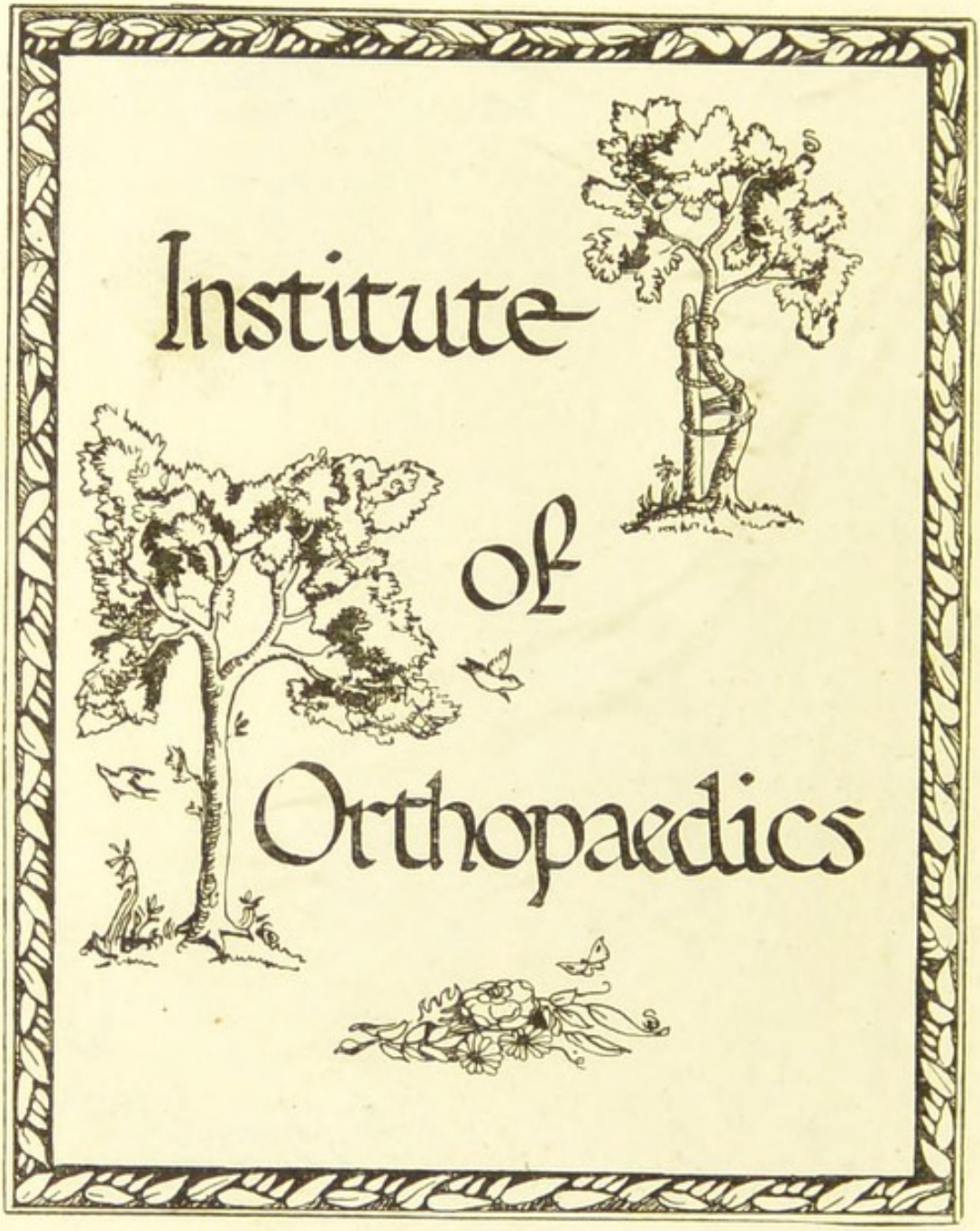
Early scoliosis, or, Curable curvatures of the spine / by Percy G. Lewis.

Early Scoliosis

OR

Curable Curvatures of the Spine

PERCY G. LEWIS



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EARLY SCOLIOSIS

OR

CURABLE CURVATURES OF THE SPINE

BY

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PREFACE.

THIS little book has its origin in the difficulty which I experienced, on first entering general practice, in diagnosing and treating these cases. From careful study of the fairly large number of cases which have come under my notice at the Victoria Hospital, St. Andrew's Convalescent Hospital, and in private practice, I am now able to command a certain measure of success in their treatment. Thinking that others may possibly have met with the same difficulty, I have written the following pages.

PERCY G. LEWIS.

Folkestone.

CONTENTS.

Early Scoliosis, or Curable Curvatures of the Spine.

GENERAL ANATOMICAL CONSIDERATIONS.

It is beyond the scope of this work to discuss fully the anatomy of the spinal column. Suffice it to say that the spinal column is a supporting pillar around which the rest of the body is arranged in such a way that the balance can be kept with as little waste of energy as possible. For this end, under different changes of position, the spine assumes different curves which are all intended to make the relations of the upper and lower extremities such that the position of the centre of gravity remains as nearly as possible the same. As the re-arrange-

ment by which this is brought about is always that which involves the least possible expenditure of energy, and the least possible change in the relative position of parts, it follows as a law that "the changes produced are the same for the same change in the surroundings."

Now there are certain natural curves in the spine which are well known; and the changes which occur in changes of position are primarily connected with changes in these curves. For instance, when a person stands on one foot, he would fall unless the body weight were shifted on to that side. To effect this, the spine bends to that side in the lumbar region, forming what is called a "primary curve." In order to prevent the body going too far over, the spine bends back to the opposite side in the dorsal region, and once more to the side on which he stands, in the cervical region. These curves are called "secondary curves." The ribs are so fixed to the vertebræ as to be part and parcel of them, and consequently partake in a very large degree in any changes which occur in them. A very great number of the muscles of the body are concerned more

or less in the maintenance of the balance, but some to a very much greater extent than others. The most important are the trapezius, latissimus dorsi, levator anguli scapulæ, the rhomboids, the splenius, the serrati postici, the erector spinæ and its anatomical continuations. In front, there are the abdominal muscles, the longus colli, the pectorals, the psoas and iliacus, &c. Taking into consideration also the ligaments which bind the parts of the spine together, the spine may be compared to a pole fixed in a vertical position by (1) a series of elastic ropes (muscles), which allow of a certain amount of movement in all directions, and (2) a series of inelastic ropes (ligaments), which, however, are only drawn taut when an endeavour is made to overstep the normal range of movement.

It is obvious, then, that to keep the pole vertical, the elastic ropes must be equal in strength and length on each side of the pole.

The spine, however, differs from the imaginary pole, inasmuch as it is not straight, and that it has to maintain two superimposed weights. In the imaginary

pole, it is quite obvious that the weight would be borne with the least tension on the elastic cords if it were evenly balanced on the top of the pole, or if the pole passed right through its centre of gravity. Failing this, the nearer the centre of gravity to the vertical axis of the pole, and the lower the weight on the pole, the less strain on the elastic cords.

With the spine, the weights which it has to bear are the head, and shoulders with the arms attached. The working of the principles just mentioned is obvious. Thus as little as possible is put on the top; the spine runs as nearly as possible (but not quite, for it is a little behind) through the centre of gravity of the shoulders. The latter is hung as low down on the spine as interferes as little as possible with their functions or the functions of other parts. It was obviously necessary for the central authority for regulating the forces which control the balance, with its watch towers (eyes) and spirit levels (semicircular canals), to be placed on the top, where its instruments could be worked to the best advantage.

