instance, the chest is usually flat in appearance because of the depressed rib condition, but the antero-posterior diameter may be normal, or even above normal. In shallow chest, both the sternum and dorsal spine are straight or nearly so. Sometimes, in this defect, the dorsal spine is anterior instead of posterior, with the sternum straight or sunken.

Shallow chest is a difficult condition to correct by gymnastics alone. Osteopathy must play its part, but even the combination of these two frequently fails. Very little can ever be done for a full grown person whose bones are set. Excellent results are to be expected in children.

The exercises for shallow chest should be designed first to elevate the sternum by loosening and elevating the ribs. Respiratory exercises are especially effective for this purpose. All exercises for chest expansion are good, but with every exercise that tends to expand the chest an effort must be made to produce a posterior curve in the dorsal spine. By flexing the head forward and keeping it flexed during any exercise for chest expansion, the effect will be a rounding out of the back and a lifting of the sternum that will ultimately increase the antero-posterior diameter. The following exercises will deepen the chest:

I. Without apparatus or external resistance.

1. Head flexed forward, making the upper back as round as possible, arms flexed with the hands resting over the chest. Inhale deeply and lift the ribs against



the hands. Endeavor to force the hands out as far as possible. (Illus. 213.)

2. Head flexed forward, arm extension forward with all the speed possible. As in Illus. 9, with the head flexed.

3. Head flexed, fling the arms forward-upward with all the force possible. (Illus. 214.)

4. Head flexed forward. Raise the arms forward-upward slowly as you inhale deeply and expand the chest to the utmost. Lower them sideways-backward as you exhale. As Exercise 11, Lesson I, Illus. 13, with the head flexed.

5. Fingers locked behind the head, pull forward on the head as you inhale deeply and endeavor to expand the chest. (Illus. 215.)

II. With assistance and resistance.

1. Patient sitting, head flexed forward, arms extended upward. The operator stands behind, grasps his hands, and offers resistance as the patient pulls down, flexing the arms, elbows well out at the sides, and inhaling deeply to expand the chest. No resistance is offered as the patient extends the arms and exhales. (Illus. 216.)

2. Patient standing, head flexed forward, hands on the hips. The operator stands behind, grasping the patient's elbows. As the patient inhales and rises on the toes, the operator forces his elbows back to increase the chest expansion. (Illus. 217.)

3. Patient standing, head flexed, arms extended upward. The operator stands behind him and pulls his arms back as the patient inhales deeply. (Illus. 218.)

4. Patient lying on his back, head elevated, resting on a pillow, arms extended forward. The operator, standing at the patient's head, resists as the latter carries his arms up and back while inhaling deeply. (Illus. 219.)

III. With apparatus.

1. Lying on the back, feet toward the exerciser, head elevated, resting on a pillow, carry the arms from the sides, straight upward and back of the head as you inhale deeply. As you bring the arms back, exhale. (Illus. 220.)

2. Standing, head flexed forward, holding light dumbbells, fling the arms forward-upward as you lunge forward, first with the left foot, then with the right.

3. Patient hanging, head flexed forward, the operator stands behind and places one hand each side at the angles of the patient's ribs, and presses inward and forward to expand his chest. (Illus. 221.)

4. Standing facing the chest weights, feet apart, head flexed forward as the arms are lifted, carry the arms down between the legs and up over head. (Illus. 222.)

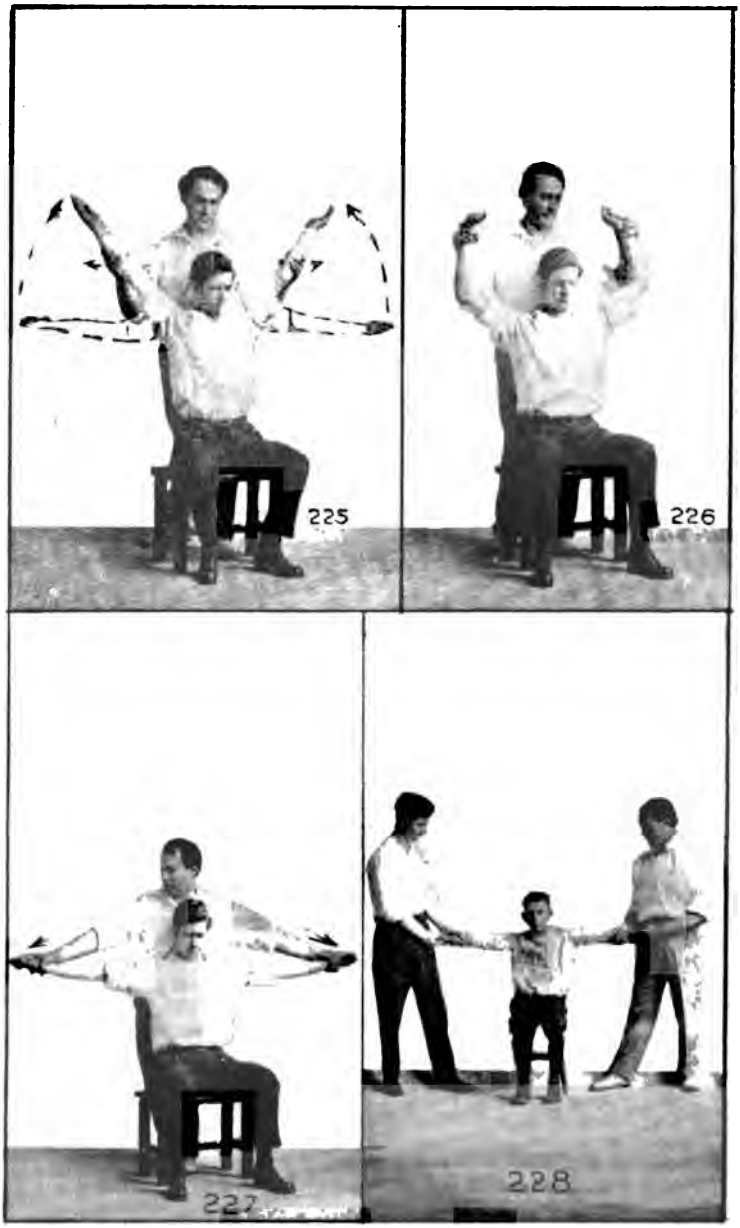
5. Practice throwing a baseball, or any light object, with each hand alternately. Or, the same effect may be obtained with an elastic exerciser. Standing with your back to the exerciser, go through the throwing motion with the right and then the left hand alternately.

NARROW CHEST.

In this condition the lateral diameter of the chest is less than the normal average. The chest is narrow from side to side, and sometimes this condition accompanies shallow chest, but not for long, because persons having such a defect do not live long.

The anatomy of narrow chest is a condition in which the ribs are depressed laterally. From the first rib down they all form an acute angle downward at the sternal and spinal attachments. The lower the rib the more acute the angle.

The corrective work must be such as to raise the



ribs laterally. Any exercise in which the arms are speedily extended sideways, or elevated sideways-upward, will tend to correct this defect. The attachments of the muscles to the lateral portions of the ribs and to the arms above, give us a purchase upon them which aids in their lateral elevation. Added to this is the effect of lateral elevation at deep inhalation. By making a special effort to raise the upper ribs anteriorly and laterally, through contracting the scaleni, sterno-cleido-mastoid and internal intercostal muscles, we add to the effect of arm raising.

I. Exercises without apparatus or external resistance.

1. Raise the arms sideways-upward and inhale as they go up. Lower them sideways-backward and exhale as they go down. See Exercise 12, Lesson III, Illus. 30.

2. Extend the arms sideways, putting all the speed possible into the extension.

3. Arms shoulder high at the sides, palms turned upward. Raise the arms up to vertical and at the same time raise the left leg sideways. As you lower the arms to shoulder height lower the leg. As you raise the arms again, raise the right leg, and so on, alternating with the legs. See Exercise III, Lesson XVII, Illus. 123. In this exercise, however, do not rise on the toes, as is shown in the illustration referred to.

4. Fingers locked behind the head, feet apart, bend as far as possible to either side. (Illus. 223.)

5. Rise on the toes, bend the knees all the way down, place the hands on the floor, fingers pointing inward, kick the feet back, and turn to the right, thus resting the weight on the left hand and the outside of the left foot. The right arm is extended upward along the head. While thus balancing the weight, elevate the

right arm and right leg a few times. Then, change sides and elevate the left arm and leg. See Illus. 134.

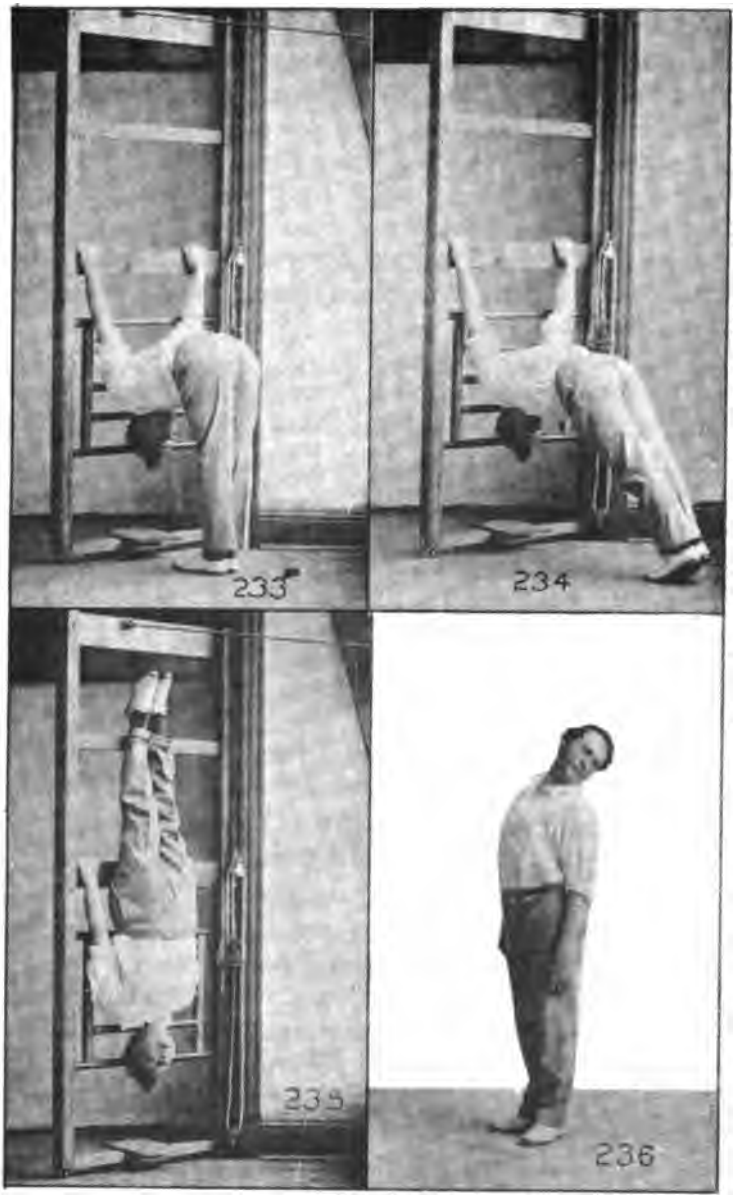
II. With assistance and resistance.

1. The patient seated, arms hanging at his sides; the operator stands behind and, grasping the patient's arms just below the elbows, he offers resistance as the patient elevates his arms sideways to shoulder height; and at the same time, the operator combines with his resistance a slight outward traction on the patient's arms. When the patient's arms are at shoulder height he tries to hold them there, while the operator forces them down to the sides, combining an outward pull on the patient's arms with his downward pressure. (Illus. 224.) Throughout this exercise the patient should preserve a good trunk and head posture.

2. Patient seated, arms extended sideways from the shoulders, palms turned upward. The operator stands behind and takes hold of the patient's wrists. As the patient inhales and elevates his arms the operator offers resistance, and when the arms are vertical the operator pulls up on them. (Illus. 225.) As the patient exhales and lowers his arms the operator resists.

3. The patient seated, arms bent upward. The operator stands behind and grasps his hands. As the patient inhales and extends his arms upward the operator resists. The elbows must travel sideways as far as possible from the body. The operator resists as the patient flexes his arms and exhales. (Illus. 226.)

4. The patient seated, his arms flexed upward, the operator stands behind him and grasps his forearms a little above the wrists. The operator offers slight resistance as the patient extends his arms sideways and at the same time inhales deeply. As the patient's arms reach complete extension the operator forces



them out still farther. (Illus. 227.) As the patient flexes the arms the operator offers slight resistance.

5. The above exercise is increased in force with the aid of an assistant. The operator and his assistant stand at either side of the patient, and each grasps one of the latter's hands. They offer resistance as the latter extends the arms sideways and at complete extension they pull out to emphasize the movement. (Illus. 228.) Both offer slight resistance as the patient flexes his arms.

III. With apparatus.

1. Standing with your left side to the exerciser, left hand grasping handle, right hand on the hip, elevate the left arm sideways upward a number of times. (Illus. 229.) With your right side to the exerciser, left hand on the hip, elevate the right arm.

2. Hanging on a horizontal bar, hands grasping as far apart as possible, swing the legs from side to side.

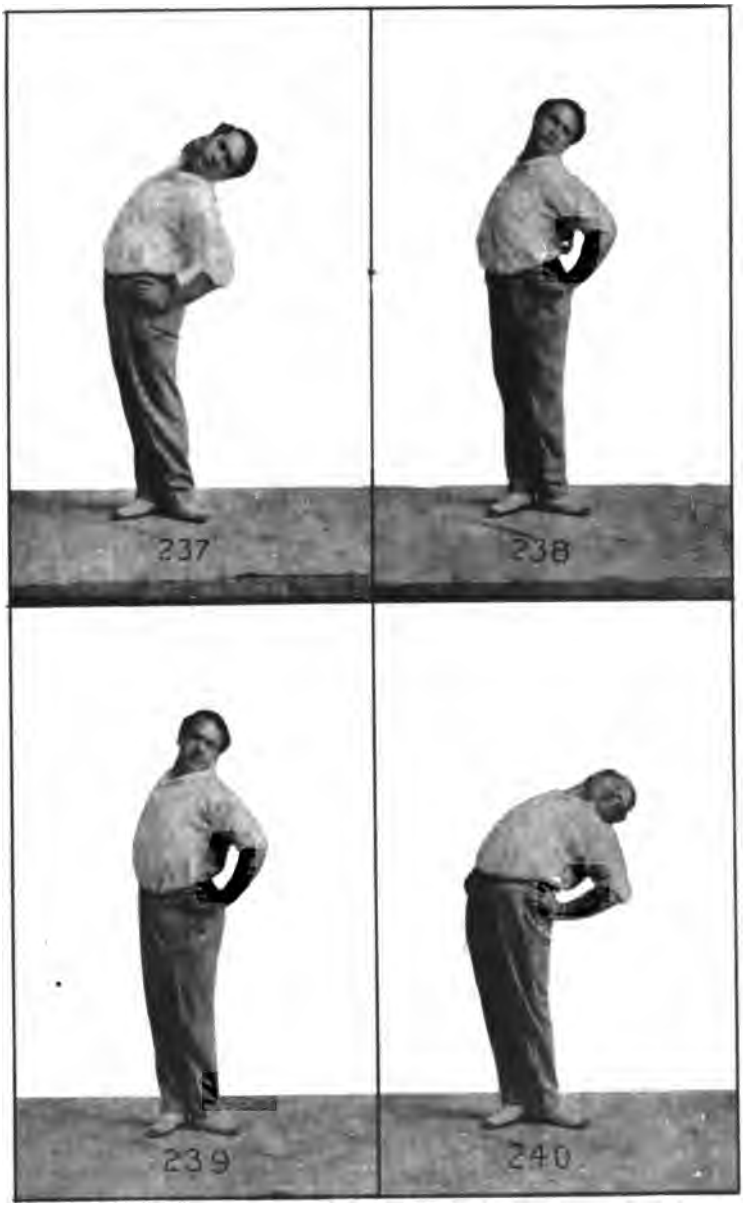
3. Arms extended upward, with or without dumbbells, feet apart, bend as far as possible to the left and right.

4. Hanging on a horizontal bar, hands grasping as far apart as possible, the operator resists at the ankles as the patient abducts the legs. (Illus. 230.)

5. Practice on the traveling rings.

ANTERIOR DORSAL

In this condition the spine, instead of rounding back gently at the shoulder region, curves forward and makes the back appear very flat. This condition usually accompanies shallow chest, but it may exist with a comparatively full chest. There is a false notion prevalent that with a straight dorsal spine one should be straight and broad of shoulders, but even if this were true, the condition is one that weakens and lowers the resistance of the thoracic organs.



Osteopathy has shown that the normal spine is gently curved posteriorly between the shoulder blades. A spine that is too straight or anterior at the dorsal region predisposes to lung, heart and stomach disturbances.

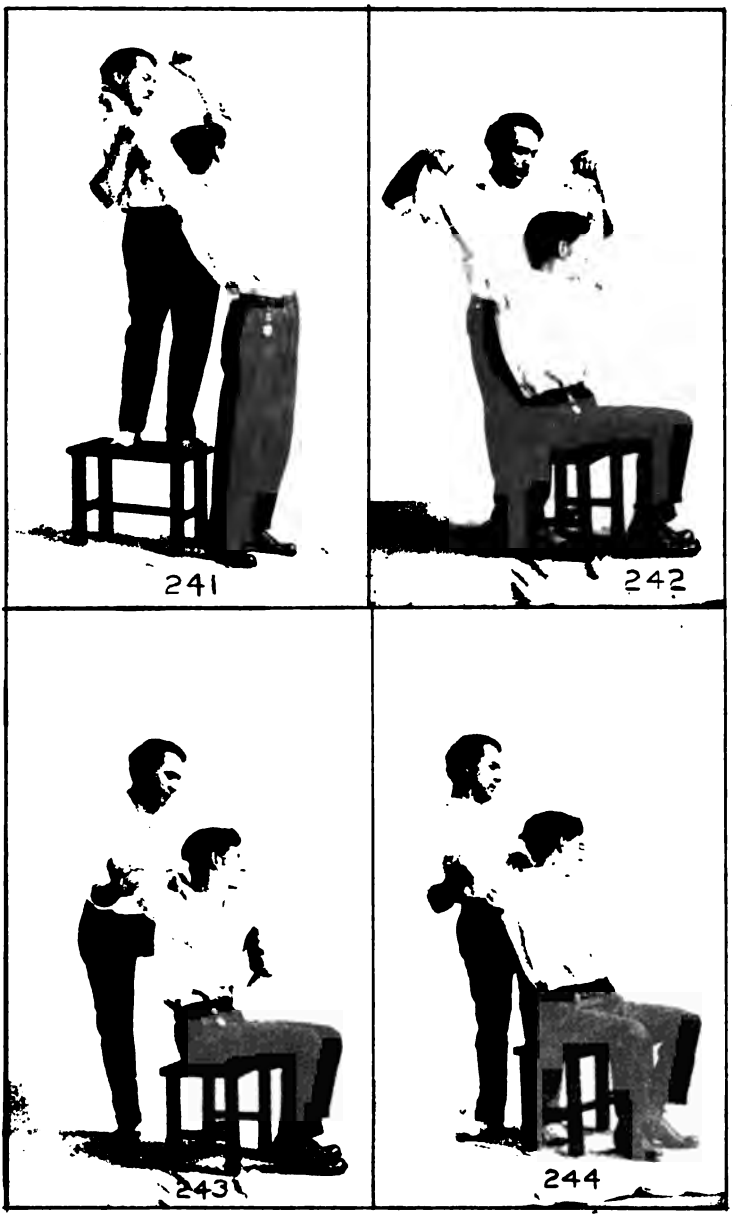
The exercises given for correcting shallow chest are of service in treating anterior dorsal. There are not many specific exercises for anterior dorsal that do not have a deleterious influence on the chest. It may be said that this is compensated for by the fact that anterior dorsal condition is quite uncommon. Another interesting fact is that nearly all gymnastic movements may be made corrective of anterior dorsal curvature.

In Chapter I we explained why the head should be kept erect and the chest forward during exercise. In the average individual the inclination is to develop a posterior dorsal condition and gymnastics must be so arranged as to counteract this tendency. A condition of anterior dorsal renders it imperative, for the individual so afflicted, to violate the general law of gymnastics. Since the body at rest tends to assume the posture it held during activity, then, to correct anterior dorsal one should endeavor to slightly round the upper back, by, or during, exercise. Walking with a drooping head, working over a bench with the head bent forward, reclining the body backward with the head kept forward as one does while reading in a Morris chair, or playing such a game as croquet, will tend to correct anterior dorsal.

Exercises to correct anterior dorsal.

1. Head flexion forward. With the chin drawn in, flex the head as far forward as possible.

2. Lock the fingers behind the head, keeping the chin drawn in, pull forward on the head, and round the upper back as much as possible.



3. Lying on the back, with the chin drawn in, elevate the head as high as possible. (Illus. 231.)

4. Back-of-neck-and-elbow-stand. Lie on the back, raise the legs and curl them over the head. Place the hands at the small of the back, keeping the elbows as far apart as possible and thus support the body on the back of the neck and elbows. As Illus. 172. By kicking upward forcibly one is able to travel by short jumps while in this position.

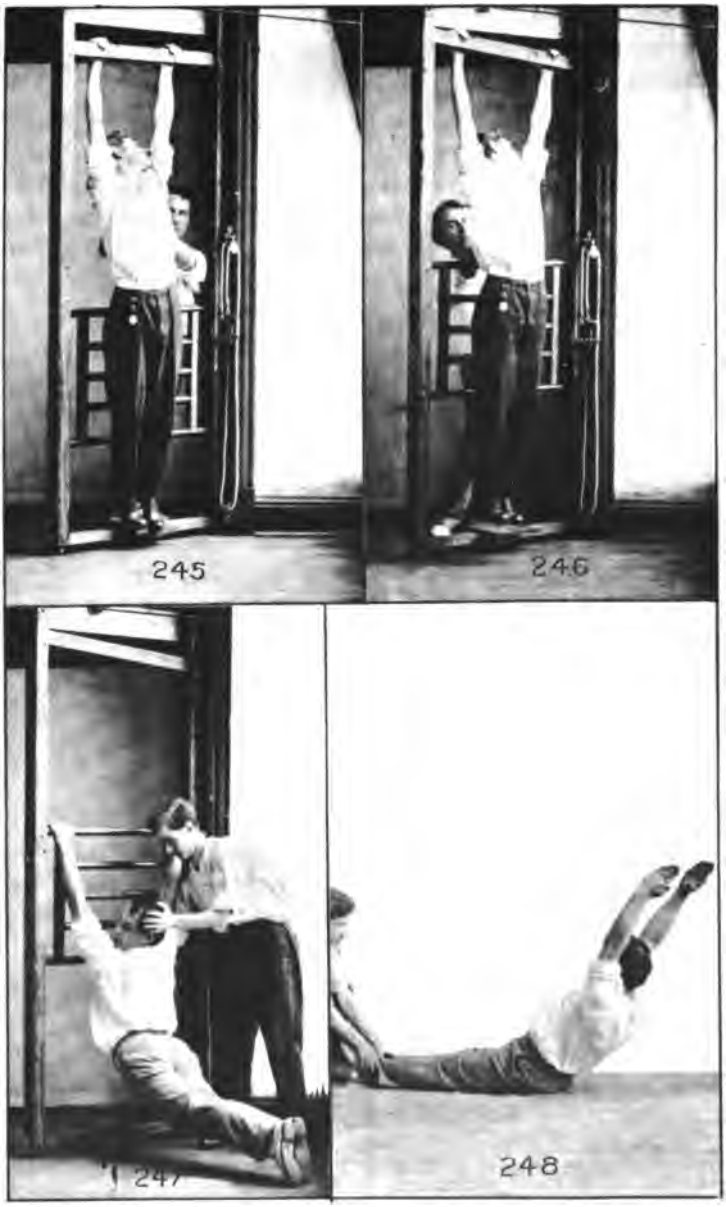
5. The patient seated, locks the fingers behind his head. The operator stands behind him and passes his hands beneath the patient's axillae, and, palms facing forward, grasps his wrists. He now makes the the patient fall backward and by pulling on the wrists, forces a rounding of the shoulders. (Illus. 232.) While holding the patient in this position he works his body forward and back, and from side to side, thus extending the posterior dorsal muscles from various angles.

6. The patient facing the stall bars, stands about two feet away from them and bends forward until the back of the head rests against the bars, and he reaches up and back and grasps one of the bars with both hands. (Illus. 233.) He then allows the feet to slide backward and the hips to sag. (Illus. 234.) If strong enough he raises the body to vertical, a few times. (Illus. 235.)

ONE-SIDED CHEST DEFECT.

A common sequel of pleurisy is a sunken rib condition of the upper chest, most frequently on the right side. The depressed ribs are usually fixed and immovable, thus rendering the lung less capacious than normal.

During a case of pleurisy, the patient tries to lie with the weight resting on the afflicted spot. This lessens the pain during the acute stage of the disease,



but it also favors the production of adhesions that ultimately fix the ribs in a state of immobility. Corrective exercises in such a case must cause an expansion of the depressed rib area, and thus gradually remove the adhesions and restore normal lung action.

For the sake of clearness in explanation we shall prescribe for a depressed upper rib condition at the right side. All the exercises explained are with such a hypothetical case in mind. By just reversing the exercises in every respect, we can effect the left upper rib area. These exercises are also very good where the apices of the lungs are threatened or slightly affected by tuberculosis. In this case they should be done alternately to either side.

I. Exercises without apparatus or external resistance.

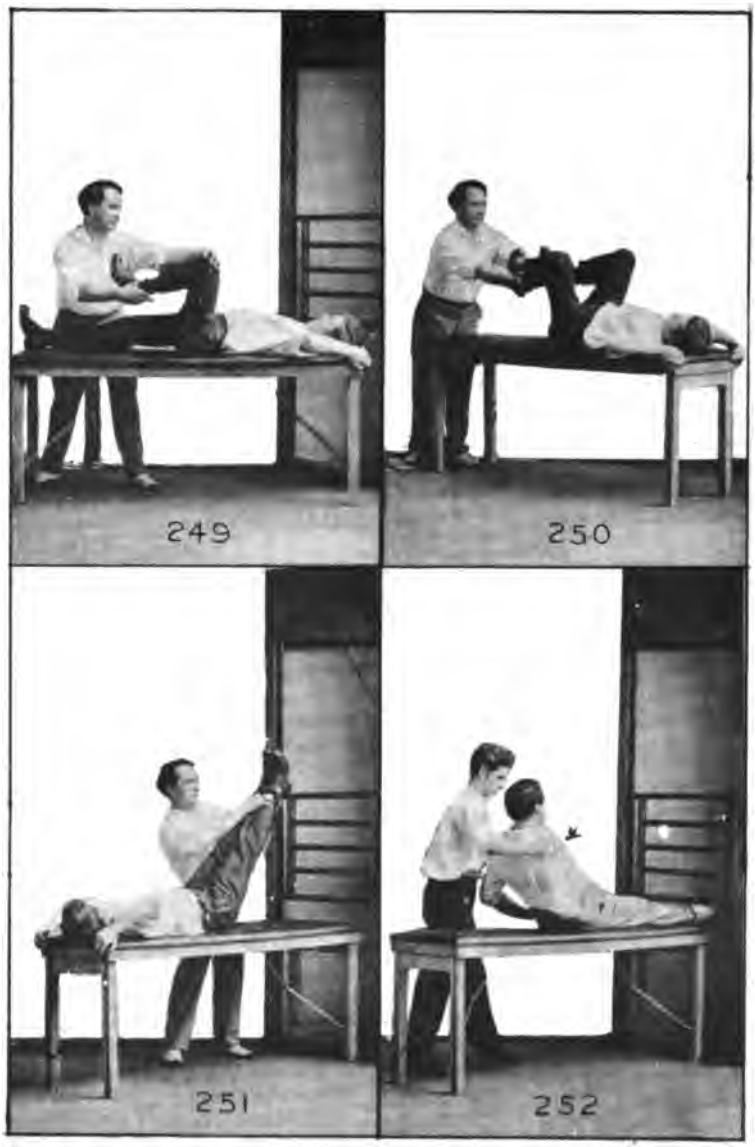
1. Feet apart, raise the arms forward-upward as you twist the trunk and head to the left and at the same time inhale deeply. As you turn the trunk forward, lower the arms sideways-backward, and exhale.

2. Head turned to left, bend it diagonally backward and to the left as you inhale. (Illus. 236.) As you elevate the head exhale slowly.

3. Left hand on the hip, right hand behind the head, body turned to right, head turned to the left, bend the head and upper body diagonally backward and to the left as you inhale. (Illus. 237.) As you stretch the head and trunk to erect posture, exhale.

4. Hands on the hips, body turned to the right, head turned to the left and bent backward. This is the starting position. (Illus. 238.) The exercise consists in straightening the head upward, while keeping it turned, and at the same time inhale deeply to expand the upper right thorax as much as possible. (Illus. 239.)

5. As number 4, except that the upper trunk, as



well as the head, is bent backward in starting position. (Illus. 240.)

II. With assistance and resistance.

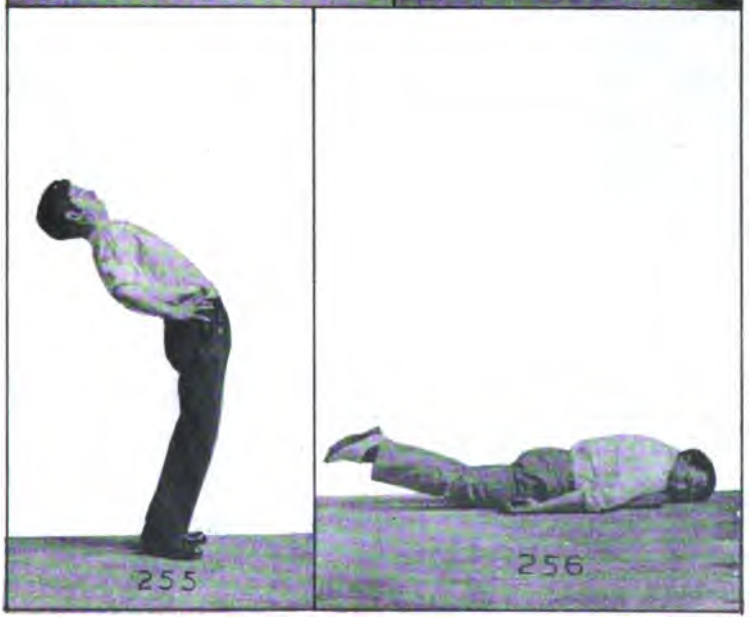
1. Patient standing, trunk turned to the right, head turned to the left. The operator stands on a stool behind him. As the pupil elevates his arms forward-upward and inhales deeply, the operator reaches over and offers resistance and, when the pupil's arms are as high as he can carry them, the operator pulls them back over his chest, exerting the greatest force on the right arm. (Illus. 241.)

2. Patient sitting, arms extended upward, trunk turned to the right, head to the left. Operator stands behind and grasps the patient's hands. As the patient flexes his arms and inhales the operator offers resistance. (Illus. 242.) The patient exhales as he extends his arms to starting position, the operator does not resist this arm extension.

3. As number 2, except that the patient's head is flexed backward at starting position, and brought to erect posture with inhalation.

4. Patient sitting, trunk turned to the right, head turned to the left, right hand behind the head, left hand on the hip. The operator stands behind with the side of his knee against the patient's scapular region, his right hand grasping the patient's right arm above the elbow, his left hand at the patient's left axilla. As the patient inhales the operator forces his right arm back to expand the right upper thorax. (Illus. 243.)

5. Patient sitting, fingers locked behind the head, elbows forward, the head is turned to the left and bent backward, the upper trunk is slightly inclined backward and to the left. The patient preserves this position of the trunk and head throughout the exercise. The operator stands behind the patient, grasps



his elbows, and offers resistance as the latter carries them backward while inhaling deeply. When the patient has carried his elbows backward as far as possible, the operator carries them back a little farther, pressing a little harder on the right than on the left. As the patient exhales his elbows are carried forward without resistance. (Illus. 244.)

III. With apparatus.

1. Patient standing, arms extended upward and grasping a horizontal bar, his head is turned and bent to the left. The operator stands behind, places his hands at the patient's interscapular region and pushes forward and toward the right as the patient inhales deeply and rises onto his toes. (Illus. 245.)

2. Patient hanging on an incline bar, right hand higher than the left, the head is turned to the left and bent backward. As he elevates the head, he inhales deeply to expand the right upper thorax.

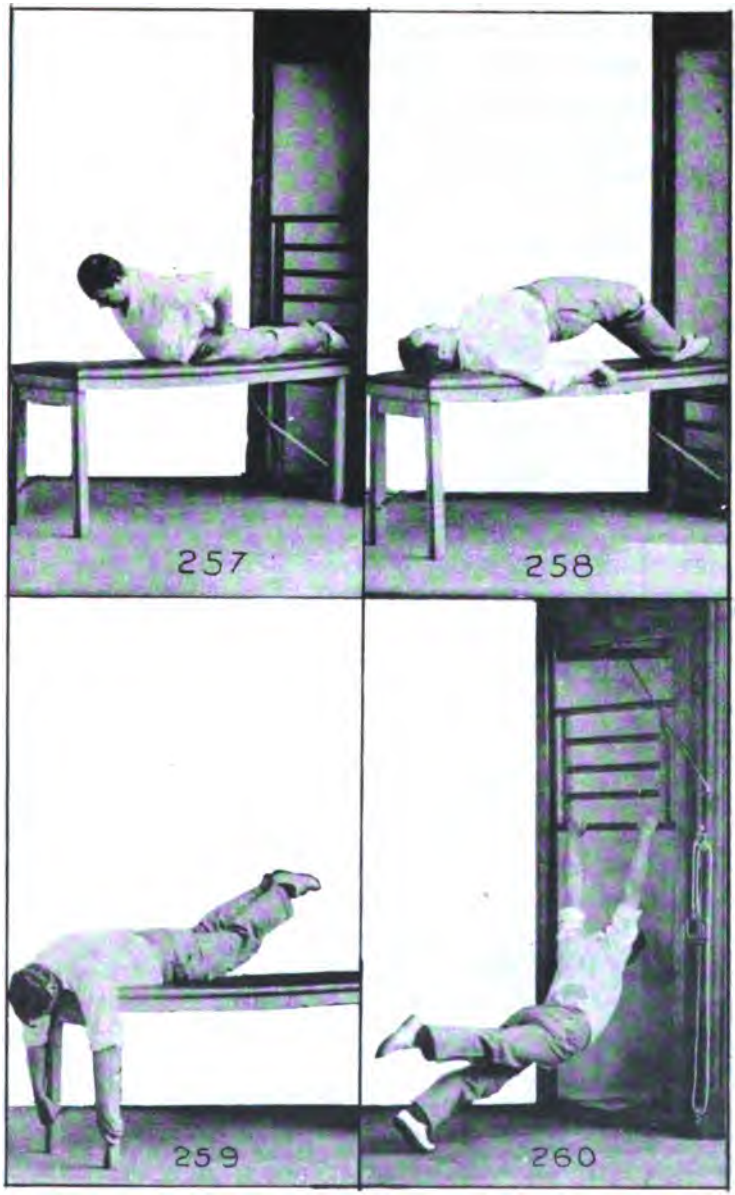
3. Repeat number 2 with forced chest expansion. (Illus. 246.) The operator stands behind the patient, places his hands at the latter's interscapular region and pushes forward and toward the right at inhalation.

4. The patient takes arch-hanging position, his head turned to the left. Keeping the head turned, he arches it upward and backward as he inhales. (Illus. 247.)

CHICKEN-BREAST.

Chicken-breast is a defect that may have a strong influence on a patient's general health. The chest is narrow and peaked at the front with the sternum very prominent. Even if the patient's health is not affected by the condition, he is usually conscious of it, and his mental attitude may have a depressing effect upon his organism.

In children this condition may be removed by mak-



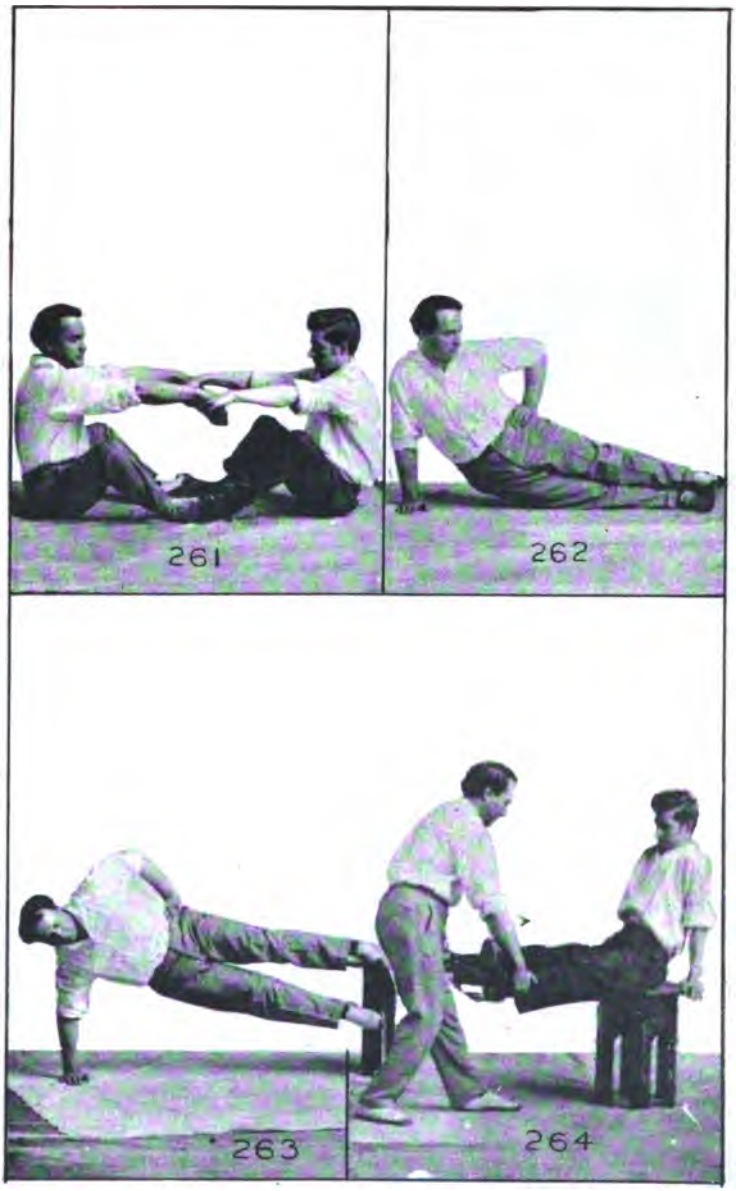
ing use of the exercises outlined just above, for one-sided chest defect. But, in treating chicken-breast, these exercises should be used alternately to both sides. In the above list, the exercises apply especially for a right upper rib depression. By just reversing every step of each exercise, the effect is centered on the left upper ribs. Repeat each exercise at least three times to either side.

In addition to the above exercises for chicken-breast, every procedure explained in treating narrow chest will be found valuable, because chicken-breast needs a lateral expansion force as well as a rib lifting one.

