In the case of the little girl who has just gone out, the abducting and inverting screws were also necessary. (*See* Fig. 171.)

These instruments and their mode of application have already been described. (*See* lecture on Hip-disease.)

In those cases of diastasis, however, in which there is no contraction of the tendons, and the limb can be restored to its normal position, the long splint should be immediately applied, and worn until recovery has taken place. If you are called to attend the case immediately after the occurrence of the accident, treat it precisely as you would a case of fracture of the thigh, and place the patient at once in the wire cuirass, plaster-of-Paris dressing, or other apparatus, which will hold the parts perfectly quiet. I prefer the wire cuirass, especially for small children.

LECTURE XXV.

DISEASES AND DEFORMITIES OF THE SPINE.—POTT'S DISEASE, OR ANGULAR CURVATURE.

Definition.—Anatomy of the Spinal Column.—Etiology.—Pathology.—Symptoms.—Method of examining the Case.—Treatment.—Mechanical Appliances.—Plaster-of-Paris Jacket.

GENTLEMEN: To-day we have to speak of deformities of the spine, and of the diseases which produce them by affecting the bony structure. Deformities of the spine may be a consequence of disease either of the bones and cartilages, or the result of irregular muscular contraction, and the important point in their study is, to arrive at the pathological changes that have given rise to them.

Of these deformities there are two: 1. The one known by the name of Pott's disease, or posterior angular curvature, in which there is destructive inflammation of the bones, accompanied with loss of substance in the bodies of the vertebræ and intervertebral disks; 2. The deformity known as rotary lateral curvature of the spine, in which there is no disease of the bones, but the distortion depending entirely upon irregular muscular contraction.

The one is distortion, the result of destructive inflammation of the bones and intervertebral substance; the other is distortion dependent upon irregular, abnormal muscular contraction. Sometimes the distortion produced by this action of the muscles very closely approaches in degree and appearance that present when the bones and cartilages are diseased, and is then occasionally mistaken for Pott's disease. (*See* Fig. 230.)

The posterior angular curvature, or Pott's disease, will first engage our attention. You will recollect that the spinal column is made up of twenty-four bones and twenty-three intervertebral cartilages, independent of the sacrum and coccyx. The bones or vertebræ are made up of a body, processes, etc., which in early life are separate, being developed from distinct points of ossification; and complete fusion does not take place until life has become considerably advanced. The bodies of the vertebræ have a soft spongy texture, while the processes and articulating facets are more dense and firm. The bodies, being spongy, are much lighter and are much less frequently fractured than bones of denser structure; they are also much better adapted to receiving concussion without injury. At the same time the force of concussion is broken by the intervening cartilages, which are also spongy and elastic, and in this manner shocks are dissipated which would otherwise be transmitted to the brain, when a person comes down firmly upon the pelvis or feet. The intervening cartilages are like the rubber buffers under the railway-cars, and are so elastic that when pressure is removed from them they will return to their original dimensions. This is a practical fact that can be demonstrated by measuring a man in the morning before he gets up and again at night after he has been upon his feet all day; when it will be found that he has shortened from one-fourth to one-half an inch, which loss will be restored when he has had a certain number of hours' rest in the horizontal position. Now, there is a disease that occurs in the vertebral column which is called Pott's disease. It may occur at any period of life, but is much more likely to occur in childhood, and especially in those children who are reckless and careless, and expose themselves to all sorts of accidents. It also occurs more frequently among boys than among girls, because they are more exposed to accidents; whereas the lateral curvature is seen more frequently among girls. With regard to this affection, I have arrived at the conclusion,

based upon an accurate and carefully-recorded experience, that it is produced almost always, if not always, by some injury to the bone or cartilage, and is hence *traumatic* in its origin.

By the profession in general, Pott's disease, above all others, has been considered as essentially of strumous origin; as depending upon a tuberculous diathesis, and not occurring unless constitutional dyscrasia is present; but, in my own judgment, it much more frequently depends upon some injury than upon any constitutional condition. The very fact that hundreds of people are walking about distorted, in many cases to a great degree, and yet remain in this condition and enjoy an average degree of health, until they have reached a good old age, is evidence that the disease which has produced the deformity is not tubercular in character.

The accidents which produce this disease are usually concussions and blows. Those children who are usually full of play may in some of their careless pranks jump from some height, and come down straight without bending the knees or hips, thereby giving a sudden and severe concussion to the bodies of the vertebræ and their intervertebral disks of cartilage, and in this manner disturbing some centre of ossification to such an extent that inflammatory action follows, and the case terminates in inflammatory softening and disintegration of the bone itself. Many times direct blows are received which are sufficient to injure the bones and give rise to subsequent trouble of a serious character. It sometimes happens that even the transverse processes of the vertebra become fractured, and the injury passes unsuspected and unrecognized, and is accidentally found at *post mortem* or in the dissecting-room.