The position of the clavicles aided by

the normal muscular tone of the scapula muscles (trapezius, latissimus, &c.), are the means adopted to keep the centre of gravity of the shoulders as near as possible to the spine. The spine is prevented falling forwards by the contraction chiefly of the erector spinæ, backwards by the abdominal muscles, and sideways chiefly by the erectors and abdominal muscles of the opposite side acting together.

When the spine bends from one side to the other under any special force, the bodies of the vertebræ being less fixed than the spines, are moved in a greater degree. In other words the vertebræ become partially turned round in the course of their movement to a position on one or other side of their normal position, and thus the bodies occupy the convexity of the curve, and the spines the concavity. This is the so-called "rotation." When we feel the tips of the spines for curvature, it is obvious that the spine is a good deal more curved than the line represented by the tips of the processes shows.

ETIOLOGY AND PATHOLOGY OF SCOLIOSIS.

The spine being kept straight by muscular tone and the equal action of muscles, it follows that any cause which tends to do away with or alter these forces, will cause curvature. Such causes may be general weakness following illness, too rapid growth, paralysis of some muscles on one side or spasm of those on the other, &c. General weakness being the most common cause, will be the one considered.

General weakness causing slackness of the muscles, leads to the patient assuming habitually bad positions. The worst of these are standing on the left leg, and writing at too high a table seated on too low a chair. Each of these tends to form a primary curve of the spine which is a secondary curve of the other. The standing on one leg causes, in addition, flat foot, which shortens the leg, tilts up the pelvis on the opposite side and so the curve is permanent in walking as well as in standing. Again, standing on one leg produces contraction of the opposite erector spinæ, complexus, &c., as anyone may prove by

placing their hands on these muscles while they shift their weight from one leg to the other. The object of this contraction, is of course, to pull back the centre of gravity, and prevent it swaying too much on the opposite side. If the patient habitually gives the preference to one leg, which is usual, increase in strength and hypertrophy of the opposite erector spinæ, &c., will take place, whereas the erector on the side on which the patient stands will remain weak. Another of the forces which keep the spine straight is now interfered with, viz., the equal action of the muscles on the two sides. On the one side are weak muscles, on the other strong. The strong soon overcome the weak, which thus become stretched and lengthened. A strong muscular force is now at work rotating the vertebræ and increasing hourly the curvature. And what is true of the erector spinæ and its continuations holds good also for all the other muscles which take part in keeping the spine straight. A somewhat similar result is seen in cases of infantile paralysis. Various deformities result from paralysis, partial or complete, of opposing sets of muscles. Again the

super-imposed weight of the shoulders and arms is best borne with the shoulders well back, *i.e.*, with the centre of gravity of the shoulders as near the vertical axis of the spine as possible. If it is too much forward, owing to stooping or the clothes being too tight in the front of the chest, it tends to produce kyphosis in a person with a straight spine, with equal legs and equal erectors spinæ. When the weight of the shoulders falls forwards, the contraction of the erectors prevents it going too far. If the erectors act equally, the two shoulders fall forwards to an equal extent, but if one is stronger than the other, the shoulder of that side does not fall forward as far as the shoulder on the side of the weaker erector, that is, the spine becomes twisted. Thus stooping is a very active cause of scoliosis. As proving this is the fact that when examining a case, the patient at first does her best to stand erect, and it is then often impossible to see that a curvature exists. If, however, you keep the patient standing while you engage in conversation with a bystander the weaker muscles become tired first, relax, and the curvature becomes apparent.

It is obvious that the above remarks about the superimposed weight of the shoulders applies also to the superimposed weight of the head. The effect of the shoulder muscles on the twisting is further shown by what has been described by Mr. Roth, as the "key-note" position. For every case, the relations of the head limbs, and trunk, may be so arranged that the spine appears straight or nearly straight. This best possible position is termed the key-note position. From a careful study of it, one can find out which are the muscles which are chiefly lengthened or shortened, and apply the exercises necessary for return of length and strength.

Knowing, then, the immense forces which act in the direction of twisting the spine, when once even a slight curvature has been produced, one sees an explanation of the extreme rapidity with which these cases often progress, and a reason for prolonged treatment, and a careful study of each case.

Though a great point has been made of the twisting of the spine, it is not the only, though it is the most important part of the pathology of scoliosis. A certain amount of

real lateral curving does take place, causing separation of the ribs on the convex side, and consequently enlargement of the chest on that side, causing approximation of the ribs on the concave side, and consequently contracting the chest on that side. The enlargement of the chest on one side causes elevation of the shoulder on that side, the contraction of the other depression of that shoulder. Elevation of the shoulder and separation of the ribs increase the distance of the edge of the scapula from the spine; depression of the shoulder and approximation of the ribs lessen the distance. The twisting of the spine increases the chest deformity resulting from the real curvature. Without twisting, the deformity could only be slight. If the legs are unequal in length elevation of the hip on the side opposite the shortest leg will take place. When one hip is raised, the opposite leg will always be found the shorter, if not naturally so, really so from flat foot or genu valgum.

Supposing that in a case of well-marked curvature, no treatment is adopted, or cure obtained, further effects will follow. Not only will the muscles become changed in length, but so will the ligaments. Later

still, not only the ligaments, but the bones become permanently altered in shape from the unequal pressure to which they are subjected. When osseous deformity has taken place a cure is nearly an impossibility. Though most cases may be very much improved, there will be a constant tendency to relapse, and the necessity will be frequently recurring for a further course of gymnastics. Some cases get altogether beyond cure, and are only saved from extreme deformity by the wearing of more or less cumbrous steel supports.

Beside the alterations, which occur in the relation of the chest and spine there are others which occur in the pelvis, as a result of stooping. When a patient stoops, this action is followed by a tilting forwards of the pelvis. With habitual stooping there is habitual pelvis-tilting. This becomes associated with changes in the length of the muscles on the front and back of the thigh. Those in front become shortened and weak, because the patient, through always leaning forwards never exercises these muscles for preventing him falling backwards. Those behind become lengthened and strengthened, be-

cause the chief work in preventing the trunk from falling forwards is done by them when the patient habitually stoops.

Twisting increases all these effects, for to produce the amount of deformity seen in even a mild case by true lateral curvature alone, would involve either separation of the vertebræ on the convex side or as great changes in the shape of the bones as are seen in an old incurable case.

With regard to this shortening of the leg, it is obvious for genu valgum that, if one leg is straight and the other crooked, the pelvis on the side of the crooked leg must be lowered if both feet are to be on the ground. With flat foot, it is obvious from a little consideration, that when the arch of the foot gives way the ankle joint must come nearer to the ground to the same extent as the arch of the foot is lowered, *i.e.*, the leg is shortened to this extent.

EVIL EFFECTS OF SCOLIOSIS.

The evil effects of scoliosis are as many and as varied as those resulting from adenoid growths in the pharynx. There

are certain concomitant effects, which, though not exactly caused by scoliosis, require consideration when the treatment of a case is undertaken. There is the considerable loss of tone of the system generally, of which the muscular weakness is but one expression. There are mostly, too, other expressions, such as bad sight, anæmia, digestive troubles, rheumatic neuralgia, pains, &c., which all have to be taken into consideration for successful treatment. Mixed up with these are resulting effects, such as more or less loss of mental energy. The brain acts best in the vertical position, and acts less well in proportion as it gets out of this position. The brain partakes of the general condition of the body; if the little body energy is used up in muscular exertion, that is, if the muscles are always over tired, so will the brain be.