In a bad chicken-breast defect in a child or youth, the plaster cast is of great value. The proper application of the cast is on the same principle as Abbott's method of treating spinal curvature. The patient is strung up on the apparatus, a clean under-shirt having been slipped on, pads of curled hair are placed on each side of the chest where the rib depressions are, and these are held in place by bandages. The plaster bandages are then wound around and when the cast is set, windows are cut out at the areas where the pads are applied. These are removed and thus allow the ribs free play where motion and expansion are most needed, and the cast exerts a pressure at the sternum and angles of the ribs.

These casts should be removed every three or four weeks, corrective gymnastic procedures practiced an equal length of time, and then a new cast should be applied.

In a bad case of one-sided chest defect, the plaster cast may be used on the same principle as for chicken-breast. In this case the pad is applied, and the window cut out only at the area of the depressed ribs.



LORDOSIS.

Lordosis or sway-back is the common condition of deep anterior bend at the waist. People develop such a defect from weak anterior lumbar muscles (psoas-iliacus), and weak abdominal muscles, or from a wrong conception of correct standing posture. Many a child, and often an adult, when told to stand up straight, simply settles the trunk backward from the waist, deepening the anterior lumbar curve and thrusting the shoulders and head forward. Wrong conception of correct standing posture is one of the chief causes of lordosis in those who have never taken exercise or been told what correct standing posture means.

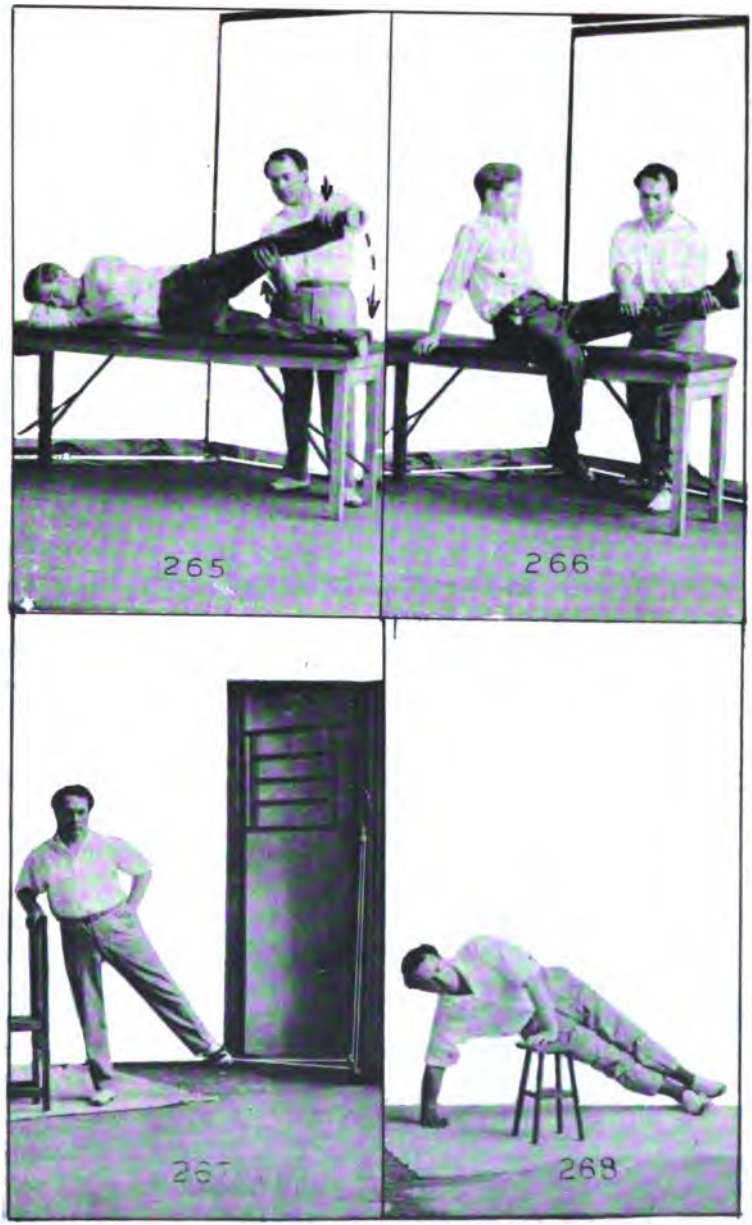
Lordosis is not only a postural defect but it is often the cause of much physical suffering. It means weak, flabby abdominal muscles and tendency to, or presence of, hernia. It predisposes to optoses of different kinds because the abdominal muscles fail to properly support the viscera. In women it means that the abdominal organs bear down on the pelvic organs and often produce a tipping of the uterus that may, in addition to menstrual pains, cause bladder or rectal troubles. Optoses may also cause adhesions between the intestines and the uterus or ovaries.

Lordosis is not difficult to correct because the exercises indicated are easily understood. But they must be practiced regularly and for a long time. Because of this fact the treatment is often considered difficult.

To correct this defect one must practice exercises that will stretch posterior lumbar muscles and strengthen and shorten the anterior lumbar and abdominal muscles. The following are typical:

I. Exercises without apparatus or external resistance.

1. Lying on the back, raise the legs. If this move-



ment is too difficult, begin by bending the knees upward, straightening the legs and lowering them slowly with the knees kept straight. As soon as you are strong enough keep the knees straight as you raise and lower the legs. (See Illus. 125.)

2. Lying on the back, fingers locked behind the head, elbows resting against the floor. Keeping the knees straight, elevate the feet and, holding them a few inches from the floor, spread the legs out and bring them together a few times.

3. Lying on the back practice leg swimming. Bend the knees up onto the chest, spread the legs apart as you straighten the knees and then draw the feet together. Practice this exercise a few times without resting the weight of the legs between movements.

4. Lying on the back, with the feet under some heavy object, hands on the hips, flex the body up to sitting posture. (Illus. 95.)

5. Lying on the back with the feet held down as in Exercise 4, arms extended and kept in line with the ears. Flex the body up to sitting posture. (Illus. 248.)

II. Exercises with resistance.

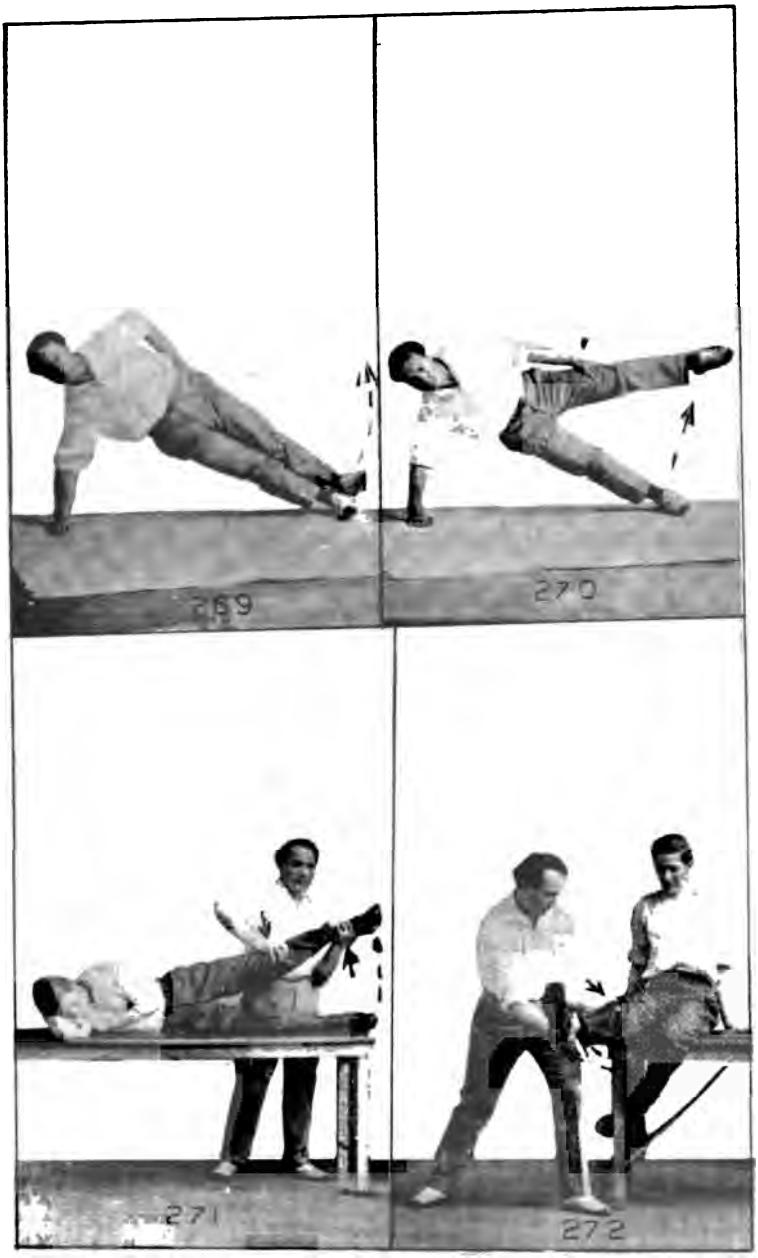
1. Patient lying on the back on a table, his hands grasping the sides near the head of it. As he draws one knee up to his chest the operator offers resistance. (Illus. 249.)

2. Patient on a table, as for Exercise 1. As he flexes both knees up to his chest the operator offers resistance. (Illus. 250.)

3. Patient lying on a table, hands grasping the head of it. As he elevates both legs with the knees straight the operator offers resistance. (Illus. 251.)

4. Patient lying on the back, feet strapped down, hands on the hips. As he comes up to sitting the operator offers resistance. (Illus. 252.)

5. Patient on table as for Exercise 4, except that



the fingers are locked behind the head and the elbows kept well back. As he comes up to sitting the operator offers resistance, and then, pushes him forward as far as possible to extend the posterior lumbar muscles. (Illus. 253.) This exercises, strengthens and shortens the anterior and stretches the posterior lumbar muscles.

III. With apparatus.

1. Hanging on a horizontal bar, flex the knees upward to right angle.

2. Hanging on a horizontal bar, flex the knees up as in Exercise 1, and, holding them up, straighten them forward alternately. (Illus. 117.)

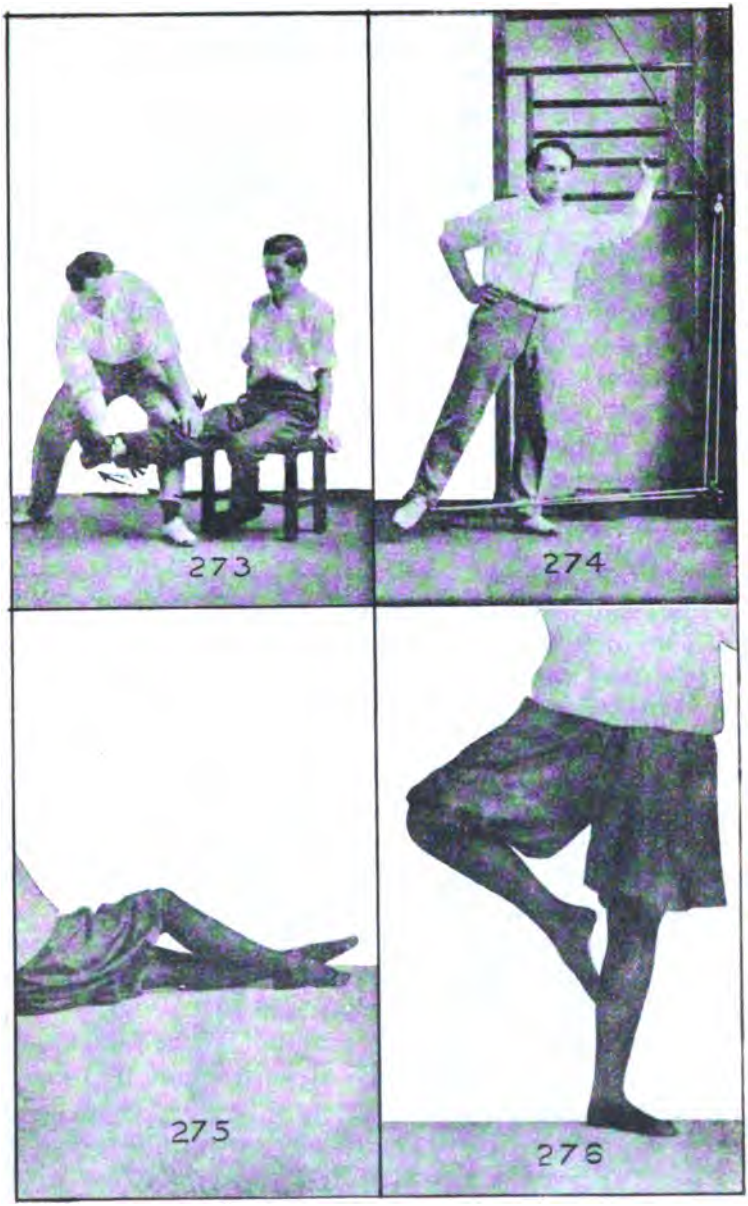
3. Hanging on a horizontal bar, raise both legs forward from the hips. Keeping the knees straight. (Illus. 147.)

4. Hanging on horizontal bar, legs held horizontally forward from the hips, spread them apart and bring them together a few times. (Illus. 147 and 148.)

5. Most cases of lumbago are compensated for by a posterior dorsal condition often verging on a kyphosis. Assuming that the case under treatment is typical, we can combine an exercise that will correct the lordosis with a force that will effect the kyphosis. The patient, while hanging on a horizontal bar, may practice any of the above four exercises while the operator stands behind and pushes forward at the interscapular region. (Illus. 254.)

POSTERIOR LUMBAR.

This defect does not exist as commonly as lordosis, but where it does exist, it is usually causative or indicative of pathological conditions. Chronic constipation, rectal troubles, and pelvic disturbances leading to menstrual complications in women, usually accompany this defect. With posterior lumbar we find, almost without exception, a rigid, straight, or anterior



dorsal spine, digestive irregularities and lung or heart weaknesses.

This defect is usually acquired by improper standing and sitting postures, by occupational postures or exertions, and by nervous irritations due to intestinal indigestion resulting from long continued improper feeding which keeps the intestinal nerves constantly irritated, and the reflex effect is to cause a tension in the anterior lumbar muscles. These muscles remain in a state of contraction and thus cause a concavity at the posterior abdominal wall where there should be a convexity. Externally we have the convex posterior lumbar instead of the normal concave.

Whatever the cause or causes, the muscles at the front are shortened and those at the back lengthened abnormally and the correction is accomplished by exercise that extend the anterior and shorten the posterior lumbar muscles. Since posterior lumbar is usually accompanied by anterior dorsal, some of the exercises are given to affect both defects at once.

I. Exercises without apparatus or external resistance.

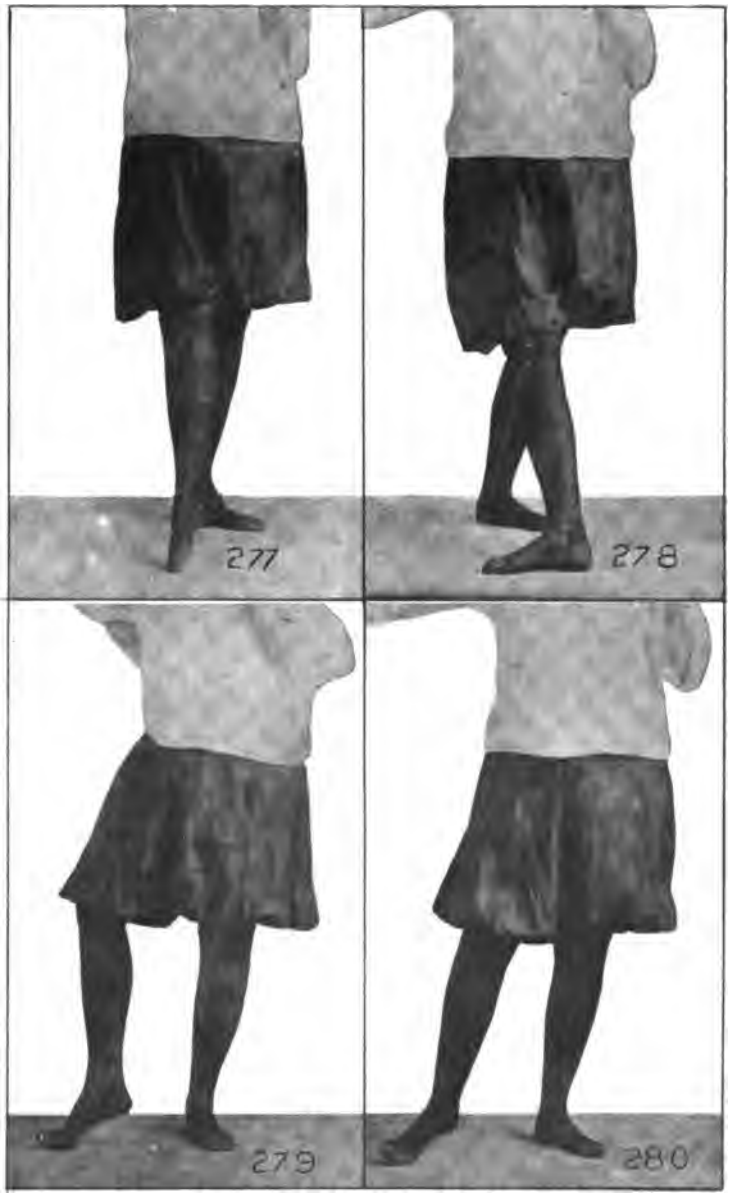
1. Hands on the hips, bend backward at the waist, keeping the head up. (Illus. 255.)

2. Hands on the hips, elevate the left and then the right leg backward, alternately. (As Illus. 17, except that the head may be allowed to droop slightly.)

3. Lying face down with a pillow under the chest, raise the legs as high as possible from the table, either alternately or together. (Illus. 256.)

4. Lying face down with a weight on the feet, hands on the hips, arch the body upward from the waist, the head being allowed to droop a little. (Illus. 257.)

5. Lying on the back, arch the body upward at the waist, resting the weight on the heels and the shoulders. (Illus. 258.)



6. Patient lying face downward, his head unsupported and projecting beyond the end of the table, a pillow under the chest, arms hanging down and hands grasping the legs of the table. The legs are lifted as high as possible from the table, knees kept straight. (Illus. 259.)

II. Exercises on apparatus or with resistance.

1. Practice 3, 4 and 6, of the above against resistance.

2. Arch-hanging, head drooping, alternate leg elevation. (Illus. 260.)

3. Stick wrestling on the floor. Opponents sit with their feet pressed together, hold a stick and at a given signal each tries to pull the other up from the floor. (Illus. 261.)

4. The so-called "slinker-slouch" walk is corrective of posterior lumbar and anterior dorsal.

KNOCK-KNEES.

This defect is usually found in the slender, lanky, flabby-muscled and loose-jointed individual. The subject usually shows a need of general resistive exercises to give firmness and strength to his muscles. From the muscular standpoint the local defect means extended internal and shortened external leg muscles. Frequently, there is a joint defect that is independent of the musculature. In such a joint defect the internal tuberosities of the tibia and femur may be too long, or the inter-articular cartilages may be thickened on the inner side.

The treatment for knock-knees is both active and passive. The active form consists of exercises that tax the inside, or adductor muscles, and extend the outside, or abductor muscles, of the legs. In this way the adductors are strengthened and shortened and the abductors are correspondingly extended. This method

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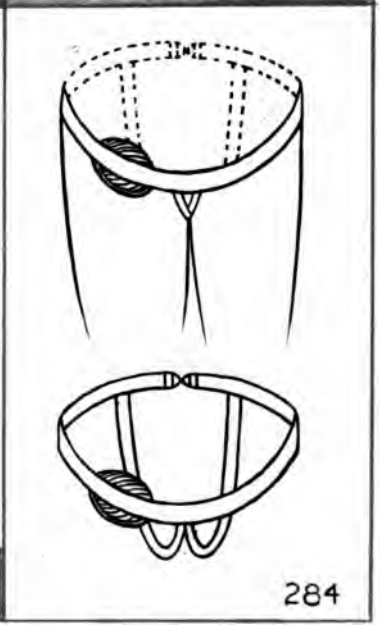

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of procedure gradually brings a force to bear that will constantly draw in at the top and bottom of the legs and cause the knee joint to go out, at the same time altering the adjustment within the joint proper, whether cartilaginous or osseous.

Such a correction cannot be accomplished in a few days or weeks but requires months or years. The treatment is based upon the idea of creating a new cell-adjustment habit by repeating the effort toward correction. As metabolism goes on in the joint it accommodates itself to the corrective force exerted.

The passive treatment, which should always accompany the active, consists in using braces that press outward at the knees and inward at some point above and below it.

There are many types of braces made which are more or less serviceable, but one need not go into expense for anything fancy. Any corrective appliance should be such as to be worn at night during sleep. Padded boards placed on the outside of the legs, with the pads resting against the outside of the thigh and leg, made secure by bands at the top and bottom and with a broad elastic tape strapped securely around the knee, thus pulling it outward, will prove efficient. A simpler method is to place a pillow between the knees and then strapping the ankles together. As long as the knees are unflexed this will prove corrective.

I. Exercises without apparatus or external resistance.

1. Walk on the external edges of the feet and at the same time endeavor to keep the knees as far apart as possible.

2. While in standing position, force the heels together, or as nearly together as possible, and at the same time force the knees apart.

3. Take side fall position and allow the body to

sag so as to extend the outside muscles of the supporting leg. (Illus. 262.)

4. Foot grasp side fall position, leg adduction. Patient rests the inside of the supporting foot on the edge of a chair or stool and, while bearing his weight on this foot and the opposite hand, he lifts the other leg a few times. The free hand may rest on the hip, as the illustration shows, or it may rest on a chair to help balance. (Illus. 263.)

II. Exercises with resistance.

1. The patient sitting, his legs extended forward and apart. The operator stands in front of him and, holding at the ankles, resists as the patient adducts the legs. (Illus. 264.)

2. The patient lying on his right side on the table. The operator stands behind him and holds the patient's left leg with the right hand inside the knee and the left on the outside of the ankle. The leg is lifted up without rsistance, then, as the patient pulls it down, the operator offers all the resistance he can at the knee, that is, lifting up here, and at the same time, he pushes downward at the ankle. (Illus. 265.) In this movement we have resistive exercise of the adductors, and passive extension of the abductors, the forces working as the arrows point.

This exercise is repeated as many times for one leg as for the other, with the patient lying on his left, the operator behind him, the left hand is at the knee, the right at the ankle.

3. A variation of number 2 may be given with more force by having the patient sit astride the table and adduct one leg at a time. For example, to exercise the adductors of the right leg, with the patient sitting, his hands grasping the sides of the table just behind him, the left knee, or inside of left foot, pressing against the edge of the table, the operator stands to

his right, grasps the inside of the right knee with his left hand and the outside of the ankle with his right hand and as the patient adducts the right leg, the operator resists by pulling hard with his left hand, and at the same time he pushes in at the ankle with his right hand. (Illus. 266.) Reverse to exercise the left leg.

In treating a child, too small to straddle a treating table, one leg should be held or strapped down while the other is exercised as above.

III. Exercises with apparatus.

1. Adduction of the leg against a chest weight or elastic exerciser. (Illus. 267.) Exercise first one leg, then the other.

2. Horse back riding is excellent to correct or prevent knock-knees. In this sport the adductor muscles are in constant use. So much so that one who rides horse back from childhood may develop bow-legs.

3. The use of braces, home made, or of the patent kind, or, placing a pillow between the knees and strapping the ankles, as already explained, are procedures that may be regarded as passive exercise by means of apparatus.

BOW-LEGS.

In reference to muscle relations the exact opposite condition to that explained in knock-knees obtains in bow-legs. The internal, or adductor muscles, are the stronger and shorter, and the external or abductor muscles are the weaker. Constant use of the adductor muscles, as in horse back riding, will develop bow-legs. But there is often an osseous condition, such as rachitis, which results in malformation. When bow-legs are the result of rachitis correction is almost impossible. Braces, which give a constant pressure inward at the point of greatest outward curve along

the shaft of the tibia and outward at the knee and ankle, may, in time, produce passive correction. This is especially true in children where the outward bend it not too marked. In very young children, it is possible to produce correction, without patent braces, by simply placing a pad inside of the ankle and knee joints and a wide strap or bandage at the point of greatest outward bend on the tibia.

Exercise will correct the form of bow-legs acquired by occupation, that is, where the entire leg is bowed from the hip to the ankle, with the greatest outward bend at the knee. These exercises should be such as to force in the knee and force out the ankle and foot by pressure, and by strengthening and shortening the abductors, and extending the adductors of the legs.

I. Exercises without apparatus or external resistance.

1. Walking on the inside edges of the feet, at the same time keeping the feet apart and forcing in the knees.

2. Standing with the feet apart and pressing in the knees, either by pushing in with the hands or by contracting the external muscles of the legs.

3. Support side fall foot eversion. The patient bears the weight of his body on one hand and the outside of the foot, steadying himself by holding a chair with the other hand. While in this position he everts the supporting foot. (Illus. 268.) Repeat on the other side.

4. Support side fall, leg elevation; supporting foot everted. The patient take side fall position as in Exercise 3, everts the foot, and, while holding this position, elevates the upper leg a few times. If control is good enough he should rest the upper hand on the hip, instead of on a chair or other support. (Illus. 269.) Repeat on the other side.

5. Side fall leg elevation with self-resistance. The patient takes side fall position. The supporting foot is everted and kept so. The upper hand is placed against the thigh. As the upper leg is elevated, the patient resists with his hand. (Illus. 270.)

II. Exercise with resistance.

In all of the following exercises the effect is increased by keeping the foot of the working leg everted all the time it is exercised.

1. Patient sitting, legs extended forward with the knees straight. The operator stands in front of him, grasps his ankles and resists as the patient spreads the legs apart.

2. Patient lying on his right side on the table. The operator stands behind him, places his right hand outside of the patient's left knee and his left hand inside of the patient's ankle. As the patient elevates the left leg, the operator resists by bearing down with his right hand and at the same time gives passive extension to the adductors by lifting up with the left hand. (Illus. 271.) Reverse for the other leg.

3. To make this second exercise stronger the patient sits on the side of a table close to the end. To exercise the right leg, the patient sits on the left side of the table near its end. This brings his right leg nearest the end, where the operator can work to advantage. The patient's left knee is curled under the table to grip it firmly, the hands grip the opposite side of the table, thus allowing the body to settle backward firmly. The right knee is straightened forward. The operator standing near the end of the table, to the right of the patient, places his left hand outside the knee and his right inside of the ankle. As the patient forces the leg outward, the operator resists by pressing inward at the knee and at the same time he gives passive extension of the adductor muscles by pulling

outward at the ankle. (Illus. 272.) Reverse in every respect to exercise the left leg.

4. For the same purpose as in Exercises 2 and 3, the force may be increased by using a chair or stool instead of a table. To exercise the patient's right leg, the latter is seated with his left foot hooked inside the leg of the chair. His hands clasp the sides of the chair. The right leg is extended forward with the knee straight. The operator stands at the patient's right, his left knee pressed against the outside of the patient's right knee, his right hand clasping the patient's right ankle. The left hand steadies the patient's knee. The operator's right foot is about two feet behind the left. Both his knees are partly bent to allow freedom of motion. As the patient carries his right leg outward, the operator offers resistance with his left knee, which is allowed to straighten backward slowly to adjust itself to the patient's movement, and at the same time, to extend the adductor muscles he pulls outward at the ankle. (Illus. 273.) To exercise the left leg, every part of this exercise is just reversed.

III. Exercises with apparatus.

1. To exercise the right leg, the patient stands with his left side to the exerciser, hooks the exerciser to the right foot and raises the right leg sideways. (Illus. 274.) To exercise the left leg the position is reversed, and the exerciser hooked to the left foot.

2. Sitting or lying, with an elastic band attached at the ankles, the patient spreads his legs apart against its resistance.

3. Patent braces that exert outward pressure at the knee and ankle and inward pressure at the tibial curve; and, the use of pillows attached between the ankles, and straps attached to press in at the greatest outward

curve of the tibiae, may be regarded as passive exercise of the legs that will correct the defect.

FLAT-FOOT.

Flat-foot, or broken arch, is a very common complaint. The loss of the arch is due to muscular or ligamentous weakness, or to paralysis of the muscles. Such a condition as infantile paralysis will produce flat-foot. In rachitis, owing to the bony softness as well as muscular weakness, we frequently find flat-foot. Flat-foot sometimes occurs from brith. Normally, the arch begins to form soon after birth, but in some cases it never develops.

Flat-foot is common among dancing and gymnastic instructors. Mention of the fact that it is common among dancers is apt to convey the idea that this occupation may cause it because the muscles of the foot are taxed to such a degree. But the fact is that in the average individual, dancer of otherwise, the muscles of the foot are capable of performing their function without pain or inconvenience if their nerve and blood supply are not impaired. While restoration of the arch is greatly aided by special exercises, the real cause of its breaking down is due to an innominate or lumbar lesion. By first setting the lesion, then prescribing exercises, beneficial results are always obtained. Exercise alone, that is, without osteopathic adjustment, will benefit less than 50 per cent of the cases prescribed for. Therefore, to cure flat-foot, that is, the acquired type, the innominate or spinal lesions below the eleventh dorsal vertebra must be adjusted. This done, exercises should be practiced regularly along with, and after, the treatment by osteopathy.

When the arch is falling, before a marked flat-foot condition exists, the person so afflicted feels intense pain in the muscles under the foot. Sometimes the

transverse arch alone is growing weak. More frequently the longitudinal arch is at fault, and occasionally, both break down simultaneously. Whether one or both are included, pain is always present, though it moderates periodically, only to return with increased intensity as time goes on. Standing on the toes, or on the external edges of the feet often gives temporary relief.

Arch supports worn inside the shoes, if properly fitted, relieve or moderate the pain, but they never restore a fallen arch to normal. They simply act as props and in no way rebuild the natural structure. They rather tend to increase the weakness present.

To rebuild the arch there are several exercises possible, but only a few that are very good. These should be repeated over and over. In addition to the exercises it always helps to press the fingers into the muscles of the bottom of the foot and give them a thorough kneading, pressing upward as in all kneading. At the same time press the arches into shape by exerting the force on the bones themselves.

1. Patient sitting, points the toes of the right foot, presses them on the floor, and keeps them dragging firmly on the floor, the heel held as high as possible, as he flexes and extends the knee. (Illus. 275.) This exercise is practiced first with one foot and then the other.

2. Patient standing, flexes the right knee well out, touches the toes of the right foot against the inside of the left leg, and flexes the knee upward as high as possible, rubbing the toes along the inside of the leg. (Illus. 276.) Repeat with the left foot. This movement taxes the muscles of the arch of the foot to such an extent as to cause pain at times, but it is the kind of pain which indicates that the real work is being done.

3. The patient points the left foot forward, reaching as far as possible with the toes, the foot rotated outward (Illus. 277), and lets the heel down so that the foot is pointed straight outward. This causes a strong tension on the ligaments inside the arch. The left foot is kept in this position on the floor, as the right foot is pointed forward and brought squarely down as the left was, with the toes pointed straight outward. This exercise is kept up in the form of walking, forward and backward. In the backward order the foot is pointed as far back as possible, and the heel is brought down so that the toes point straight out sideways. (Illus. 278.) Then, the other foot is carried backward, etc. This exercise, and the two above have been used with success to develop the arches of a dancing teacher who had congenital flat-foot, and the illustrations for this particular defect were posed for by her.

4. Another form of exercise that is very helpful in developing the arches is to raise the heel and toes of the foot and press down with the ball of it. (Illus. 279.) This exercise forces the arch into position. The idea is to bear down hard with the ball of the foot in a gripping motion, either while sitting or standing, and at the same time lift the heel and toes as high as possible.

5. Rising on the balls of the feet, by lifting the heels and toes of both feet, or walking on the balls of the feet with the heels and toes kept as high as possible, will serve as variations of Exercise 4.

The exercises given above will rebuild the transverse as well as the longitudinal arch, because they tend to strengthen all the muscles under the foot as well as those of the leg whose tendons are distributed under the foot. For special effect upon the transverse arch, when the patient rises on the balls of the feet,

as the heels and toes are lifted, he should press outward with the inner metatarso-phalangeal joint (Illus. 280), and press inward with the external metatarso-phalangeal joint. (Illus. 281.) This may be done one foot at a time as the illustrations show, or with both feet, while the heels and toes are kept lifted.

PIGEON-TOES.

This is a condition that can always be corrected in any individual who is able to walk. It is sometimes the result of paralysis in which the external rotators and everters of the feet have been effected. But, even in such cases, persistent effort will correct the defect. One case was that of a woman of 26 years, who had had infantile paralysis in childhood and retained this defect. She was cured of it in less than four months of persistent effort. Another case was that of a five-year-old boy who had a club-foot condition (double equino-varus), that kept him from walking for over two years. Casts or braces were not used and nothing was done except to give him corrective gymnastics. In a few weeks he began to walk but in a very ungainly way. His legs were kept spread far apart and the toes turned in so as to make him sway as a duck does in walking. In the course of a little over six months he became as lively as any average boy of his age.

To correct typical pigeon-toes, that is, where the feet simply turn in, it is necessary to strengthen the external rotators of the feet and legs and stretch the internal rotators. In a case resulting from club-foot, where the everters of the feet as well as the external rotators are weak, a few additional exercises are necessary. By practicing daily the following exercises, pigeon-toes can be corrected.

I. Exercises without assistance or resistance.

1. Walking with the feet kept turned outward as

far as possible. The patient should walk along the cracks in the floor, or draw chalk lines, and try to place his feet in line with them. (Illus. 282.)

2. Press one foot in front of the other, toes pointing straight sideways, and flex the knees without allowing the feet to rotate. (Illus. 283.)

3. Foot externally rotated, raise the leg forward, carry it sideways and down to position. Keep the knee straight and the foot turned outward as much as possible all through this movement. Repeat with the other leg; and so on, alternately.

4. If the patient has a slight club-foot condition, with pigeon-toes, he should try to walk on the inside edges of the feet, as well as to keep the feet outwardly rotated.

5. In standing position, heels together, toes turned out as much as possible, he should evert the feet, that is, raise the outside edges, over and over.

II. Exercises with resistance.

1. Patient lying on his back, or sitting with the knees extended forward, rotates the feet outward against the operator's resistance. The operator holds at the patient's toes, resists the outward rotation and, when the patient has carried the movement as far as possible, the former forces the feet still farther back to extend the internal rotators.

2. The patient lying or sitting as for Exercise 1, his feet rotated outward and toes pointed downward. As he flexes the ankle upward and outward the operator offers resistance.

3. Patient lying or sitting as for above exercises, his feet rotated outward, and kept so throughout this exercise. As he spreads the legs apart, the operator offers resistance.

4. For club-foot condition, in addition to the above, the patient is lying or sitting and everts the feet

against the operator's resistance. When the patient has turned the outside edges of the feet as high as he can, the operator forces them up still further.

EXTERNALLY ROTATED FEET

This is an uncommon defect but it does exist, and deserves a few words. It is common, and considered normal, for the feet to turn outward slightly, but when they turn out so far that something seems wrong and ungainly to all, it is time to correct them. It is weakening for the feet to turn out too far. In sprinters, coaches often have to correct this defect. Where a race is won by inches, the position of the runner's feet may be the determining factor. If the sprinter's feet are kept straight forward he gets full benefit of his reach in each stride, but, if his feet are turned outward he may lose a fraction of an inch at each stride which rapidly counts up against his chances.

Apart from the competitive aspect of this defect, one whose feet turn out too much loses all springiness of even a normal arch in walking. Such a person cannot stand long walks. He tires easily and all his movements seem ungainly.

This defect is the result of wrong habits in walking, or of congenital maladjustments. It is seldom the result of paralysis in which the internal rotators have been affected. If the muscles are normal and the defect is simply habitual, the patient can easily correct it by persistently walking with the toes held straight forward or turned in. Single and resistive exercises just opposite to those explained for pigeon-toes will have a corrective effect. Every exercise explained under pigeon-toes, except those pertaining especially to club-foot, should be practiced from a reverse aspect.

CHAPTER VI.

The Gymnastic Treatment of Inguinal Hernia.

There are many forms of Hernia, but the inguinal type is the most common and most amenable to treatment.

The term "rupture," so commonly used, is wrong. Rupture means an actual tearing of the peritoneum. In hernia there is seldom a tear, but we find a stretching of the natural openings of the inguinal canal through which the intestines or other tissues protrude. It is interesting to know how the term rupture originated.

R. W. Murray, F. R. C. S., in his book on "Hernia, Its Cause and Treatment," says that Galen (A. D. 131-201), whose knowledge of the body was based upon monkey anatomy, stated that inguinal hernia was "due to a rupture of the peritoneal process, or to a gradual distention of it. In the case of rupture, it was believed that the tear involved the aponeurosis of the abdominal muscles as well as of the peritoneum.

"It is a strong evidence of the master mind of Galen that his anatomical and physiological teaching should have remained unchallenged until Vesalius (1514-1564), after carefully dissecting many human bodies, exposed the numerous errors into which Galen had unavoidably fallen. The awe and reverence for the name of Galen was so great that his statement regarding the rupture of the peritoneum in hernia was generally accepted up to the time of Heller (1708-1777)."

Further on, Dr. Murray says: "Though inguinal hernia is a very common complaint, has wide geographical distribution and a very ancient origin—in fact, it is far from improbable that an inguinal hernia first appeared in one of the children or grand children of Adam—we are still far from agreed as to its exact causation, and consequently still further from agreement as to the best way of curing it."

A hernia is a gradual stretching of the tissues and escape of the abdominal contents either into a preformed or congenital sac or, as in the common acquired type, by the formation of a sac from the peritoneal lining of the abdomen. Abdominal herniae are named from the part through which they pass, as inguinal, femoral or umbilical. The scrotal or labial herniae are simply the inguinal herniae so developed that the sac and its contents has emerged from the external abdominal ring and entered the scrotum or labia. We may also find the ventral hernia: a protrusion through any part of the anterior abdominal wall except at the unbilicus or above it; the epigastric hernia: a protrusion of peritoneum in the space bounded by the ensiform cartilage, the ribs and the umbilicus; the obturator hernia: a protrusion through the obturator membrane or obturator canal, and felt below the horizontal ramus of the pubes internal to the femoral vessels.

A hernia consists of the sac and its contents. The sac is made up of peritoneum and lining membrane of the abdominal cavity. The sac is divided into the mouth, the neck and body. The mouth is the aperture communicating with the abdominal cavity. The body is the expanded portion. The neck is the constricted part at the abdominal opening.

Hernia of the bladder, caeum and sigmoid flexure may occur without a true hernial sac. The anterior

wall of the bladder is not covered by peritoneum and may cause actual protrusion in the inguinal hernia. Protrusion of fairly large size will also drag a part of the bladder covered with peritoneum, when both the bladder and abdominal contents are found. The same condition exists in sigmoid and caecal hernia, except that in these the peritoneum covers the anterior wall of the first and the posterior wall is dragged down without this covering.

The contents of the sac are omentum, intestine, or any movable contents of the abodmen. "In some cases," according to De Garmo, "even a kidney or parts of the liver have been found in the hernial sac."

Herniae are divided clinically into the reducible, irreducible, incarcerated, inflamed and strangulated.

In *reducible inguinal hernia* the contents can be reduced into the abdominal cavity. The acquired sac is always reducible at first. That is, it is free from adhesions. Sooner or later adhesions are formed and render it permanent. The sac then forms a moist serous lining to the inguinal canal.