After such disturbance or separation of one or more ossific centres of the vertebræ, several months may elapse before attention is drawn to the case, and perhaps by that time the bones have been partially destroyed and the distortion developed. Then it is said at once that the exhausted condition which may be present is evidence of constitutional cachexia, whereas it is simply the result of long-continued suffering from a local disease dependent upon some direct injury to the parts involved.

Abscesses, commonly known as psoas or lumbar abscess, are quite frequently developed in connection with this disease, and the pus formed among the diseased vertebræ becomes imprisoned

by the fibrous tissue with which it is surrounded, and does not reach the surface, in many cases, as in an ordinary abscess, but must travel along under the sheath of the tendons until it reaches the point where psoas abscesses usually show themselves. This may require a long time, and give rise to serious constitutional disturbance. In some cases these abscesses penetrate the tissues and present themselves between the ribs. When the disease has advanced so far that inflammatory softening and degeneration of the bone are present, the weight of the body upon the inflamed and degenerating parts will cause absorption to take place, which will go on most markedly upon the anterior portion of the bodies of the vertebræ; and, as they lose their thickness at this point, the bodies fall together, and this causes the spinous processes to assume a peculiar-shaped prominence, which has given rise to the name posterior *angular* curvature.

Symptoms.—The *symptoms* of this disease vary according to its location in the spinal column. When it has advanced far enough to produce a deformity, there is usually no difficulty in diagnosis. It may be present, however, long before any deformity becomes developed, and the important point is, to be able to recognize it at that early period. The symptoms, at the beginning, are sometimes very obscure; but the nerves that make their exit from the spinal canal at points opposite to the seat of the disease become more or less involved, and will manifest such disturbance by symptoms developed at their distal extremities. For instance, if the disease is situated in the cervical region, long before any distortion appears the patient will complain of difficulty in swallowing; many have a choking sensation as if there were a string around the neck; difficulty about the larynx, producing an irritable and continued cough; pain in the thorax, etc. Such symptoms may be the only ones present that will attract attention; but they are sufficient to arouse your suspicions, and, if you cannot by means of the laryngoscope and physical examination of the chest detect any disease of the larynx or lungs, or any of the thoracic organs, sufficient to account for the symptoms present, you should at once make a thorough examination of the spine.

When the disease is in the dorsal region the patient very often complains of pain in the lower part of the chest and upper part of the abdomen; also a *constricting* sensation as if a band were around the body; complains more or less of indigestion and

flatulence, and may have been treated for dyspepsia. He may also complain of pain in the chest, pain about the heart, and perhaps may have been treated for rheumatism.

Again, when the disease is lower down in the spinal column, he may have a sense of *constriction* about the abdomen, may suffer from constipation and flatulence, and perhaps have been treated for worms.

When the disease is still lower in the spine, the leading symptoms may be those referable to the bladder and rectum. The *chief* symptom in the case may be a frequent desire to pass the urine. Then the patient may also suffer from streaking pains down the thighs.

When such symptoms are present, and they cannot be explained by the presence of some well-recognized disease, always go back to the point where the nerves distributed to these regions make their exit from the spinal canal, and carefully examine the bony structures which surround them.

Early in the progress of the disease reflex contractions are excited among the muscles, which result in a change in the appearance and action of the child, that is worthy of special attention.

Every joint of the lower extremities is bent for the purpose of preventing any concussion from affecting the bodies of the vertebræ. The chin is made to project; the shoulders become elevated; and it is impossible for the child to stand upright and receive any concussion whatever which may be communicated to the bodies of the bones without suffering pain. The muscles of the back are held rigid, in order to prevent any movements of the bodies of the vertebræ upon each other. The child is unable to stoop down and pick up any object upon the floor; but, if asked to do so, he begins by bending his hips, and then his knees, and finally reaches the object by squatting down to it. These patients never bend the back, for bending the back presses the bodies of the vertebræ together, and gives rise to pain; consequently all the movements of the child are directed in such a manner as to prevent any motion in the spinal column.