The lungs perform their functions best with an expansile elastic chest. If one half of the chest is cramped and distorted the normal expansion of the lungs is interfered with. Intercostal neuralgia may be due to pressure on nerves, or interference with them. In the same way the heart and circulation become interfered with.

The abdominal organs suffer from interference with the chest organs, and possibly uterine displacements have their predisposing, if not exciting, causes, in the direct or indirect effects of muscular weakness.

The fact that girls suffer from scoliosis more than boys do is due to the fact that boys' muscles are stronger and more developed from the nature of their games and recreation. Football, cricket, and tennis have a more developing tonic effect than the dancing classes and stately walks of girl schools.

DIAGNOSIS OF SCOLIOSIS AND SYMPTOMS.

The diagnosis of scoliosis is often difficult from the small amount of real lateral curvature.

Pain may or may not be present. It is always greatest in patients of a rheumatic tendency. Probably the vertebræ (or their joints) which are most subjected to irregular or uneven pressure, become the seat of rheumatic changes. The pain often has a distinctly rheumatic character, hence

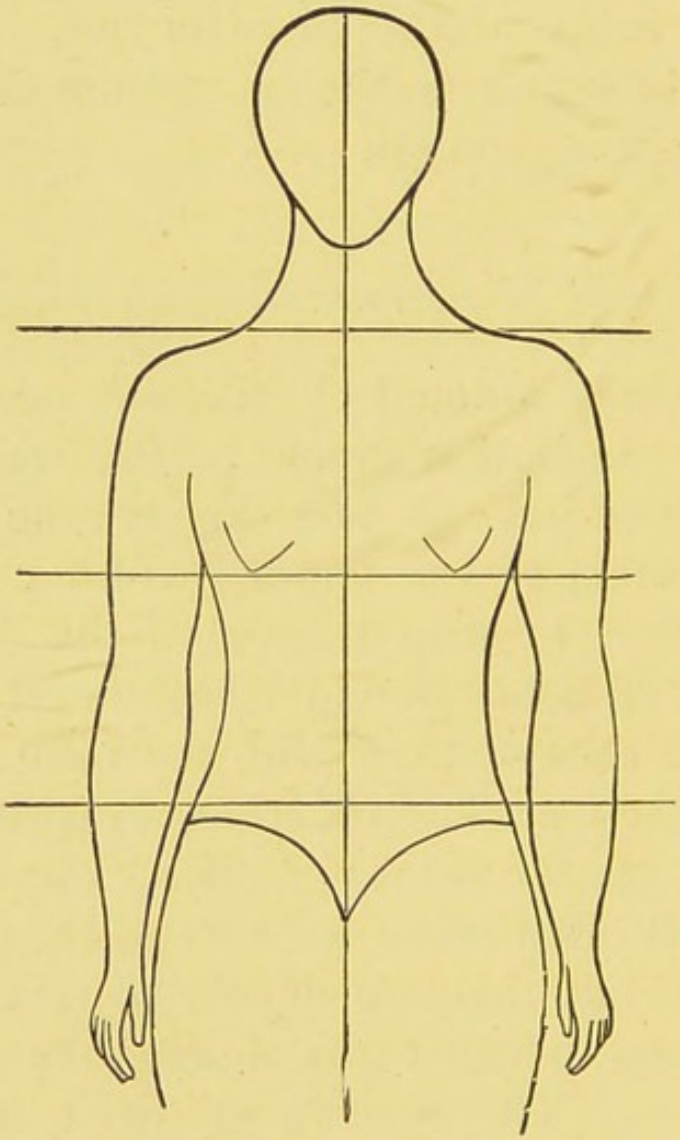
early scoliosis is often mistaken for lumbago.

Deformity.—The first point noticed by the patient is that one hip or one shoulder is "growing out." Often the tailor or dressmaker is the first to discover this. Sometimes stooping is the immediate cause of advice being sought.

Method of Examination of a Case.

The least amount of exposure necessary is that the clothes should be removed from the shoulders to just above the great trochanters of the femur. With children it is best to strip them entirely. In all cases the boots should be taken off. The patient should stand with the back to the light, the feet close together, arms hanging loosely at the sides. Under examination patients often make the best of themselves at first, but they are unable to retain this improved position for more than a few minutes. The muscles get tired, and the real amount of deformity becomes apparent. While waiting for this the surgeon should, commencing at the top, notice if the ear-tips are level, if the contours of the

shoulders are level and equal, if the spaces formed by the intervals between the arms and the sides of the body are equal, if the scapulæ stand out equally, and if they are



the same distance from the spine, if the two sides of the chest look equal behind. He should mark the crests of the ilia with ink

or aniline pencil to see if they are the same level.

The patient should now be turned round, and the appearance of the chest as to inequality or bulging, noted. The knees should be noted, to see if the patellæ are level, the legs for genu valgum, and if so, whether it is equal on the two sides; the feet carefully examined for flat foot. If the latter is found, it should be carefully noticed which is the worse side. The surgeon should next—with the patient seated, if she be too tall—look down on the shoulders from above, to see if the shoulders are placed exactly above the hips. In scoliosis one shoulder will be found to have gone backward and the other forward.

The lumbar region should be noted for inequality of its two halves. The back should be noted generally, for obvious spasm, or hypertrophy or atrophy of any particular muscle or muscles.

To get a good idea of the amount of curvature of the spinal column, as shown by the spinous processes, it is best to feel for the tip of each process, and dot it with ink. When all are marked, the curvature is very obvious. By marking them in this

way, a much truer idea is given than the way generally recommended, of running the finger down the spine until the skin is made red. The red line so often does not correspond with the tips of the processes when the fingers are removed.

The amount of rotation is estimated as follows : the surgeon sits facing the light, and the patient stands with his face to the light, *i.e.*, with back to the surgeon. The patient now bends forwards from the hips, with the hands hanging, as if to touch the ground. The patient now slowly raises himself from behind forward. As he does so, each pair of ribs stands out against the light, and it is at once obvious if any inequality in the two sides of the chest at that level, exists.

Though all this sounds easy in theory, it is only attained by constantly examining a number of cases. It is best to commence with a normal individual, as by placing a book under one foot nearly all the features of a case of scoliosis can be reproduced. By varying the thickness of the book, different degrees of lateral curvature can be produced.

Diagnosis from other Conditions.—From

caries, lateral curvature is easily distinguished, when once the essential points are grasped. The alternative name for caries (angular curvature) carries one a long way on the road. An angular curvature is almost necessarily caries, or its result. A prominent tender vertebra points to caries. But perhaps the most diagnostic point of all is spasm. With caries there is always spasm of some of the muscles attached to the spine, which causes some limitation, it may be a great deal, of movement. The limitation will be obvious if the feet or pelvis are fixed and the body bent in various directions by the surgeon. Sometimes it will be seen that the movement between several adjacent vertebræ is abolished. This is partly from inflammatory thickening of the parts covering the spine, and partly from spasm of the muscles. Other evidences of tubercular disease would, of course, aid the diagnosis. The practice commonly recommended, of running a hot sponge, or piece of ice over the spine for evidence of a tender spot, is apt to be fallacious. For after all, one only diagnoses periostitis by this means, and rheumatic periostitis is not uncom-

mon in cases of lateral curvature. Hence the pain exacerbated, or occurring only at night.

The irregular contortions of the spine occurring in rickety children, and due chiefly to a laxness of ligaments and disturbance in the relative weights of the head and abdominal organs, with abnormal curvature of the legs, present no difficulties in separating them from ordinary cases of curvature. There frequently is twisting of the spine in these cases.