Irreducible hernia presents the usual symptoms of hernia, but cannot be replaced in the abdomen. A hernia that has been reducible may in time become irreducible because of adhesions, because of the growth of omental fat, or because of the increase in size of the mass. It may result in serious complications because of its prominence, which renders it liable to bruise and thus give pain, or there is always danger of obstruction and strangulation. Irreducible hernia usually requires surgery.

Incarcerated or obstructed means a condition in which there is an obstruction caused by the damming up of feces or undigested food. The fecal current is stopped but the blood flow in the intestinal walls is undisturbed. This condition is most likely to take place in

irreducible hernia or umbilical hernia, especially if the patient is constipated. As this condition developes the tumor enlarges and becomes tender and painful. The abdomen may become distended and painful. Soothing procedures are necessary until the bowels are emptied, by first giving an enema, and then, castor oil. Surgery is usually necessary to repair this type of hernia.

Inflamed hernia is due to injury of an irreducible hernia. It is a local peritonitis manifesting as a mass that is tender, painful and hot. In inflamed enterocele there is much fluid formed, while in epiplocele the mass becomes hard. There is constipation, vomiting and usually fever. The hernia cannot be reduced, and the mass shows impulses on coughing. Every means possible should be employed to empty the bowels, using enema to first empty below the hernia, then giving castor oil or salts. Surgery is advisable to prevent strangulation.

Strangulated hernia is a condition in which the blood vessels, whether intestinal or omental, are constricted and blood circulation arrested along fecal obstruction. Strangulated hernia is dangerous to life. It usually occurs in patients having old inguinal hernia, who lead an active life. There may occur a slipping out of more intestine or omentum into the inguinal sac and this causes a pressure at the opening or neck of the sac, sufficient to check the blood circulation. The patient feels sharp colicky pains in the region of the umbilicus soon after this occurs and he rapidly grows weak. There is much retching and often, vomiting. The pain gradually becomes continuous. Later the hernia becomes irreducible. It is found larger than usual, tender, painful and the skin above it may be reddened. There is no impulse upon coughing.

This type of hernia usually results in gangrene

with danger of death unless surgery is applied. Measures should be taken to reduce the condition. The patient is placed on his back, preferably on an incline plane with the body higher than the head, the knees bent to relax the abdomen as much as possible. By gentle manipulation it is frequently possible to reduce this condition. Then, the abdominal walls can be strengthened. If reduction is impossible, surgery is necessary.

Inguinal herniae are also named according to their contents. In *enterocele* the sac contains portions of intestine. In *epiplocele* the sac contains omentum. *Entero-epipocele* is the name applied when the sac contains both intestine and omentum. A *cystocele* contains a portion of the bladder.

Causes of Hernia. It is most liable to occur in the male. It occurs at any period of life and sometimes hereditary predisposition seems to exist. Sometimes a mass of fat forms in the canal before the hernia appears and it seems to have a causative relation to it. Any strenuous occupation predisposes to hernia. Weak, flabby abdominal muscles, predispose to hernia. Muscular relaxation from ill-health, or following pregnancy, and wounds or scars following operations, or abscesses may predispose to hernia. The exciting causes are muscular effort, lifting, strains, jumping, sudden effort to guard in falling, and so on.

When a hernia is forming the person feels a muscular pain in the lower abdomen, which is intensified on sneezing or coughing. This may be noticed weeks before it is evident that a hernia is present. If a hernia is suspected, careful examination should be made. Insert the tip of the little finger in the external ring and ask the patient to cough. Where a hernia is present, succession will be detected on coughing. In a healthy person no more than the tip of the

little finger can be inserted in the external ring. If the top of the index finger can be inserted the aperture is dilated and even if there is no hernia present one may safely be prognosed. In examining the external ring in a man, invert the skin of the scrotum and carry the finger into the ring.

Reducible Hernia. In reducing a hernia, no instrument surpasses the human hand. When a hernia is reducible the contents of the sac can be emptied into the abdominal cavity. But unless the sac can be reduced with the contents out of the inguinal canal into the abdominal cavity, the case is surgical and requires radical treatment. Most cases are curable by exercise before the sac is adhered. After the sac is adhered it requires long continued proper use of the abdominal muscles to produce the desired results. Correct use of any muscle tends to make it normal.

The shape of the sac can be felt in the reducible hernia. There is a smooth enlargement at a known hernial opening, larger below than above, which began above and extended downward. It is often possible to feel the neck. In enterocele the enlargement becomes smaller and may disappear altogether on lying down. Straining, lifting, or standing, especially while leaning forward, makes the mass more prominent; cough causes impulse or succussion. The protrusion is elastic and there is a gurgling sound when the mass suddenly disappears on reduction. In epiplocele the mass is less elastic. It is often irregular and compressible and feels doughy. There is little impulse on coughing, and muscular effort or standing has little influence on its size. Percussion gives a dull note and reduction is accomplished slowly and no gurgling sound results.

PALLIATIVE TREATMENT.

The victims of reducible hernia often complain of pain on exertion, of dyspepsia and often, of constipation. It is advisable to eat so as to keep the bowels open, and keep from violent exercises and sudden strains.

The only proper truss is one that does not bore into the opening from outside. All kinds of methods have been applied to hold the viscus in place, but nearly all have had an oval surface which bored into the opening and tended to enlarge it. The standard truss, with its oval or sharp surface, forces into the opening and wrestles with the mass from within which is trying to come out. The result of this wrestling match is never curative. The truss is usually made strong enough and so adjusted as to overcome the pressure of the internal mass. The result of this force either way is to keep the aperture open and permanent. No truss with a conical surface ever acted as more than an artificial support. If a cure results while the standard truss is worn it is in spite of the truss. The only correct truss or support for any inguinal hernia or traumatic rupture of the abdominal wall is a broad stout band, or a band with a flat pad attached to it that exactly fits over and closes the opening from the outside without boring in. A flat piece of wood about three-eights of an inch thick whittled out in an oval edge, lined with silk or chamois, and attached to the band will serve properly. Such an appliance will keep the hernia from bulging, keep the parts normally within the abdomen and give the aperture a chance to close up under exercise. A proper hernial support can be made by fitting a piece of 1¼-inch rubber tape around the body, bringing it close to the pubes at the front. Then attach two narrow bands lined with

chamois or silk, about one inch apart at the front, pass them between the thighs and attach them at about five inches apart at the back. With these bands so adjusted that the broad abdominal part fits snugly over the hernial area, attach the flat pad so that it will press at the internal inguinal opening. (Illus. 284.) This appliance is to be worn during the day. While exercising it should be removed.

Treatment. The gymnastic treatment of inguinal hernia has been used successfully by Dr. Geo. H. Taylor many years ago. The late Dr. J. W. Seaver, of Yale, contributed a very instructive article to the Yale Medical Journal, February, 1900, 1904, on "The Treatment of Inguinal Hernia in the Young."

In most cases it is advisable to proceed with caution, fitting the exercise to the individual, and regulating their force from gentle to strong as the patient gains. Our experience has satisfied us that the best way is to proceed progressively from gentle to strong. Dr. Seaver, whose extended experience enabled him to speak with confidence and authority, allowed even the heaviest gymnastics after the patient had practiced preliminary work for a while.

Dr. Seaver said: "It has been my experience that the patients that are most active and most anxious to take part in athletic work are the ones who repair most rapidly, while men with an aversion to physical activity do not show satisfactory results." Our experience has been such as to corroborate this statement.

The treatment of hernia is in a sense like the treatment for obesity. When the treatment is once made clear, the fact that it requires exertion on the patient's part makes it unfavorable. It is necessary to repeat the need for exercise to the patient, and to insist upon his practicing it daily. Exercise is the only means of

re-inforcing the musculature of the abdomen. Braces, corsets, props, trusses, never have strengthened anyone. Besides exercise for local development of the abdominal walls, general muscular exercise is advisable. The work outlined in the chapter on home gymnastics should be taken in earnest. Any procedure tending to restore normal, raise the viscera, develop correct carriage, etc., will relieve the pressure upon the abdominal walls and hasten permanent recovery.

It is sometimes advisable to allow the patient to rest a few days or weeks before commencing vigorous exercise. But during this period of rest local kneading and vibration with the proper application of cold water will always prove beneficial.

In the application of exercises, those are best which particularly tax the oblique fibers of the abdominal muscles. The muscle fibres which form the pillars of the internal and external openings are fibres of the oblique and transversalis muscles. There are three layers of muscle: the inner layer is made up of the fibers of the transversalis muscle, the middle layer of the internal oblique, and the external layer of the external oblique muscle. The fibers of the external oblique pass downward from the lower six ribs, and the tendon is inserted at the anterior third of the crest of the ilium. At the pubic crest, between these two points, the muscle is folded upon itself in a tendinous structure that forms the basis of Poupart's ligament. At the lower third of the pubic spine the tendons of the transversalis and internal oblique muscles as well as that of the external, do not coalesce, but leave an arched opening called the external ring. There is a slit-like opening formed by a separation of the horizontal fibers of the transversalis, through which passes the spermatic cord in the male and the round ligament

in the female. The passage from the internal to the external ring through which these structures pass, is called the inguinal canal. This canal is formed by the lack of coalescence of the fascia constituting the myolemma of the oblique muscles. It is an oblique canal about an inch and a half in length, directed downward and inward parallel with, and a little above, Poupart's ligament.

Into this canal, by way of the internal ring opening, may pass any free viscus of suitable size. Once in the canal it may pass downward until it is checked at the super-pubic fascia or in the scrotum or vaginal labia. Not infrequently it distends the scrotum and produces a large swelling that hangs down several inches. This form of hernia is known as the indirect or oblique inguinal.

Where the protrusion penetrates some part of the abdominal wall internal to the epigastric artery it is called a direct inguinal, or internal oblique hernia. In this form the protrusion may escape from the abdomen through the fibers of the conjoined tendon or the tendon is gradually distended in front of it so as to form a complete investment for it.

Without further details about forms and names of herniae, let us review briefly the philosophy and application of the gymnastic treatment. It is safe to make the general statement that very seldom do herniae exist in individuals whose abdominal muscles are strong and kept in good tonic condition. We usually find that herniae exist in individuals whose general muscular systems are flabby and weak. The abdominal muscles are relaxed and offer but a weak support to the viscera. The fundamental standing position described in Chapter II explains how these muscles should function. In every case where special exercise

is taken to cure hernia, general exercise should also be taken. The reason is obvious.

For local effect the best types of abdominal exercises are performed with a lateral twist of the trunk, with the patient lying on the back, or the legs are drawn up from the sides, having first been placed so as to cause a contraction of the oblique fibers. The exercises described are sufficient to cure any case of hernia that is amenable to exercise. They do not include the entire possible variety, but only a selection of the best and most specific. They are all chosen for their local and specific effects, keeping in mind their general effect upon the organism.

In applying the treatment it is advisable to proceed as follows:

With the patient lying on his back, feet higher than the head:

(1) Reduce the hernia.

(2) Give the necessary osteopathic procedures.

(3) The patient's knees flexed to relax the abdominal muscles, give local kneading and vibration; alternately giving kneading a few minutes, then, vibration a few seconds.

(4) Give the exercises described below. In the beginning give the first five, then, add one at each succeeding treatment until all can be practiced at one session without tiring the patient. When all have been mastered progress by increasing the number of times each movement is repeated, always stopping short of exhaustion.

(5) After exercising give a general manipulation of the abdomen to keep the bowels active. Stimulate the liver by rhythmic pressure, percussion and vibration.

(6) Make sudden applications of cold water or ice bag over the inguinal region to cause contraction before putting on the supporting elastic pad.

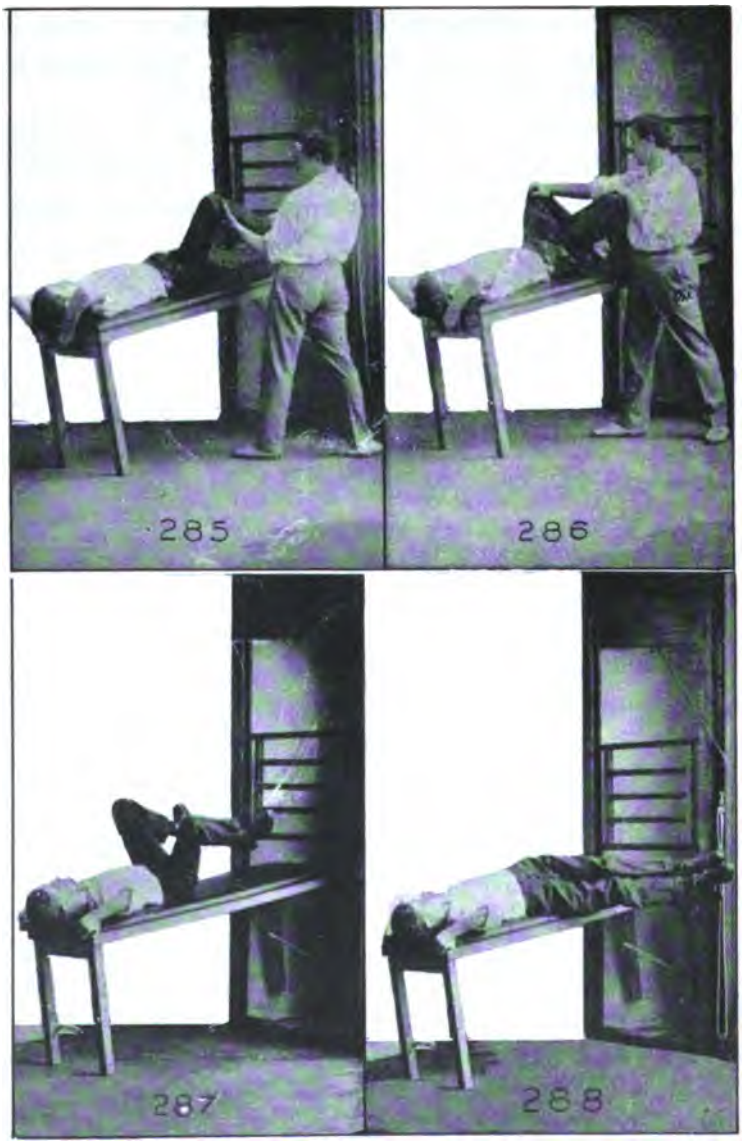
As soon as possible urge the patient to lay aside the supporting pad. In a short time the abdominal muscles will be toned up to a degree that will render artificial support unnecessary for hours at a stretch. These periods will increase in length as the tonicity of the muscles is restored. When the patient feels capable he should go without the support, though he should carry it with him to put on in case of need. In a few months, even this precaution will be unnecessary.

While exercising to cure hernia the patient should lie on his back on an inclined table, the feet higher than the head. An incline of 10 or 15 degrees is about right. In this position gravity prevents the intestines from bulging out during the exercises.

1. Patient lying on the back, the legs apart, the arms extended back along the head and the hands grasping the sides of the table. The operator resists as the patient draws the knee of the afflicted side up to his chest. (Illus. 285.) This is repeated a number of times. For the sake of general effect upon the abdominal muscles it is well to flex both knees, with or without resistance.

2. Patient lying on his back, knees bent and apart. The operator offers resistance as the patient brings them together. (Illus. 286.)

3. Patient lying on his back, hands grasping the sides of the table back of his head, he flexes the knees up to his chest and straightens the legs to the left, then, he flexes them again and straightens them to the right, and so on a number of times. This exercise needs



no assistance or resistance and particularly affects the oblique muscles of the abdomen.

4. Patient lying on his back, legs far apart, hands grasping the table back of the head. As he elevates the legs he draws the feet together so that they touch at vertical position. As he lowers the legs he gradually spreads them apart again.

5. Reverse leg swimming. The patient is lying on the back, hands grasping the sides of the table beyond the head. He spreads the legs apart, bends the knees up to the chest as he brings the legs together and then straightens the legs out, while they are close together; and repeats the entire motion a few times, the feet are kept off the table throughout the movement. (Illus. 287.)

6. Circle the knees, keeping the feet off the table. The patient is lying as for above exercises. He flexes the knees up to the chest, carries them out to the side and then downward as he straightens them out, then, continuing in one movement he carries the legs around to the right and gradually flexes the knees as he completes the circle. This is repeated a few times without interruption, then, in reverse order the knees are carried to the right, downward, to the left and up to flexion, and so on. When this circling is done as in the first case, it effects chiefly a right inguinal hernia, and in the second case, a left inguinal, although the movement benefits and strengthens the entire abdominal walls.

7. Lying as for above movements, feet together, the patient elevates the legs and spreads them apart as they go up, bringing them together as they are lowered again.

8. Patient lying as for above movement, he raises the legs to vertical and, keeping them close together, knees straight and feet pointed, lowers them out to

the left (Illus. 288), then elevates them to vertical and lowers them to the right, and so on. This is a valuable exercise to strengthen the abdominal walls, elevate the viscera, and reduce the size of the waist. To effect the hernia side especially, the legs are lowered and elevated from the afflicted side most. For instance, supposing there is a left inguinal hernia, the legs may be lowered twice or three times to the left, to once to the right.

9. Patient lying and grasping sides of table as for above exercises, he raises the legs to vertical, keeping the knees straight, toes pointed, and carries them down and outward to the left, then straight down without touching the table, over to the right and upward to vertical again, describing as large a circle as possible with the feet. This circling is done going down to the right, from vertical position, or in reverse order. It should be repeated several times in either direction in a continuous movement without resting the feet. To effect the hernia side particularly, perform the last half of the circle, that is, the lifting of the legs, to that side, and repeat twice or three times in that direction to once in the opposite.

10. Patient lying, with the hands on the hips, the feet strapped or held down, keeping the head back, he flexes up to sitting position. (Illus. 289.)

This movement, as well as the two following may be made more difficult by placing the hands at the shoulders, or locking the fingers behind the head, keeping the head in line with the trunk and the elbows well back as the body is flexed upward.

11. The feet held down as for Exercise 10, hands on the hips; to affect a right inguinal hernia, the patient turns the shoulders as far as possible to the left, so as to twist the trunk and place the strain particularly at the right inguinal region. The trunk

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is kept twisted as it is flexed up a few times. (Illus. 290.)

To affect a left inguinal hernia the trunk is twisted to the right and kept so during the exercise.

12. The feet held down as for the above two exercises, the hands on the hips. The patient flexes the trunk half way up and, holding it there, the head in line with the body, the shoulders well back, he twists to the left and forward, or to the right and forward, a few times. The turning is done opposite to the hernia side. This exercise should be done to both sides, to strengthen the entire abdominal region, but, it is best to especially effect the hernia side by turning twice or three times to the opposite, to once on the same side as the hernia.

CHAPTER VII.

Lateral Curvature of the Spine.

Any lateral deviation of the spine from the median line, involving several vertebrae, is a scoliosis. Seen from the rear the spine should be straight. A lateral view should present the normal anterior cervical, posterior dorsal and anterior lumbar curves. These are essential to elasticity, and it is a mark of weakness if they do not exist, or if they are exaggerated. The osteopath is familiar with the normal curves and no more need be said.

But scoliosis, especially from the gymnastic treatment standpoint, may be profitably discussed. It is a very common defect and its successful treatment must include some form of exercise. These exercises are important both in correcting lateral curvature and preserving the normal when attained.

Statistics show that left dorsal curvature is most common in men, and right dorsal in women. Why this is true is not so easy to explain as is the simple statement that it is so. Another fact, whatever the reason of curvature, the treatment follows the same general law. Cervical scoliosis is very uncommon. Lumbar scoliosis is not as common as dorsal. In this last condition we usually find one hip prominent. When one curve becomes quite marked, there results a secondary or compensatory curve at some other portion of the spine. The secondary curve is the result of nature trying to preserve equilibrium in the body.

Scoliosis may be muscular or osseous in origin.

The muscular type is the result of unequal muscular action, and the osseous is due to inequality of growth in the bones. The cause of this inequality of growth in the bones may be due to various causes, such as prevail in rachitis, etc. The muscular type is the most common and most amenable to proper exercise. The osseous type, as a rule, cannot be materially benefitted in grown persons. But, in growing children, by prescribing the diet that will best furnish the elements for bone construction, and by having them persistently perform proper exercises, much can be done. Exercise, if practiced persistently, will even change the shape of the bones themselves, and it will usually alter the adjustment of separate bones.

From the standpoint of mobility and equilibrium the bones are the most passive of tissues in the body. They are held in place by ligaments, cartilages and muscles. The bones, cartilages, and ligaments have no power of motion, but they are dependent upon the muscles attached to them. When a bone is out of its normal position it has been displaced by some power not within itself, that is, some power in the muscles, or outside the body. It usually requires a force outside the body to replace the bone, but, to keep it in place, the muscles and other tissues around it have to be toned up. Given its normal blood and nerve supply, no power will tone up a region of the body like proper exercise. Unless exercises are used in correcting a scoliosis, there will always be a tendency for it to collapse again. That is why the use of a brace, alone, or bone adjustment alone, will not give satisfactory results.

Forcible correction by plaster jacket, steel brace, or plaster jacket and bone adjustment combined, will not prove sufficient in the majority of cases. The plaster jacket or brace of any kind tends to support

the spine and relieve the muscles of their work and after the spine has been straightened out, when this artificial support is removed, the flabby muscles are too weak to keep the trunk erect. The only correct line of treatment is to combine the articulating effect of osteopathy, with the toning up effect of exercises, and the use of a properly adjusted, correcting brace that is easily put on or off. With a removable brace, a patient can practice his exercises every day, take osteopathy as frequently as the doctor directs, and wear the brace during the day between exercises or treatments.

The most suitable brace is made of stiff leather and laces on like a corset. The illustration (291) shows its construction. It can be put on or removed by the patient himself in a few minutes. The exercises are chosen to fit the individual's case, practiced every morning, and evenings also, if convenient, osteopathic adjustment is given at least twice a week and the brace is worn during the day. As the spine straightens, the brace is readjusted, or a new one made; or, a broad elastic band is fastened on the inside so that the pressure is constantly exerted at the point of the greatest bend. Thus we have three forces working: the osteopathic to correct the bony condition, the gymnastic to re-establish harmonic relations of the muscles, and the gain made by these two forces is preserved by the brace.

To get a clear idea of the gymnastic treatment, let us trace the development of an acquired scoliosis. Uneven muscular action causes an unbalance in the relative strength of the muscles of the spine. As those of one side (usually the right) through work, became stronger than their antagonists, there is a shortening of the stronger and a stretching of the weaker muscles. The common curvature is the left dorsal, because the

muscles of the right side being stronger, pull the spine over. When the curvature is just becoming apparent the muscles of the concave side are much stronger and thicker than those of the convex. But, as time goes on and the curvature increases, the spine becomes bent so that the muscles on the convex side have to bear the weight of the trunk, and thus become hypertrophied, while those of the concave side become shortened, and, relieved of their work, they become flabby and, in many cases, atrophied. That is why we find the tense, enlarged muscles on the convex side of the curvature, and the lax tissues on the concave side.

Besides this condition in the muscles we find a more interesting condition in the vertebrae and ribs. As the curvature increases, the vertebral bodies, being so much thicker than the spinous processes, prevent the spine from bending directly to the side. There is a rotation in all the vertebrae included in the curve with the bodies to the side of the convexity where they have most room, and the spinous processes to the concave side. Lateral bending of the spine is always accompanied by rotation of the vertebral bodies toward the convexity of the curve, and as lateral curvature is simply a persistent deviation of the spine, which is induced by super-incumbent weight, it may be assumed that rotation of the vertebral bodies precedes the lateral distortion that first attracts attention. Rotation of the spine carries with it all the parts that are attached to it. That is why, posteriorly, the ribs bulge out so prominently on the convex side and are so depressed on the concave side. Corresponding to this posterior condition, we find the sternum drawn to the side of the convexity and the ribs in front quite prominent on the side of the convexity. (Illus. 292.) The intervertebral disks are also altered as the curvature increases, and in the extreme cases, these are

so compressed out of shape as to allow the vertebral bodies to approximate on the concave side of the curve, and finally, ankylose. Total recovery from such an extreme case is impossible, even in the child, while total recovery, even in a grown person, is possible in the average case where there is no ankylosis.

There are other causes of scoliosis, besides those already mentioned. The above explanation applies in the average individual who is able to get around and work or even take part in athletics. But muscular weakness, due to infantile paralysis, malnutrition, etc., must be considered. The large muscles along the spine are called extrinsic, and the smaller muscles which are attached from vertebra to vertebra in short segments and are peculiar to these parts are called intrinsic. Persons with weak intrinsic spinal muscles habitually assume bad postures, because the spinal column cannot be held firmly in position, and thus, such weak muscles are to be regarded a predisposing, if not as exciting causes of scoliosis. As a proof that muscular weakness, and not merely unbalanced muscular development, is the cause of many scolioses, if one removes the super-incumbent weight, by placing the patient in reclining position, or supplying braces that simply support the spine without any specific aim at correction, the curvature disappears in time. Then, removal of the brace will shortly be followed by a reappearance of the curvature. When the scoliosis is due to infantile paralysis, the general rules explained in the treatment for this ailment, and the laws of corrective gymnastics should be followed. For a person having a scoliosis as the result of muscular weakness, general gymnastics are indicated.

Another cause of scoliosis is that explained by osteopathy. Scoliosis may follow a twisted or subluxated innominate, uneven length of leg, or a well

developed lesion involving a number of vertebrae, due to the constant irritation of some internal organ. Where the liver had been overtaxed for some time, to the extent of producing gall-stones, marked left curvature from the sixth to the twelfth dorsal was found. Regulating the action of the liver by proper dieting along with osteopathic adjustment was sufficient to produce a correction. Setting an innominate lesion has frequently sufficed to correct lumbar curvatures.

The average case is usually a single or C curvature. The advanced case almost invariably presents a compensatory curvature and is known as the S curvature. The distribution of weight about the line of gravity in preserving upright equilibrium in the body explains the characteristics of lateral curvature. The normal contour of the spine is the result of static conditions, and a change from this normal relation of one part induces a corresponding change elsewhere. A curvature with rotation in the lumbar spine will be balanced by the opposite curve and rotation in the dorsal. These curves may divide the spine equally or one may be short and one long, and occasionally three distinct curves may be present.

It is necessary to ascertain which curve is primary and which secondary, and regulate the treatment accordingly. In examining a curvature it is well to use a blue pencil to mark the spinous processes. With every spinous process marked, direct the patient to assume the forward lax position, that is, the knees are kept straight, and as the patient stoops forward the arms and head hang down loosely. This puts the spine on a stretch and, by observing the blue pencil marks, one can see which curve is primary and which secondary because the secondary curve straightens out most. The curve that is least changed by this position

is the primary curve, and the work should be directed at its correction.

In this forward limp position the ribs on the convex side of the curve bulge out. If the curve is in the lumbar spine, there is not much bulging on the convex side, but the muscles are enlarged and tense. There is sometimes a slight rotation of the pelvis accompanying the lumbar curve, but this is not always caused by the curvatures, rather it may be the cause of the curvature. The dorsal curvature may be so marked that the spinous processes cannot be palpated or marked, and the transverse processes of the convex side of the curve form a line of nodules that may seem like the spinous processes. Where there is double curvature and no straightening of the spine is perceptible as the body is drooped forward, note whether or not the ribs bulge. If the dorsal curve is primary the lower ribs of the convex side bulge out. If the lumber curve is primary there is little or no bulging of the lower ribs. Another point is to be observed with the patient standing. If the shoulders are level, the dorsal curve is compensatory; otherwise the shoulder on the convex side is the higher.

In the correction of spinal curvature, there are several things to remember. There are three stages which influence correction: (1) The childhood stage, during which the work is easy and the prognosis very good; (2) the stage from puberty to full growth, when the work is comparatively easy, and the prognosis for full recovery fair; (3) the quiescent period, when growth is completed, the bones set, and prognosis conditional or very poor. Each case has, of course, its peculiarities. The exercises must be adapted to the individual's condition and needs. The heart must be examined, for its condition greatly influences the success of the treatment. Many exercises are so strenuous as to be

contra-indicated where the heart is weak. The physical condition of the patient thus influences the speed or possibility of recovery. There is no case, however slight, which can be cured in a few treatments or adjustments. It usually takes months and frequently years for full recovery, and the prospective patient should not be misled into expecting anything different. For results, the patient's co-operation is necessary. He has to do most of the exercising and his persistency and regularity in this will have important bearing upon the treatment. If the patient is poorly equipped in muscle, general gymnastics and games are to be recommended along with the specific exercises.

In correcting spinal curvatures, as already stated, nothing equals the combination of osteopathy, medical gymnastics and the adjustable brace. Articulating the vertebrae, to gradually alter and reconstruct the intervertebral disks, reducing the lesions to restore proper nervous control of all the organs, and thus, secondarily, their normal functioning; properly regulated exercises to restore equilibrium and harmony between the antagonistic muscles of the spine; and lastly, as an adjunct, wearing a corrective brace between treatments and exercises, to prevent any setback in the treatment; these three processes will give results where any one of them alone would fail.

The Abbott method of treating spinal curvature is the best ever devised for correcting by plaster of Paris jacket. It is the quickest and surest method, and the best adapted to serve as an adjunct to osteopathy, because the windows cut out at the concave areas permit manipulation and osteopathic adjustment while the jacket is doing its work on the convexities. Without exercises, however, even this method has its limitations.

It must not be forgotten that the bones and their

cartilages are the most passive of tissues, entirely dependent upon the muscles and their ligaments for correct and permanent position. Even though the curvature is entirely corrected, or over-corrected, after having used one or several jackets, still, if the muscles remain weak or unbalanced, there will sooner or later recur a curvature.

The Abbott jacket has features that were never thought of before, or at least, never utilized. Before the jacket is put on, the patient, after bathing carefully, slips on a clean undershirt. Strips of felt are then placed over the convexities of the curvatures. Strips of felt are also placed over the hips and the forward shoulder. These are meant to serve as pads for protection against soreness, or even sores, that the jacket might produce. The concavities are filled in with curled hair or sufficient layers of felt to obliterate them and round out all surfaces, both at the front and back. A second shirt is then put on, and the patient is placed in the hammock on the Abbott frame.

The patient is so placed as to produce as great a correction as possible without pain. This is accomplished by the use of straps and broad bands attached to the top and sides of the frame. The jacket is then put on in uniform thickness. It is extended low over the hips and high up on the shoulders. Sometimes it is extended around the forward shoulder to force it back. Before the jacket has set solid, the edges are trimmed around the axilla, and at the hips, to allow free play of the arms and legs. The windows are cut out at the concavity of the curvature and also that of the ribs, and the stuffing is removed.

These windows are the unique features of the Abbott jacket. They serve as areas of negative pressure where this is necessary, and allow free play to the ribs in respiration. They also serve as openings

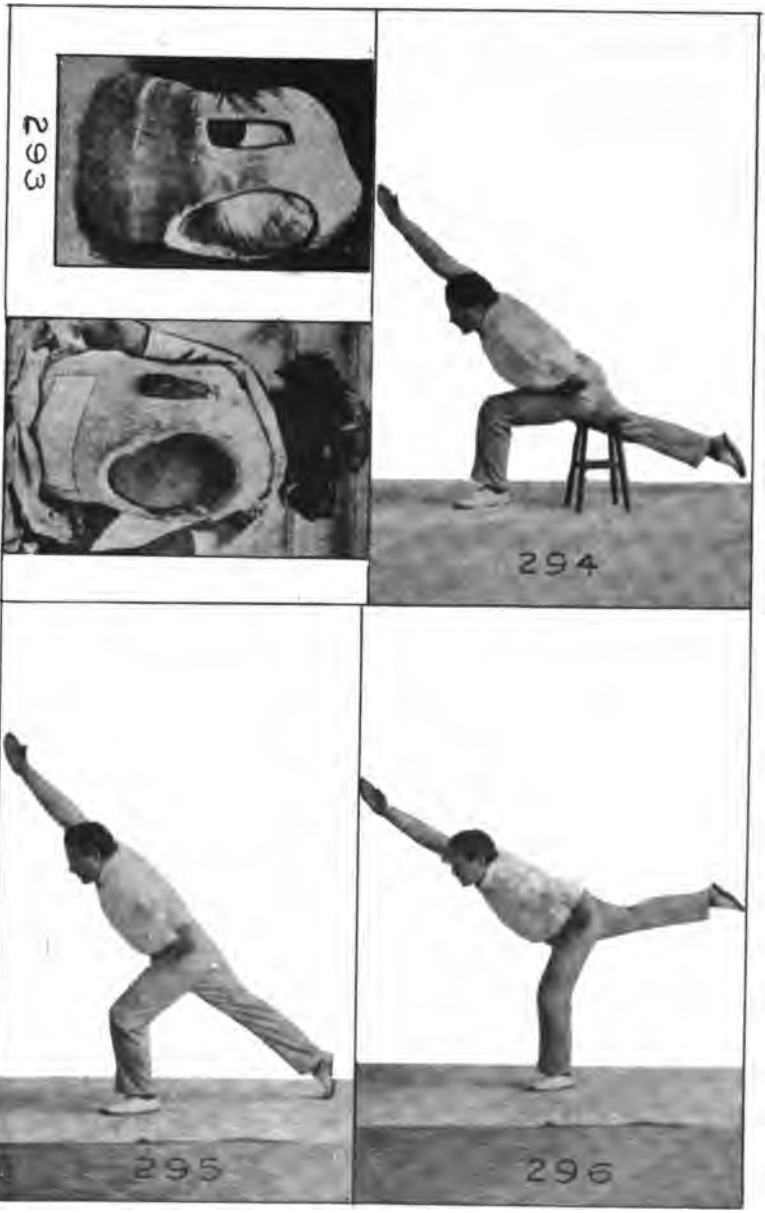
through which the osteopath can do his adjusting. (Illus. 293.)

The Abbott jacket is usually left on from three weeks to about three months, all depending upon the case under treatment. Some cases are corrected by one or two jackets and others require several changes. My opinion is that changes in the jacket should be more frequent than heretofore, and a period of two or three weeks should elapse between each change, during which corrective exercises could be applied. That is, put on the jacket in the usual manner and leave it on for two or three weeks, then remove it and prescribe exercises for the same length of time. Then let another jacket be put on and left on two or three weeks. Then exercise again. Osteopathy is to be applied all the time, while the jacket is on or during the periods of exercise. When the jacket has accomplished its work, let the patient wear a leather brace such as is described above. This brace is to be worn during the day, between exercises or treatments.

The successful treatment consists of osteopathic procedures that tend to rotate the vertebrae back into normal position. To effect this properly the pressure is applied toward the convexity. The reason for this is clear if one recalls the relative position of the bodies and spinous processes. There are many methods of technique in applying this rotary pressure and articulation, and every osteopath knows how to proceed in their application.

It is needless to present all possible exercises for spinal curvature. We shall limit ourselves to a description of a number of typical exercises with and without apparatus, and then give three typical programs.

In considering the exercises for a single curvature we must recall the principles of corrective gymnastics.



These principles are all that apply here. Now we need to demonstrate a few positions and movements that bring them into play.

For clearness of explanation in considering the exercises for dorsal scoliosis we shall speak of the most common type, the left dorsal. From the muscular standpoint in a left convex curve the muscles of the right side are contracted or shortened and those of the left are extended; weak at first and later hypertrophied as well as hyperextended. The aim of our exercises must be to shorten the muscles of the convex side and lengthen those of the concave. The exercises, therefore, must be such as to cause the right side to be extended and the left side contracted.

The exercises for correcting spinal curvature tend to make the hypertrophied muscles of the convex side still larger and to merely extend the already dwindled or atrophied muscles of the concave side. This process must go on until the muscles of the concave side have extended enough to begin performing their duty by antagonizing those of the convex. Then, when balance between the two sides is approximated, the exercises must take on more of a symmetrical nature, such as in the chapter on home gymnastics.

It seems superfluous, yet (because most people are slow in grasping a simple principle) excusable, to state that the following exercises are to be reversed in case of right dorsal single curvature, or right dorsal and left lumbar double curvature. The point is to always extend the arm or leg on the concave, and flex them on the convex side. The explanation and illustration of each movement should make this clear.

SERIES I.

1. Spring sitting position is one of the most important and effective exercises in lateral curvature. As

the illustration (294) shows, the weight of the body is born by the left buttock resting on the edge of a chair or stool. The left hand grasps the hip, the right arm and right leg are extended, and the body, bent forward until nearly horizontal; from the fingers to the toes should be a straight line, or there might be a slight arching backward of the trunk. In this movement the erectors of the spine are brought into play with the extremities of those on the left brought closer together while the muscles on the right are hyperextended. Spring sitting position is an exercise that is always indicated and advisable in spinal curvature. It should be introduced a few times in each program. It is one of those exercises that is worth several less specific ones done merely for the sake of variety.

2. With the hand on the hip, lungeing forward with the left foot, and at the same time extending the right arm upward, pointing as far as possible with the right fingers and toes, gives the same effect as spring sitting, but more forcibly. (Illus. 295.)

3. The same type may be made still more powerful by combining a balance movement with the extension of the right arm and leg. (Illus. 296.) This is called horizontal half-standing position.

SERIES II.

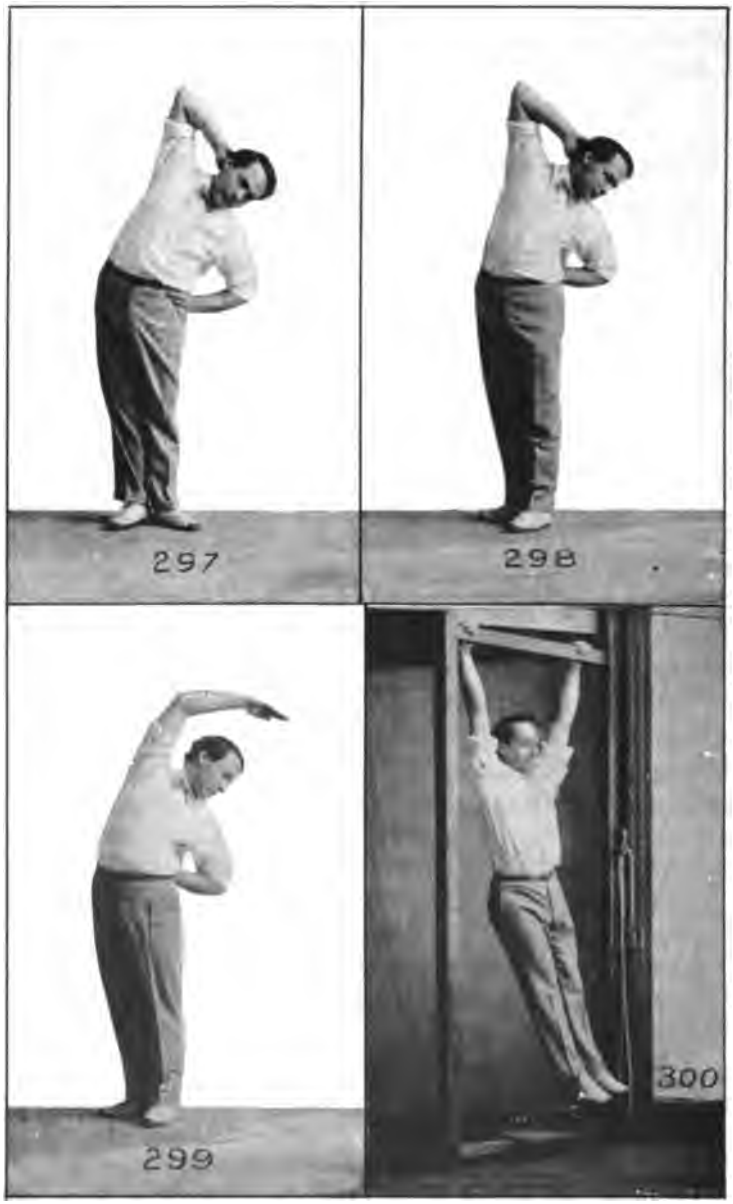
1. Left hand on the hip, right hand behind the head, bend to the left. (Illus. 297.)