The cases which do frequently get mistaken, are those cases of curvature of the spine secondary to other conditions, such as disease of the hip, knee, or ankle, in which there is shortening, or in which the patient habitually uses the sound leg for standing, or for carrying most of the weight. The cases are very frequently, however, diagnosed as caries, and treated with jackets and instruments. Cases of curvature occur, too, from the contraction of one side of the chest following pleurisy, and from paralysis of the muscles, the result of infantile paralysis.

GRAPHIC RECORD OF CASES.

In the treatment of every case a graphic representation should be taken every month as a record of the case. Thus improvement, over-correction, or getting worse may be at once made manifest. When one has become adept at its use, there is nothing so good as Roth's scoliosiometer. This gives a very fair record of the case, and by putting one tracing over the other and holding them up to the light any change can be at once noted. The instrument consists of a strip of metal, which can be moulded to the chest wall, just below the angles of the scapulæ. It is then transferred to a piece of paper, and a tracing taken on the inside. If the position of the spine and scapulæ be marked on the strip while it is on the chest, and then marked on the paper, not only can the difference in shape be noted, but the difference in size of the two sides can be measured. This instrument gives the horizontal deformity only. To record the vertical, it is best to have a diagrammatic rubber stamp which records the normal, and to mark on the diagram how the case under consideration differs from it.

When one becomes expert at it, a true record of each monthly improvement may be kept. (See page 22 for diagram.)

It is only by keeping frequent accurate records that proper control over the treatment can be kept, and over-cure prevented. A patient will not be very grateful if the result of treatment is to substitute a curvature to the right for one to the left, or *vice versa.*

TREATMENT. (STAGE I.)

The treatment is obvious from a consideration of the pathology. Loss of tone of the system generally must be treated by attention to the digestion, by tonics, and, above all, by *fresh air.* If possible, all lessons should be given up for three months, and the time devoted to treatment. Patients should go to bed early in order to avoid hot, gas-lighted rooms.

The patient should never be allowed to get overtired, for over-fatigue means the assumption of bad positions. A walk of an hour, with rest for an hour alternately throughout the day, would be a very good arrangement. Standing and stooping being

causes of scoliosis, should, if possible, be avoided entirely. If standing is necessary, it should always be with the feet two or three inches apart, and the flat foot should be corrected with suitable boots. The stooping should be overcome, first, by having the clothes loose in the front of the chest, and, secondly, by the patient's attention being constantly directed to remedying it. She should get in the habit of standing with the heels against the wainscot, and flattening herself against the wall, so that the shoulders and back of the head touch it. Then she should try to keep this corrected position, while she walks about, returning to the wall occasionally to correct any deviation from it. Further, by having mirrors placed in suitable positions, she will be able to constantly correct the unequal heights of the shoulders, and bring them level again.[1] The patient must sit only in straight-backed chairs, and with her back against the back of the chair. The knees should be slightly separated and the feet rest comfortably on the

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[1] "Re-education of the Muscular Sense" (Roth).

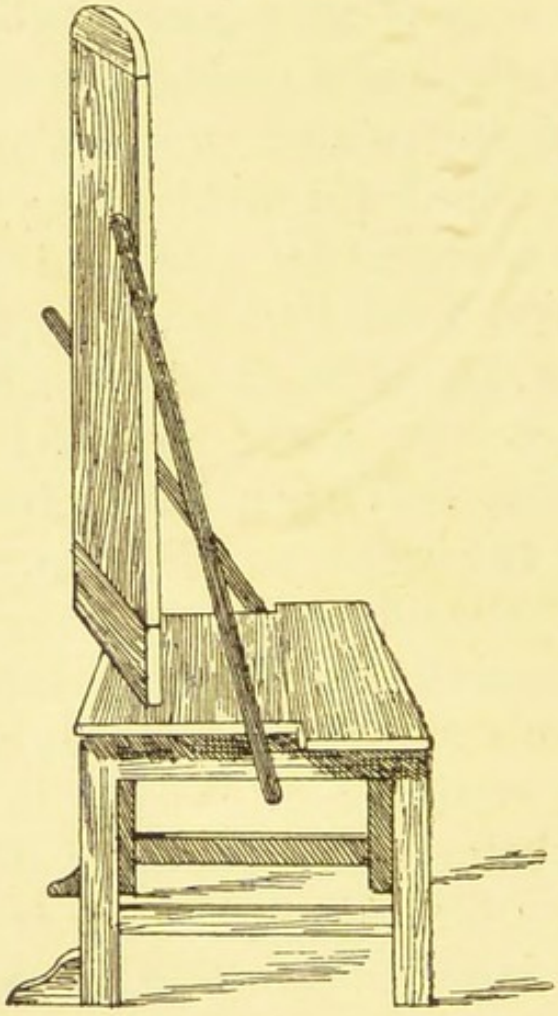
ground, or on a footstool if the chair is too high. For meals or for writing, the chair should be pushed as closely into the table as possible. For writing, the paper should be raised on a sloping desk, and for piano playing the back should be supported, and the elbows touch (or nearly touch) the back of the chair. Patients should never sit cross-legged, as this produces a curve of the spine. The question of rest is very important. No doubt the best rest is in a straight-backed chair, or in one the back of which makes an angle of 130° or 135° with the seat. In any case, rest in the daytime should not be prolonged beyond an hour, and half-an-hour at a time is better. Too much rest retards the regaining of muscular tone.

Massage, Swedish movements and instruments are often prescribed for these cases, and, in conjunction with other treatment, may do good, but there are more rapid and powerful means at our disposal.

Next to loss of tone, it was mentioned that the assumption of habitually bad positions was a cause of curvature. With a little trouble one can find out what are

the chief bad positions which each patient is in the habit of assuming. Remembering that lateral curvature is really twisting, if we allow that bad positions cause lateral curvature, we must also allow that the same bad positions cause twisting, and consequently that a reversal of all the bad positions will cause untwisting. Here, then, is a hint for treatment: make the patients reverse all the bad positions. Make them hold the head up, the shoulders back, and if in the habit of standing on the left foot, make them stand on the right, &c., &c. They will then be passively unrolling the spine, and it is to unroll the twist that should be our object. Another means of passively unrolling the spine is the author's spinal cushion. It consists in a kind of vertical bolster fixed to the back of the chair on the side of the raised shoulder. The raised shoulder is generally the one which is further back than it should be, from the twisting of the spine. When the patient leans back against the bolster, she forces the shoulder of that side forwards, and in order to get the lower shoulder against the back of the chair a certain amount of involuntary active force