2. Left hand on hip, right hand behind the head. Turn the trunk to the left and bend to the left. (Illus. 298.)

3. Left hand on hip, right arm extended upward, turn to the left and bend to the left. (Illus. 299.)

SERIES III.

1. Hang on an incline bar, the right hand higher



than the left, reach for the floor as you swing the feet from side to side. (Illus. 300.)

2. Same as one, except that the legs are held to the left a few seconds at each second or third swing of the feet.

3. Hang with the body bent up to the left; while keeping the left side contracted, abduct and adduct the legs. (Illus. 301.)

SERIES IV.

1. Left hand on the hip, right hand behind the head, elevate the left leg sideways. (Illus. 302.)

2. Left hand on hip, right arm shoulder high at side, palm turned up, elevate the right arm to stretch as you raise the left leg sideways. (Illus. 303.)

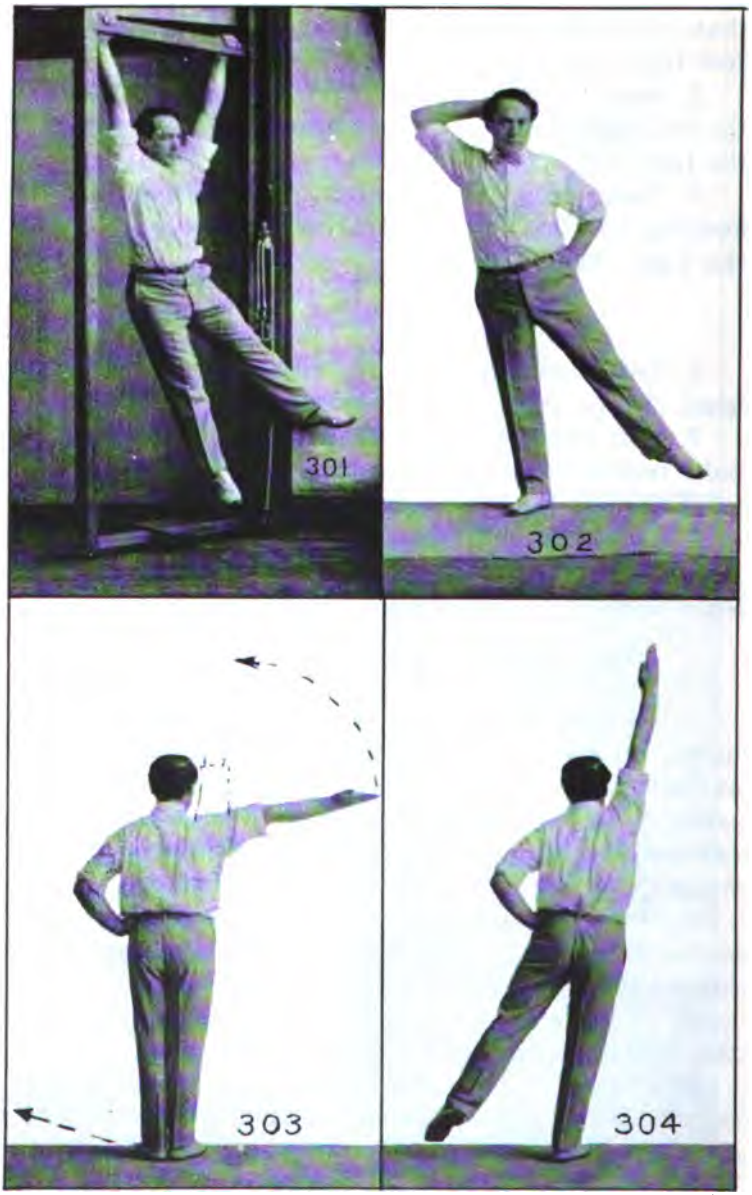
3. Left hand on the hip, right arm extended upward, reach upward with the right arm as you raise the left leg sideways. (Illus. 304.)

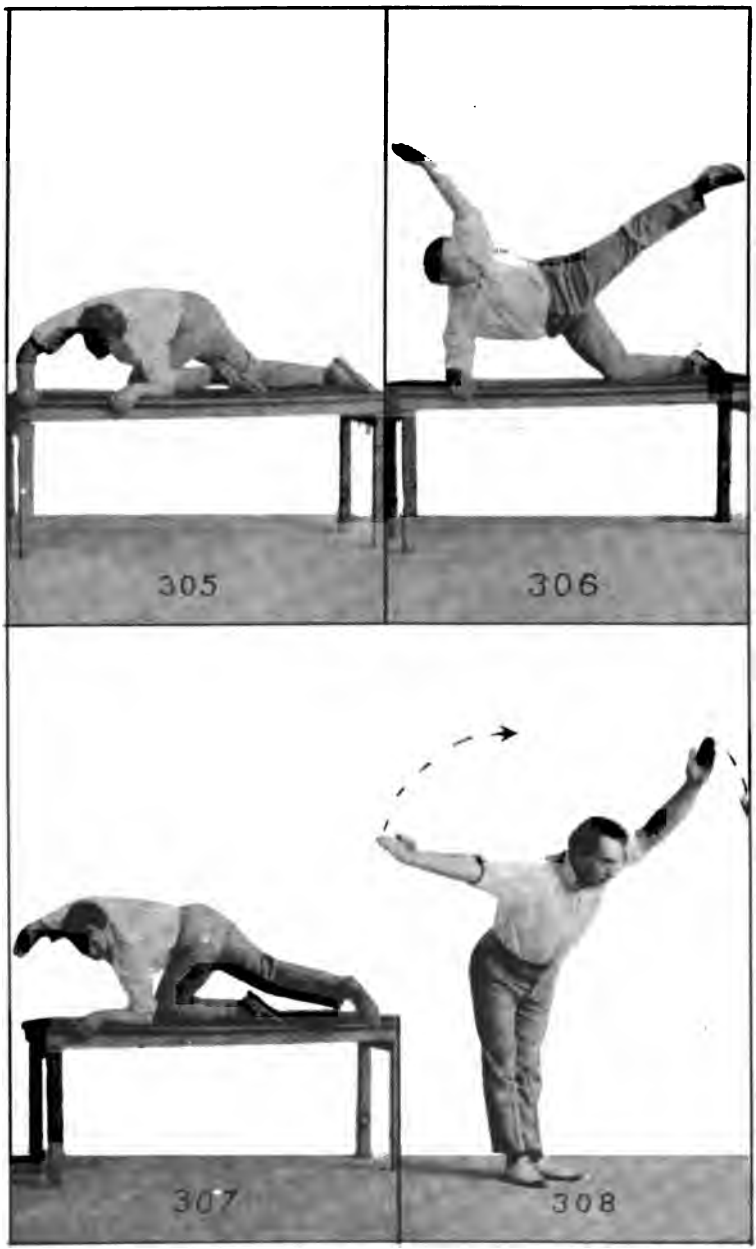
SERIES V.

1. On hands and knees, bend the left knee under the body, the left elbow outside the knee, the right leg is extended backward and rests against the edge of the table, or is held by the physician. The right hand is carried around to the left, the arm circling the head, while the trunk is bent to the left. (Illus. 305.)

2. On hands and knees, slightly bend the right elbow so that the trunk is twisted, left side uppermost, now extend the left leg and arm and elevate them and the head at the same time, thus causing a contraction of the left spinal muscles. (Illus. 306.)

3. On hands and knees, extend the right leg backward and carry it as far as possible to the left, carry the right hand over in line with the left and bend the trunk as far as possible to the left. (Illus. 307.)





SERIES VI.

1. Standing with the trunk forward from the hips, the arms bent upward, (1) extend the left arm upward and the right sideways, (2.) in one movement, elevate the right and lower the left to shoulder height, reaching up as high as possible with the right, (3) flex the arms, etc. (Illus. 308.)

2. Arms bent, lunge forward with the left foot. While pointing the right foot backward as far as possible, go through the same arm movement as above. (Illus. 309.)

3. Repeat the same arm movement while in horizontal half-standing position on the left foot. (Illus. 310.)

SERIES VII.

1. Lying on the right side, left arm extended upward, raise the left arm and leg. (Illus. 311.)

2. Bearing the weight on the right arm and side of the right foot, left arm extended, allow the body to sag and elevate the left arm and foot. (Illus. 312.)

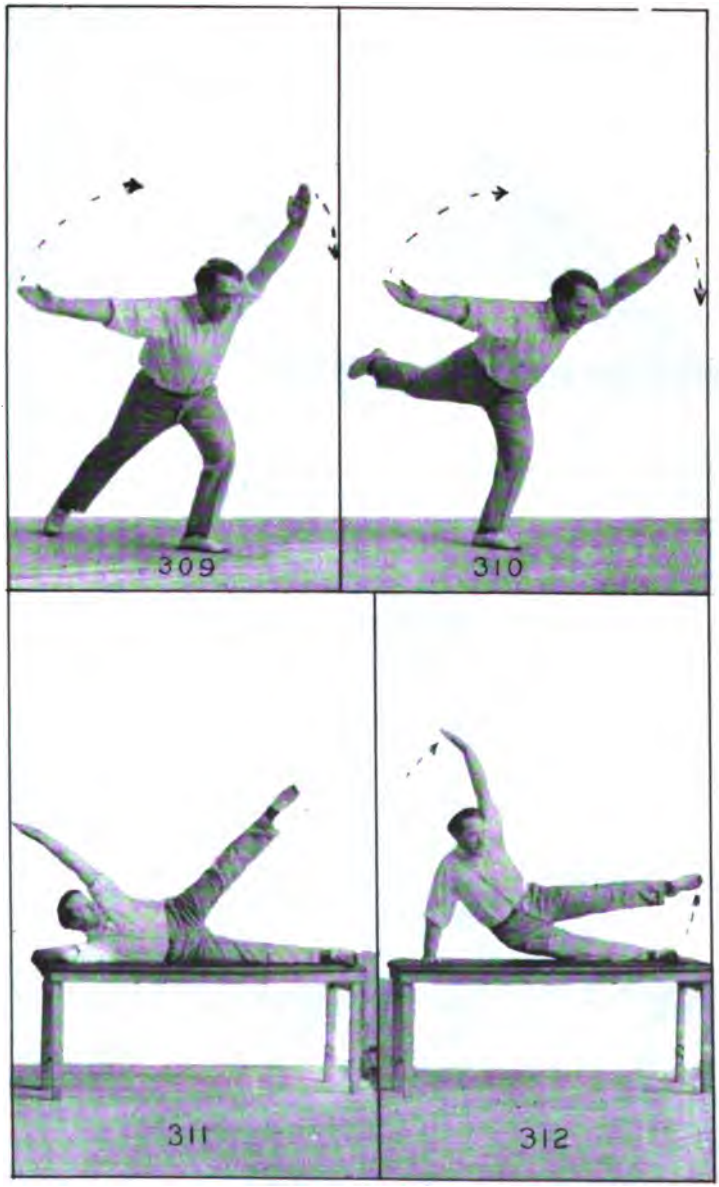
3. Bear the weight on the left hand and side of the left foot, right hand on the hip, allow the body to sag and then arch it upward as high as possible. (Illus. 313.)

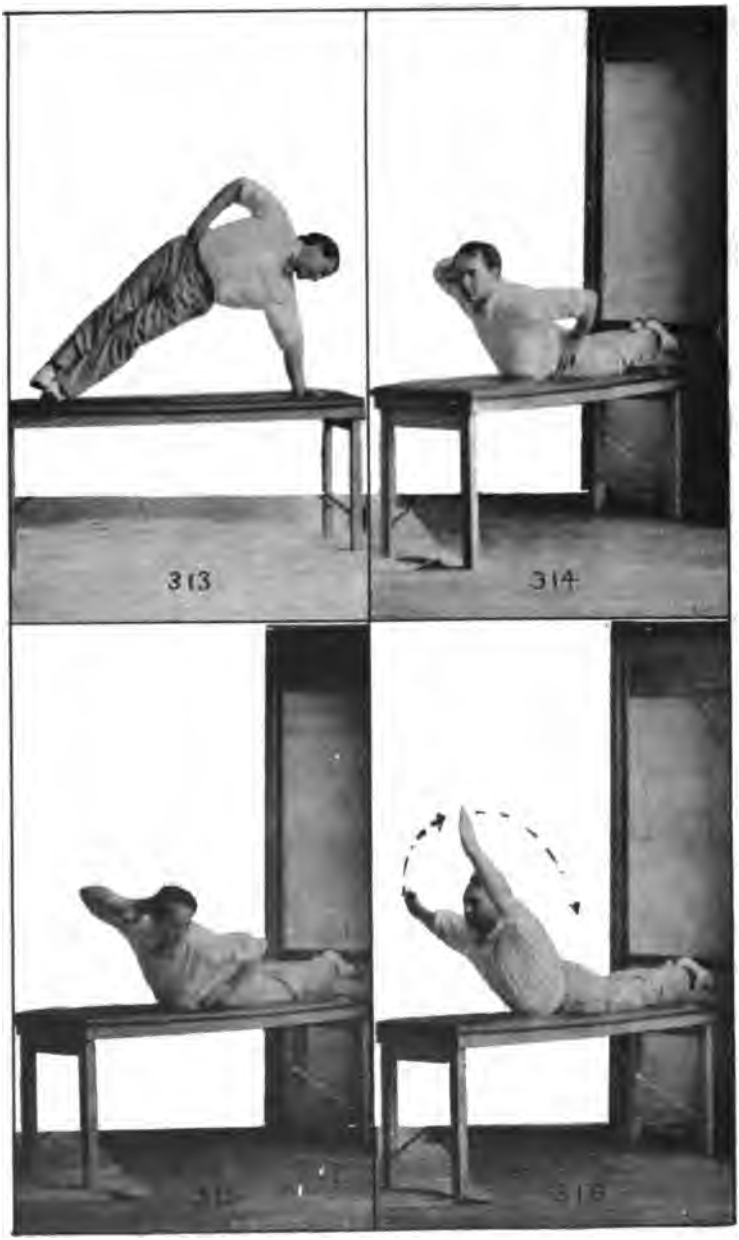
SERIES VIII.

1. Lying face down, with the weight on the feet, left hand on the hip, right hand behind the head, arch the trunk upward. (Illus. 314.)

2. Same as one, but when the trunk is arched upward, bend it to the left a few times. (Illus. 315.)

3. Lying face down, with a weight on the feet, arms bent. Arch the trunk upward and go through the same movement as Series VI, Exercise 1. (Illus. 316.)





SERIES IX.

Repeat 1, 2 and 3 of Series III, while pressure is applied at the rib elevation.

In *double curvature* the same general rule holds as in single. For clearness of explanation, let us assume that the S curvature is a left dorsal, as that discussed above, with a right lumbar compensatory. The exercises must be such as to cause an extension of the right dorsal and left lumbar and a contraction of the left dorsal and right lumbar. Therefore, in so far as the dorsal curve is concerned, the parts of the exercises described above, done with the arms and trunk remain the same, but the portions done with the legs are reversed. We shall explain the application by examples, and also add a few that particularly affect the lumbar curve.

SERIES I.

1. Spring sitting is done with the left hand on the hip, the right arm extended upward, the right buttock resting on the edge of a chair, and the left leg extended backward. (Illus. 317.)

2. The left hand on the hip, the right arm extended upward as you lunge with the right foot. Hold this position as you reach with the right arm and left leg. (Illus. 318.)

3. The left hand on the hip, the right arm extended upward, assume horizontal half-standing position on the right foot. (Illus. 319.)

SERIES II.

To effect the lumbar curve, place the right foot on a book, or block, about 1 inch thick, tense the right lumbar muscles so as to cause an extension of the left lumbar sufficiently to straighten this curve, or force it into the opposite direction. While holding this posi-

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tion with the feet, the upper body goes through the same exercises as in single curvature. (1, 2 and 3, Series II.) (Illus. 320.)

SERIES III.

Hanging on the incline bar, as in Series III for single curvature, except that in each one the right leg is shortened as much as possible without bending the knee. This causes a shortening of the right lumbar and an extension of the left, while hanging on the incline bar, right hand uppermost, will extend the right and shorten the left dorsal muscles. The same rule applies in 1, 2 and 3 of this series. (Illus. 321.)

SERIES IV.

1. Upper body as Series IV for single curvature, right leg is elevated. (Illus. 322.)

Likewise 2 and 3, doing with right foot what was done with the left in single curvature.

SERIES V.

1. With arms, as for single curvature, but, right knee is bent under body, left leg extended. (Illus. 323.)

2. Place a book on the edge of a stool, sit on the stool resting the left buttock on the book. Have the feet far enough apart to give a firm position, and, without altering the erect posture of the trunk, raise the right buttock to the level of the left. This causes a strong contraction of the right lumbar muscles, and an equal extension of the left. The left hand on the hip, the right behind the head. While keeping the right buttock elevated, turn the trunk to the left and bend diagonally against the bulged portion of the ribs. (Illus. 324.)

3. Using a book on a stool as in No. 2, after setting the lumbar spine as erect as possible, the patient en-

deavors to straighten entire spine by reaching upward with the head. While the patient holds this position, the operator resists as he pulls down with the left and pushes up with the right hand. (Illus. 325.)

SERIES VI.

1. Place a book under the right foot, and fix the lumbar spine as straight as possible, then bend the body forward and practice the arm exercise explained in Series VI, No. 1, for single curvature.

2. Arms bent; lunge forward with the right foot. While pointing the left foot backward as far as possible, repeat the same arm exercise as above. (Illus. 326.)

3. Repeat the same arm exercise as above while in horizontal half-standing position on the right foot. (Illus. 327.)

SERIES VII.

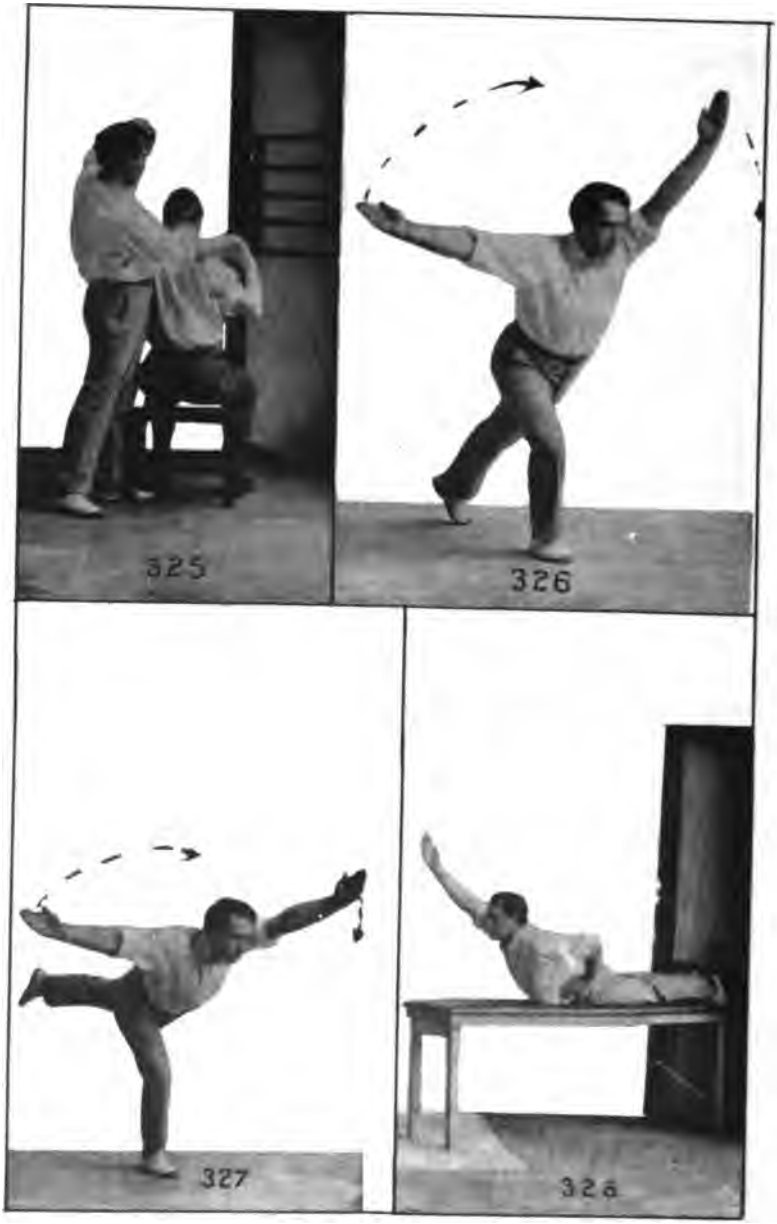
1. Lying face down, with a weight on the feet, the right leg held shorter than the left without bending the knee, the left hand on the hip, the right hand behind the head, arch the trunk upward.

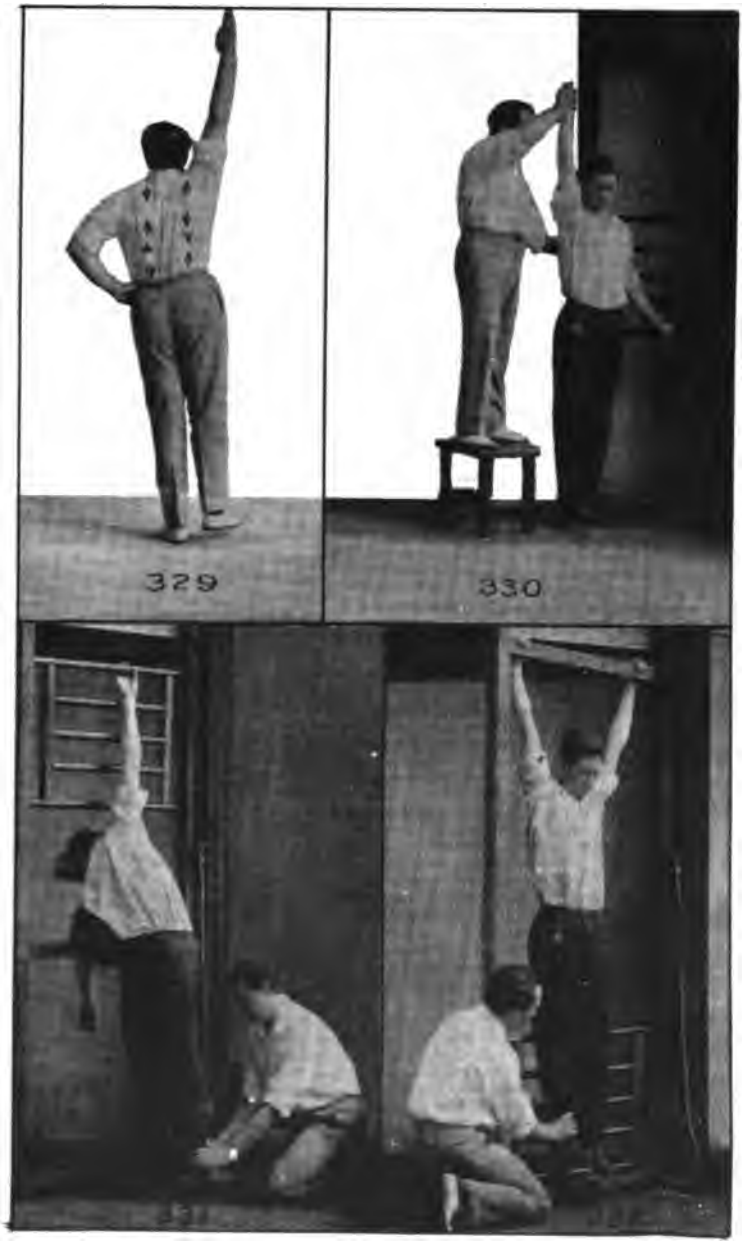
2. Same as above except the right arm is extended upward and kept in line with the ear as the trunk is arched upward. (Illus. 328.)

3. Lying face down with a weight on the feet, right leg shorter than the left without bending the knee, arms bent, arch the body upward and extend the right arm upward as you extend the left sideways. Repeat this arm exercise a few times while holding the trunk arched.

SERIES VIII.

1. Left hand on hip, right arm extended upward, reach upward with the right arm as you elevate the right foot without bending the knee. (Illus. 329.)





2. Patient on stool near stall bar, left hand grasping low rung for steadiness, right arm extended upward as much as possible—under resistance, shorten right leg without bending knee. (Illus. 330.)

3. Patient leaning to the left over pad, right arm over the head, resist right leg elevation sideways. (Illus. 331.)

SERIES IX.

1. Patient hanging on incline bar, right hand higher than the left. He raises the legs to the left and holds while the right leg is shortened against resistance. (Illus. 332.)

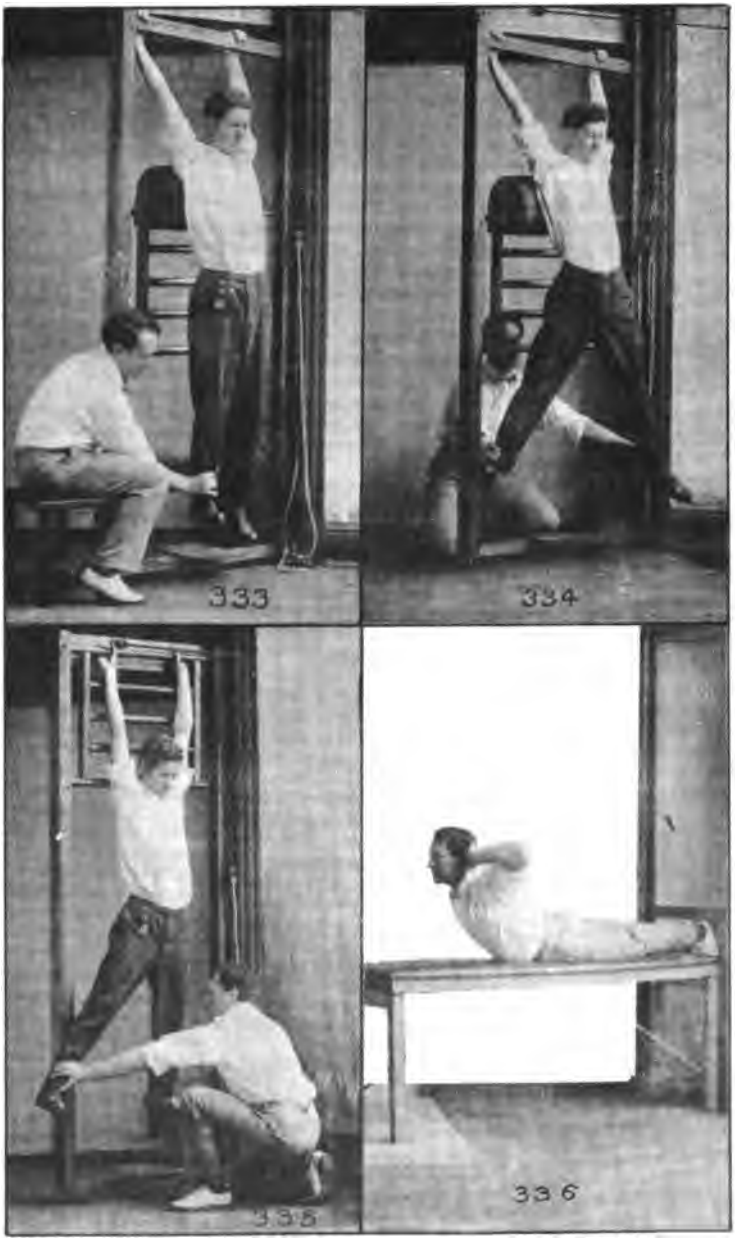
2. Patient hanging on incline bar, right hand higher than the left, convexity of the curvature resting against the pad; give resistive shortening of the right leg without bending the knee. (Illus. 333.)

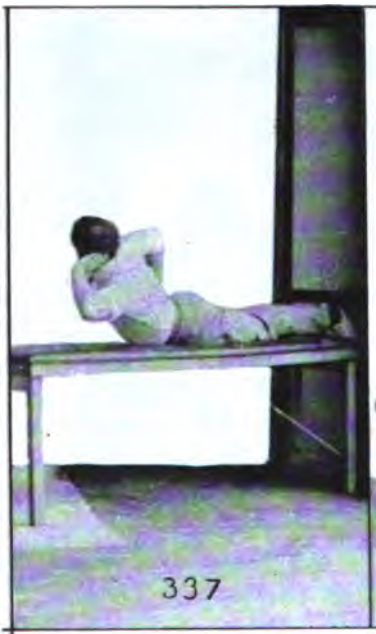
3. Patient hanging against pad as Exercise 2. The patient shortens his leg, without bending the knee, and keeps it so throughout the exercise. He then abducts the legs against the operator's resistance. (Illus. 334.)

To *correct lumbar curvature,* many of the useful exercises are given under the treatment for double curvature. The part of the work done with the legs is typically corrective of lumbar curvature. Given a right lumbar curve, the upper body may be kept in symmetrical position by having both hands on the hips, or locked behind the head. Or, to emphasize the work, the right hand grasps the hip and the left is locked behind the head or extended upward, while the right leg is elevated sideways, or shortened without bending the knee.

Typical exercises follow:

1. Right hand on the hip, left hand behind the head, raise the right leg sideways.





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2. Same position of hands as No. 1, shorten the right leg without bending the knee.

3. Right hand on the hip, reach upward with the left hand as you shorten the right leg without bending the knee.

4. Lying on the left side, raise the right leg, with or without resistance.

5. Hanging on the horizontal bar, resistive right leg abduction. In this movement the left leg is firmly fixed and only the right is elevated sideways against resistance. (Illus. 335.)

6. Hanging, right leg upward traction against resistance without bending the knee.

7. On hands and knees, bend the right knee under the body, right elbow beside it, extend the left leg backward as far as possible and carry the body over to the right.

8. Lying face down, weight on the feet, right leg held shorter than the left without bending the knee, the right hand on hip, left hand behind the head, arch the body upward and bend it to the right. (Illus. 336.)

9. With the same starting position as No. 8, arch the trunk, carry it to the right, then twist to the right and lower and raise it a few times. (Illus. 337.)

10. Support the body on the left hand and side of the left foot, allow the trunk to sag. While holding this position the patient elevates the right leg against his own resistance. (Illus. 338.)

11. Support the weight on hands and toes, allow the hips to sag, twist the hips to the right and abduct the right leg, with or without resistance. (Illus. 339.)

12. Spring sitting, or horizontal half-standing position are useful, left arm and leg extended.

In advising a patient to practice the above exercises, the programs are arranged in about the order given. For the first program, Nos. 1 of each series

are prescribed. When the patient has mastered these so that they become easy, Nos. 2 are taken as a step in advance, for a second series. Later Nos. 3 are practiced. This rule applies for both single and double curvatures. In single lumbar curvature a condition which rarely exists without a dorsal compensatory, select the easier movements first and add the harder ones as the patient grows stronger. A constant repetition of these movements, though of limited variety, will bring about best results because of their specific nature. They are the kind of exercises which should be repeated over and over without seeking merely variety.

For results, each movement is to be repeated at least seven times; ten or fifteen times is better. The patient must be made to feel the muscles that are at work and put his entire will power behind each movement. Between exercises he should endeavor to assume and maintain a correct posture of the spine.

The doctor will find that the best method of procedure is to give whatever osteopathic treatment the case requires, then supervise the exercises. Occasionally, examine the brace to see whether it needs readjusting or altering.

If the Abbott method is used, the first program should be practiced for the period elapsing between the first and second jacket. When the second jacket is removed, the patient should repeat the first program a few times and then take up the second. The second is to be repeated until it is so well mastered as to have become easy. By the time the third program can be utilized the average patient will no longer need the Abbott jacket. But the leather brace should then be utilized, if one is needed.

CHAPTER VIII.

Games, Sports and Dances; Their Active Principles and Corrective Application.

All methodical gymnastics, no matter of what system, become tedious to the one who practices them. This is especially true if one repeats the same routine of movements from day to day as in practicing a tabloid system, with never, or but seldom, a change. It is less true where one changes exercises with a definite progression from day to day as in the practice of Swedish gymnastics. Even in the practice of this system the work may at length become tedious unless a certain amount of play is introduced.

Games and sports are not absolutely necessary to perfect physical development, but they are most popular and most generally indulged in of all forms of unproductive activity, unproductive in a financial sense, but productive in a health sense.

If one has the right spirit he will keep up the practice of a few well chosen exercises through life, and get keen enjoyment without needing the encouragement of games and sports. The splendid health preserved by a hygienic life furnishes the zeal required to keep up interest.

Most games and sports are one-sided and if any one is indulged in frequently for a long time one-sided development will result. Every game or sport taxes some set of muscles or region of the body, more than the other portions, and in time will prove more detrimental than beneficial. Still, this very fact may be taken advantage of in outlining a personal program.

Where an individual is weak in the region, or in the respect in which a given game will tax him, it should be recommended for him. This statement may be further elucidated.

Leaving aside the pleasure to be derived from games or sports, all have some special use from a developing standpoint. In this chapter, after a brief analysis of their general characteristics, we shall group the games according to their active principles and then, indicate in what cases they should be applied. By active principle we mean the fundamental elements of a game or sport in relation to its chief effect upon the participant.

For best results hygienic gymnastics should come first in order to develop a good physical foundation. Where necessary, in conjunction with hygienic gymnastics, corrective gymnastics should be employed. Lastly, as a fruition and logical topping off to other work, games and sports should be indulged in. But, in their employment, they should be selected first, according to the individual's needs, that is, with a view to making him strong or skillful where he is weak or awkward, and secondly, for pleasure. This is, of course, speaking from the therapeutic standpoint as well as that of physical perfection.

One need not feel an aversion to the idea of selecting games with a view to their therapeutic effects. The selection once made, all idea of therapy may and should be forgotten in getting the pleasure out of the game. The time to think seriously is when one is deciding which game he shall practice. Then, once in the game, he should abandon himself to the spirit and joy of it.

It would be impossible and also impractical to enumerate in detail the characteristics of games as a whole. We have to group them, and analyze the general characteristics of groups or take them singly for

more specific details. Games vary from the intense labor of wrestling; tug-of-war and Rugby to the intellectual type as chess, and, sentimental type as post-office.

In general, it is best for boys of less than 18 years to keep from violent efforts such as weight lifting, shot-putting, boat-racing, and all games or sports requiring a high degree of special skill or long continued exertion. Because of our abnormal modes of life in civilization, it is best for those past their thirtieth year to practice no games or sports requiring great speed. The majority "settle down" to some vocation or profession soon after the twenties and through "dignity" or because they have lost incentive for activity and play are, at thirty, fat and lazy or thin and nervously weak.

Because of the foolish and ancient practice of their mothers wearing corsets, hobbles and tight shoes, jumping and skipping rope are examples of what girls should not practice after puberty. Corsets, according to Seaver, have reduced women's backbones to bachaches, and they have imposed a super-induced pressure on the pelvic organs that have resulted in all kinds of pelvic weaknesses and disturbances, which have become hereditary and of which women have tried in vain to free themselves. Gynecologists have waxed rich through specializing on women's diseases, most of which might be prevented by simply beginning with the young girls and developing their waist muscles and forbidding the use of corsets. Indian women who have never worn corsets do not know such sufferings as white women.

Tight shoes have reduced the human foot to such a state that one or more toes have had to be amputated in many cases, and this has led to the statement that the small toe is no longer necessary. According to

this state of affairs, owing to tight shoes, our feet will from compulsion drop one toe after another until we become cloven-hoofed and lastly solid-hoofed. Such statements sound ridiculous, but the facts warrant their utterance.

It is bad for a person past 30 to practice exercises requiring speed, or for girls past puberty to remain active, for the same reason that it is bad for a person with rheumatism of the legs to practice jumping or high kicking, or for one with a broken back to sit up.

Keeping in condition for games or sports is considered by many as something akin to the mysterious. They have an idea that to excel one must place himself in the care of some professional who will give him a formula and, presto, some record will be shattered. This is a false view which is made the most of by those who gain most by it. The fact is that what counts for most in any phase of life is the oft-repeated mite, rather than the short and strenuous effort. A little study of a few minutes each day kept up through life will keep the mind fresh and accomplish more than the most concentrated course in the best university in the world. From the health standpoint the few minutes of well selected exercises practiced every day will accomplish for health and physical efficiency what no concentrated course under the best instructor in the world can begin to promote. This same line of reasoning is true in relation to keeping oneself fit for any game or sport.

The baseball players who do nothing but eat, drink, and laze around during the winter are hardest to get into playing condition during the spring training, and such players have the shortest careers in the major leagues. If a little exercise, including running, throwing and shadow batting were practiced daily through

the winter, the spring training for the individual would become a superfluity.

As a rule, people do not like set work or regular programs. They enjoy games because in games there is always the element of chance and possibility of the unexpected. One usually has a favorite game or sport and he practices that at the exclusion of all others. But if one is all round in his physical training he will at length reach a stage where his favorite game will be whichever one he happens to be playing. Baseball, tennis, golf, football, hockey, polo, handball, any and all are keenly enjoyed where one plays for the fun of it. This is the spirit to cultivate in games. Victory is not as important as participation in a game. Good health and amusement should be our first considerations.

Combative exercises include fencing with foil, broad-sword or rapier; single-stick drills, boxing, hand-wrestling, jiu-jitsu, tug-of-war and so on. In any of these the object is to conquer the opponent by physical force and skill. Victory is won by the masterful employment of muscular resistance, aggressiveness, yielding or trickery.

From a moderate and correct use, the general effects of fencing with foil are to develop keen sense of touch, or what is termed muscle sense, cunning, good generalship, agility, grace and elasticity. Broad-sword is cruder than foil fencing and less likely to develop the finer qualities of control. Fencing with the foil requires a great nervous waste compared to the muscular strength required. Broad-sword fencing requires a high degree of nervous activity, but this is balanced by a corresponding need of muscular effort. Single-stick includes some of the qualities of both foil and broad-sword fencing, only to a lesser degree.

In foil fencing the extensor muscles of the legs

are strongly taxed in lungeing. Decreasing slightly in degree in the order mentioned, these different forms of fencing develop co-ordination, strategy, combativeness, exhileration, patience and self-reliance.

If any or all of these are carried to excess we find over-development of the leg, shoulder and arm, and in some cases scoliosis: right dorsal in right-handed people, and vice versa. To counteract any such tendency one should practice fencing with the left hand as much as the right. At least he should practice the lunge to the weaker side many times each day.

Boxing is well called the manly art of self-defense. If practiced properly it will develop self-reliance and self-dicipline. It will teach one his limitations as well as physical powers. It requires nothing but the natural physique and padded fist for a necessary apparatus. Good brain action and judgment are of more value than brute force. Normal physique with endurance and proper use of nature's weapons will furnish no end of healthful enjoyment. It will also develop powers that may prove of great service sometime in life. Carried to excess, or in the hands of the natural bully, boxing will increase arrogance and self-conceit. Speaking from the muscular standpoint, if carried to excess at the exclusion of other exercises, it will produce round shoulders by over-developing the pectoral muscles and neglecting the back shoulder muscles. For this reason, to keep the shoulders square, boxing should be counteracted by rowing, or exercising with the chest-weight, while facing the machine.