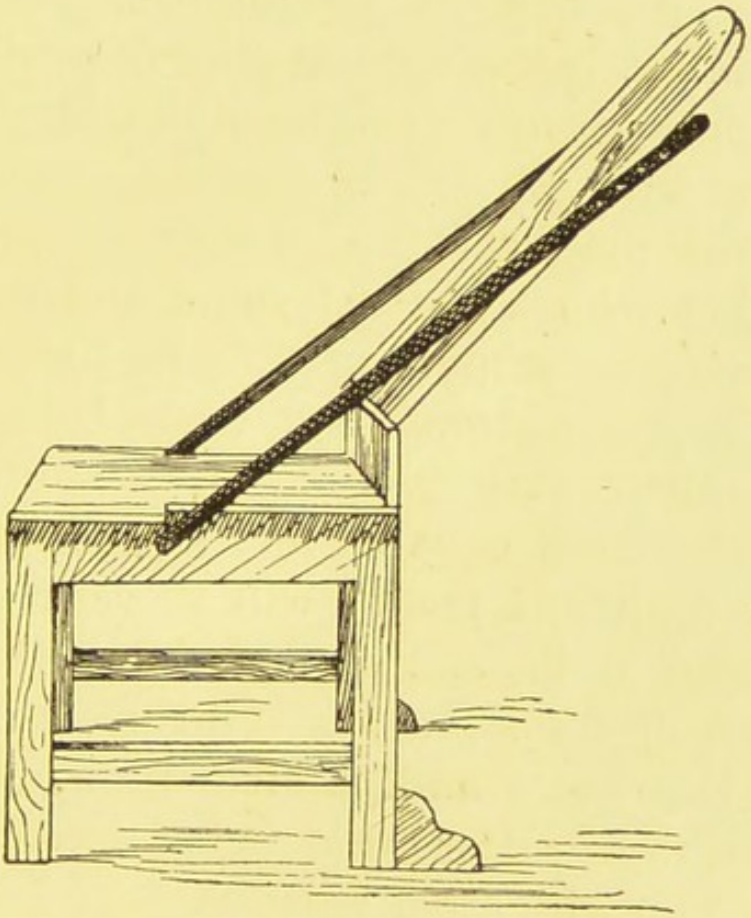
is necessary. Further, the stretching the stronger muscles of the higher side undergo by this means soon tires them and allows of lengthening. The slacken-



ing of the muscles on the side of the lower shoulder which this untwisting causes, allows of their shortening. Thus the vertical bolster is a potent means of treatment. Used transversely or obliquely it

may in the same way be used for stooping, or for the various combinations of stooping and twisting.

A more complicated apparatus is the author's spinal chair. This consists of a

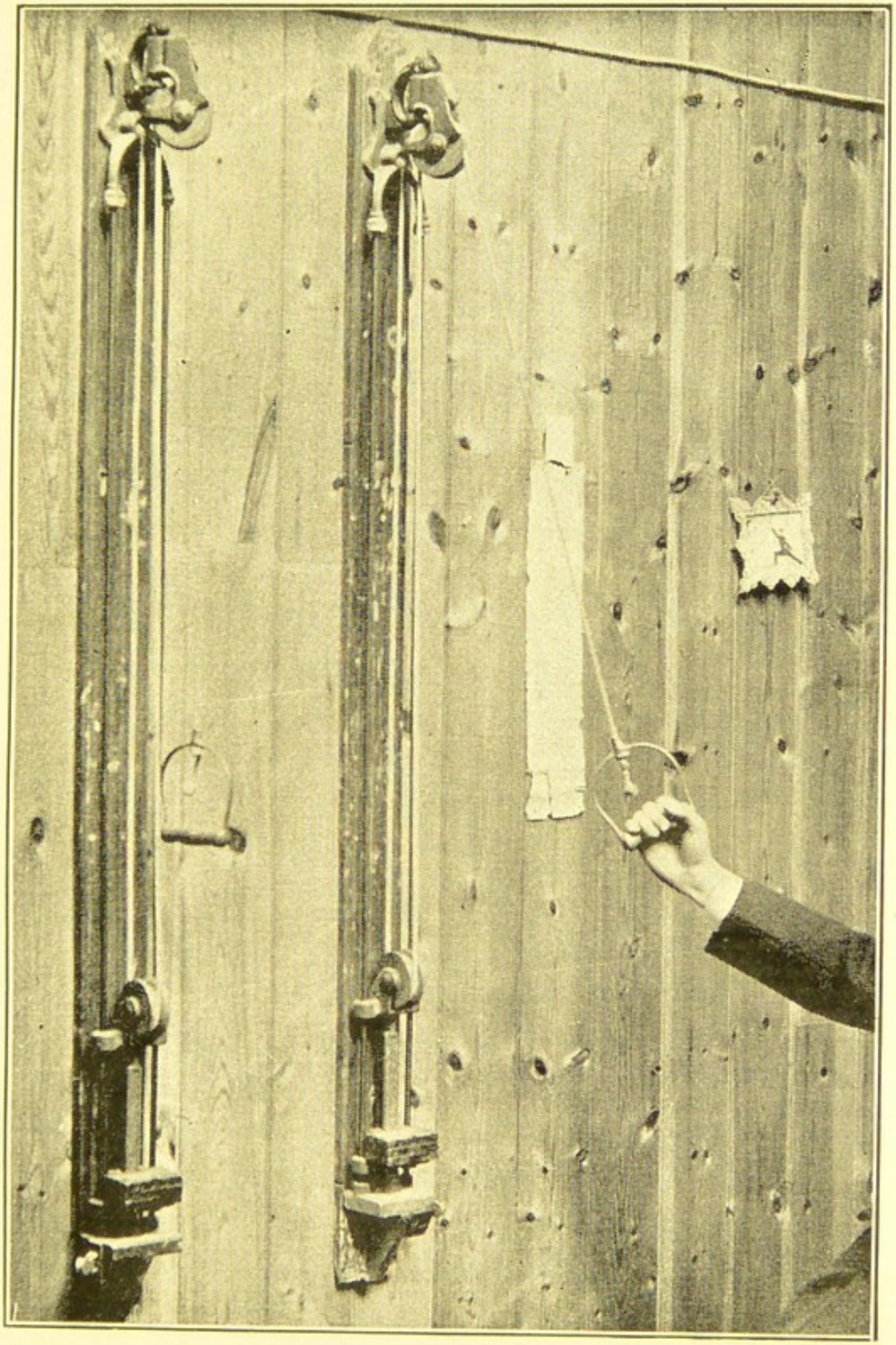


straight-backed chair, the back of which moves on a pivot, in such a way that either margin may be made to advance while the other recedes. It can be fixed in any position by a simple mechanism,

and is virtually a more developed idea of the vertical bolster. Further, by means of a pair of hinges, the back may be let down to any angle and used as a reclining board. (The foot piece is not shown in the plate.)

The practice of gymnastics, *properly carried out*, is the natural cure of scoliosis. The muscles are weak, and should therefore be strengthened by suitable exercises. But the matter is not nearly so simple. Starting with a twisted spine, and taking the two erector spinæ muscles for example: One is very strong and contracted, and the other very weak and stretched. Exercise both equally, and the difference in strength and length will be very much the same at the end of the course, though both will be stronger. Obviously there it is the weak and stretched one which wants the greater amount of exercising, and so on with other muscles.

But before discussing this, it will be well to consider for a moment the treatment of another complaint which has a bearing on the treatment of scoliosis, viz., the deformities which result from infantile paralysis. The treatment of these, the author first learnt from Dr. Robert Jones



DOWD'S MACHINE.

of Liverpool. The principle involved, already touched upon, applies also to other deformities. Taking, for instance, a case of paralysis of the extensors of the wrist from infantile paralysis. Generally a considerable proportion of the muscular fibres recover; but during the time they were weakened or *hors de combat*, the unaffected flexor muscles so easily overcame them, that the extensors became over-stretched, and the flexors shortened. When the attack is over, any contraction of the extensors is too feeble to overcome the strong flexors, and has very little or no effect beyond pulling in the slack. If, however, the action of the flexors is eliminated by forcible further flexion of the wrist, the extensors are pulled out to their full length, and any little contraction they may be capable of is shown by movements of the fingers. If these movements of the fingers take place, it shows that recovery is possible. The first point in treatment is to restore the natural relation as to length, between the flexors and extensors. This is done by putting the forearm and hand up in a splint in such a way that the extensors are slack

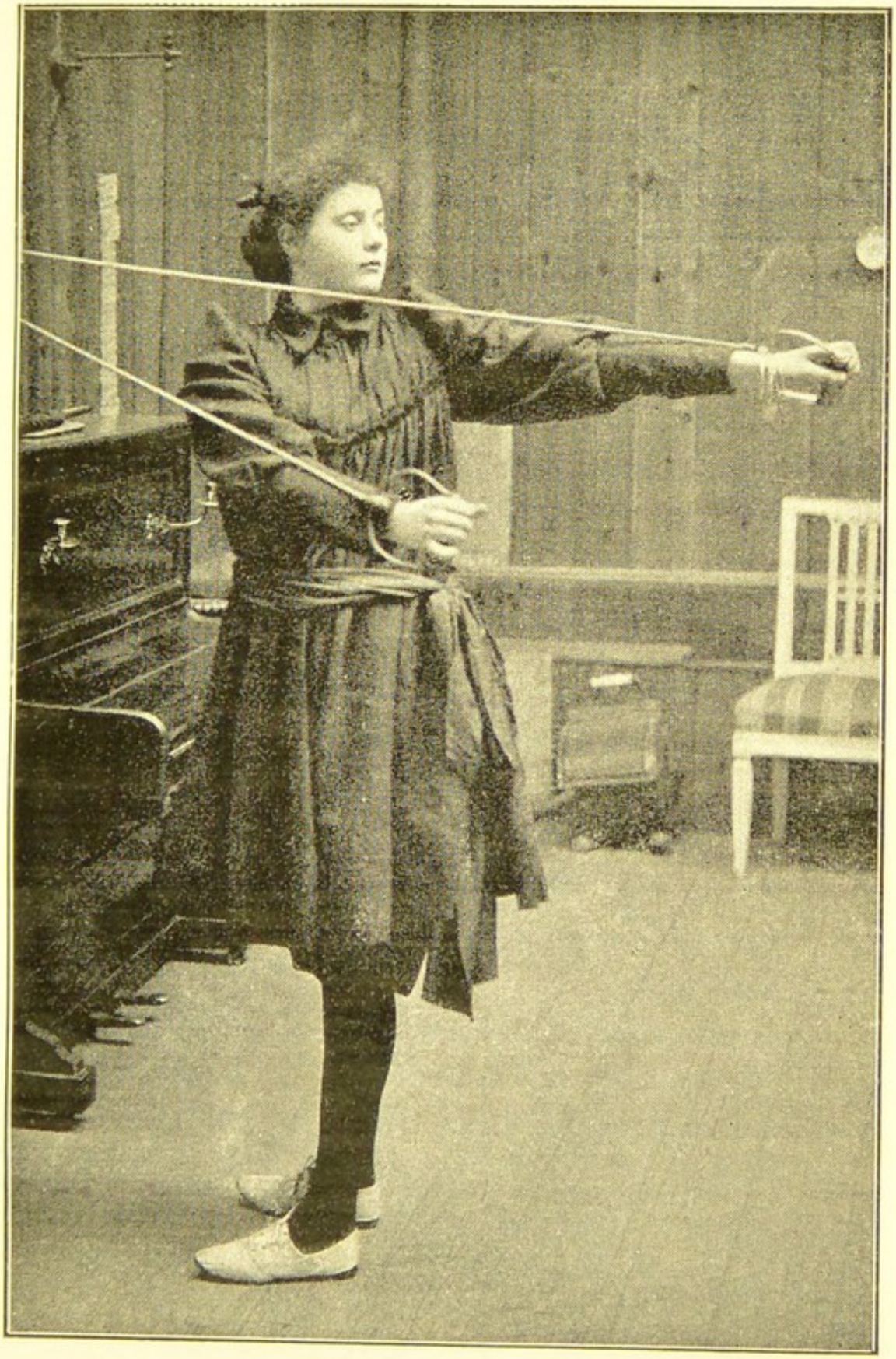
and the flexors stretched, *i.e.*, the hand is half extended. The extensors being now unopposed, shorten, and the flexors lengthen. Gradually, as this takes place, the amount of extension is increased, until the strong flexors are slightly longer than natural, and the extensors shorter. The splints are now taken off daily for various muscular exercises, and the limb gradually becomes restored to usefulness.

In cases of scoliosis, though one has not often to deal with paralysis, yet one has to do with extremely weak muscles. For many reasons (to be mentioned later), it is not advisable to put these cases into splints, so the exercises must be made to produce the same result, viz., to shorten lengthened muscles, and lengthen shortened ones.

In stooping, the abdominal muscles are shortened. The exercises should therefore be chiefly of the opposing back muscles.

In curvature to the right with the right shoulder highest, it is the right back muscles which are the stronger and shorter, and so have chiefly caused the twisting. To untwist, the opposing muscles

THE UNTWISTING EXERCISE.
(First Position.)



THE UNTWISTING EXERCISE.
(Second Position.)

must be chiefly exercised. In addition to exercising the left erector, there is a set of muscles which by suitable exercises may be made to untwist the spine, viz., the left trapezius and latissimus with the left and right pectorals. These may for this purpose be regarded as one muscle, and act as such, being in fact only interrupted here and there by bony attachments, one of which, the arm bone, is a movable one. The exercise which does this is as follows:

Exercise for Untwisting.

Patient standing. Starting with the arms straight and horizontal, and inclined as far as possible to the right, both arms are rapidly moved against resistance as far as possible to the left, and by rotating the spine to the left, they can be carried still further. They should be allowed to remain a few seconds thus, and then by slackening the muscular force, the resistance should be allowed to carry them back. With the double modification of Dowd's[1]

[1] This consists essentially of a pair of ropes passing over two wheels, with weights at one end moving in a groove, and handles at the other. (See plates.)

machine this is easily arranged. In the same way, by standing sideways to the machine the left erector may be much exercised, while the work of the right is done by weights, and consequently is very little exercised.

Exercise for Stooping.

The muscles which allow the shoulders to fall forwards (stooping), are best exercised thus. "Patient stands facing the machine, with arms horizontally straight out in front. Each hand grasps a handle of the machine. The hands are then made to describe a horizontal circle round the body until they nearly meet behind the back. The weights then draw them forwards again, when the exercise is repeated."

Exercise for Poking of the Chin.

The muscles which allow poking of the chin forwards can be exercised thus:— "Patient stands facing the machine, and places each hand, which is holding one of the handles of the machine, at the back

EXERCISE FOR LEFT ERECTOR SPINÆ.
(First Position.)

EXERCISE FOR LEFT ERECTOR SPINÆ.
(Second Position.)

of the head. Starting with the chin on the chest, the head is moved as far back as possible. The weights are then allowed to bring the head forwards again, when the exercise is repeated." Instead of using the hands to fix the weights to the head, a strap may be fastened to the end of one of the ropes, and passed round the head.

The Rhomboid Exercise.

Patient standing with arms by sides, simultaneously draws back both shoulders as far as possible, keeps them in this position while he counts four, and then allows them to return to the original position. The exercise is then repeated.

N.B. — The shoulders are not to be shrugged, that is, drawn up, but to be pulled horizontally backwards. Shrugging the shoulders may be used as an exercise for the levators anguli scapulæ.

The Trachelo-Mastoid Exercise.