Hand-wrestling is perhaps the best, safest, and most easily practiced of combative exercises. It requires no special preparation. It is done by opponents clasping right hands, standing with outside of right feet touching, their left feet well back so that with the knees partly flexed they will have a firm base.

By pulling, pushing and twisting, each endeavors to cause his opponent to move one or both feet. The first to move a foot loses a point. This exercise practiced with the left as much as with the right hand will develop great strength of wrist, arm and shoulder, and produce agility. Hand-wrestling on a thickly padded floor would prove excellent for locomotor ataxia patients, or any individual whose equilibrium is weak.

Wrestling, especially catch-as-catch-can style, is a form of combative exercise which requires a combination of strength, endurance, good generalship, skill and courage. The catch-as-catch-can style includes the finest points of all other styles, namely: collar and elbow, each holding opponent at collar and elbow; side-hold; Swiss style, holding at knee and waist; Graeco-Roman style, holding above waist; Japanese style, pushing opponent off a high stand. These few sentences apply chiefly to the American style.

A weakling should be advised against much wrestling at first though weaklings wrestling together would gain much benefit. Continued for years at the exclusion of relaxing exercises wrestling will develop a great bulk of muscles possessed of little elasticity. Wrestling develops the flexors more than the extensors, especially of the arms. The average wrestler is slow, massive, muscle-bound and awkward. The ideal wrestler is agile, tricky and graceful. Great benefit may be derived by correct use of wrestling. Carried to extreme wrestling is likely to produce an athletic heart which always shortens a man's life by several years.

Wrestling is not an ideal form of exercise. It is too strenuous. It is straining instead of training.

Little need be said about tug-of-war. Like heavyweight lifting, this form of sport is always a strain. Those on tug-of-war teams who are able to keep up

the strain for years do so because of a naturally strong physique. They do not possess their strong physique because of this sport, but in spite of it. The strongest are apt to injure themselves by it. Tug-of-war is not to be recommended as a general practice. It is true that a tug-of-war match taxes the entire musculature at once, but it does so in such a strenuous way that it strains both heart and lungs and develops a tight general muscle-bound condition and slow, laboring gait.

Jiu-jitsu is more a system of self-defense than of aggressive wrestling. It is what American wrestlers call "dirty work." Every effective hold or trick in jiu-jitsu places the opponent at one's mercy, that is, it forces him to yield or suffer a dislocation or broken bone. Jiu-jitsu is not, strictly speaking, a form of wrestling, but it is a combative sport, a knowledge of which enables even a weakling to master one much his superior in strength. Americans who have combined antagonistic gymnastic exercises with a few jiu-jitsu tricks and called it "a thorough Japanese system of physical culture," knew what they were about. They acted upon P. T. Barnum's famous statement in relation to the average American.

Jiu-jitsu is a system of holds which are secured by yielding just enough to take advantage of an opponent's strength and by locking, or twisting the arm, neck or leg, or pressing upon a superficial nerve center, cause him to cringe or collapse so as to get an advantageous hold that is somewhat punishing in its effect. It is difficult to get a good instructor in jiu-jitsu, and therefore, it is well known to but few in America. It is not to be commended as a system of bodily culture. But it has value as a system of self-defense.

Basketball, baseball, football, Rugby, lacrosse, handball and tennis may be considered as fairly repre-

sentative of running and ball games. Speaking generally, the effects of these games is to develop elasticity, strength of leg, increase peristalsis, endurance, heart action, blood pressure, respiration, and metabolism. Speaking psychologically, these games are especially effective in developing presence of mind, judgment and coolness in relation to the unexpected. They develop a great power of concentration by requiring non-expectant attention and produce a high type of co-ordination.

Basketball is the most strenuous of indoor games. It requires such quick thinking and concentrated attention that it is nervously exhausting. It is made up of quick starts and stops with periods requiring extreme muscular exertion. It is filled with opportunities for bang-up grandstand activity that is often too conspicuous in many athletes who are proud and self-conceited. The game is so strenuous that it severely taxes the heart. One of the worst features of basketball is that it is played indoors where the air is usually foul at a time when the purest air is very necessary.

Basketball, then, is a game for the strong and well trained. It may be played by weaklings, but such do not bring out its characteristic features. For the well trained and vigorous it will condense a great deal of muscular development of the entire body with pleasure into a short space of time.

The possible results from playing basketball at the exclusion of other sports or gymnastic work are, erroneous posture, due to an overuse of the pectoral muscles especially on the side of the throwing arm, which draw the shoulders forward and produce round shoulders; heart failure from too strenuous and long continued effort; pelvic congestion, especially in girls; and over-development of the legs. In championship

games, there is often shown a lack of mental repose in the participants especially before actual contests.

Baseball is an excellent all round game for pure sport. It possesses all the best qualities of basketball. The best features of baseball are that it is played out of doors. It is exhilerating, requires and develops quick thinking and action, judgment, co-operation or team work, and non-expectant attention or concentration. It develops the leg muscles, the throwing muscles, good respiration, and the general bodily rotators according to the side to which one swings his bat. Right-handed batters develop chiefly the trunk rotators to the left and vice versa.

Carried to excess, the one-sided features will develop scoliosis, heart lesions; mentally it may develop arrogance and self-conceit.

Moderately used, baseball will promote good carriage, co-ordination between eye and muscle, elasticity, good lung action and metabolism, good digestion, increased peristalsis, and increased endurance. If the left arm is used as much as the right, especially in throwing, and if the upper body generally is trained to counteract the one-sided tendency of the game, one will preserve good health, efficiency and playing ability many years longer than is now common. For winter training, elastic exercisers should be used as follows: With the exerciser attached shoulder high, your back to it, go through the throwing motion a number of times, alternately with each arm, but making scores or even hundreds of extra throws with the weaker arm. Then, to counteract the effect of throwing on the posture of the shoulders, face the machine and exercise the back shoulder muscles by spreading the arms out sideways and then upward and going through a rowing movement.

The best way to counteract the one-sided effects of batting is for a player to learn to bat with either side and practice both sides equally. But where there is a favorite side, one way to counteract it and get good training is to swing a bat, as in shadow batting, to the other side. Or, hold the elastic exerciser handles as if holding a bat and swing a number of times to the weaker side.

The pitcher is the one who has the most strenuous and specifically one-sided work. He should practice the weaker arm, and exercise the back shoulder muscles to preserve his health and remain efficient for years. During the game the pitcher should have the attention already mentioned in Chapter III.

Therapeutically speaking, baseball is useful in many ways, but especially in cases requiring a change of mental activity from the intellectual to the motor centers, as indicated in neurasthenics of mental type, in slight paresis and paranoia.

Football, Gaelic or association, is a game which requires a high degree of bodily control, especially active repose, for there is so frequently a tendency to use the arms and hands, an action which the rules prohibit. The head and shoulders may be employed to bounce the ball, and the feet do most of the actual work. Great endurance is required because of the size of the field and amount of running. Control and skill of the feet and legs is highly developed by this game. But the upper body is badly neglected. The typical player shows the one-sided effects of this game. The shoulders are sloping and undersized, the arms scrawny, but the body below the ribs shows a high type of development. This is the tendency of the game. There are many football players who show good general development, but this is true in spite of foot-

ball, or chiefly because of some other form of activity that taxes the upper body, arms and shoulders. Therefore the most pronounced characteristics of football are that it requires overuse of the legs in relation to the upper body and it strongly taxes the heart and lungs. But, because it is played in the open air, if not overdone, it improves heart power. Counteracted by upper body work, it is an ideal sport.

Therapeutically speaking, it may be classed with hand-wrestling, for developing equilibrium. But it is far more effective for developing endurance and promoting metabolism.

Rugby, the great American college game, is an all round developer and strenuous taxer of the entire mechanism, nervous and muscular. It combines catch-as-catch-can wrestling, running, football, greater team work than baseball, with the bang-up features of basketball as well as an opportunity for the individual star to do grandstand stunts. In nature it is impossible for two bodies to occupy the same space at the same time. Dr. Seaver, of Yale, once described Rugby as twenty-two bodies trying to occupy the same space at the same time. Rugby is splendid for those equal to it, but it is dangerous for weaklings. Apart from the liability of injuries among the untrained, Rugby is so strenuous as to exact the most thorough training system to fit the participants for all exigences of the game. They require endurance for a great deal of running, strenuous shoving and grappling, and their muscles must be in perfect tone to prevent injuries by the hard jolts and falls.

Therapeutically, when Rugby is played in its true spirit, that is, vigorously, courageously and aggressively, little can be said except that it is a test of one's mettle, rather than a benefit. If no injuries result

from the game, one is benefited because of his careful training for it, and exhilerated by the actual sport. While the new or open style of play has rendered rugby less dangerous, still the game is not to be considered except as our modern humane gladiatorial combat. One who can stand a few strenuous games of Rugby gives evidence of possessing good health, but one who values his health should avoid this game as a general thing.

Lacrosse may be called the real American game, because it originated among the Indians. But it is not as popular as baseball or football. It lacks the elements of chance of the former and lacks the necessary headwork of the latter. Team work in lacrosse is not so important or essential as skillful maneuvering of the crosse. A few on a team adept at catching, carrying and passing the ball are often seen playing all around their opponents. The muscular side of lacrosse corresponds in a degree to basketball. There is a great deal of running with arm work only intermittently. Of course, the arms are employed in carrying the crosse, but this is a light piece of apparatus which in no degree taxes the muscles of the arms as the foot work does those of the legs. Therefore, as in all running games, the chief developing effect of lacrosse is on the legs. A high degree of muscular sense is required for effective use of the crosse for catching, scooping, retaining, or passing the ball at various rates of speed and for judging distances.

The crosse is so made that it can only be used from one side. Unless made for left-handed individuals, it is so bent and the mesh so woven that it must be carried right hand back of the left, that is, the right hand gripping near the end of the handle, the left free to slide up or down, and throws are always made with the lift principally from the left to right at the

upper part of the swing. All of which means that the right side muscles at the lower right waist region are taxed more than those of the left side. If lacrosse is practiced at the exclusion of other activities, a player will show one-sided development.

Like all running and ball games, moderate use of lacrosse will develop strength of leg, elasticity of the body generally, muscular sense, good eye and judgment. It will increase peristalsis, promote excretion, develop endurance and a high type of co-ordination. Used to excess, it may produce athletic heart, which will lead to heart-failure.

Tennis is one of the best of the popular games. Enough of the game may be easily learned to enable one to gain the most beneficial results from it without necessarily becoming expert. But one may play for many years, from childhood to maturity, and always feel that he may yet surpass himself, so difficult is it to become absolute master of all the fine points of the game. It is a game requiring cool and quick judgment, as well as great endurance and agility. It will also develop a keen sense of honor and fair play because the lines are not always visible to one's opponent and thus one has to announce when a play is foul or fair. It is a game in which a woman who is proficient may equal or surpass most men without having to be favored in any way. The competition between an expert woman and man may be real and tax the ingenuity and strength of the man.

Tennis has so many fine points to recommend it that it needs little defense. But there is one bad side to this game. The racket can only be used with one hand. If each hand were used alternately, playing one game or set left- and one right-handed, there would be nothing more required for good development except a few exercises to correct the round and drooping

shoulders. The constant swing of the arm downward and forward in striking tends to over-develop the muscles that pull forward and downward on the shoulders. Corrective exercises are indicated.

The sudden starts and stops required in tennis, together with the deft use of the racket, will develop co-ordination between eye and muscle. It will develop elasticity, strength of leg, endurance and muscular sense. An expert tennis player can tell without looking at the racket at what angle he is carrying it or striking the ball.

Carried to extreme, tennis may produce increased peristalsis, overtax the heart, and, especially in women, may cause pelvic congestion.

Handball is a game that requires great co-ordination between the hand and the eye. Few games equal this one in showing the limitation as well as possibilities of the human hand. The ball is often hit deftly with either hand, but here again we too often find a player with a favorite hand. The stroke in hitting the ball is usually one corresponding to the uppercut in boxing, a swing of the arm along the side of the body, forward, or forward and inward, employing the anterior fibers of the deltoid and superior fibers of the pectoralis muscles.

The posture of the body in handball is that of a slight stooping with the chin protruding, thus depressing the chest. The muscles chiefly used are those that tend to draw the shoulders forward. The forced attitude of the head in watching the ball tends to droop it. The lower body and legs are employed in the bends and twists and starts and stops required in the game.

As a game handball has many fine points to recommend, and few to condemn it. The faulty developments that may result from this game are to be counteracted according to corrective gymnastic principles.

A slight variation from real handball may be played by using a tennis-ball against any smooth wall.

Field-hockey, ice-hockey, hurling and ice-polo are types of group games in which the object is to send a puck or ball into the opponent's goal and prevent them from reaching your goal. In each of these games, while the rules governing them are different, the muscular activity is very much the same, although there is a special point in favor of ice-polo and ice-hockey. In field-hockey and hurling the object is allowed to be struck from only one side, that is, whether you are right- or left-handed, you are forced to strike from the right-hand side. The stick has to be held so as to hit, stop or pass the ball from the player's right to left. In ice-hockey you may use the stick from either side and strike, stop or pass the puck from either hand, although not allowed to raise the stick above a certain height. In ice-polo one is as free in the use of his stick as he chooses, provided he strikes the ball and not his opponent. Ice-polo, or old "shinny," as we played it in New England, was governed by might, at times. We were as free in our maneuvers as the Indians used to be in their lacrosse games. With a broad, free swing at the ball, allowed to raise the stick to any height, and actively skating about, almost every man for himself, we obtained plenty of exercise though we developed little skill. Ice-hockey required such a degree of self-restraint in handling the stick, and the rules were so binding that it had a wholesome civilizing influence upon us, but the rule requiring us to keep the stick below the two-foot level compelled us to maintain a stooped posture. The teamwork enforced upon us by the rules in order to succeed in victory was a first-hand lesson in co-operation. We learned that by combining efforts we could accomplish far more than by playing every man for himself.

Field-hockey has been intended as a girls' game and it has been so spoiled by restraining rules encompassing players within a limited territory, and the rule requiring the use of the stick only from the right, seems so to add insult to injury, that boys will never abduct this game from the girls. The bad effect of always swinging from right to left means the employment of the muscles pulling both arms down from right and up to left, and the slightly greater taxing of the muscles that twist the body toward the left at the waist region. The head is drooping in the most active part of the play.

Hurling is a game as active and nearly as wild as ice-polo, except that the ball must always be struck from the right, as in field hockey. "Shinny on your own side" is frequently heard from participants in a hurling game, warning an opponent who is on the wrong side of the ball. If the offender does not "shinny on his own side" he is likely to receive a reminder of his duties with a stroke below the knees. But, aside from the little thrills furnished by hot-headed players, hurling is a strenuous game, requiring a vast amount of one-sided arm work and nimble foot work.

The effects of the above four games are to overtax the legs in comparison to the arms, and all tend to produce drooping-head and the last two develop a one-sided arm and shoulder condition.

The difference between ice-polo, or "shinny," and golf is as great as the difference between the use of the unwashed savage finger and knives and forks in eating. Golf has been called the gentleman's game. There is more literature on golf than almost any other single game or sport. Golf is dignified partly because it is costly. The poor can hardly afford the time or equipment for this game. But, aside from all pros and cons, the developmental side of golf is of some

interest. The stroke is always from one side unless one is ambidextrous, or tries to be for health's sake. In right-handed people the swing is full and free from over the right shoulder, down and toward the left, up to and around the left shoulder, including a slight twist of the body toward the left. After such an exertion comes a walk. Sometimes one carries his golf sticks, but dignity employs a caddie. The eyes might be benefitted by watching the ball and seeking it if lost track of, but dignity pays the caddie for the use of his eyes. A Frenchman has said that life begins in gelatine and terminates in bone. Dignity, stiff joints, rheumatism and rheumatic gout follow one another. Golf is a splendid game for middle-aged and old people. Not much of the gelatinous elements are required. Golf is dignified hurling.

Golf takes one out in the open air. The arms are never overtaxed. To play well one requires good co-ordination between the eyes and arm muscles. The player usually does his own walking, although some ride a bicycle between strokes. Golf never injured anyone unless he allowed himself to serve as a bunker. Golf is like a good walk with a little arm work occasionally. The gymnastic value of golf can be obtained by a walk in the country, carrying a walking stick and occasionally knocking the head off a daisy.

Croquet has never developed a single athletic heart. It develops a certain amount of co-ordination between the eye and the arm muscle. It requires skill to aim straight and pass the wickets or strike an opponent's ball. The stooping required tends to develop and limber the back and it may prevent lumbago. Its gymnastic effect is bad because it requires so much stooping and drooping of head.

Bowling is one of the most popular of indoor sports. Though one-sided, it is very beneficial, but the

environment is usually bad. The close indoor air, thick with smoke, in which it is played, and the late hour it usually induces one to keep, are points against it. But these conditions are not caused by bowling; they are simply evils that accompany it.

The muscular effects of bowling are one-sided. The favorite arm is always used in rolling the ball and the other is neglected. Long continued bowling produces an over-developed right arm and much weaker left in right-handed people and vice versa. The work of the legs is also somewhat specialized. In right-handed bowlers, the ball is supported in front of the body with both hands, but mainly with the right and steadied with the left. At the movement to roll the ball, the right arm swings backward carrying the ball, at the same time the left arm and leg move forward and the trunk bends slightly to the right as the body surges forward. The feet are far apart, the left knee bent almost to right angle and the right leg extended backward, the toes of the right foot serving partly to anchor the body and partly to bear their share of the weight. Thus, in the principle act of bowling the muscles in the legs that are taxed the most are the back muscles of the left and the anterior muscles of the right.

Bowling is a very pronounced one-sided exercise. The best way to counteract this is to bowl left- as well as right-handed. For any anatomical defects, the principles of corrective gymnastics apply.

Bowling in itself has great advantages, especially if one uses the left as well as the right side. It is filled with excitement and offers a splendid opportunity for individual satisfaction as well as amusement. It is a vigorous exercise, without being of a straining nature. It will produce a fine arm and rounded shoulder development, though the flexors of the arms are

affected more than the extensors. The main therapeutic effect of bowling is to deepen the chest.

Swimming is one of the best of all-round exercises. Breast-stroke swimming has the evenest developing effect because all the work is symmetrical, both sides doing the same thing, and the body is kept in an ideal posture for chest development. Side-stroke, trudgeon or crawl, practiced first to one side then the other, or where the swimmer alternates from side to side with each stroke as most speed swimming strokes require, will afford splendid development as well as recreation.

Properly practiced, swimming will give one a smooth, muscular, well rounded form. It will develop elasticity in the muscle and correct faulty posture by overcoming drooping head and shoulders. This corrective effect is especially true of breast-stroke swimming which requires a high carriage of the head to keep it out of the water. The lungs are benefited because of the enforced arching back of the body produced by expanded upper chest condition which reacts by furnishing deeper and more thorough ventilation of the lungs in response to the increased need of oxygen.

Swimming establishes in one a high degree of self-reliance and courage. It also teaches that, in some ways, one can overcome nature, or, at least, successfully combat it as long as his endurance permits.

If swimming is over-indulged in, one develops massive shoulders. Long distance swimming in cold water may produce cramps, and even heart failure. Therefore, moderation is indicated in the practice of swimming.

Rowing, ordinarily, as practiced in catboats or in the pleasure boats in a park, has a slightly different effect than in a racing boat or shell with a sliding seat.

In the first case, with the fixed seat, the effect is not as strong as with the moving seat. The chief effect of rowing is on the back and shoulder muscles. The same truth holds good in a sliding seat except that, in the latter case, there is also a marked effect on the abdominal muscles. Moderate practice will greatly benefit health, because it is an outdoor sport. Rowing develops and corrects the shoulder region, strengthens the abdominal muscles, increases respiration and promotes digestion and metabolism. Speed rowing develops combativeness. Because of the limit to the speed possible to a rower, and the length of time required to cover a distance which seems very short from over the water, rowing develops patience, perseverence, a certain sense of rhythm and automatism.

If rowing is over-indulged in, and the head is carried forward too far on the return stroke, the result may be round shoulders, protruding chin and, because of the constant use of the back muscles, lordosis may result.

To obtain the greatest benefit from rowing, one should practice the alternate stroke part of the time; that is, while one hand is on the stroke, the other is carrying its oar back for a new stroke.

Back water stroking once in a while will benefit. Back watering will particularly tax the abdominal muscles, the extensors of the arms and the chest muscles. If the chin is kept in and the head carried high, great benefit and no mal-formation will result.

Canoeing is far more interesting than rowing for several reasons. Canoeing is less monotonous. It is usually more risky and a certain amount of risk requires a more alert state of mind. This develops cautiousness and presence of mind.

Canoeing is usually done with a single paddle. The stroke itself requires special attention in order to

keep the canoe going straight. The canoe is usually so light that one can go over very shallow water, on inland streams or lakes, and it is easy to carry the canoe over a portage from one stream or lake to another. In primitive surroundings, in timber lands and unsettled country, a canoe and camping trip offers tempting attractions.

The gymnastic side of canoeing is to be considered apart from its attractions. The peculiar stroke of the paddle requires a position and employment of the arms that produces sagittal chest expansion. The arms and shoulder region are all benefited, though the legs get no exercise. The lungs are benefited by the forced expansion of the upper chest and the increased respiration due to the exertion. The psychological effects of canoeing are courage, resulting from the risky nature of the sport, a certain sense of secure repose resulting from the feeling of safety in spite of the chances taken, and power of distant observation developed by watching the shore, for guidance, or for game.

Where canoeing is over-indulged in and all the paddling is done from one side, it will produce one-sided muscular development, perhaps scoliosis, and a weakening of the legs. It is said that along the Amazon river, where the savages live most of their lives in canoes, their arms are as large and in many cases larger than their legs, because they use their arms almost constantly in paddling, and they simply sit on their crossed legs.

Skating on ice, an almost unknown and ancient practice in cities, has certain gymnastic values that are worth considering. Skating consists principally of a series of balance movements in which the weight is born by one leg after the other has given the stroke; the free leg is used with the arms to preserve equi-

librium and then moves forward to carry the weight of the body in the next stroke. In fancy skating the strokes consist of short curves with the body inclined inward in relation to the curve, the free leg and the arms are employed in balancing the body. The pivot in all curves is the center of gravity, influenced by the laws of centrifugal force, leverage and penetrating energy.

The effects of skating are plentiful and good. The chilly and crisp winter air compels one to action in order to keep warm. This activity reflects upon the body by promoting metabolism and increased respiration. Nearly all the good effects of running and running games, added to the best effects of balance movements will result from skating. Skating tends to establish perfect physical equilibrium and correct posture. It develops elasticity of muscles, grace of motion, and strengthens the muscles of the calf, thigh and waist region. The erectors of the spine are also exhaustively employed in long continued straight away speed skating.

Skating is very exhilarating. There is much satisfaction felt in the ability acquired at every new achievement in skating. And these new achievements are limitless if possibilities are considered.

But, in one's eagerness to achieve, skating may be carried to excess. Where opportunities afford a chance to carry skating to excess, the same bad effects as of running may result. That is, heart dilatation, lung congestion, and, in women, pelvic congestion.

Roller-skating is very similar to ice-skating and therefore needs little consideration. It differs from ice-skating in that it is usually practiced indoors or, at least, on dusty pavements. Consequently it is less hygienic than ice-skating. The stroke in roller-skating is in a straight line, the body carried well forward.

There is little of the curved stroke effect noted in ice-skating, and roller-skating offers less opportunity for fancy play. The effects of roller-skating are similar to those of ice-skating.

Skiing or Swedish snow-shoeing has become popular in the portions of America inhabited principally by people of Scandinavian ancestry.

Ordinarily, the skis are used for swift travel over the snow. Progress is made by sliding over the snow, alternately pushing one foot at a time and carrying it forward with a lifting and sudden dropping of the heel for propulsion. The feet move along straight forward in a parallel line. Sometimes, to aid progress and preserve equilibrium, especially on crusted snow and on inclines, one or two poles are used.

Skis are used by many of the woodsmen of our northwest over well-beaten trails and to cross lakes for packing in supplies from settlement stores. They are frequently used by hunters for swift travel. With the Laplanders, skis are a necessity. So dependent are they upon these that to lose or break a ski often means loss of life. In this country, skiing survives mostly as a winter sport.

The effects of skiing are very much the same as skating and running though in much less degree. They develop strength of leg and equilibrium and give one a sense of man's superiority over nature.

For developing pure daring, few sports surpass the form of skiing used in exhibition work. A specially prepared long shoot, with a smooth hump at the bottom is used by the competitors. They slide down this shoot acquiring great speed on the descent and just as they reach the hump they nearly squat and spring up to add as much as possible in height to their speed thus working in enough reciprocating force with their penetrating energy to carry them through the air

sometimes 150 feet before striking the ground again. In order to establish a record they must land in perfect erect posture from their long leap and slide along over the snow without losing their equilibrium.

This form of skiing requires and develops courage, great strength of leg, good physical control and produces a high degree of mental exhilaration.

Canadian or Indian snow-shoeing can hardly be called a sport. Yet it is frequently used for exercise and since it requires a special type of walking, a few words in explanation would not be wasted. Many people in the northern states practice walking on snow-shoes for exercise. In the north woods of this country and Canada everyone uses snow-shoes at some time or other, for hunting, packing supplies, or simply for long distance walking. With the snow at least two or three feet deep through the winter season there is no other method of travel except Esquimo fashion or on skis.

To walk with snow-shoes requires less power of equilibrium than with skis, but rapid progress is not as easy as with the latter. Still, heavy burdens may be carried more easily on snow-shoes. The steps are taken by carrying the moving foot outward to avoid striking the ankle of the other leg, and far enough forward to keep from placing one shoe over the edge of the other. If the edge of the forward shoe rests on the edge of the rear one, when the next step is attempted one is sure to trip forward into the snow. A few minutes' practice is all that is required to clarify these remarks.

The effects of snow-shoeing are very much the same as ordinary walking, strengthening the muscles of the legs, developing endurance and especially perseverance. Progress on snow-shoes can never be very rapid, although, over a well worn trail, one is capable

of a slow jog. Therefore, a great deal of snow-shoeing would tend to slow one's running speed. The fact that snow-shoeing can only be practiced out of doors in crisp weather makes it a desirable sport. It gets one out into the bracing winter air and offers enough activity to keep him warm without over-taxing his strength.

The above sports and games constitute a list of typical popular forms of recreation. But, unless one possesses good health he can hardly participate in any of them, and frequently, good health is injured by participation in some of them. Without resorting to corrective gymnastics or needing to practice hygienic gymnastics many seek to establish within themselves a high state of health by some form of play that will qualify them for the most strenuous of games or sports. It is difficult by real play to supplement or counteract the evils of play. But, a number of gymnastic games have been invented for this purpose. These gymnastic games may lack the spontaneity of most games, but, when their value is emphasized, and their practice is guided by the needs of the individual much good can be obtained.

There are hundreds of gymnastic games possible and most of them are explained in detail in books devoted to that subject. For our purpose we shall select a few of the best for correcting given defects.

The medicine ball is the very best and most useful of recreative exercising apparati. It may be used out of games, simply by being tossed about in various ways. The developing or corrective effect of its use depends upon the throw. It may be thrown as any object with one or both hands, pushed as a shot or heavy weight, thrown backward over head, thrown between the legs, thrown underhand, or sideways with both hands. The force used is according to the in-

dividual's strength, and the weight of the ball. No well-equipped gymnasium should be without medicine balls of various weights.

Supposing one is in the habit of putting the shot always from one side, in playing with the medicine ball he would counteract the evil tendencies of shot-putting by pushing the medicine ball from the other hand. To counteract the overuse of the chest muscles which would eventually shorten and make him round-shouldered, he should swing the ball over head and backward, hurling it as far as possible each time. It is plain how the medicine ball can be employed.

To further the corrective effects of play in Circle Ball, Circle Touch Ball, Dodge Ball, Straddle Ball, Straddle Pin Ball, and all such games, where the object of the game is to strike a player or object, or dodge the ball, the throws should be made by employing a motion of the arm or arms that will be corrective in its effect. By throwing for corrective effects, just as much pleasure can be gained from a game, with a great deal more benefit to its players. Not only can such games be made more beneficial but the same game may be made to lose some of its monotony, or made to seem like a new game by varying the styles of throw.

Volley-ball is a splendid game for the fine control of the hands it develops and for the fact that it compels an upright standing posture especially if the net is tied up eight or ten feet high. It has some of the elements of tennis in that it requires a batting stroke sufficient to carry the ball over the net, yet, the ball being light and the court bounded, the stroke must be so regulated as not to carry the ball out of bounds.

Hill dill is a pure running game that every child has played at some time in life. This game was known as Monny Moss where I played it in Massachusetts.

It is a simple running game that develops the muscles of the legs and good endurance. It has no more developing effect than common tag.

Hang-tag is one of the best of games for the playground or gymnasium, or as a picnic game in the woods. A player saves himself from being tagged by hanging. Its effect is to strengthen the arms and shoulders, raise the ribs, benefit the respiratory apparatus, and furnish sufficient leg work to give an all round development.

Indian-club wrestling is a splendid game to promote nimbleness of the feet. Where one is pulled around and jerked about rapidly, at the same time hopping about to keep from knocking over the upright Indian clubs, and endeavoring all the while to force the other players to do so, there is a variety of activity that more or less taxes all the muscles and has as a predominant characteristic the effect of developing nimbleness and balancing power.

Chicken-fight, a game in which a player holds up one foot and tries by pushing or pulling to make the opponent lose his balance and touch the upraised foot to the ground, is also a good developer of nimbleness and balance power. This game may be varied in its application but the leading effect remains the same.

Bull-in-the-ring, a very popular boys' game, tends to develop powerful shoulders and arms and a tenacious grip of hand.

Stick-wrestling can hardly be called a game. It should properly be classified with hand-wrestling. The game consists in opponents taking an even hold on a stick and by pulling, pushing and twisting in various ways, make the opponent let go. It is a good way to strengthen the wrist and fore-arm.

Tournament is a beautiful game for exhibition work. A large sized and strong boy serves as war-

charger and carries a light-weight boy on his shoulders. The rider carries a stick, well padded at one end, to serve as spear. The game consists in one rider trying to dismount an opponent. The horses and riders pair off so that several may take part in a game and furnish splendid amusement for onlookers. The effects of this sort of sport are manifold. The boys playing the part of the horse are taxed about the shoulder, arms and legs and practically their entire musculature is exercised. The riders need strong adductors of the thighs to keep their position, and the muscles of the abdomen and waist region, as well as the arms and shoulders are exercised. The effect of this game on the rider especially is to overtax the front muscles of the body and the pectoral muscles so that it would result in increasing the effect of all round-shoulder-developing tendencies.

One of the best games to counteract the bad effects of nearly all round-shoulder developers is arch-ball. The players in this game stand in two or more rows of equal length, one player behind the other. A line serves to mark where the first player should stand. The ball, either a medicine or basket ball, is dropped backward over the head while the trunk is bent backward, causing a slight arch-flexion, the next player catches it as it comes down and passes it on to the next, and so on to the last who runs forward to the front line and starts the ball down again. At each round as the last player is running forward with the ball, all take one step backward to leave sufficient space for the runner at the front. This goes on until the player who stood at the head of the line at the beginning of the game has come back to first position. The line finishing first wins the game. Much pleasure is derived from this game because of its competitive quality. But the backward bending caused by it gives

the same effects as arch-flexion, explained in Chapter II.

The above survey of characteristic games is brief, but takes in the chief effects of the most popular of them. Some writers are so imbued with the spirit of play that they advocate the use of games at the entire exclusion of formal gymnastics. "Play is natural," they say, "and only when one plays is he responding to nature's call for activity." So far this is true, but, in our modern civilized life, nearly all our occupations, which are by no means natural, call for a greater use of the flexors than the extensors of the body, and nearly all cause a stooping posture of the trunk and drooping of the head. Because of this one sideness to our daily work, corrective exercises are necessary for normal development. From the fact that our daily life is in many respects artificial, it is but natural that artificial means like corrective exercise should be found necessary. Nearly all games call for a stronger play of the flexors than the extensors of the body. Therefore, the addition of evil effects of games to the occupational activities calls for special procedures. I do not mean to decry nor minimize the good effects of play, but I do mean to have their evil effects recognized.

Some defenses of play are ridiculous. "Play, play, play," is the slogan in many circles. Why play all the time one is physically active? Why not be serious part of the time in our physical work? Why not seriously attempt to counteract the bad effects of play by corrective gymnastics. Or, if this seems too stiff and dry, why not master the principles of corrective gymnastics and apply them even in play? Play itself, rightly arranged, may be made a means of correction. I heard an advocate of play recommend it for the strong because they could stand it and gain

enjoyment by it, and for the weak, because it would at least make them forget their troubles and weaknesses. I have heard the same line of defense for the use of whiskey. Play has its place but it should not exclude other forms of activity in our institutions of learning.

Before closing this chapter a few words would not be wasted in reference to dancing. Conventional dancing is of course the most general, most popular, and least valuable, gymnastically speaking. The physical effect of all dancing is on the lower limbs, about the same as walking or running, although the stuffy atmosphere of the dance hall, and the tight, stiff, obstructing garments, limit the possibilities of physical benefit. The automatism of the rhythm certainly does not develop one mentally.

The new style of popular dancing offers much chance for all round activity. The tango, maxixe, one step and hesitation, etc., are very active, verging upon the strenuous. But they make for ungainly carriage of the arms, head and shoulders, and for flat-footed walking. This is especially true of the tango, one-step and turkey-trot.

The law of gymnastics that "the body at rest tends to assume the position it held during activity," is true in all forms of activity. Visit the average dance hall and see the protruding chins, forward throw of the heads, sunken collar bones, forward thrust of the shoulders, gawky outward angle of the elbows and knees and dragging of the feet and apply this gymnastic law and little more need be said.

Folk dances, like favorite old folk songs, will always remain popular among those who appreciate the real in the traditional. To enter into a lengthy descriptive analysis of folk dances would require too much space. Sufficient to say that from the vigorous

Hungarian or the Russian Cossack dances to the Colonial Minuets, there are all kinds and grades of activity, but mainly of the legs. That is, the effect muscularly is to develop the legs and increase the lung activity, and give the arms and body proportionately loose, free play but little strenuous or developing work.

The latest style of esthetic, interpretive, and plastic dancing has every point in its favor. In a large measure the interpretive and plastic style of dancing are a revival of the beautiful ancient Greek dances.

The esthetic style of dancing is inclined to be stiff and artificial and, though pleasing to the eye, lacks the spontaneity and fullness of classic interpretive dancing. The dances of the troups from the Russian Imperial Ballet training schools are as far above conventional or popular esthetic dancing as grand opera music is above ragtime and popular light classic music. Popular dancing is an amusement; esthetic dancing is often a profession that will accomplish little more than afford the teacher a livelihood. But real interpretive dancing is a fine art.

To become an expert interpretive dancer requires more than a mere wish and a fat purse. If you lack good health you are handicapped in dancing as in any other pursuit. Too much dancing, even of the interpretive type, will not furnish a well-proportioned physique. Such artists as Novikoff, and Mordkin, despite their press agents' claims of perfection, could be improved by good gymnastics properly applied on corrective principles. They are wonderful performers, but their legs outproportion upper body development. With few exceptions, the members of the Russian troups performing in this country showed the muscular legs and skill required to execute wonderful leaps, difficult, and withal, graceful steps, but their shoulders especially showed evidence of neglect. They

are "beautiful statues come back to life," as the advertisement stated, but not perfectly proportioned statues. Because it is commonly accepted as true that a woman's lower limbs out-proportion her upper limbs and body, it has been accepted as normal, and therefore, this prevalent notion makes one conclude more favorably as regards the physical proportion of most of the women of this famous troup.

It is evident from what has been said that chiefly the legs and feet are exercised in dancing. And the effect of this is shown even in the best exponents of interpretive dancing.

There is a new school of rhythm interpretation recently started by Jacques Dalcroze, of Hellerau, Germany, which bids fair to revolutionize training for dancing as an art, and to improve the physiques of future interpretive dancers. Dalcroze realizes the importance of the healthy physique as a foundation, and the perfect physique as a priceless ornamental adjunct to plastic dancing. Therefore he urges, expects, and makes provision at his training school for, Swedish gymnastics every day as part of the training of the future artist. This is done to preserve health, promote physical perfection and to establish the firmest foundation for physical control. Physical perfection and control are to interpretive dancing as harmony is to music interpretation.

The ultimate aim in the Dalcroze system is to develop the pupil to the point where he will not only go through the correct movements in correct time, but really feel the motive behind a musical composition. Dalcroze is aware that technicians are very common but reasoners are rare. To reason why a composition is as it is, is beyond the intellect of the average. As we have students and translator's of Greek language, but few interpreters of Greek thought, so do we have

many who can perform cleverly upon a musical instrument, but few who can grasp the spirit of the composer and render a correct interpretation. To get into the spirit of a composition, to get so in harmony with the feeling of a composer at the time he composed as to feel the naturalness of doing just what he did and nothing else is a quality which Dalcroze aims to develop and make common. The great composers were complete musicians, not merely finger technicians, and when in a given mood they were driven irresistably to effect what was handed down to us as musical classics.

To grasp music and rhythm to the degree that enables one to spontaneously and with none but fitting motions, to interpret the compositions of a Mozart, a Schubert, or a Chopin, is to be physically and mentally what they were musically it is to have such a fine adjustment of brain, nerve, muscle and bone, and such a grasp of music and rhythmic art as to constitute a living and moving symbol of the musical composition.

There is no royal road to this standard of culture. It requires a vast amount of tedious training. The few examples of interpretive dancers on the stage at present are but a suggestion of future achievements. The present exponents of interpretive dancing have had a sort of mushroom career. They seized upon the idea and in a comparatively short time rushed to the stage to perform in the spotlight. While something can be said in praise of them, one still feels that much is lacking in their performances and that a thorough grounding along the line of the Dalcroze's method would put a finishing touch to their work. Dalcroze's ideal seems correct. Whether his method is the best to attain his ideal remains for the future to determine.

Dalcroze aims to start with very young children, as young as five years or less. He begins with march-

ing to music, making them march in time, with changing rhythms. Various measures, notes and rests, at varied tempos are introduced and the pupils gradually trained to mark time to them. In marching the feet are moved to the note-value and the head is nodded, the arms, and later the body, are moved to the various tempos.

The pupils are thus taught to "realize" rhythm. As skill is acquired the pupils are given more complex work. For instance, one arm may beat two while the other beats three. That is, beginning with the arms vertical, the one beating three goes down to the side. The other goes down to the shoulder height and up. But the two arms do their respective work in the same measure of time. While the arms are thus engaged in "realizing" different rhythms, the head may be nodding at some other rhythm and the body swaying at still another. Thus may one acquire efficiency in "realizing" the most complex rhythms.

When one has grown efficient in sensing and expressing simple and complex rhythms, the next and most natural step in advance is to take up the interpretation of musical compositions in rhythmic movements. The physique, namely the feet, legs, arms, body work, the facial muscles of expression, and the appropriate dress, all play their part in good plastic or interpretive dancing.

The physiological effects of dancing resemble those of running or running games. Dancing promotes metabolism, increases respiration, develops endurance, and, if supplemented by upper body work, it is very beneficial.

Anatomically, much dancing will over-develop the lower body and legs and produce poor shoulders and arms.