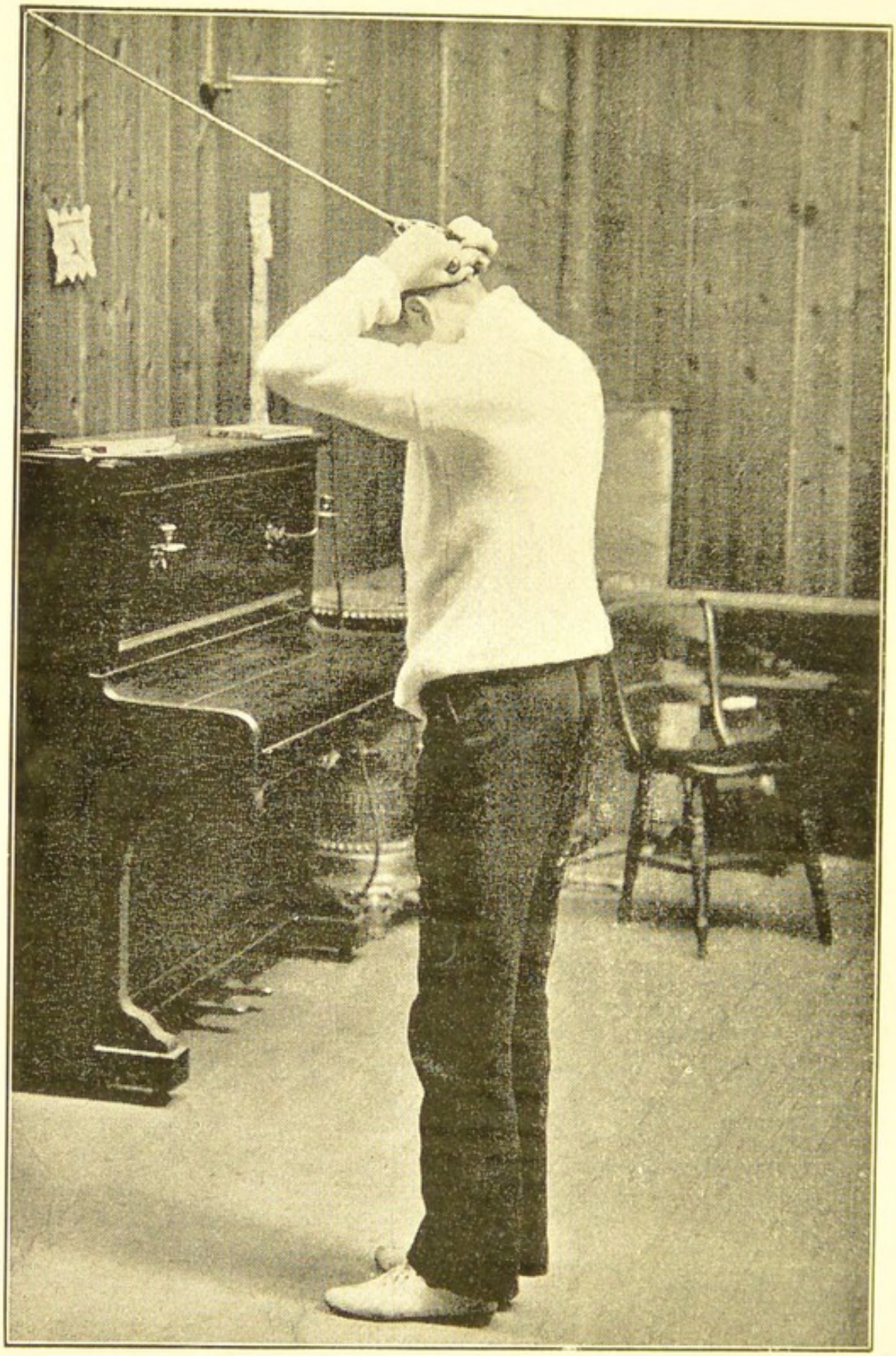
Trachelo-mastoid exercise. Patient sitting with chin on chest, turns the head rapidly to the left, and slowly allows it to return. This exercises left trachelo-mas-

toid and right sterno-mastoid. This exercise may be repeated several times. If the right trachelo-mastoid and left sterno-mastoid are to be exercised, the head is turned to the right. By taking the handle of Dowd's machine between the teeth (or with a suitable mouthpiece), the head may be moved against resistance, and the resistance may be used to passively return it.

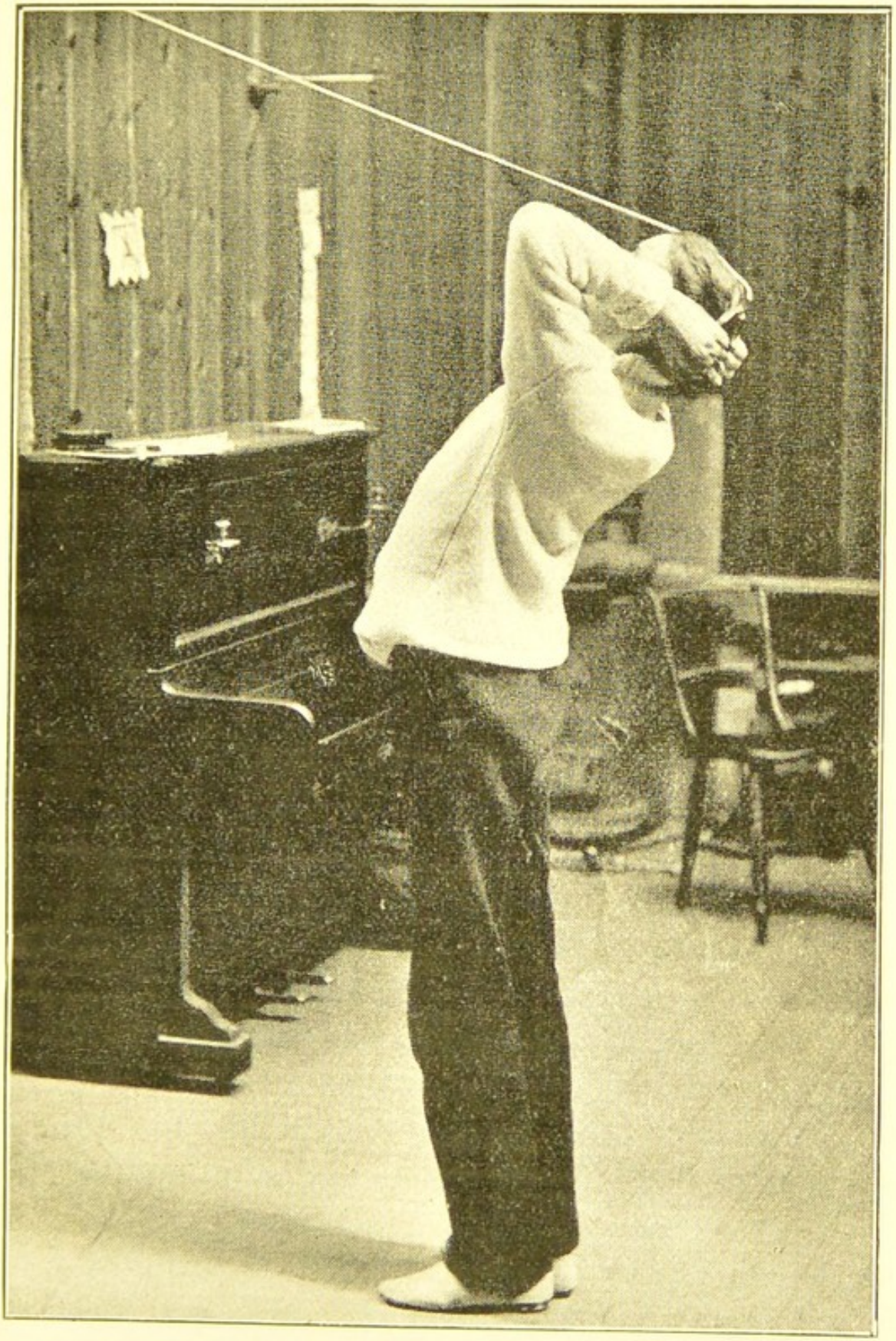
Exercise for the Erectors Spinæ.

The two erectors spinæ can be exercised together thus :—" Patient stands facing the machine, arms straight out in front, hands holding handles, and body inclined towards the machine. The arms are now raised vertically over the head, and as far beyond as possible (keeping the hands the same distance apart), and the head and body arched as far back as possible without upsetting the patient. The weights are now allowed to bring the hands back into the original position, and the exercise is repeated.

" If one erector is weaker than the other, it may be more exercised than the other by gradually increasing its weights and



EXERCISE FOR MUSCLES AT BACK OF NECK
(First Position)



EXERCISE FOR MUSCLES AT BACK OF NECK.
(Second Position.)

lessening or entirely removing the weights, which the strong one has to move." (See also exercise for untwisting.)

In all these exercises, which are for strengthening the back muscles, it will be noted that the patient stands facing the machine. The common mistake which is made by gymnastic masters is to make the patient stand with his back to the machine, as these exercises apparently expand the chest. As a matter of fact they just exercise those muscles which tend to produce stooping, viz., the pectorals and abdominal muscles, the work of the back muscles being done by the weights, the back muscles escape being exercised; and this is their tendency if given a free hand, in all their exercises. Hence one of the reasons for skilled surgical supervision. In exercises for the legs and arms, there is not the same necessity for making a difference between the two sides, unless there is a marked difference in the size of the two limbs. The machine may be made of use in the treatment of flat foot, for by means of a strap the foot may be attached to the handle of the machine and thus each set

of muscles may in turn be made to raise the weight.

TREATMENT. (STAGE II.)

When, by means of the various methods which have been described, something like equality has been established between the two sides of the body, *and not until then*, the patient may enter on the second part of the treatment, which consists in a course of general gymnastics. Then the "bad positions" instead of being reversed must be dropped altogether, but a lesser amount of the curative exercises must be persevered in for some time, though it may be in a lesser degree. The principle of untwisting should be borne in mind in all exercises. Thus, in climbing ladders or the gridiron the arm of the higher side (*i.e.*, the shoulder which is generally the twisted back one) should be kept a rung higher than the lower one, and the leg of the side on which the hip does not protrude should proceed up the ladder a rung in front of the other.

Where it is the right back muscles which are the stronger, *i.e.*, where the right shoulder is the higher and further back, the

left shoulder muscles may be well exercised by left-handed badminton.

Another means of expanding equally the thorax and exercising the erectors spinæ, is swinging from a trapeze, the feet not touching the ground. But this is only to be used in the second stage of the treatment. Partial dislocation of the collar-bones has followed its too early use. Both the leg and arm muscles should be strengthened by different kinds of exercises, and they should be exercised equally. Strengthening the muscles generally, improves tone generally, and is therefore good. In the case of flat foot, of course the worse foot requires the greater exercising. Further, the strengthening of the leg muscles makes it much easier for the patient to maintain the erect posture. All should be exercised equally, for here the stronger muscles are the longer, and may therefore be trusted when improved positions are maintained, to overcome the shorter and weaker. (See page 17.)

Unfortunately the curves vary with each case, though some are much commoner than others, depending of course amongst other things, upon which *are* the habitually

bad positions which each patient is in the habit of assuming.

Certain exercises should therefore be prescribed for each case, in the same way as certain drugs are prescribed for each case of dyspepsia. A stock mixture cures a certain number, makes a certain other number worse, or has no effect. Success is greatest to him who knows how to best vary his prescriptions and instructions for general mode of life, to each case. And it is exactly the same when gymnastics are the chief means of cure instead of drugs.

OTHER CONSIDERATIONS.

Age for Treatment.

Cure may be begun at any age, at any rate as soon as the child has sufficient intelligence to do as it is bid. With very young patients passive movements and "table-work" must take the place of the machine. By "table-work" is meant the series of movements performed on a table, some active and some passive, all with a view of developing and strengthening muscles. Cure is fairly easy up to 35 or

40 years of age. After the latter age it becomes more and more difficult, as the ligaments get fixed and the bones altered in shape. After 40, too, patients often lack the energy necessary to undergo a cure, and prefer some sort of apparatus. There is however, no theoretical reason why, if all the organs are healthy, cure should not be obtained by these means at any age.

Length of Treatment.

The length of time during which a patient should be under treatment varies considerably, and it is often impossible at the commencement to give even an approximate idea. Some cases are so very slight that a month of treatment is sufficient; most cases require three months, and others six; a few very bad ones require a year. These periods, however, compare very favourably with the length of treatment under the instrument cure. The length of treatment is much shorter if the patient is a boy, if one has the active co-operation of the patient and his friends, if the exercises are done daily, if carried out under a competent gymnastic master,

if there is active and intelligent interest shown by the supervising surgeon, and if no intercurrent malady occurs to break the continuity of the treatment. The treatment is longer for girls, because they must be absent at least three days a month, and longer if there are disorders of menstruation. It is longer, too, if other things, such as school, late hours, &c., are allowed to interfere with the course.

Relapse.

Relapse rarely occurs if the treatment is sufficiently prolonged, and if a course of home exercises are persevered in for some months after. For some time after cure has taken place the patient should be re-examined at intervals of three months. It should always be remembered that a patient once cured is not thereby insured from a recurrence of the disease, if the conditions which caused it are again allowed to occur.

The Gymnastic Master.

Unless the surgeon has much time at his disposal a gymnastic master is a ne-

cessity, and happy is the surgeon who has one he can trust. It is essential that both should be pulling together, or failure will result.

The following is the procedure recommended and adopted by the author. Before the patient has the first lesson the surgeon should see the gymnastic master, and carefully explain the case to him, giving him in writing short notes of the case, pointing out the exact deformity, the muscles weak or lengthened, and explaining the treatment to be adopted for the first month. If possible the surgeon should be present for the first lesson, and after that should from time to time pay surprise visits, more especially towards the end of the lesson, to see that the patient has not been over-tired.

No new exercises should be given without the consent of the supervising surgeon. At the end of a month the surgeon takes fresh graphic records, again sees the gymnastic master, and pointing out the changes produced by the treatment, makes such alterations in the exercises, length of the lessons, &c., as he may consider necessary.

The Use of Instruments.

Are instruments ever of use, and if so, when? is a question very frequently asked. That it is wrong to treat every case of lateral curvature with instruments, as a matter of routine, there is no doubt whatever. If a case is deemed to be curable by exercises, it may be taken as an axiom that the use of an instrument is wrong. The objection to the wearing of any kind of instrument is the same as the objection to the use of braces to keep back the shoulders. They take the place of muscular work, and encourage laziness and muscular wasting. The removal of the instrument at night, and for a short time daily for exercises, does not remove this objection to their use. There is another very great objection, viz., that the use of instruments almost necessitates frequent visits to a specialist. Though this is all very well for those patients who live near one, the often long journeys are very irksome to country patients, and the expense entailed places the treatment out of reach of the poorer classes.

The author is inclined to think that

if a case is curable at all, it is curable without instruments. The use of the vertical bolster or the modified spinal chair he believes to have all the advantages, and none of the drawbacks, of an instrument. The plaster of Paris jacket has so often had its disadvantages pointed out that it is unnecessary to do so here. It is, however, most useful for the treatment of rickety contortions, and within the reach of the poorest.

Instruments are of use in the treatment of *in*curable curvature and of caries. In the latter disease occurring in children, the use of Sayres' box gives admirable results, but the treatment of these conditions is beyond the scope of the present work.