Psychologically speaking, dancing is amusing, and

exhilarating. When one masters new steps or dances he obtains mental satisfaction that re-acts by improving bodily health.

In concluding this rambling chapter let us review some of the salient points that are worth remembering.

Dancing in general is to be classified therapeutically as leg work. The arms and body are employed but hardly to compare in amount with the foot and leg work.

Esthetic and interpretive dancing develop grace, self-command, and harmony between brain and body. This kind of dancing, when it has been preceded by a good course in physical training, puts on the finishing touches and rounds out the individual's consummate skill. With a perfect physique, ability in artistic dancing means a completed physical being. Add to this, a well balanced and cultivated brain, and you have a mature and complete personality. Such exists only in theory.

Most people are not so much interested in developing themselves into complete personalities, as they are to learn some quick method for offsetting or concealing their weak points. The first thing girls worry about when convinced that exercise is good for them, is how they can prevent double-chins, fill the hollows of their necks, or reduce their hips. Next is how they may obtain most amusement while exercising.

Dancing suggests itself as an amusing and appropriate exercise for girls. But, no matter how persistent a girl may be, unless she naturally inherits a good physique, she will never become a finished dancer without having first followed out a course of gymnastic training to fill her needs. Enough has been said on hygienic and corrective gymnastics to serve here.

Boys, when sounded on the question of exercise, think first of learning self-defense, and next, of ac-

quiring enough skill and power to excel in some favorite sport. The same rule holds for boys as for girls. To excel in any sport or game a boy must have a good natural physique, or it must be developed by consistent and persistent exercise according to his needs.

In glancing hurriedly over the above chapter one will gather a number of points of the games and sports discussed that stand out prominently.

To develop strength of arm and wrist one should practice hand-wrestling, stick-wrestling.

To improve equilibrium, we have hand-wrestling, Indian-club-wrestling, chicken-fight, skating.

To improve muscular sense, nothing surpasses foil-fencing, tennis, volley-ball, handball; and kindred games are also good for this purpose.

Right-handed fencing is good to counteract left dorsal curvature, and vice-versa. This is true because in the lunge to the right, the trunk is inclined to the right, so that in order to hold the head and right shoulder high the left spinal muscles have to contract forcibly.

For the awkward, clumsy and muscle-bound, fencing, handball, basketball, tennis, golf, skating, dancing, and any of the games requiring nimbleness and accuracy without much strength.

For lumbago, and stiff back, croquet is beneficial.

For the soft, cowardly boy, boxing and wrestling.

For the flat or shallow chested boy, boxing stands high.

To develop courage and self-reliance, boxing, wrestling, jiu-jitsu, single-stick, skiing, swimming.

To develop hardiness, for the anaemic or consumptive type: in moderation, snow-shoeing, skiing, skating, bag-punching, rowing, canoeing and camp life.

To develop self-control and a sense of fair play: tennis, golf.

To develop grit: bull-in-the-ring, high-diving, ski-jumping, Rugby, boxing and wrestling.

To develop stick-to-it-iveness or continuity: stick-wrestling, tug-of-war, swimming, rowing.

To develop endurance: running and all running games; lively dances, skating, swimming.

To develop concentration: baseball, lacrosse, tennis.

For neurasthenics or paranoiacs: baseball, tennis, handball, volley-ball, medicine ball and hang-tag.

To correct round or drooping shoulders: breast-stroke swimming, arch-ball, throwing medicine ball over head, rowing, hang-tag.

CHAPTER IX.

Individual Programs.

Chapter I explains the principal laws underlying gymnastics. Chapter II gives a number of lessons that meet the needs of the average. Chapter V presents special exercises for various anatomical defects. Chapter VIII classifies amusements in a manner to guide one in selecting his play activities. It seems that after having carefully read through those chapters anyone ought to know how to proceed in applying the work, but experience has taught differently. General principles and examples do not seem sufficient. Many want concrete directions. Though they have a fairly clear idea of what to do in given cases, still they like examples of what has already been done. The following are examples of programs that have been actually arranged for patients.

Every patient is advised to follow the general course of exercises given in Chapter II. But those requiring special attention receive a few minutes as frequently as their case demands. Where children are concerned, the parents or nurse should be instructed in carrying out the home program.

One method is to have a set of forms to fill in according to the individual's needs. In this form may be written the needed exercises, and this is to be added to the regular hygienic gymnastic program. An example of this form is as follows:

CORRECTIVE EXERCISES.

1. Exercises to correct the posture and carriage of the head.

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2. Exercises to correct the posture of the shoulders.

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3. Exercises to correct posture of the spine.

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4. Exercises to correct the defects in the chest.

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5. Exercises to correct the legs.

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6. Exercises for the ankles and feet.

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In the above form prescribe two or three special exercises under whatever defects exist in the patient. Sometimes women or young girls want instructions to beautify themselves as well as to improve their health. The following is typical of the most common program:

PROGRAM OF BEAUTIFYING NATURE.

1. Exercises to correct or prevent double chin.

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2. Exercises to fill the hollows in the neck.

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3. Exercises to reduce the waist.

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4. Exercises to reduce the hips and thighs.

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The above forms are merely types of what one is called upon to fill out. The selection must be carefully made in prescribing the exercises, and the patient must be impressed with the fact that perseverance is the chief element after the exercises are outlined. Regular periodical repetition of the movements, and holding constantly in mind the ideal aimed at, will bring quickest results.

The above forms are best in cases where patients feel that a specific program is necessary. But, with the majority, the best way is to arrange one program in which the special and general needs are met. This is done by introducing special procedures at appropriate places in a regular day's order. This is the method that suits most people and is, to my mind, the best.

In applying corrective gymnastics, as in giving treatment, we should attend to the individual, not

merely to his drooping head, round shoulders or knock-knees. Therefore a program should be outlined to benefit him generally, as well as meet his special needs.

In Chapter V are given enough special procedures for all types of anatomical defects. The present need is to outline home programs for conditions not already covered by preceding chapters, and incidentally, give a clue to making out all types of programs.

SPECIAL PROGRAMS FOR HEART DISTURBANCES.

In disorders of the heart where the bed or office treatment has restored the heart sufficient to render it safe to practice gymnastics, the following programs are types of what has been actually done with great benefit to the patient. The aim is to gradually rebuild the heart muscle, and the exercises are to be practiced at home every day, morning preferably, besides continuing the treatment explained in Chapter IV.

The first program is very mild and the second is moderate. For harder programs the outline on home gymnastics will furnish material. The important point to remember is that a respiratory or vascular expansion exercise is to be introduced at every third or fourth movement.

In a very severe case of mitral incompetence, even with stenosis, or in cases of aortic incompetence, or in combined mitral and aortic valvular lesions, where the patient is confined to bed, I combine the following programs with osteopathic adjustment. The osteopathic treatment proper takes pre-eminence over any procedures given. If I go into details about the gymnastic procedures and say nothing about the osteopathic ones, it is because osteopathy is specific and varies according to each case, while gymnastics are general and serve merely as an adjunct. But, in order to be of service, an adjunct must be understood and

rightly applied. With every program, the osteopathic adjustments are given first and then the gymnastic procedures follow.

A word in explanation of this method of treatment. The osteopathic principle of healing is to remove the obstructions and nature will accomplish the cure. Any procedure that tends to assist nature after obstructions are removed will hasten recovery. Therefore, by kneading the muscles, and by other procedures that assist to perform the heart's work, the heart itself will have a better chance to reconstruct. As soon as the patient begins to gain strength, easy resistive movements of the extremities are introduced. These are gradually increased in difficulty until the patient is able to exercise himself, when his daily programs are arranged according to the third program below. When the patient has reached the stage where he can exercise safely by himself, the osteopathic treatments and exercises are of course no longer taken together. To make matters clear, in the third program below, I have used the first program of the chapter on home gymnastics with the addition of respiratory exercises. As the patient gains, progression is made according to Chapter II, except that respiratory exercises are introduced in every program as in the one below.

PROGRAM I.

Apply whatever osteopathic procedures the case demands.

1. Ankle and wrist circumduction.
2. Kneading of the arms and legs.
3. Lifting up and back on the shoulders as the patient inhales. As the lifting is released the patient exhales.
4. Hand vibration over the heart area.
5. Kneading of the chest and abdomen.

PROGRAM II.

To be applied when the patient is able to begin the easiest of resistive movements. These are first applied at the small joints of the extremities. Later, the larger joints are exercised and the force is gradually increased. In this treatment I proceed in exactly the order given below. The entire treatment takes from twenty-five to thirty minutes.

1. Whatever osteopathic adjustments the case requires are applied.
2. Patient lying on the back or reclining, give kneading and then circumduction of the left arm, left leg, right arm and right leg, in the order named.
3. Kneading of the chest followed by gentle ulna percussion, or short and light vibration.
4. Lifting of the shoulders with respiration.
5. Manipulation of the abdominal viscera with a view to promoting peristalsis and excretion rather than for its effect upon circulation.
6. Patient lying face down, give kneading of the back, followed by percussion or vibration along the spine.
7. Shoulder lifting with respiration.
8. Resistive movements of the ankles and wrists. The operator offers slight resistance as the patient flexes and extends these.
9. Shoulder lifting with respiration and gentle vibration over the heart area.

In number eight of this program, the force of resistance is gradually increased as progress is made. As soon as the case warrants it, give easy movements of flexion and extension of the knees and elbows. At first these are hardly resisted, the operator doing little more than guiding. As time goes on and the patient's heart gains strength, more resistance is applied. When

the patient is able to sit up, and capable of strong movements of the ankles and wrists and moderate resistive movements of the knees and elbows, introduce movements of the hips and shoulders. Arm and leg rotation, that is, keeping the elbows and knees straight and turning the palms up and down from the shoulder, or the feet outward and inward from the hip, against resistance. The patient lying on his back, flexing the knee up to his chest, against easy, and later, hard, resistance. Such are types of advanced movements that are to be introduced into the above program as the case demands. The order of procedure never changes. The only change takes place in the strength of the resistive movement.

By the time a patient has reached the stage where resistive movements of the hip and shoulder are possible he can begin with a daily program of home gymnastics. This program should be practiced every day, preferably in the morning. The treatment as outlined in Program II should continue three times, and later, twice a week, for a few weeks after the home gymnastics have begun. Later, the osteopathic procedures and home gymnastics suffice. After the heart is restored, for health and prophylactic reasons, home gymnastics should be continued as a daily habit.

PROGRAM III.

(See Lesson I, Chapter II.)

1. Hands on the hips, head bent backward, lift it to erect posture as you inhale deeply. As the head is flexed backward again, exhale slowly.
2. Turn the head to the left and right alternately.
3. Flex the head to the left and then to the right.
4. Heel elevation.
5. Raise the arms sideways slowly to shoulder

height and at the same time breathe in deeply. Lower them slowly as you breathe out.

6. Hands on the hips, feet apart, turn the body to the left and then to the right.

7. (a) Hands on the hips, drop the head back and arch the chest.

(b) Hands on hips, bend forward from the hips.

8. Arm extension forward and upward.

9. Arms at the sides, shoulder high. Keeping the arms straight out from the shoulder, the hands traveling in a circle only as far as the shoulders do, lift the shoulders up and back as you inhale deeply. As you allow the shoulders to settle, exhale slowly.

10. Hands on the hips. (1) rise on the toes, (2) bend the knees half way, (3) stretch the knees and (4) lower the heels.

11. Alternate arm flinging foward-upward, beginning with the left.

12. Repeat Exercise 9 of this program.

13. Hands on the hips, feet apart, bend as far as possible to the left and then to the right.

14. Raise the arms forward-upward, inhaling deeply as they go up. As you lower them, sideways-backward, exhale slowly.

As the reader can see, this program is exactly the same as Lesson I of Chapter II, with the addition of respiratory exercises. This program will serve the average heart patient for a few weeks. Progression in such a case is made by increasing the number of times each movement is repeated. When the program becomes easy, Lesson II may be utilized by adding a respiratory exercise at every third movement, or more frequently, as the case demands. Exercise 9 of the above program is always good for the purpose of filling in a program for a heart patient. It is to

this type of illness, what the spring-sitting position is to a spinal curvature.

SPECIAL PROGRAMS FOR CONSUMPTIVES.

Before giving any program in detail let us consider hastily a few prophylactic procedures. Children who inherit the phthisic thorax, or in whose family there has been tuberculosis, should be cared for early in life. Plenty of fresh air, good nourishing food, and corrective gymnastics to deepen and broaden the chest, besides general hygienic gymnastics and outdoor games, are the most important measures to apply. Respiratory exercises to utilize the entire lung tissue and especially the apices of the lungs, should occupy an important place in the daily program. The physical strength should be increased by every means possible.

It must not be forgotten that in pulmonary consumption the lungs are congested and there is always danger of hemorrhage if they are used violently, therefore general chest and breathing exercises are to be employed with great caution at first. Chest percussion, and short vibration, which have the effect of constricting the blood vessels, or preferably, osteopathic precedures that promote peripheral, and decrease thoracic circulation should be given frequently.

It is seldom advisable and usually unnecessary to send a tubercular patient to a hot, dry climate. The air in one city is as good as another if a patient gets it fresh and in abundance without exposing himself.

When the patient's disease has reached a far advanced stage, little can be done except to make him comfortable. To give active gymnastics or breathing exercises might result in a fatal hemorrhage. Therefore, besides the proper osteopathic procedures, the following program will prove beneficial:

PROGRAM I.

1. The patient lying on the back his arms out at the sides. Give a general gentle kneading of the arms and legs, chest and abdomen.

2. Lift up and back on the shoulders a few times.

3. Give chest percussion, and gentle vibration.

4. Patient on the side, manipulate the back thoroughly.

5. Rapid circumduction of the hip and ankle joints.

6. Repeat number 2, and let the patient lie or recline easily with his arms out at the side or with the fingers locked behind the head. This procedure is a gentle and safe inducer of activity in the apices of the lungs.

If your patient possesses a strong physique, has good vitality and is receiving the best of care from the standpoint of food, air and cleanliness, there is a chance that he will regain enough strength to derive benefit from the second program. In such a case prognosis is very good and thorough, diligent effort will bear good fruit.

The second program applies to a case that is recovering from a low condition, or to one whose illness is far advanced but not enough to render him helpless. It applies to what used to be known as the second stage of consumption.

Pulmonary consumption used to be generally divided into three stages. The first stage was when the disease was just beginning. There was pain in the chest, the first rales were heard, and the night sweats and daily rising temperature were first experienced, but the patient as yet felt no marked weakness. In the second stage, the disease was marked by more rapid pulse, night sweats and daily rising temperature, and the patient's endurance was very much lessened.

An occasional pulmonary hemorrhage of no serious nature, may occur at this stage. The third stage was determined by the patient's great weakness, anemia, emaciation, louder rales, constant coughing and expectoration, and enlarged spleen. At present there is seldom made a division of the disease into stages. There are so many variations to any and all such rules, depending upon the individuals themselves, their environment, the rapid or slow progress of the disease and so on, that the idea of dividing the disease into three stages has become obsolete.

For a patient whose affliction is far advanced, but who is still able to get around the following program will be found very beneficial:

PROGRAM II.

1. Apply whatever osteopathic procedures the case indicates.

2. The patient sitting, hands on the hips, the operator stands behind him and gives him passive shoulder circumduction and respiration. (Illus 160, Chapter IV.)

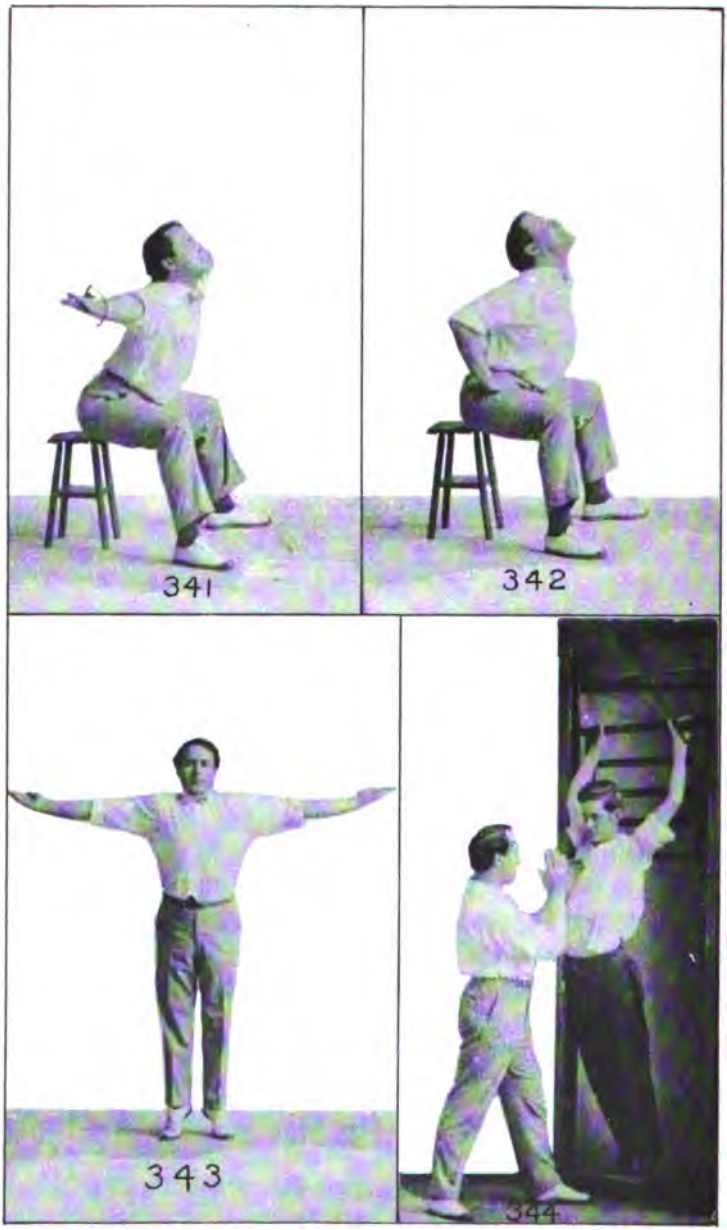
3. Patient sitting or standing, his fingers locked behind the head, the operator gives ulna percussion of the chest. (Illus. 340.)

4. Patient lying on his back, give rapid circumduction of the hips; first one, then the other.

5. Apply short vibration over the chest, especially at the seat of congestion.

6. Patient sitting, he leans forward, arms out from the shoulders, and, while keeping the body forward, flexes the head backward and at the same time turns the palms upward. (Illus. 341.)

7. Patient reclining, the operator resists as he flexes and extends the ankles.



8. Patient standing, hands on the hips, head turned to the left, he bends it to the left as he inhales. After repeating a few times, he turns the head to the right and bends it to the right at inhalation. This will emphasize the use of the apex of the lung first of the right, then the left. Any of the corrective exercises explained under one-sided defect in Chapter V, may be used to advantage here.

9. Patient sitting on a stool, or kneeling, hands on the hips; he turns the trunk to the left and then to the right.

10. Patient reclining, the operator offers resistance as he flexes and extends the knee a few times.

11. Repeat number 2.

12. Patient standing, arms extended upward, hands grasping something, the operator gives chest percussion.

13. Patient advised to lie in an airy place, his body well protected from the cold. He is to lie on his back, preferably with his arms out from the shoulders, or with the fingers locked behind the head.

For the typical consumptive type, the one who is predisposed to tuberculosis of the lungs, as well as the patient who is in the incipient stage of the disease, the following program will be of great value. With plenty of fresh air, good food and other hygienic practices observed, it is sufficient to prevent the disease and restore health in the afflicted.

PROGRAM III.

1. Osteopathic procedures, such as setting and lifting the ribs, adjusting the dorsal spine, promoting peripheral, and reducing pulmonary circulation.

2. Patient sitting, his hands on the hips, trunk inclined forward, he flexes the head and upper trunk backward as he inhales deeply. As the head and

trunk are returned to commencing position he exhales. (Illus. 342.)

3. Patient sitting, arms extended upward, the operator stands behind, grasps his hands, and offers resistance as the patient pulls his arms down to flexion. The elbows should be carried straight out from the shoulders as they travel downward. As the arms come down the patient inhales. As they are extended upward slowly, the operator offering no resistance, the patient exhales. (See Illus. 216.)

4. Patient kneeling, his fingers locked behind the head. Keeping the elbows well back, head high to keep the chest expanded, he twists the trunk to the left, and then to the right.

5. Patient standing; while inhaling deeply, he elevates the arms sideways to shoulder height and just as they reach shoulder level he suddenly turns the palms forward-upward, and as the palms are turned the heels are lifted. (Illus. 343.) This causes a sudden and great expansion of the apices of the lungs. As the patient exhales slowly, he lowers the heels, turns the palms downward and lowers the arms.

6. Patient lying on the back, arms extended and grasping some heavy object, he elevates the legs alternately or together, according to his strength. (Illus. 61.)

7. Patient takes arch-hanging position and while holding it, the operator gives resistive neck extension. (Illus. 208.)

8. Repeat number 5.

9. Patient standing, arms extended upward, hands grasping stall-bars or trapeze. He rises on the toes and leans the body forward to expand the chest. While the patient holds this position the operator gives percussion of the chest. (Illus. 344.)

10. Fingers locked behind the head, feet apart, the

patient bends as far as possible to the left and then to the right.

11. Repeat Number 5.

For a daily program in one who is inclined to lung weaknesses of any kind, and especially for the typical consumptive type, it is advisable to practice the home gymnastics outlined in Chapter II, in addition to all kinds of outdoor activity, according to the individual's strength. To render these programs more specific, at every second or third exercise of these lessons, introduce breathing Exercise Number 5 of Program II, above. In this way the entire set of lessons in Chapter II may be made prophylactic against pulmonary tuberculosis.

SPECIAL PROGRAMS FOR LOCOMOTOR ATAXIA.

Locomotor ataxia is not in itself a disease, but, strictly speaking, it is a symptom of the change going on in those sections of the spinal chord known as the columns of Goll and Burdach. The condition is marked by a loss of control and muscular-sense. The muscles themselves show little or no loss in size and strength, but, in the typical case, they show a loss of tone. While the other symptoms, as of the bladder and intestines, and the darting pains, cannot be effected by gymnastic treatment, the muscular condition and control can be greatly benefitted.

One of the most important things to do is to keep the patient's courage up. He must not be allowed to give up hope, but must be impressed with the idea that by persistent and regular effort he can regain control of his muscles. He must re-learn ordinary movements, if they are lost. If he has not lost much of his control he must work to retain his powers and acquire new ones. By acquiring new powers, the simple movements of everyday life are rendered easy and graceful. Therefore, to make walking easy, we teach

as many balance movements as possible that require more control than walking. Where there is loss of control of the hands, the same principle holds good with movements of the arms and hands. Of course, in very low cases, where even walking is impossible, and where there is such a poor muscular-sense that a patient cannot even carry food to his mouth, the most elementary movements are introduced. It would be impossible to describe in detail every step in progress to be taken in re-developing lost control. Only typical movements and methods can be given.

The ideal in every case is to restore perfect control and muscular-sense. This ideal is a condition in which the muscles respond readily to all shades of volition for power, speed, strength, skill and agility. With the patient willing and persistent, this ideal is possible in most cases, if time enough is allowed. Time enough is an unknown quantity, depending upon the patient and his perseverance. Most patients, however, are satisfied if they regain power of locomotion sufficiently to get back to work.

To tone up the muscles, to restore strength and to reduce nervousness, it is well to give thorough kneading of the arms, legs and back, and follow this by a few simple resistive movements. Then follow with movements of control.

The following program is by no means intended to be utilized at once. The average patient can stand but very little at each treatment. The outline is simply intended as a suggestion of various steps to follow, but it is the best order in which to introduce progressive steps. Let the patient repeat one or two exercises once or twice a day, according to his strength and skill, and then go on to the next.

A typical locomotor ataxia patient has lost all sense of fatigue; therefore, in giving him exercises it is

advisable to watch for signs of it. A very rapid pulse, even as high as 150, and a state of listlessness are some signs that the work suffices for one session.

PROGRAM I.

For a patient who has lost control of his arms and hands.

Always begin by applying whatever osteopathic adjustment the conditions indicate.

1. Give thorough kneading of the arms and shoulders.

2. Give resistive movements of the shoulder joints.

(a) Movements of elevation and depression.

(b) Movements of adduction and abduction. That is, the patient sitting, his arms out from the shoulders, the operator resists slightly as the patient carries them forward and back to position.

(c) Patient sitting, his arms out from the shoulders. Operator stands behind, holds the patient's hands and resists as the latter turns the palms up and down.

3. (a) Resistive flexion and extension of the elbow joints.

(b) Resistive flexion and extension of the wrists and fingers.

4. (a) Double arm extension sideways.

(b) Double arm extension forward.

(c) Double arm extension upward.

(d) Double arm extension downward.

5. Alternate arm extensions in the four directions given above. The patient extends the left arm sideways; as he flexes the left he extends the right, etc.

6. Arm extensions in bilateral directions.

(a) Left arm upward, palm turned in, right arm sideways, the palm turned down. (1) Bend the arms upward, (2) extend the left upward and the right side-

ways, (3) bend the arms, (4) extend the right upward and the left sideways, etc.

Following the same count as in (a):

(b) Extend the left forward, palm turned in and the right sideways, palm turned down, changing with count.

(c) Left arm upward, and right forward, changing with count.

(d) Left arm sideways, right arm backward, changing with count.

(e) Left arm forward, right arm backward, changing with count.

(f) Left arm upward, right arm backward, changing with count.

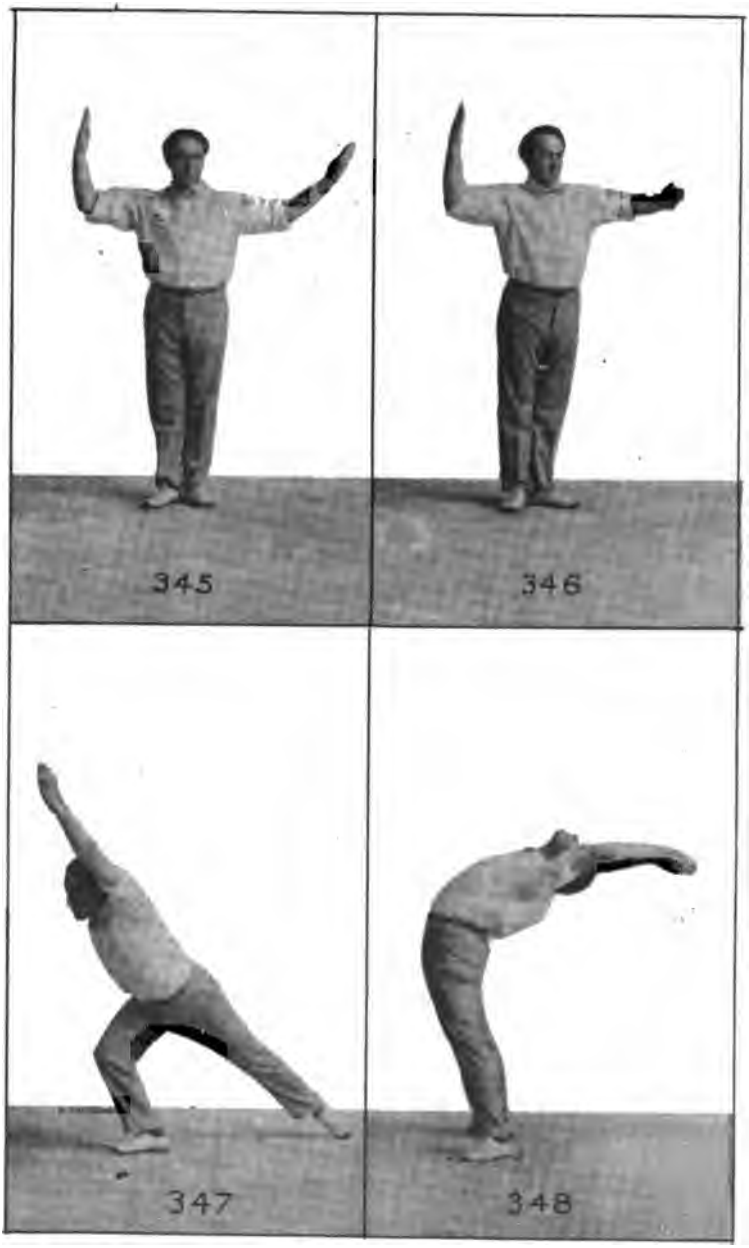
7. (a) Arms sideways, shoulder high, palms down, turn the left palm up (forward-upward). As you turn the left down turn the right up, and so on.

(b) One arm out at the side, while watching it, turn the palm forward, and close your eyes to get the feeling. Turn it down again. Next, without watching, try to turn the palm forward again and hold it.

The operator should vary this exercise by making the patient turn the palm at various angles. For instance, palm down, have him turn it one-fourth the way upward, then forward, which is half-way upward, then three-fourths the way upward and, finally, completely upward. Have the patient close his eyes and try to stop at various angles. This is to be done first with one hand, then the other.

(c) The patient is made to flex the arm at various angles. The operator may stand before him and flex his arms, and the patient tries to imitate, without watching his own arms.

For instance, the operator begins with his arms at the sides. He turns the palms up and flexes the fore-arms to right angles. The patient imitates. He



then lowers them to an angle of forty-five degrees. He holds one at that angle while he straightens the other, or flexes it again to right angles. Thus one arm is flexed at one angle and the other at another. (Illus. 345.)

He may vary this still more, by flexing both arms at right angles and then, keeping them thus flexed, lower one to horizontal forward position. (Illus. 346.) As he lifts this one he lowers the other. This same stunt is rendered more difficult by having one elbow at right angles and the other at forty-five degrees.

These are but suggestions of the possibilities in restoring control of the arms. They are capable of all kinds of variations. Our aim is not to exhaust the possibilities, but to make clear the principle.

The chief point to remember is to first make the patient imitate you, then let him try to do these movements by himself, to command, or from memory, and without watching his movements with the eye, but depending entirely upon his muscular sense.

As a general rule, if a patient acquires skill and control sufficient to perform these movements correctly, his hands and fingers will take care of themselves. But, if special finger work is required, or deemed advisable, one has access to all kinds of devices for the purpose. The following are examples:

(1) Frenkel recommends the use of a perforated board, which is placed before the patient. The holes are numbered and the patient's exercise consists in placing the tip of the index finger of either hand into the hole called for by the operator. Another way is to stick a peg into the hole named.

(2) Have the patient practice drawing vertical and horizontal lines. Later have him draw circles, and then, pictures of various simple objects. Use a large sheet of paper, with a large pencil. The lines should

be no less than a foot in length, and the circles over six inches in diameter. The object is to bring in the entire arm and not merely the fingers.

As the patient regains control finer work, requiring more of the wrist and finger action, should be introduced.

One of my patients regained and acquired control by first making a dog-house, and then, after practicing drawing and exercising at a perforated board, regained sufficient skill to make his little daughter a doll-house with all its furnishings, even to wiring it and installing toy electric lights in it.

PROGRAM II.

A series of exercises whose ultimate aim is to restore walking. The first few are for a patient who is confined to his bed. They are progressively selected and as soon as one is mastered the next should be introduced. All of these exercises are but typical of what one may employ to restore control of the legs.

1. Patient lying on his back in bed.

(a) He flexes first one knee, then the other, drawing the foot lightly over the mattress.

(b) Flexes both knees up together.

(c) Flexes the left knee up. As he straightens the left knee he flexes the right, and so on alternately.

2. Patient lying on his back in bed.

(a) He flexes the left knee up and touches the left heel to the right knee. He repeats with the right.

(b) He flexes the left knee up, touches the left heel to the right knee and then the middle right shin bone before resting the leg. He repeats with the right.

(c) He flexes the left knee up, touches the right knee with the left heel, straightens the left knee up, flexes it again and touches the middle of the right shin

bone with the heel and then lowers the leg. He repeats with the right.

3. Patient lying on his back in bed.

(a) He flexes both knees up, straightens them up and lowers the legs slowly.

(b) He flexes both knees up, straightens them and lowers the legs half-way down, spreads them apart, brings them together again and lowers the legs slowly the rest of the way.

(c) He raises both legs half-way up (knees kept straight), spreads them apart, brings them together again, and lifts them to vertical. As he lowers them he repeats the leg-spreading as described in (b) above.

(d) He raises both legs half-way up, spreads them apart, brings them together and touches the right toes with the left heel, spreads them apart, brings them together again, touches the left toes with the right heel, and, bringing the heels together, raises the legs to vertical.

At first the legs are lowered from this position, without adding to the movement. Later, when the patient has gained sufficient strength and control, the legs are spread and heels touched to toes in reverse to the upward movement.

4. Patient lying on his back in bed.

(a) Against the operator's resistance, he flexes one knee up to his chest and extends the leg again. He repeats with the other leg.

(b) Against the operator's resistance, he flexes both knees up to his chest and extends them. The operator grasps at the ankles and resists the movement in each direction.

(c) The patient's knees are flexed, his feet resting squarely on the bed. Against the operator's resistance he spreads the knees apart and draws them together again. The operator grasps outside the patient's

knees to oppose as the latter spreads them and he grasps inside as the patient draws them together again.

(d) Patient on his back, knees straight. The operator grasps at the ankles and resists according to the patient's strength as the latter abducts and adducts the legs.

(e) Patient lying on his back, the knees are kept straight and the movement takes place in the hip joint. The operator grasps the patient's toes and offers resistance as the latter rotates the toes outward and brings them together again.

5. To teach the patient to walk again.

(a) If he is unable to bear his weight with the help of his hands grasping a pair of rails about two feet high, arrange the rails overhead so that he can more easily bear his weight in this half-hanging condition. In one case it was necessary to resort to an overhead trolley arrangement. A rail was hung up on which a roller, such as are used for sliding doors, was attached, and from this was suspended a strap that supported the patient from under the arms. For a few weeks he practiced walking back and forth with the aid of this apparatus.

(b) As soon as the patient is able he should practice walking between two rails.

(1) Lines are drawn on the floor at regular intervals, upon which he is to set his toes or heels.

(2) When he has mastered this style of walking, the lines are drawn at irregular distances.

(3) Outlines of the feet are drawn upon the floor, and he is to set his feet squarely and exactly inside these outlines. These are drawn to point straight forward or outward at various angles.

6. As soon as a patient has mastered the above exercises he is to practice walking with crutches and repeat the various exercises explained under 5.

Later he is to try these with one crutch and a cane, and then give up the crutches entirely and practice at first with two and then with one cane.

7. When he is able to stand or walk without any support, exercises such as the following are in order. Without watching the feet any more than is absolutely necessary.

(a) (1) Place the left foot forward about twenty inches, (2) bring it back, (3) place the right foot forward, (4) bring it back. Repeat a number of times.

(b) (1) Place the left foot sideways about twenty inches, (2) bring it back, (3) place the right foot sideways, (4) bring it back.

(c) Hands on the hips, rise on the toes. Lower the heels slowly.

(d) (1) Place the left foot forward, (2) rise on the toes, (3) lower the heels, (4) bring the left foot back. Repeat with the right foot forward, and so on.

(e) (1) Place the left foot sideways, (2) rise on the toes, (3) lower the heels, (4) bring the left foot back. Repeat with the right foot, and so on.

The above are typical of the movements indicated in restoring muscular control. When a patient is capable of performing these fairly well he is able to begin with the exercises outlined in the chapter on home gymnastics. Begin with two or three movements of the first lesson. The next day add one or two, and so on, until the entire lesson can be practiced without exhaustion.

All of the movements in Chapter II, especially of the first fourteen lessons, are done in free standing and, therefore, serve as movements of control. Let a patient progress as rapidly as he can in the regular outline.

SPECIAL PROGRAMS FOR INFANTILE PARALYSIS.

After what has been said on infantile paralysis, in Chapter IV, it seems almost superfluous to say any more. But when it comes to instructing mothers, or guardians, on the home treatment of this type of case much time may be saved for the doctor and better results will accrue to the patient if a typical outline is given.

Before describing a hypothetical case and its treatment, a few words about methods of treatment and prognosis might not be amiss. The use of a properly adjusted brace is helpful. It is claimed that many a case has been restored to normal by means of braces alone. This hardly seems possible where there was extensive destruction of the cells of the anterior horns of the spinal cord. But, in mild cases, the brace alone might suffice. The use of the brace with osteopathy and exercise is the ideal.

There are some braces constructed with elastic attachments that seem to bring quick results, but, as a matter of fact, only aggravate the unbalanced muscular condition. As an instance, a child whose extensor muscles of the legs from the glutei down are the only ones affected, is sometimes fitted with a brace that seems to bring immediate results. Such a brace is made with jointed steel to allow flexion of the hip and knee joints. Steel bands at the waist, back and front of the thighs and legs, furnish anchorage for elastic strips to serve in place of the extensor muscles, thus giving antagonism to the flexors. These elastic strips are attached over the regions of the glutei from a steel band that reaches around the waist to one attached to the thigh steel strips, just below the buttocks. This elastic tissue takes the place of the glutei and extends the hip joint when the flexors of the hip (the

psoas-magnus and iliacus) are relaxed. When these muscles contract hard enough to overcome the pull of the elastic bands they flex the hip. Thus by contracting the flexors of the hips the elastic pull is overcome and flexion is produced. When these muscles relax, voluntarily or otherwise, the extension results. The same principle applies at the thigh and leg. Elastic strips are attached to do the work of the depleted extensors and antagonize the flexors.

This principle is wrong because it prevents the possibility of restoring normal muscular control. The elastic bands by antagonizing the flexors really exercise and strengthen them. We, therefore, have a condition in which the weak muscles are kept weak, or made weaker, because they are relieved of their work, and the strong muscles are made stronger by virtue of the fact that they are being constantly exercised.

In cases where one set of muscles is intact and the other only partly paralyzed, elastic strips are sometimes used to assist the weaker set. But, even here, the tendency is to relieve the work of the weaker and antagonize and thus strengthen the stronger muscles. This process, though it enables the appliance maker to sell his goods, and though it may seem like an achievement for the doctor on the case, yet, to say the least, delays progress for the patient.

Elastic strips have no place in proper treatment of infantile paralysis, that is, in so far as they are used to antagonize intact or nearly intact muscles. The proper method of treatment by gymnastics is to apply procedures that tend to temporarily weaken or relax the stronger and gradually strengthen the weakened muscles and thus bring about a state of equilibrium between the antagonists. When equilibrium exists, exercises to strengthen all muscles are in order.

The only brace that can really work in conjunction

with osteopathy and exercise is the regulation jointed brace with clasps to lock the joints when necessary. In this brace, if the patient is weak along the spine, a corset brace is added to the leg brace. If a patient is too weak to walk, owing to paralysis of the leg and even the waist muscles, for locomotion all the joints are locked, crutches are used and both legs swing between the crutches. To begin developing control, the brace joint at the hip is unlocked on one side, and the patient makes an effort at each step to control this joint. At every few minutes the movable joint is locked and the other one unlocked, and thus each is exercised alternately. In time, when the thigh muscles have regained strength the knee joints may be unlocked alternately. Later, one hip and the opposite knee, or both hips and one knee are unlocked, according to the patient's ability.

Besides the brace described above, which usually proves sufficient to reinforce the ankle, it is sometimes found necessary to utilize special shoes or ankle braces and artificial arches. These points and others like them are details that the doctor in charge can take care of. It will be found best, however, not to resort to any more artificial supports than is absolutely necessary. Properly applied exercises will develop the weak parts, if there is any possibility of development left, and even though the process is slow in point of time, it is the surest for permanent satisfaction.

Plaster of Paris casts and jackets, and surgical grafting of muscles are methods that are no longer, or at most but very little used. There is really no place for plaster of Paris casts in treating infantile paralysis. Whatever good these can do in correcting deformities may be done far better by rest and exercise. A plaster cast always isolates a part and isolation means weakening in reference to muscles, and the muscles are

usually so weak that little isolation is necessary. Muscle grafting is also an ill-advised procedure. The process is to cut strands of unaffected or stronger muscles and graft their loose end into the depleted muscular tissue. It is easily seen that to graft a strand of extensor fibre into a flexor muscle would only lock muscular action if it were successful. If unsuccessful, as this process usually is, the patient is subjected to a great deal of unnecessary pain.

The object in the mind of a surgeon who performs muscle grafting is to stimulate a new growth of muscle cells in the depleted ones. The aim is good, and the work is usually done neatly, but the method and results are wrong. A surgeon who understood the mechanics of exercise would not undertake such a job.

In the first place, the destruction of muscular tissue is not the cause but the result of nerve-cell destruction in the cord. Therefore, even though muscle grafting were a success, still, without proper nerve control, there could be no muscular control. If the grafting of a strand of extensor muscle fibre into a flexor muscle does stimulate new growth here, still, the new flexor muscle fibres are under extensor nerve control, and the best that could possibly result of such an operation would be a locking up of the joint under control of the old and new muscle fibres. In the case instanced, stimulation over the extensor nerve would produce contraction of the fibres under its control and thus the extensor and flexor would contract at the same time. A few so-called successful cases of muscle grafting that have come to me for treatment had immovable ankle joints as a result of such muscle grafting. Such cases cannot be benefited. If it were possible to perform a second operation to undue the mischief of the first, then the usual process of treatment outlined below might help.

As explained in Chapter IV, the aim of the treatment for infantile paralysis is to restore, if possible, the motor cells in the spinal cord. Evolution teaches that our brain and nervous system are the result of necessity. The repeated experiences of lower orders of life gradually gave rise to a central controlling station for the surface activities of the organisms. As we study the different forms of life we find a more and more complex nervous mechanism. In the higher forms, all muscular and organic functioning is under control of distinct nerve cells. The more complex the life of the organism, the greater the number of cells in each group to control special functions. Thus, demand by a functioning part means increase of nerve cells to control this part. So that the law that structure governs function is no truer than that function controls structure.

Using a part, within the limit of exhaustion, will improve it. To exercise the muscles of your arm means better muscles, and to increase the complexity of t' ' arm exercises means a gradual increase of nerve cells controlling it. Therefore, following this cue, to begin with assistive, then resistive exercises, and later supply exercises of control, will restore a degenerated part, if there are nerve cells left to appeal to. The test for this is whether or not a patient is capable of moving or producing any perceptible contraction in the muscles in question. If he can produce motion in the toes or ankles, or in the fingers and wrists, it is possible in time (and time means months or years), to restore sufficient control to answer a patient's needs, and by persistent self-effort all traces of the ailment may in time disappear.

Before giving the treatment of a hypothetical case there remains one observation that is worth noting. There is a theory prevalent that infantile paralysis is

due to bacterial infection, and some think they have discovered, while others are still seeking, a serum to cure the disease or at least prevent the paralysis that usually follows the acute stage. It is to be hoped that some such discovery will be made and may such a discovery soon arrive. But in the cases coming under my care, diet seems to have played an important part. Without a single exception, in every case that I have treated, or made inquiries about, the patient was partial to and lived almost entirely upon starches, fats, sugars and proteins. Vegetables, with the exception of the potato, which is also a starch, and, with one or two exceptions, fruits are not relished by this class of patients. It requires coaxing to get such persons to eat vegetables and fruits. In the cases treated, progress has been steadiest and most rapid in those who reduced consumption of meats and starches to a minimum and adopted a diet in which vegetables and fruits predominated. Therefore, diet is of great importance along with other natural procedures.

Given a typical case which shows depletion and almost complete paralysis of the arms and legs, and perhaps a slight weakness of the spinal muscles. Proceed with the treatment somewhat as follows:

1. Give whatever osteopathic adjustment the conditions indicate.

2. Give thorough kneading of the spine, arms and legs, and follow by percussion along the large nerve trunks of the arms and legs.

3. Give assistive, later resistive, and finally single or hygienic exercises.

In the case given above, the exercises are applied in about the following order. Remember that weeks and even months may elapse before a patient has gained sufficiently to progress from the first to the second joint of the affected limb. The first program ap-

plies to the arms, the second to the legs. But the first movements of each program are to be used in the same treatment. It is for convenience of description that they are divided.

TYPICAL PROGRAM FOR THE ARMS.

I. The patient on his back or reclining, practices first with one arm, then the other.

1. Have the patient try to raise the arm forward from the shoulder. If he is unable, raise it for him while he is making the mental effort. At first assist, later, resist as far as he can go and assist further to the completion of the movement.

2. The patient tries to raise the arm sideways from the shoulder; if he is unable, raise it for him while he is making the mental effort. Begin resisting his efforts and assisting further as soon as conditions demand it.

3. The patient's arm rests diagonally across his body, instruct him to carry it up and out as far and as high as possible. At first assist, and as soon as the patient has gained sufficient strength and control, offer resistance according to his strength and assist to completion of the movement.

II. The patient lying on his back or reclining.

1. The patient is told to flex and extend his elbow. Assist until he has acquired some control, then resist slightly as far as he can go and assist further.

2. The patient's arm is flexed at the elbow and the forearm held across the body. He is told to keep the elbow flexed and carry the forearm forward and outward from the body. As soon as he has acquired power, resist according to his strength and assist as the case requires, while the patient is making the mental effort.

III. The patient reclining. Clasp his hand and tell

him to turn his palm down, then up and out. At first assist, and later resist, according to his strength. Pronation is usually acquired before supination. Therefore, for a time resistance is greater against the former, but it should not so far exceed resistance to supination as to create an unbalanced condition. When any region seems to progress unevenly, that is, where one set of muscles is restored more rapidly than its antagonists, it is well to guard against developing a deformity. In such a case as this, pay more attention to the naturally weaker movement. This would be done, in this instance, by resisting supination two or three times to pronation once.

2. The patient's arm is held out straight sideways from the shoulder. If he cannot hold it there himself, the operator supports it at the elbow with one hand while he clasps the patient's hand with the other. The patient pronates and supinates the hand against the operator's resistance. In this movement, while the exercise is similar to the last one above, the effect is made more far-reaching by bringing in the shoulder muscles in the pronation and supination.

IV. Patient sitting or reclining.

1. The operator holds his wrist above the joint with one hand and with the other hand he takes hold below the wrist. The patient is told to flex and extend his wrist forward and backward. At first assist and later resist, according to the patient's strength.

2. The operator holding the patient's wrist as for the last exercise. The patient is told to invert and evert, that is, to flex the wrist from side to side. The operator assists and later resists the movement.

3. The thumbs and fingers are exercised individually or collectively, in the same way as other movable parts. At first assist and later resist, according to the patient's strength.

TYPICAL PROGRAM FOR THE LEGS.

I. The patient lying on his back.

1. He is told to flex the hip joint. At first assist and as soon as he acquires ability, resist according to his strength.

2. As soon as possible the patient is to flex both hip joints at once. At first assist and later resist, according to his strength.

II. The patient lying on his back and knees flexed up, heels close to his buttocks.

1. The operator usually has to flex the knees up for the patient and keep them there during the exercise. The patient drops the knees to one side and by twisting the upper body, lifts them up and drops them to the other side. The operator has to assist at first and, later, he offers resistance.

In this exercise it usually occurs that the adductors remain weak longer than the abductors.

2. The patient on his back, knees flexed as for the last exercise. The patient spreads the knees apart and lifts them together again. At first the operator has to assist. Later, according to the patient's strength, he offers resistance.

III. The patient lying face down.

1. He is told to raise one leg at a time off the bed, keeping the knee straight. At first, he needs assistance, and the muscles are so depleted that no warning to keep the knee straight is necessary. When he has acquired strength, no assistance is necessary, and he may even stand a little resistance.

2. The patient is told to flex one knee up and extend it. It takes a long time to restore control of the knee, but, by assistive action, gradually changing to slight resistive movement in each direction, sufficient

power is at length acquired to perform a variation of the movement as below.

3. The patient lying face down as before, he is told to flex the left knee. As he extends it, he flexes the right knee, and so on. At first assistance is given and later, resistance as applied according to the patient's strength.

IV. The patient lying on his back.

1. The operator takes hold of his ankles and commands him to spread the legs apart and draw them together again. This movement is done against resistance, or with assistance, as the case demands.

2. The operator takes hold of the patient's toes. The patient is commanded to rotate the toes outward and inward without in the least flexing the knees This movement brings into play the external and internal rotators of the femur as well as the anterior tibial muscles. The anterior tibial muscles, which are the flexors and external rotators of the ankle are usually the weaker and need most attention.

3. The patient is told to elevate one leg at a time, keeping the knee straight. While it is coming down the other is elevated. This is in imitation of a walking motion, and for a long time needs the operator's assistance, never his resistance.

4. A somewhat similar exercise to the above is to command the patient to "tread water," that is, he partly flexes the hip and knee and pushes down again against the operator's resistance. As one leg is straightened the other is flexed. The operator offers resistance, or assistance, while holding the patient's feet.

V. The patient lying on his back.

1. The operator commands him to flex and extend his ankles. At first he assists and later resists. The movement is performed first with one ankle at a time,

and later with both together, alternately or simultaneously. The ankle remains weak for a long time.

2. Another exercise of the ankle which supplements the above is for the patient to flex the ankle as he rotates the foot outward. This is done at first with assistance and later with resistance. One ankle is exercised at a time and later, both at once, moving alternately or simultaneously.

3. The patient is told to evert the foot, that is, to turn up the outer edge. The operator assists, and later, resists.

The above outline is very limited when one considers all the movements that are possible to the human body. But these movements are selected as types. According to the patient's specific needs and strength, select from the list of corrective exercises given in Chapter V, and, as soon as he is capable of performing exercises by himself, utilize those given in Chapter II.

For *paralysis following cerebral hemorrhage,* or for *disability* or *atrophy following fractures* or *other injuries,* the line of treatment explained for infantile paralysis is applicable. This is especially true for cerebral hemorrhage sequelae. All movements are given at first assistive and, as soon as the case warrants it, resistive. Progress is usually quite rapid after a cerebral hemorrhage, that is, if restoration is at all possible, and in comparison to progress in infantile paralysis. In atrophied members following fracture, so much depends upon the amount of destruction caused by the injury that no outline can be given as typical. But the general principle of assistance and then resistance to movements always obtains.

SPECIAL PROGRAM FOR OBESITY.

Obesity is very hard to reduce for one reason, and the reason is the obese person. By the obese person

is meant his will power along with his fat. At the present writing there are very few fat people in Belgium. The reason is obvious. There is so little food in Belgium, since the German invasion, that the people are on the verge of starvation. Enforced starvation diet will soon reduce any obese person. So will any voluntary restricted diet do it, but voluntary implies will power, and will power is what most obese people seem to lack.

To reduce weight one's food should consist of something like the following:

Breakfast: Baked apples, or stewed prunes, or some fresh fruit in season, barring bananas.

Lunch: Nuts, and raw salad of such as carrots, onions, celery, cabbage, tomatoes and such dressing as one prefers. Olive oil and lemon juice make a good dressing. Any variety of raw vegetables is good. The above is simply a suggestion.

Dinner: A little lean meat or fish, cooked vegetables of the green kind as spinach, chard, dandelions, beet tops, mustard greens, asparagus; or summer squash, cauliflower, stewed onions, carrots and parsley. No more than one baked potato, or some bran bread or a little dry toast.

Avoid all farinaceous foods, milk, cream and other animal fats. Candies, pastries and puddings are to be excluded. Drink only water, lemonade or sweet cider.

Such a dietary, combined with exercise will reduce anyone to normal. When once reduced, one may again partake of other foods, but he should do so rather sparingly and he should continue exercise or active play.

For exercise, the movements described in about the order given for the treatment of hernia, though they need not be done on an inclined table, and all the exer-

cises given in Chapter II, in which the body is bent or twisted sideways, and all the respiratory and jumping exercises are especially good.

In conjunction with proper diet and osteopathic treatment, the following outline would answer the needs of an obese person. Repeat each exercise five or more times each side.

I. Raise the arms forward-upward and rise on the toes as you inhale deeply. As you lower the arms sideways-backward, lower the heels slowly and exhale. (Exercise 14, Lesson V, Illus. 43.)

II. Hands on the hips, flex the left knee as high as possible toward the chest. Straighten this knee and lift the right, and so on.

III. Feet apart, arms straight out from the shoulders, keeping the arms in this relative position, without allowing them to come forward, twist the trunk rapidly from side to side. (Exercise VIII, Lesson XVII, Illus. 132.)

IV. Stand with you back toward wall, about two feet from it. Arms extended upward. Bend backward and rest the sides of the index fingers and cushions of the thumbs against the wall. Hold this position as you alternately flex the knees up as high as possible. (Illus. 108.)

V. Arms extended upward, keeping the knees straight, flex forward-downward to the floor if possible.

VI. (a) Arms extended upward, rise on the toes and reach (Exercise 9, Lesson II).

(b) Arms extended upward, weight carried as high as possible on the toes, walk slowly forward and backward.

VII. Hands on the hips, (1) rise on the toes, (2) bend the knees, (3) extend the knees, (4) lower the heels. (Illus. 10.)

VIII. The arms flexed forward onto the chest,

elbows shoulder high, wrists straight, fingers straight. Lunge forward with the left foot as you fling the arms sideways forcibly. Flex the arms as you bring the foot back; and fling them sideways again as you lunge with the right foot.

IX. Practice as many as you can easily perform of the exercises described under inguinal hernia treatment in Chapter VI.

X. Arms extended upward, feet apart, bend as far as possible to the left, and then to the right, side.

XI. Practice various jumps; upward, forward, or with turns. Or high kicking, hitch-kick, etc.

XII. Repeat Exercise 1.

Besides the above exercises, which are aimed especially to reduce the adipose tissue, one should practice every day such procedures as are necessary to correct anatomical defects. Most obese people are inclined to round shoulders and sway back. Since this is so, corrective gymnastics are indicated.

STRETCHING AND RELAXING EXERCISES FOR THE MUSCLE-BOUND.

Many people, when they decide that exercise is good for them and begin to inquire after advice, are easily attracted by the flagrant advertisements in periodicals in which the "Professors" with foreign names guarantee to "enlarge your arm one inch in one month or money refunded." These "Professors" (always spelled with a capital "P"), usually claim to have discovered an entirely new system, or rediscovered an old, ancient and forgotten one. The basis of their methods is usually a form of tensing or resistance muscular work, or graduated weight lifting, that develops a hard, stiff and tight muscular condition. The ardent enthusiast who follows such advice is certain to increase his muscle bulk in a short time, but it is a

question whether the ultimate results will satisfy him.

The kind of muscles that one develops by this work will only last as long as the exercises are continued. Such muscles are to be approved more for their bulk than their quality. One has to exercise merely to keep them up. Instead of being of much service to the brain, the brain must be of service to them.

The type of physique that these muscles furnish is a poor tool to the brain. Instead of responding to all shades of volition, such muscles are only fit to perform the type of work that the exercises consist of. The individual who possesses such a physique always holds himself as if he were under a strain. His muscles are tense and rounded out like a dime museum freak on exhibition. When one is conscious of such a physique he is constantly feeling of his own arms, chest, or legs, to sense the elevations of flesh. In other words, pride in the possession of muscle bulk makes itself manifest by the possessor's deportment as well as by his stiff, posing attitudes. There are a number of women who use tensing and dumb-bell exercises and they show it by their mannish, dumpy appearance.

It is easier to change a stiff, muscle-bound individual into a graceful and agile one, than to build substantial muscle onto a flabby, loose-jointed person. The former has foundation to work on, and, perseverance in correct exercises will surely bring about desired results. But it is always difficult to build muscle on one who is weak, delicate, or lazy by nature.

A muscle-bound condition is usually the result of one's occupation. Those who exercise hard enough to develop such a condition are few compared to the number of clumsy, large-muscled men who acquire their stiffness from hard labor. But, of those likely to undertake procedures that will counterbalance their muscle-bound condition few will be recruited from the

army of toilers. Therefore, the following outline takes into consideration primarily the person who exercised himself into such a condition, although about the same general outline applies to the case of a hard laborer.

1. To learn to relax well, lie on your back and make yourself as limp as a rag. Relax the muscles from the toes up. This method of relaxing will not only limber up stiff muscles, but, when one finds it difficult to get to sleep, it will prove valuable in conjunction with, and following vascular expansion of the legs. This procedure is best mastered by closing one's eyes and concentrating on the region that is being relaxed. Begin with the toes. Imagine them so limp that they are hanging down like the tips of a withered plant. Next, allow the ankle to drop from limpness. Next, feel the muscles of the legs, from the ankles to the knees become so soft that they seem to hang like water-bags from the bones. Next, get the same feeling in reference to the muscles of the thigh and hips. Then, feel the spine loosen up and apparently drop onto the mattress segment by segment. Next, allow the fingers, wrists, forearm, and upper arm relax as you did the legs. And last, the neck and head feel as limp as the rest of the body.

2. Another procedure is to stand or kneel on a mattress and suddenly relax the muscles so that you drop down like a balloon collapsing.

3. Lying on the back, arms extended, reach with the fingers and toes as far as possible.

4. Practice light club swinging, fencing, tennis and any of the games or dances that require agility and nimbleness.

For a daily program, besides the above general procedures, the following outline will prove of service:

1. Arms bent, extend them upward slowly, reaching as high as possible and rising on the toes as you

inhale deeply. Slowly flex the arms and lower the heels as you exhale.

2. Arms bent. As you lunge sideways-forward with the left foot, extend the left arm upward and the right downward along the right thigh. In the lunge allow the rear heel to leave the floor, keeping only the toes of the right foot down. In this position, reach and streteh the left arm and right leg to the utmost. Repeat the movement lungeing to the right with the right arm extended upward and the left downward. (Illus. 347.)

3. (a) Arms extended upward, feet apart, bend the arms, head and upper body backward, without holding the breath. (Illus. 348.)

(b) Arms extended upward, bend forward as far as possible without bending the knees. Reach the floor if possible. (Illus. 116.)

4. Hang on a horizontal bar or trapeze, make the body as limp as possible and reach the floor. While hanging, swing the feet from side to side and at every swing try to feel so limp that the feet seem to descend lower and lower.

5. Arms extended upward, rise on the toes and reach upward. While reaching, keep your balance steadily as you alternately flex the knees to right angle. (Illus. 349.)

6. Arms extended upward, raise the left leg backward and at the same time bend the trunk forward until the entire body, from fingers to toes, is in a horizontal position with the extremities slightly arching upward. While holding this position reach with the fingers and toes. Repeat with the right leg elevated backward. (Illus. 137.)

7. Fling the arms forward-upward as you lunge forward with the left foot, and as you bring the foot back bring the arms down to the sides in a sideways-

backward sweep. Repeat with a lunge with the right foot. The arm motion should be a continuous one, forward-upward and sideways-backward to the sides, while the lungeing foot travels forward and then back immediately, only stopping long enough at the lunge to complete the movement without having to introduce ungainly efforts.

8. Practice high kicking, or hitch-kick.

9. Arms held straight out from the shoulders, feet apart, twist the trunk rapidly from side to side.

10. Arms extended upward, feet apart, bend first to one side and then the other, curling the further arm over the head.

11. Practice the "low-down dance." (See Exercise V, Lesson XIX.) Or, holding a stick with both hands, jump forward and backward over it without losing hold of it.

12. Repeat Exercise Number 1 of this program.

ANTAGONISTIC EXERCISES FOR THE FLABBY-MUSCLED LOOSE-JOINTED INDIVIDUAL.

A person who has never worked hard, exercised or played games to any extent cannot have firm, well-rounded muscles. This may not always show in his appearance because, in these days of padded tailoring, the scrawney and the robust may be given the same outline. But the facial expression will disclose weaknesses that tailoring can never conceal. The physical incapacities of the individual are also apparent in his bearing, motions, voice, and lack of aggressiveness. Even politeness in a weakling seems less good manners than policy. It serves him as a method of self-defense. A strong, virile person feels more pity and contempt than respect for a weakling.

Good muscle and a submissive or subservient will cannot exist in the same individual. One cure for

cowardice is physical training. The strong personality has a solid physical foundation.

The normal body is at least forty-five per cent muscle. The quality of this muscle tissue is an index to the mind and will of its possessor.

A weak-willed individual may be repaired and rendered strong by exercise. To be effective this exercise must be persisted in. For a weak-willed person to become persevering means that he must utilize, and acquire by utilizing, powers that in themselves amount to virtues. Patience, perseverance, concentration and self-sacrifice are all necessary to achivement in physical development. Therefore, when a weakling is really improving himself physically his work has a manyfold reactive effect upon his mental power.

The best kind of work for a flabby muscular condition is of a tensing, antagonistic type. When firmness and sufficient bulk have been acquired it is proper to change from the type of work outlined below to the kind outlined in Chapter II.

As already stated in discussing the program for muscle-bound individuals, most exploiters of physical culture teach a type of work that tends to tense and add bulk to the muscles. Therefore one need never be at a loss for that kind of exercise. But such work is never really adapted to the needs of anyone except the flabby-muscled person. And for his purpose its need is only temporary.

As explained in Chapter I, exercising a part will tend to render it normal. The quality of effort required to perform the exercise will develop that same quality in the muscles. Therefore any procedures that require tensing of the muscles will give tone to flabby muscles.

To keep within bounds of danger it is best for the

individual to resist his own movements by opposing one arm or leg against the other.

1. Close the fists and, pressing the knuckles against each other, move the arms up and down or from side to side.

2. Lock the fingers and, while pulling outward on the hands, move them up and down or from side to side.

3. Press the palms of the hands firmly against each other and, keeping the elbows straight, move the arms vertically and then horizontaly as fast as possible without shifting the position of the hands.

4. Keeping the left elbow close to the body flex the arm a few times against resistance offered by the right hand. The right hand clasps the left firmly and keeps up a resistance as the left forearm moves up and down. Practice this exercise with the right arm, resisting with the left.

5. Grasp a wand or stick, holding it behind the head, the hands at a little more than shoulder width apart. Move the wand from side to side by flexing one arm as the other extends. For about ten counts apply the force inward, that is, push one hand against the other.

6. With the hands in the same position as in Number 5, move the wand from side to side while applying the force outwardly, that is, pull hard, one hand against the other.

7. The wand held in front of the shoulders, push the hands inward against each other as you move the wand from side to side.

8. The wand as in Number 7, pull outwardly on the hands as you move the wand from side to side.

9. The wand held in front of the thighs, hands about as far apart as for the above exercises, keeping the elbows straight all through the exercise, move the

wand in a sweeping motion up to the left, then down and up to the right. Apply the force inward, pushing one hand against the other for about ten counts, and then, repeat the motion while pulling outward on the hands, thus applying the force outward.

10. The wand held back of the thighs, elbows kept straight, move the wand as far as possible up to the left and right corresponding to Exercise 9; first applying the force inward and then outward.

11. The arms extended upward, the wand held with the hands far enough apart so that when one arm is lowered to shoulder height the other is vertical, keeping the elbows straight and pushing inward on the wand, carry the wand down the left, then up, and down the right. Repeat the same movement while pulling outward on the wand. The effect of this exercise can be increased by bending the trunk sideways to the side at which the wand is lowered.

12. Take a rope or strap, about three feet in length. Hold one end in each hand and place one foot over the center of it. Flex the arms up and extend them as high as possible above shoulder height while offering resistance with the lifted foot. Repeat a number of times and then exercise with the other foot.

13. Flex one knee up behind and loop the rope around the instep. The ends of the rope held in the hands, extend the arms upward against the resistance of the leg. Repeat with the other leg.

Resistive exercises with a rope, wand, or merely with one arm or leg against the other, are capable of many variations. The pupil will easily evolve new movements. As one tries those suggested above many others suggest themselves.

Another method of developing firm muscles is to exercise with spring or elastic exercises. The old style chest weights, while very useful for all-around pur-

poses, do not equal the elastic or spring exerciser for specific development of tense muscle. It is useless to do more than mention this form of exercising because every spring or elastic exerciser of good or medium quality has a chart or handbook of instructions accompanying it.

Besides the above suggestions another good plan for developing firm and unyielding muscles is for two persons to resist each other's movements by following the outline given above; or by making the work more playful, as hand-wrestling, stick-wrestling, turning wrists, locked-finger-wrestling, or lifting chairs by their bottom rung. Hand- and stick-wrestling have been explained. Turning wrists (Illus. 350), consists in opponents sitting at opposite sides of a narrow table, resting their right elbow on the table, clasping hands and each trying to twist and bend the other's wrist and forearm to the table. The elbows must not be lifted off the table. This exercise should be practiced with either hand. Locked-finger-wrestling consists in opponents standing facing each other with arms extended upward, palms facing and opponents' fingers crossed. (Illus. 351.) The object of this exercise is to force your opponent to his knees by bending his wrists backward. It will develop strong fingers and forearm muscles. To lift a chair by the bottom rung is to grasp firmly with one hand the lower front rung and lifting the chair in its upright position. The tendency is for the chair to drop backward unless the hand grips tightly enough. All exercises or games of this kind will develop muscular tenacity.

CORRECTING SPECIAL DEFECTS IN CONJUNCTION WITH A GENERAL HYGIENIC PROGRAM.

One is frequently called upon to arrange an outline of exercises for a patient who cannot take regular

treatment, or follow out a progressive course of lessons. Out of city patients who are only in town for a few days are the ones likely to make such a demand. The most interesting case that ever applied to me for such advice was given the program below, which is introduced here as typical. For a patient with different defects the corrective procedures are selected to fit his needs, but the same general principles are followed.

In the case in mind the patient, a 15-year-old boy, presented round and narrow shoulders, narrow chest with an upper right rib depression resulting from pleurisy, a slight left dorsal scoliosis, and flabby abdominal muscles with a inclination to swayback. His general muscular condition was very flabby.

With the material available in preceding and in the present chapter, the reader could easily arrange the necessary program. The patient himself could select his own exercises. The last program given for the flabby-muscled individual would suit his general needs. To fill his special needs all necessary procedures are explained in Chapter V.

The problem was to select a number of exercises and arrange them as nearly as possible according to the Swedish day's order. The following program was made up and the patient was instructed to continue special work as long as his case demanded. When the corrections were made he was to discontinue special work and take up symmetrical work of the kind outlined in Chapter II. His parents were instructed to write me as soon as any defect seemed corrected and I would then advise what to do next.

1. Raise the arms sideways-upward while inhaling deeply, and at the same time rotate the trunk to the right. As you lower the arms, sideways-backward, rotate the trunk forward and breathe out slowly. The

trunk is rotated twice to the right to once to the left. The effect of rotation to the right is to expand the right upper chest more than the left, and the movement has a corrective effect on the depressed ribs. The elevation of the arms sideways-upward tends to produce lateral expansion of the chest and thus correct the narrow chest condition.

2. Alternate double arm extension sideways with left arm sideways and right arm upward. In four counts this movement is performed as follows. (1) Arms are bent forward, (2) they are extended sideways forcibly, (3) they are flexed, (4) they are extended with the left going sideways as in (2) and the right upward.

The effect of forcible extension sideways is to broaden the shoulders and chest, and that of combining the left sideways with the right upward is corrective of the left dorsal curvature.

3. Head rotation to the left and right. When the head is turned to the left bend it sideways-backward to elevate the right upper ribs.

4 (a) With the head turned to the left, fingers locked behind the head, keeping the elbows well back, bend the head and upper spine backward a few times.

The head turned to the left combined with backward flexion, tends to elevate the right ribs more than the left. The backward flexion in itself elevates all the ribs and supplies the chest. Keeping the elbows back in this movement reacts by correcting the round shoulders.

(b) For the purpose of relieving congestion of the back after any backward flexion one should always follow by bending the trunk forward. Therefore, in this case, to render this movement corrective of the spinal curvature as well as relieving of the congestion, place

the left hand on the hip and the right behind the head, as you flex forward from the hips a few times.

5. (a) Hang on a slightly inclined bar or trapeze, with the hands as far apart as possible, right hand higher than left, and flex the arms to pull the body up a few times. Keep the elbows well out to the sides instead of close to the body.

(b) If unable to pull the body up to arm flexion, or in addition to it, hang with the arms as far apart as possible, right hand higher than the left, and flex one or both knees up to the chest a few times.

(c) Whenever you have the chance, play hand-tag, climb trees, or exercise on traveling rings.

The purpose of keeping the hands far apart is to produce lateral expansion of the chest and shoulders. The same reason applies for keeping the elbows to the sides at arm flexion as well as to correct the round shoulders. Knee upward flexion tends to strengthen the abdominal muscles and also correct lordosis.

6. Arms sideways, shoulder high, palms turned up. Elevate them to vertical as you raise the legs sideways alternately.

Besides being a balance movement this exercise has a broadening effect on the chest.

7. Arms flexed forward, fling them sideways forcibly as you lunge forward, first with the left and then with the right foot.

The chief effect of this exercise is to expand the chest and correct the round shoulders.

8. Running out of doors, or rope-skipping, to get up a good circulation and a demand for oxygen, thus reacting on the lungs by causing rapid respiration.

9. Arms bent, flex the trunk forward from the hips. While holding this position, in one motion, extend the left arm upward and the right sideways at the same time. The right palm is turned upward. Continuing

the motion, elevate the right arm to vertical as you lower the left to horizontal and flex the arms again. Repeat a few times always to the same side.

The effect of this movement is corrective of the spinal curvature. Performed while the body is stooped forward with the head kept high, it is corrective of the round shoulders.

10. Lie on the back, arms resting on the floor back of the head. Elevate the legs to vertical a few times. Later, elevate them and lower them to one side, elevate them again and lower them to the other side, and so on. Various forms of leg elevations or movements may be introduced for variety.

The effect of this form of exercise is to strengthen the abdominal muscles, and thus support the viscera and correct swayback.

11. Standing with the feet apart, left hand on the hip, right hand behind the head, twist the trunk to the left and then to the right. When the trunk is turned to the left, bend the head and upper body to the left slightly.

The effect of this movement is to develop the transverse and oblique muscles of the abdomen, and thus strengthen nature's corset. By keeping the right hand back of the head while the left is on the hip, and especially by bending the upper spine to the left when the body is turned to the left, the right spinal muscles are extended more than the left and the movement is thus rendered corrective of the spinal curvature.

12. Arms held sideways at shoulder height, the feet apart. The right palm is turned upward while the left is kept downward. The trunk is bent to the left and then to the right alternately. As it is bent to the left the right arm is elevated and curled over the head, at the same time the head is turned to the left and bent slightly backward as it bends sideways with the

trunk. As the body bends to the right the right arm is lowered to a line with the shoulder and the left arm is kept in line with the left shoulder while the head is simply bent sideways with the trunk, without being rotated to the right.

The general effect of this movement is on the side and waist muscles. It taxes the lumbar muscles, and the lateral fibres of the oblique abdominal muscles. It tends to broaden the waist and the chest. Lifting the right arm over the head as the trunk bends to the right, is corrective of the spinal curvature. Turning the head to the left, and bending it slightly backward as the trunk bends to the left is corrective of the right upper rib depression.

The physiological effect of sideways bending is to hasten portal circulation and, thereby, assimilation. As the trunk bends to the right the liver is compressed, thus forcing the blood out of it, and at the same time the portal veins and their branches are extended and their paths straightened, thus reducing the friction of the blood on the walls of the vessels and easing its flow. As the trunk bends to the left the portal veins and their branches are slightly compressed, thus forcing the blood out of them, and at the same time the liver is expanded and its capacity increased and the blood is sucked into it. This entire process, by hastening portal circulation, keeps up a rapid exchange of blood in the intestinal region and thus aids digestion.

13. Practice antagonistic exercises or various exercises with an elastic or spring exerciser.

Details are not necessary here because the program preceding this one can be referred to for suggestions. Just such exercises as are given there were explained to the pupil for whom this program was made out.

14. Practice various forms of jumping; upward, forward, sideways. Upward jump with arms and legs

flung sideways particularly applies. (See Chapter II for various jumps.)

15. Repeat Exercise 1 of this program.

At the end of three months the boy's parents wrote that his spinal curvature was corrected. They were advised to omit those portions of the exercises that particularly applied to this defect. Thus the work was performed symmetrically, that is, the same movements were done to each side. But the head positions and movements corrective of the right upper rib depression were continued. It took over nine months to correct the rib defect. But the general musculature still lacked tone and the exercises on an elastic exerciser were continued. After over a year and a half of this program, the pupil was given an outline corresponding to those in Chapter II.

A FEW EXERCISES TO ARTICULATE AND LIMBER THE SPINE.

Every osteopath has had to treat patients whose spine was so rigid that it seemed almost hopeless to limber it enough to yield to treatment without hurting the patient. For such cases it is helpful to prescribe a few exercises that can be practiced at home daily to limber the spine. The following have been used with success. They are all exercises that occur at some time or other in a hygienic gymnastic program, but they will stand repetition in a group by themselves:

1. Arms extended upward, bend forward, touching the fingers to the floor if possible, without bending the knees. As you erect the trunk, keeping the spine limber, carry the arms backward and bend the head and trunk backward slightly. This is to be repeated several times.

2. Standing with the arms extended upward, twist the trunk to the left and bend forward, in relation to

the shoulders, until the hands nearly or quite touch the floor. In coming up from this movement, still keeping the body turned, carry the arms and upper body back and then, forward and down again. Repeat a few times and then practice the movement with the body turned to the right.

3. Lock the fingers behind the head, the elbows forward, forearms close to the sides of the face. Twist the trunk to the left and bend as far as possible forward (in relation to the way the shoulders are facing), and to the left, at the same time pulling hard on the head to limber the upper dorsal spine. Repeat with the trunk turned to the right.

4. Standing with the feet apart, arms straight out from the shoulders. Make the spine as limp as possible while still preserving an erect position, and rapidly twist the trunk from side to side. The head should turn as far as possible so that one can see around further than to the rear and thus give the entire spine a longitudinal twist.

5. Standing with the feet apart, arms extended upward, bend as far as possible to the left, carrying the head as far as possible to the left and curling the right arm over the head. Bend to the right in the same way. Keep the spine limp in this exercise in order to get all the lateral bend possible.

6. Arms straight out from the shoulders, heels together, bend forward from the hips and, keeping the body bent and the arms straight from the shoulders, twist the trunk to the right so that the left arm will point directly at the floor while the right arm is straight upward. (Illus 352.) In this position reach for the floor, touching it between the feet, or, if possible, outside the right foot. Still keeping the body bent forward, twist it to the left and reach for the floor with the right hand, and so on.

7. Hanging on a horizontal bar, the spine as limp as possible, swing the legs from side to side, reaching for the floor with the feet. While simply hanging limp, with vibration applied along the spine, much relaxation is produced.

OCCUPATIONAL GYMNASTICS.

This term is used as expressive of gymnastics for harmonious development that are designed to counteract the evil influences of one's occupation. All occupations have some influence upon health, be it good or bad. Many in themselves have an evil influence. Most forms of toil may be made to improve health through their effects upon the muscular system.

Whatever one's occupation may be, even though the entire muscular system is used, the exertion usually consists of a repetition of the same general motions. Thus all toil tends to produce one-sided development. To counteract this tendency one must vary his work, or make it bilateral, or practice some kind of exercise to counteract its one-sidedness.

For perfect health the body must be in perfect adjustment, each part with all the others, and if the daily occupation is such as to completely bring some portion out of co-operation with the rest, or to compress it and interfere with its normal functioning, there will result deformity.

The principle in corrective gymnastics illustrates what happens in one-sided work. If one set of muscles is weak its force is overbalanced by the muscles pulling in the opposite direction and the parts depending upon the antagonistic action of these two sets of muscles for support and posture become deformed or diseased. The shortened flexor muscles of the arm in oarsmen or wrestlers show a condition produced by over-contraction of these muscles and a neglect of their

antagonists, the extensors. Dr. Sargent cites an example of swimmers who begin in childhood and continue frequent swimming to advanced life and thus acquire a broad, flat hand which better serves as a propeller in water.

The abnormalities which it is possible to develop by one-sided muscular exertion give us a clue as to how they may be counteracted. It is needless to reiterate the principles of corrective gymnastics, therefore we shall limit ourselves to a few concrete examples.

Shovelling dirt is a healthy form of toil from the muscular standpoint. The fibers of the deltoid and trapezius muscles that lift the shoulder up and back, on the side of the forward hand, the flexors of the arm and the forearm muscles that flex the fingers, the extensors of the back and legs, and the rotators of the entire trunk are brought into forcible action. The extensor muscles of the rear arm, that is, the one at the handle, are used more than its flexors. It has been said with good reason that this form of toil is one of the most healthful. When not overdone it ranks with the old style form of hay pitching. But the shovel user always has a favorite side. Usually, if one is right-handed, the left hand grips the shovel along the shaft and the right hand holds the grip. The shovel is thus lifted toward, and sometimes above, the left shoulder, and the body is at the same time twisted to the left. To counteract the one-sidedness that may result from this the shovel should be carried as much with the right hand forward, left hand back, and lifted to the right, as it is to the left. Whether this is done by timing oneself or counting the lifts matters little, so each side is taxed equally. This would render shovelling a complete developer of the large and strong muscles.

But, for perfect physical development, it should be counteracted by light work preferably in the form of play. Shoveling is a slow and hard form of toil and produces slow, labored, clumsy movements, because it develops a muscle-bound condition. Relaxing exercises, free-standing home gymnastics, stretching exercises and games should be indulged in at every opportunity. Opportunities are abundant at present with the increasing number of playgrounds.

What is said about shoveling applies with equal force and little variation in pitching hay, swinging the sledge, chopping, hoeing and whatever other occupations require lifting or striking. Whatever the motion is, the opposite should be done to balance the effect of the effort and any game or corrective procedure that is indicated should be supplemented for the sake of health and physique.

It is needless to enumerate every form of toil in which the corrective principles may be applied, for the plan of procedure to counteract any abnormal development is plain.

The details given as necessary to develop a perfect physique may at times seem trifling, but remember Michael Angelo's statement to one of his visitors. He had been working a long time at a piece of sculpture which to his frequent visitor had seemed finished for many days. The visitor wondered why Angelo kept puttering away at it, touching it here, then there, and then all over again, never seeming quite satisfied with it, so he asked the sculptor why he wasted so much time on trifles which no beholder could ever discover. Angelo, who was too thorough to ever turn out a piece of work short of perfection, answered: "It is true that these are mere trifles, but trifles make perfection and perfection is no trifle."

APPENDIX

For the benefit of teachers of gymnastics who wish to make use of the movements described in Chapter II, the commands are given below. The descriptions of the movements alone do not suggest the best commands and unless one has made a study of Swedish gymnastics he is liable to confuse his pupils with inexact commands. Every teacher of gymnastics has some method of arranging his pupils for class work and we will not take up space for such explanations. The commands are given for the movements in the order they come in the lessons. A dash precedes and an exclamation point follows the words that are to be emphasized. The commands are given only once, or for one side. Since each movement is to be repeated at least three times to either side for developing effect, the reader will understand that a repetition of the same commands with the side indicated will suffice. If the hands, arms or feet are left out of fundamental position after a movement has been repeated a sufficient number of times, the command "Position!" should be given.

Lesson I.

1. "Head to the left (r)—turn! Forward—turn!"
2. "Head to the left (r)—bend! Upward—Stretch!"
3. "Hips—firm! Heels—lift! Heels—sink!"
4. "Arm elevation sideways with respiration—one! Two!"
5. "Hips—firm! Left foot sideways—place! Trunk to the left (r)—turn! Forward—turn! etc. Position!"
6. (a) "Hips—firm! Trunk backward—bend! Upward—stretch!" (b) "Trunk forward—bend! Upward—stretch! Position!"
7. "Arm extension upward and forward, in four counts—one! Two! Three! Four! etc. Position!"
8. "Hips—firm! Heels—lift! Knees—bend! Knees—stretch! Heels—sink! Position!"
9. "Alternate arm flinging forward-upward, beginning with the left—one! Two! etc. Position!"
10. "Hips—firm! Left foot sideways—place! Trunk to the left (r)—bend! Upward—stretch! etc. Position!"
11. "Arm elevation forward-upward with respiration—one! Two!"

Lesson II.

1. "Head backward—bend! Upward—stretch!"
2. "Heels—lift! Sink!"

3. "Arms upward—bend! Arm extension sideways with respiration—one! Two! Position!"

4. Prepare to jump—one! Two! Three! Four!"

5. "Hips—firm! Left (r) foot forward—place! Trunk to the left (r)—turn! Trunk forward—turn!"

6. As Lesson I.

7. "Arm extension sideways and backward—one! Two! Three! Four!"

8. "Hips—firm! Left (r) leg backward—lift! Sink!"

9. "Arms upward—stretch! Heels—lift! Upward—reach! Lowering the heels slowly—position!"

10. "Prepare to run! (This means to bend the forearms along the chest, fingers curled upward, and at the same time rise on the toes.) In place—run! Halt! Or, in place—walk! In a gymnasium class it should be: 'Double quick—march!' after 'Prepare to run!'"

11. "Arms sideways—lift! Palms upward—turn! Turn them down again! Repeat with count—one! Two!"

12. "Lie on your back! Arms upward—stretch! Left (r) knee upward—bend! Upward—stretch! Leg sink!" To bring the pupils to position: "Place the hands under the small of the back—push against the floor as you come up to sitting. Cross the legs and spring up to—position!"

13. "Hips—firm! Trunk to the left (r)—bend! Upward—stretch!"

14. "Upward jump—one! Two! Three! Four! Five!"

15. "Arms forward—bend! Arm flinging sideways slowly with respiration—one! Two! Position!"

LESSON III.

1. "Hips—firm! Left foot sideways—place! Heels—lift! Sink! The same—one! Two! etc. Position!"

2. "Arms upward—bend! Alternate extension upward, beginning with the left—one! Two! etc. Position!"

3. As Exercise 14, Lesson II.

4. (a) "Hips—firm! Left foot sideways—place! Trunk to the left (r)—turn! Keeping it turned, trunk backward—bend! Upward—stretch! etc. Trunk forward—turn!"

(b) Going on from (a), "Trunk forward—bend! Upward—stretch! etc. Position!"

5. "Hips—firm! Feet—close! Left (r) foot forward—place! Heels—lift! Sink! etc. Position!"

6. "Arms forward—bend! Arm flinging sideways forcibly—one! Two!"

7. "Prepare to run. In place—run! Halt! (See Exercise 10, Lesson II.) Position!"

8. "Hips—firm! Trunk half-forward—bend! Head to the left (r)—turn! Forward—turn! etc. Trunk upward—stretch! Position!"

9. "Lie on your back! Arms upward—stretch! Left (r) leg upward—lift! Sink!" (Back to position as Exercise 12, Lesson II.)

10. "Hips—firm! Feet—close! Trunk to the left (r)—bend! Upward—stretch! etc. Position!"

11. "Hips—firm! Heels—lift! Stride jump—begin—one! Two! etc. Stop! Heels—sink! Position!"

12. "Arm elevation sideways-upward, with respiration—one! Two! etc."

LESSON IV.

1. "Hips—firm! Left (r) foot sideways-forward—place! Change feet—one! Two!" etc.

2. "Arms upward—bend! Arm extension sideways slowly with the palms turned up, inhaling as they go out—one! Two! Position!"

3. Prepare to jump—one! Two! Three! Four!"

4. (a) "Hips—firm! Trunk to the left (r)—turn! Keeping it turned, trunk backward—bend! Upward—stretch!" etc.

(b) "Trunk forward—bend! Upward—stretch! etc. Position!"

5. "Arms upward—bend! Trunk to the left (r)—turn! Arm extension sideways—one! Two! etc. Trunk forward—turn! Position!"

6. "Hips—firm! Alternate heel and toe elevation—one! Two! etc. Position!"

7. "Arms upward—bend! Arm extension sideways forcibly, palms turned up—one! Two! etc. Position!"

8. (As Exercise 10, Lesson II.)

9. "Arms sideways—lift! Trunk half-forward—bend! Head to the left (r)—turn! Head forward—turn! etc. Trunk upward—stretch! Position!"

10. "Heels—lift! Knees—bend! Place the hands on the floor, fingers inward, elbows inside the knees. Feet backward—place! Feet forward—place! etc. Position!"

11. "Hips—firm! Left (r) foot forward—place! Trunk to the left (r)—bend! Upward—stretch! etc. Position!"

12. "Forward jump—one! Two! Three! Four! Five!"

13. "Arm elevation sideways slowly with heel elevation and respiration—one! Two!"

LESSON V.

1. "Arms upward—bend! Alternate arm extension sideways, palms turned up, beginning with the left—one! Two! etc. Position!"

2. "Prepare to jump—one! Two! Three! Four!"

3. "Arms sideways—lift! Palms upward—turn! Arm elevation with heel elevation and respiration—one! Two! etc. Position!"

4. "Hips—firm! Feet—close! Left (r) foot forward—place! Trunk to the left (r)—turn! Forward—turn! etc. Position!"

5. (a) "Arms sideways—lift! Left (r) foot sideways-forward—place! Trunk to the left (r)—turn! Keeping it turned, trunk backward—bend! Upward—stretch! etc. Trunk forward—turn! Position!"

(b) "In one movement, left foot sideways place and arms upward—stretch! Trunk forward—bend! Upward—stretch! Position!"

6. "Arms upward—bend! Trunk to the left (r)—turn! Arm extension upward—one! Two! etc. Position!"

7. "Hips—firm! Heels—lift! Head to the left (r)—turn! Forward—turn! etc. Heels—sink! Position!"

8. "Double arm flinging forward-upward—one! Two!"

9. "Prepare to run! In place—run!" Or, "Double quick—march! Halt! Position!"

10. "Arms sideways—lift! Trunk half-forward—bend! Palm turning forward-upward—one! Two! etc. Trunk upward—stretch! Position!"

11. (As Exercise 10, Lesson IV.)

12. "Hips—firm! Feet—close! Left (r) foot forward—place! Trunk to the left (r)—bend! Upward—stretch! etc. Change feet—one! Two! etc. Position!"

13. With 90° turn to the left, (r) upward jump—one! Two! Three! Four! Five!"

14. Arm elevation forward-upward with heel elevation and respiration—one! Two!"

LESSON VI.

1. "Arm elevation sideways-upward with heel elevation and respiration—one! Two!"

2. "Arms forward—bend! Arm swimming—one! Two! Three! etc. Position!"

3. "Prepare to jump—one! Two! Three! Four!"

4. "Feet—close! Arms sideways—lift! Trunk to the left (r)—turn! Forward—turn! etc. Position!"

5. (a) "Feet—close! Arms sideways—lift! Left (r) foot forward—place! Trunk backward—bend! Upward—stretch! etc. Position!" (b) [As (b), Exercise 5, Lesson V.]

6. "Arms upward—bend! Trunk to the left (r)—turn! Arm extension upward and forward—one! Two! Three! Four! etc. Trunk to the right—turn! etc. Trunk forward—turn! Position!"

7. "Arms sideways—lift! Heels—lift! Head to the left (r) turn! Forward—turn! etc. Heels—sink! Position!"

8. "Left arm upward and right arm sideways stretch—one! Two! Change arms—one! Two! etc. Position!"

9. (As Exercise 9, Lesson V.)

10. "Arms sideways—lift! Trunk half-forward—bend! Palm turning forward-upward—one! Two! etc. Trunk upward—stretch! Position!"

11. (As Exercise 11, Lesson V.)

12. "Hips—firm! Left foot sideways—place! Trunk to the left (r)—turn! Trunk to the left (r)—bend! Upward—stretch! etc. Trunk forward—turn! Position!"

13. "Sideways jump—one! Two! Three! Four! Five!"

14. "Arms forward—bend! Fling them sideways slowly, as you place the left (r) foot forward and breathe in—one! Two! Right foot forward, three! Four! etc. Position!"

LESSON VII.

1. "Arm elevation forward-upward with heel elevation and respiration—one! Two!

2. "Hips—firm! Feet—close! Alternate foot placing forward with heel elevation, beginning with the left—one! Two! Three! Four! Five! Six! Seven! Eight! etc. Position!"

3. "Arms upward—bend! Arm extension sideways, palms turned up—one! Two! etc. Position!"

4. "Arms sideways—lift! Trunk to the left (r)—turn! Forward—turn! etc. Position!"

5 (a) "Arms sideways—lift! Left foot sideways—place! Trunk backward—bend! Upward—stretch!" etc.

(b) (Continuing with the feet apart.) "Arms upward—stretch! Trunk forward—bend! Upward—stretch! etc. Position!"

6. "Neck—firm! Heels—lift! Sink! etc. Position!"

7. "Arms forward—bend! Trunk half-forward—bend! Arm flinging sideways—one! Two! etc. Trunk upward—stretch! Position!"

8. "Prepare to run! Double quick—march! Halt! Position!" (The running in class work is only one of the maneuvers of marching.)

9. "Arms upward—bend! Trunk half-forward—bend! Arm extension sideways and backward—one! Two! Three! Four! etc. Trunk upward—stretch! Position!"

10. "Stoop-fall position—one! Two! Head to the left (r)—turn! To the right (left)—turn! etc. Position!—one! Two!"

11. "Hips—firm! Left (r) foot forward—place! Trunk to the left (r)—turn! Trunk to the left—bend! Upward—stretch! etc. Trunk forward—turn! Change feet—one! Two!" [Repeat to the right (left).] Position!"

12. "Arms upward—bend! Trunk to the left (r)—turn! Arm extension sideways and upward—one! Two! Three! Four! etc. Trunk forward—turn! Position!"

13. "Hips—firm! Left (r) foot forward—place! Heels—lift! Change feet jumping, begin—one! Two! etc. Stop! Heels—sink! Position!"

14. "Arms upward—bend! Feet—close! Trunk to the left (r)—turn! Arm extension sideways slowly, palms turned up, with respiration—one! Two! Trunk forward—turn! Position!"

LESSON VIII.

1. "Arms forward—bend! Feet—close! Trunk to the left (r)—turn! Arm flinging sideways slowly, with respiration—one! Two! Trunk forward—turn! Position!"

2. "Hips—firm! Left (r) foot crosswise-forward—place! Heels—

lift! Sink! etc. Change feet—one! Two! Heels—lift! Sink! Position!"

3. "Arms sideways—lift! Palm turning upward—one! Two! Position!"

4. "Arms sideways—lift! Left (r) foot sideways-forward—place! Trunk to the left (r)—turn! Forward—turn! Change feet—one! Two! etc. Position."

5. (a) "Right hand on the hip, left arm upward stretch—one! (Both arms bend upward)—two! (The left arm goes up while the right grasps the hip). Right foot forward—place! Trunk backward—bend! Upward—stretch! Change arms and feet—one! Two! etc. Position!"

(b) "Arms upward—stretch! Trunk forward—bend! Upward—stretch! Position!"

6. "Arms upward—bend! Trunk to the left (r)—turn! Arm extension sideways and backward—one! Two! Three! Four! Trunk forward—turn! Position!"

7. "Neck—firm! Left foot sideways—place! Heels—lift! Sink! Position!"

8. "Arms forward—lift! Arms flinging sideways—one! Two! Position!"

9. (As above for running.)

10. "Arms forward—bend! Trunk half-forward—bend! Arm swimming—one! Two! Three! Trunk upward—stretch! Position!"

11. "Lie on your back. Arms upward—stretch! Grasp! Knees upward—bend! Knees upward—stretch! Slowly, legs sink! Position! One! Two!" (See Exercise 12, Lesson II.)

12. "Hips—firm! Left (r) foot sideways-forward—place! Trunk to the left—turn! Trunk to the left (r)—bend! Upward—stretch! Change feet—one! Two! etc. Position!"

13. "Arms flung sideways, upward jump—one! Two! Three! Four! Five!"

14. "Arms forward—bend! Trunk to the left (r)—turn! Arm flinging sideways slowly with respiration—one! Two! Trunk forward—turn! Position!"

LESSON IX.

1. "Arms forward—bend! Arm flinging sideways slowly with respiration—one! Two! Position!"

2. "Arms upward—bend! Left (r) arm upward and right (l) arm sideways—stretch! Change arms—one! Two! etc. Position!"

3. "Prepare to jump—one! Two! Three! Four!"

4. "Arms sideways—lift! Left (r) foot forward—place! Trunk to the left (r)—turn! Forward—turn! etc. Change feet—one! Two! etc. Position!"

5. (a) Left foot sideways—place! Left (r) arm upward stretch and right (l) hand hip firm—one! Two! Trunk to the left (r)—turn!

Trunk backward—bend! Upward—stretch! etc. Trunk forward—turn! Change arms—one! Two! Trunk to the right (l)—turn! etc. Position!

(b) As (b), Exercise 5, Lesson VIII.

6. "Arms upward—bend! Trunk to the left (r)—turn! Arm extension forward and upward—one! Two! Three! Four! etc. Position."

7. "Neck—firm! Feet—close! Left (r) foot forward—place! Heels—lift! Sink! etc. Change feet—one! Two! etc. Position!"

8. "Arms sideways—lift! Arm flinging forward—one! Two! Position!"

9. As given above for running.

10. "Arms upward—bend! Trunk half-forward—bend! Left arm upward and right arm sideways—stretch! Change arms—one! Two! etc. Arms—bend! Trunk upward—stretch! Position!"

11. "Lie on your back! Neck—firm!" The rest is as for Exercise 9 Lesson VIII.

12. "Hips—firm! Trunk to the left (r)—turn! Trunk to the left (r)—bend! Upward—stretch! Trunk to the right—turn! etc. Forward—turn! Position!"

13. "Arms and legs flung sideways, upward jump—one! Two! Three! Four! Five!"

14. "Feet—close! Trunk to the left (r) turn! Arm elevation forward-upward with respiration—one! Two!"

LESSON X.

1. "Arms upward—bend! Arm extension sideways slowly, palms turned up, with respiration—one! Two! Position!"

2. "Hips—firm! Heels—lift! Head rotation to the left and right—one! Two! Heels—sink! Position!"

3. "Hips—firm! Left foot sideways-forward—lunge! Change feet—one! Two! etc. Position!"

4. "Feet—close! Arms sideways—lift! Left foot forward—place! Trunk to the left—turn! Forward—turn! Change feet—one! Two! etc Forward—turn! Position!"

5. (a) "Arms upward—bend! Trunk backward—bend! Arm extension sideways—one! Two! etc. Trunk upward—stretch! Position!" (b) As (b), Exercise 5, Lesson VIII.

6. "Arms upward—bend! Trunk to the left (r)—turn! Arm extension forward and sideways—one! Two! Three! Four! etc. Position!"

7. "Hips—firm! Heel elevation and knee flexion to sitting position—one! Two! Three! Four! Position!"

8. "Arms upward—bend! Trunk half-forward—bend! Arms forward—stretch! Arm flinging upward—one! Two! etc. Arms—bend! Trunk upward—stretch! Position!"

9. As for running in above lessons.

10. "Arms upward—bend! Left foot sideways—place! Trunk half-forward—bend!" Remainder of command as Exercise 10, Lesson IX.

11. "Stoop fall position—one! Two! Foot placing forward and backward—one! Two! etc. Position—one! Two!"

12. "Hips—firm! Feet—close! Trunk to the left (r)—turn! Trunk to the left (r)—bend! etc. Trunk to the right (l)—turn! etc. Trunk forward—turn! Position!"

13. "Half-step forward jump—one! Two! Three! Four!"

14. "Feet—close! Trunk to the left (r)—turn! Arm elevation sideways-upward with respiration—one! Two!"

LESSON XI.

1. "Arms sideways—lift! Palms upward—turn! Arm elevation with respiration—one! Two! Position!"

2. As Exercise 1, Lesson I.

3. "Hips—firm! Left foot forward—lunge! Change feet—one! Two! etc. Position!"

4. "Feet—close! Arms sideways—lift! Left (r) foot forward—place! Trunk to the left (r)—turn! Forward—turn! etc. Change feet—one! Two! etc. Position!"

5. (a) "Arms upward—bend! Left foot sideways—place!" The rest of (a) and (b) like Exercise 5, Lesson X.

6. "Left foot sideways—place! Trunk to the left (r)—turn! Arm extension forward, upward, sideways and backward—one! Two! Three! Four! Five! Six! Seven! Eight! etc. Trunk to the right (l)—turn! Repeat with count—etc. Trunk forward—turn! Position!"

7. "Arms upward—stretch! Heels—lift! Reach upward! Arms bend and heels sink! etc. Position!"

8. "Arms sideways—lift! Trunk half-forward—bend! Arm flinging forward and sideways—one! Two etc. Trunk upward—stretch! Position!"

9. As for running in above lessons.

10. "Arms upward—bend! Trunk half-forward—bend! Alternate arm extension sideways, palm turned up, beginning with the left—one! Two! etc. Trunk upward—stretch! Position!"

11. "Hips—firm! Heels—lift! Knees—bend! Kneel! Trunk backward—incline! Upward—stretch! etc. Sit back on the heels and spring up to—position!"

12. "Hips—firm! Left foot sideways—lift! Grasp! (At stall-bars the foot is hooked between two wrungs.) Trunk to the right—bend! Upward—stretch! Left foot—sink! About—face! Right foot sideways—lift! etc. Position!"

13. "Hips—firm! Heels—lift! Hop forward—begin! Stop! Heels—sink! Position!"

14. "Arms sideways—lift! Arm circumduction with respiration—one! Two! etc. Position!"

LESSON XII.

1. "Arm elevation forward-upward with respiration—one! Two!"

2. "Alternate arm flinging forward-upward, beginning with the left—one! Two! etc. Position!"

3. "Hips—firm! Feet—close! Left foot forward—lunge! Change feet—one! Two! etc. Position!"

4. "Arms sideways—lift! Heels—lift! Knees—bend! Kneel! Trunk to the left—turn! To the right—turn! etc. Forward—turn! Sit back on the heels and spring up to—Position!"

5. (a) "Arms upward—stretch! Left foot forward—place! Trunk backward—bend! Upward—stretch! Change feet—one! Two! etc. Position!"

(b) As given above.

6. "Arms upward—bend! Left foot forward—place! Trunk to the left—turn! Arm extension sideways—one! Two! Trunk forward—turn! Change feet—one! Two! Trunk to the right—turn! etc. Position!"

7. "Feet close! Arms upward—stretch! Heels—lift! Reach! Heels—sink! Position!"

8. "Arms sideways—lift! Arms half-forward—bend! Arm flinging upward—one! Two! etc. Position."

9. As given above.

10. "Arms upward—stretch! Trunk half-forward—bend! Arm extension upward—one! Two! Trunk upward—stretch! Position!"

11. "Lie on your back! Neck—firm! Left leg upward—lift! Sink! Right leg—lift! Sink! etc. Place the hands under the small of the back. Push up to—sitting! Cross the legs and spring up to—Position!"

12. "Left arm upward, stretch, and right hand hip—firm! Trunk to the right—bend! Upward—stretch! Change arms—one! Two! etc. Position!"

13. "Hips—firm! Left leg backward—lift! Heel—lift! Toe hopping—begin! Stop! Heel—sink! Change feet—one! Two! etc. Position!"

14. "Arms forward—bend! Trunk to the left—turn! Arm flinging sideways slowly with respiration—one! Two! etc. Trunk to the right—turn! etc. Position!"

LESSON XIII.

1. "Arm elevation sideways with knee flexion and respiration—one! Two!"

2. "Arms sideways—lift! Arm flinging forward—one! Two! Position!"

3. "Prepare to jump—one! Two! Three! Four!"

4. "Neck—firm! Left foot sideways—place! Trunk to the left—turn! Forward—turn! To the right—turn! Forward—turn! Position!"

5. (a) "Feet—close! Arms upward—stretch! Left foot forward—place! Trunk backward—bend! Upward—stretch! etc. Change feet—one! Two! etc. Position!"

(b) "Arms upward—stretch! Trunk to the left—turn! Trunk forward—bend! Upward—stretch! Trunk to the right—turn! etc. Position!"

6. "Arms upward—bend! Feet—close! Left (r) foot forward—place! Trunk to the left (r)—turn! Arm extension upward—one! Two! etc. Trunk forward—turn! Change feet—one! Two! etc. Position!"

7. "Feet—close! Arms upward—stretch! Left foot forward—place! Heels—lift! Sink! etc. Change feet—one! Two! etc. Position!"

8. "Arms upward—bend! Left foot sideways—place! Trunk half-forward—bend! Arm extension upward—one! Two! etc. Trunk upward—stretch! Position!"

9. As given for running in above lessons.

10. "Arms upward—stretch! Trunk half-forward—bend! Arm elevation—one! Two! Trunk upward—stretch! Position!"

11. "Hips—firm! On the left—kneel! Trunk backward—incline! Upward—stretch! etc. Change knees—one! Two! etc. Position!"

12. "Right hand hip firm and left arm upward stretch—one! Two! Trunk to the right—bend! Upward—stretch! Change arms—one! Two! etc. Position!"

13. "One hundred and eighty degrees turn, upward jump—one! Two! Three! Four! Five!"

14. "Left foot sideways—place! Trunk to the left—turn! Arm elevation sideways with respiration—one! Two! Trunk to the right—turn! etc. Trunk forward—turn! Position!"

LESSON XIV.

1. "Arm sideways—lift! Palms upward—turn! Arm elevation with knee flexion and respiration—one! Two! Position!"

2. "Hips—firm! Alternate foot placing forward with heel elevation, beginning with the left—one! Two! Three! Four! Five! Six! Seven! Eight! Position!"

3. "Left arm upward and right arm sideways—stretch! Right palm upward—turn! Arm elevation—one! Two! Position!"

4. "Neck—firm! Heels—lift! Knees—bend! Kneel! Trunk to the left—turn! To the right—turn! etc. Forward—turn! Sit back on the heels and spring up to—Position!"

5. (a) "Left foot sideways—place! Arm upward—stretch! Trunk to the left—turn! Trunk backward—bend! Upward—stretch! etc. Trunk to the right—turn! etc. Trunk forward—turn!"

(b) Continuing from (a), "Trunk to the left—turn! Trunk forward-downward—bend! Upward—stretch! etc. To the right—turn! etc. Trunk forward—turn! Position!"

6. "Arms upward—bend! Feet—close! Left foot forward—place! Trunk to the left—turn! Arm extension sideways—one! Two! etc. Trunk forward turn! Change feet—one! Two! Trunk to the right—turn! etc. Trunk forward—turn! Position!"

7. "Hips—firm! Left foot forward—place! Heel elevation and knee flexion—one! Two! Three! Four! Change feet—one! Two! etc. Position!"

8. "Left foot sideways—place! Arms upward—bend! Trunk half-forward—bend! Arms forward—stretch! Arm flinging sideways—one! Two! Arms—bend! Trunk upward—stretch! Position!"

9. As given in above lessons for running.

10. "Arms upward—bend! Trunk half-forward—bend! Left arm upward, right arm sideways, palm turned up—stretch! Arm elevation—one! Two! Arms—bend! Trunk upward—stretch! Position!"

11. Pupils facing stall-bars or facing each other in two lines. Command is given to one line. "Sit on the floor! Feet—grasp! Trunk backward—stretch! Upward—bend! etc. Cross the feet and spring up to—Position!"

12. "Feet close! Left hand hip firm and right arm upward—stretch! Left foot forward—place! Trunk to the left—bend! Upward—stretch! etc. Change arms and feet—one! Two! etc. Position!"

13. "Hips—firm! Left foot sideways—place! Heels—lift! Heel-striking stride jump—one! Two! etc. Heels sink! Position!"

14. "Arms upward—bend! Left foot sideways—place! Trunk to the left (r)—turn! Arm extension sideways, palms turned up, with respiration—one! Two! Trunk forward—turn! Position!"

LESSON XV.

1. "Head backward—bend! Upward—stretch!" "Head to the left bend! Upward—stretch! To the right—bend! Upward—stretch!"

2. "Heels—lift! Sink!"

3. "Arms upward—bend! Arm extension upward with lungeing forward alternately, first with the left foot, and then the right—one! Two! Three! Four! etc. Position!"

4. "Prepare to jump—one! Two! Three! Four!"

5. "Arm elevation sideways-upward with heel elevation and respiration—one! Two!"

I. (a) Class lined up back to wall or stall-bars, or in double line, rear line to support. "Arms upward—stretch! Trunk backward—bend! Grasp! Heels—lift! Sink! etc. Upward—stretch! Position!"

(b) "Left foot sideways—place! Arms upward—stretch! Trunk forward-downward—bend! Upward—stretch! Position!"

II. Pupils facing bars: "Under grasp—grasp! Arms bend! Stretch! etc! Position!"

III. (a) "Hips—firm! Leg circling beginning with the left—one! (Raise the leg forward) Two! (Circle it and bring it forward at "one!" etc.) Change feet—one! Two! etc. Position!"

(b) "Hips—firm! Left foot crosswise-forward—place! Heel elevation and knee flexion—one! Two! Three! Four! etc. Change feet—one! Two! etc. Position!"

IV. (a) "Arms forward—lift! Arm flinging sideways—one! Two! Position!"

(b) "Arms sideways—lift! Arms half-forward—bend! Arm flinging upward—one! Two! etc. Position!"

V. As explained in above lessons for running.

VI. "Arms upward—bend! Trunk half-forward—bend! Arm extension upward slowly—one! Two! Trunk upward—stretch! Position!"

VII. "Stoop-fall position—one! Two! Alternate leg elevation beginning with the left—one! Two! Three! Four! Feet forward—place! Position!"

VIII: "Arms upward—stretch! Left foot forward—place!' Trunk to the left—turn! Forward—turn! etc. Change feet—one! Two! etc. Position!"

IX. "Side-fall position on the left hand—one! Two! Three! Leg elevation—one! Two! etc. Change hands—one! Two! etc. Forward—turn! Feet forward—place. Position!"

X. "Arms upward—stretch! Heels—lift! Slow walking forward—one! Two! etc. Backward—one! Two! etc. Heels—sink! Position!"

XI. (a) (Class lined in single file and take turns running and walking as teacher directs.)

(b) "Twice upward jump—one! Two! Three! Four! Five! Six!"

XII. "Arms forward—bend! Arm flinging sideways slowly with slow marching forward, beginning with the left foot—one! Two! etc. About—face! The same, beginning with the right foot—one! Two! Position!"

LESSON XVI.

1. "Neck—firm Heels—lift! Sink! Position!"

2. "Arms forward—bend! Arm flinging sideways with lungeing forward beginning with the left—one! Two! Three! Four! Position!"

3. (As given above.)

4. "Arms upward—bend. Arm extension sideways, palms turned up—one! Two! Position!"

5. "Arm elevation forward-upward with respiration—one! Two!"

I. (a) "Arms upward—stretch! Trunk backward—bend! Grasp! Left knee upward—bend! Stretch! Right knee—bend! Stretch! Trunk upward—stretch!"

(b) [Continuing from (a).] "Trunk forward-downward—bend! Upward—stretch! Position!"

II. (a) Class in single file, take turns at traveling rings.

(b) Class facing horizontal bar, chest high. "Over grasp—grasp! Feet forward—place! Arms—bend! Stretch! Position!"

III. "Neck—firm! Heels—lift! Left leg backward—lift! Sink! Right leg—lift! Sink! etc. Heels—sink! Position!"

IV. "Arms upward—stretch! Trunk half-forward—bend! Lower the arms forward. Arms upward—fling! Lower them again. The same with count—one! Two! etc. Trunk upward—stretch! Position!"

V. For running, as given above. "Hips—firm! Heels—lift! Knees—

bend! Sit! Hopping forward—start! Stop! Knees—stretch! Heels—sink! Position!"

VI. "Lie face down. Feet—grasp! Arms upward—bend! Trunk upward—bend! Arm extension sideways, palms turned up—one! Two! Trunk—sink! Place the hands on the floor, fingers turned inward. Arms—stretch! Feet forward—place! Position!"

VII. "Hips—firm! Heels—lift! Knees—bend! Kneel! Trunk backward—incline! Upward—stretch! Sit back on the heels and spring up to—position!"

VIII. "Neck—firm! Feet—close! Left foot forward—place! Trunk to the left—turn! Forward—turn! etc. Change feet—one! Two! etc. Position!"

IX. "Arms upward—stretch! Trunk to the left—bend! Upward—stretch! To the right—bend! Upward—stretch! Position!"

X. "Over grasp—grasp! Knees upward—bend! Alternate knee extension forward, beginning with the left—one! Two! etc. Knees downward—stretch! Position!"

XI. "Jump to opposite sides, first to the right—one! Two! Three! Four! Five! Six!"

XII. "Arm elevation sideways-upward with heel elevation and respiration—one! Two!"

LESSON XVII.

1. "Heels—lift! Sink!"

2. "Hips—firm! Alternate leg elevation sideways, beginning with the left—one! Two! Three! Four! Position!"

3. "Arms forward—bend! Arm flinging sideways with alternate lungeing forward, beginning with the left—one! Two! Three! Four! Position!"

4. "Arm elevation sideways with palm turning upward, heel elevation and respiration—one! Two!"

I. (a) "Arms upward—stretch! Trunk backward—bend! Travel downward—one! Two! etc. Travel up again—one! Two! etc. Trunk upward—stretch! Position!"

(b) "Arms upward—stretch! Left foot forward—place! Trunk forward-downward—bend! Upward—stretch! Change feet—one! Two! etc. Position!"

II. "Over grasp—grasp! Feet forward—place! Feet backward—place! etc. Position!"

III. "Arms sideways—lift! Palms upward—turn. Arm elevation with heel elevation and leg elevation sideways, beginning with the left—one! Two! Three! Four! Position!"

IV. "Hips—firm! Left foot sideways-forward—lunge! Arms forward—lift! Arm flinging sideways—one! Two! etc. Hips—firm! Change feet—one! Two! (The same arm movement.) Hips—firm! Position!"

V. As given above for running.

VI. "Lie face down. Feet—grasp! Arms upward—bend! Trunk upward—bend! Arm extension upward—one! Two! etc. Trunk—sink! Place the hands on the floor, fingers inward. Push up to stoop fall. Feet forward—place! Position!"

VII. From the above movement, instead of coming to stoop fall the pupils might be commanded to: "Turn over! Neck—firm! Legs upward—lift! Sink! etc. Place the hands under the small of the back. Push up to—sitting! Cross the legs and spring up to—position!"

VIII. "Feet—close! Arms upward—stretch! Left foot forward—place! Trunk to the left—turn! Forward—turn! Change feet—one! Two! etc. Position!"

IX. "Arms upward—bend! Left foot sideways—place! Trunk flexion alternately to the left and then to the right, with arm extension—one! Two! Three! Four! Position!"

X. Pupil at the parallel bars: "Balance hang—hang! Arms—bend! Stretch! etc. Position!"

XI. Class in line to follow in turn as directed.

XII. "Arms forward—bend! Arm flinging sideways slowly, with half-step sideways-forward and respiration—one! Two! Position!"

LESSON XVIII.

1. "Arm elevation sideways with heel elevation and respiration—one! Two!"

2. "Hips—firm! Left leg backward—lift! Sink! Right leg—lift! Sink! Position!"

3. "Left arm upward, right arm sideways—stretch! Change arms—one! Two! etc. Left arm upward, right forward—one! Two! etc. Left arm sideways, right arm forward—one! Two! etc. Position!"

4. As given in preceding lessons.

I. (a) and (b) as in preceding lesson.

II. Class in line taking turns to do as commanded.

III. "Hips—firm! Horizontal half-standing position on the left foot. Right leg backward—lift! Arch the body from head to foot! Right leg—sink! Left leg backward—lift! etc. Position!"

IV. "Arm flinging forward-upward with lungeing forward alternately, beginning with the left foot—one! Two!"

V. As given above for running.

VI. "Lie face down. Feet—grasp! Neck—firm; Trunk upward—bend! Forward—sink!"

VII. Continuing from the above: "Place the hands on the floor, fingers inward. Push up to stoop fall! Feet through the hands—place! Feet backward—place! etc. Feet forward—place! Position!"

VIII. "Arms sideways—lift! Left foot sideways—place! Rapid trunk rotation to the left and right—one! Two! etc. Trunk forward—turn! Position!"

IX. "Side fall position on the left hand—one! Two! Three! Right arm upward—stretch! Arm and leg elevation—one! Two! etc.

Change sides—one! Two! Left arm upward—stretch! etc. Trunk forward—turn! Feet forward—place! Position!"

X. "Over-grasp—grasp! Legs forward—lift! Sink! Position."

XI. "Ninety degrees turning to the left, upward jump—start! Stop! The same to the right—start! Stop! Position!"

XII. "Arms sideways—lift! Palms upward—turn! Arm elevation with heel elevation and respiration—one! Two! Position!"

LESSON XIX.

1. "Arm elevation forward-upward with respiration—one! Two!"

2. "Hips—firm! Left leg sideways—lift! Sink! Right leg—lift! Sink! Position!"

3. "Arm swimming—one! (At one the arms are bent forward.) Two! Three! (Two and three are run together as the arms are carried forward and sideways.) Position!"

4. As Exercise III, Lesson XVIII.

I. (a) "Arms upward—bend! Trunk backward—bend! Arm extension sideways—one! Two! Trunk upward—stretch! Position!"

(b) "Arms upward—stretch! Trunk forward-downward—bend! Touch the floor! Upward—stretch! Position!"

II. At the teacher's discretion.

III. "Arms forward—bend! Horizontal half-standing position on the left foot. Right leg backward—lift! Arm swimming—one! Two! Three! etc. Right leg—sink! Left leg backward—lift! etc. Sink! Position!"

IV. "Hips—firm! Left foot sideways-forward—lunge! Trunk to the left—turn! Arms forward—lift! Arm flinging sideways—one! Two! etc. Hips—firm! Trunk forward—turn! Change feet—one! Two! etc. Position!"

V. Running as explained above. Low down dance: "Arms forward—lift! Heels—lift! Knees—bend! Right knee forward—stretch! Change feet jumping—start! Stop! Knees—stretch! Heels—sink! Position!"

VI. "Arms upward—bend! Horizontal half-standing position on the left foot right leg backward—lift! Arms sideways—stretch! Palms upward—turn! Arm elevation—one! Two! Arms—bend! Right leg—sink! Left leg backward—lift! etc. Left leg—sink! Position!"

VII. "Stoop fall position—one! Two! Left leg—lift! Arms—bend! Stretch! Left leg—sink! Right leg—lift! etc. Feet forward—place! Position!"

VIII. "Feet—close! Arms sideways—lift! Trunk rotation rapidly to the left and right—one! Two! etc. Trunk forward—turn! Position!"

IX. (a) "Hips—firm! Trunk flexion sideways with opposite leg elevation, first to the left—one! Two! Position!"

(b) "Right (l) foot sideways and arms sideways—lift! Trunk flexion to the left (r)—one! Two! etc. Position!"

X. "Balance hang—hang! Horizontal lever trunk forward—bend!

Legs in line with the body. Trunk upward—stretch! Position! or, 'Spring off!'"

XI. (a) At teacher's discretion.

(b) "Sideways-forward jump, first to the left—one! Two! Three! Four!"

XII. "Arm elevation forward-upward with trunk rotation and heel elevation, first to the left—one! Two! Three! Four!"

LESSON XX.

1. "Head to the left—turn! Forward—turn! To the right—turn! etc. Head backward—bend! Upward—stretch!"

2. "Arms upward—stretch! Left foot sideways—place! Heel elevation and knee flexion—one! Two! Three! Four! Position!"

3. "Arms upward—bend! Left arm upward, right arm downward, stretch, and left foot sideways-forward—lunge! Change arms and feet—one! Two! etc. Position!"

4. "Arm elevation forward-upward with heel elevation and respiration—one! Two!"

I. (a) "Neck—firm! Left foot sideways—place! Trunk to the left—turn! Trunk backward—bend! Upward—stretch! etc. Trunk to the right—turn! etc. Trunk forward—turn! Position!"

(b) "Arms upward—stretch! Trunk to the left—turn! Trunk forward-downward—bend! Upward—stretch! Trunk to the right—turn! etc. Trunk forward—turn! Position!"

(a)' "Arms upward—stretch! Left foot sideways—place! Trunk backward—bend! Place the hands on the floor! Upward—stretch! Position!"

(b)' "Arms upward — stretch! Trunk forward-downward — bend! Touch the palms to the floor! Trunk upward—stretch!"

II. "Over-grasp—grasp! Legs forward—lift! Leg abduction—one! Two! Arms—bend! Leg abduction—one! Two! Arms—stretch! etc. Legs—sink! Position!"

III. (a) "Neck—firm! Heels—lift! Left knee forward—bend! Stretch! Right knee—bend! Stretch! etc. Heels—sink! Position!"

(b) "Arms upward—stretch! Horizontal half-standing position on the left foot right leg backward—lift! Right leg sink, arms forward—reach, and right leg forward—lift! Left knee—bend! Stretch! Right leg backward—lift, with arms upward—stretch! etc., as before. Change feet—one! Two! Left leg backward—lift! etc. Position!"

IV. "Arm flinging forward-upward with long lunge forward—lunge! Arm flinging with change of feet forward—one! Two! etc. Position!"

V. As explained above, in Exercise V, Lesson XIX.

VI. "Lie face down! Feet—grasp! Arms upward—stretch! Trunk upward—bend! Arm elevation—one! Two! etc. Place the hands on the floor, fingers inward and push up to stoop fall. Feet forward—place! Position!"

VII. (a) "Arms upward—stretch! Left leg forward—lift! Grasp!

Trunk backward—bend! Upward—stretch! Change feet—one! two! etc. Position!"

(b) "Reverse stoop fall!" Or, "On the hands—stand!"

VIII. "Arms upward—stretch! Rapid trunk rotation to the left and right—one! Two! etc. Position!"

IX. "Feet sideways place and arms sideways—stretch! To the left—wheel! To the right—wheel! etc. Position!"

X. "Balance hang—hang! Horizontal lever on the left hand, right arm upward stretch and trunk forward—bend! Legs and arm in line with the body! Trunk upward—stretch! Change arms—one! Two! etc. Spring off to—position!"

XI. "Lie on your back! Prepare to spring up. Legs over head bend and hands on the floor—place! Spring up to—position!"

XII. "Stepping out with the left (r) foot, hitch kick—one! Two! Three!"

XIII. "Arm elevation sideways with palm rotation, heel elevation and respiration—one! Two!"

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