When walking about the room, the child will reach with his hands from one article of furniture to another, making careful calculation that he shall not be deprived of the support furnished by one article before he receives support from another. If he

cannot obtain any support by catching hold of various articles within reach, he will rest his hands upon his thighs in order to transmit the weight of the head and shoulders through the legs to the ground, thereby giving them support without bearing upon the diseased vertebræ. The patient instinctively makes every position which he takes serve to lift the weight of the shoulders and head from a spinal column which is in a state of disease. When, therefore, a case presents itself in which the patient complains of cough, indigestion, disturbances about the bladder or rectum, or constant and persistent pain in the chest or abdomen, and you are not able to detect any disease of the lungs, stomach, liver, or other organs which will account for the development of such symptoms, I have to repeat to you again, do not fail to examine the spine. The question now arises, How is this to be done? In the first place, put some object upon the floor and ask the child to pick it up, and then carefully note the position he assumes while performing the act. If the vertebræ are diseased, he will squat down and pick up the object in the manner just described, and rise up in the same careful way that he went down, keeping the back as nearly straight as possible, and allowing no movements in the spinal column which he can prevent. He never bends over like a healthy child, but keeps his spinal column as free from movement as possible.

You will then strip the child naked and lay him across your lap, face down, with the arms over one thigh and the legs over the other, and then gradually separate your thighs. When that is done, the first thing you will notice, probably, will be that the child takes a long breath, a long-drawn sigh of relief; and this leads me to speak of another symptom which I have omitted to mention. When the child is walking about, particularly if the disease is in the dorsal or lower cervical region, he breathes in a short, grunting manner, because of the constant effort on the parts of the muscles to hold the trunk still. In other words, there is a constant effort to put a *muscular splint* on the child's body to prevent motion in the spinal column, and thus the child, by his short, grunting breath and muscular rigidity, is trying to teach us doctors what the indications for treatment are in his case. The pressure upon the intercostal nerves is sometimes so great as to produce almost spasmodic respiration. Now, by placing the child across the lap in the manner described, and

then making gradual extension upon the spine by separating your thighs, thereby relieving the nerves of all pressure and the muscles from all irritation, the first thing that will be noticed is this long sigh of relief—a *full inspiration* and *complete expiration*. As long as the child is held in that manner, he will be perfectly comfortable and breathe easily, if you do not carry the extension so far as to produce reflex muscular contraction. Then close the limbs again, and the muscles are at once excited to contract, and the child again begins his short, catching respiration.

There may be more or less spasmodic muscular action all over the body when the extension is removed; but, if there is not, it can be very easily developed by placing one hand upon the head and the other over the bottom of the sacrum, and crowding the bodies of the vertebræ together. The instant that is done, you will see a spasm, probably of both legs and arms, and the child will cry out on account of the pain; and, the moment extension is made, he is all easy again.

Now, all this can be done when the disease is in the anterior part of the *bodies* of the vertebræ, or in the intervertebral disks; but it may be, in the case which you are examining, that the anterior bodies of the bones and the disks have not yet become involved, and yet the child is suffering from Pott's disease. For, when the dorsal portion of the spinal column is affected, the disease does not always expend itself upon the anterior portion of the bodies of the vertebræ at first, but the part most exfensively involved may be upon the *sides* of the vertebræ, where they form a junction with the ribs.

In these cases the blow or injury is generally received upon the sides of the body, and the heads of the ribs are driven against the vertebræ with such force as to give rise to a starting-point for an inflammation. Consequently you must not be content with examining the spinal column, as far as the bodies of the vertebræ alone are concerned, but you must test the sides of the vertebræ by pressing the heads of the ribs against their articulating facets. Very frequently you will not be able to develop any symptoms of spinal disease, until you press upon the ribs in this manner. You may be able to press the spine down without producing pain; percuss the spine without producing pain, and the spinal column may apparently be straight, all of which might lead you to the conclusion that it is not diseased; but pressure

upon the ribs, which will bring their heads in contact with the articulating facets, gives the patient pain, and at once you have evidence of diseased vertebræ. By pressing upon the ribs separately in this manner, the exact location of the disease can be determined.

When the child is placed across the lap, and extension is made, a moderate downward pressure upon the spinous processes will make them more comfortable, because it removes the pressure from the anterior portion of the bodies of the vertebræ.

The fact that pressure can be made over the spinous processes without causing pain is regarded by many as evidence that no disease of the bones is present. But it is the anterior portion of the body of the vertebræ that is affected, and, when these begin to give way, the spinous processes begin to stick out, and by crowding upon them we remove the pressure from the diseased surfaces, and consequently the suffering of the patient is diminished. There is another item in the way of examination that may be of service to you in making out obscure cases, and that is the use of ice and intense heat. There are some cases in which no definite symptoms can be obtained by examining the patient in the manner described. In such cases the application of ice or intense heat may be of service; for the nerves made irritable by the disease will receive impressions much quicker than they do normally, so that when a piece of ice, or a vial or thimble containing hot water, is passed along the spine, no response is obtained until the point opposite the disease is reached, when there will be a sudden move of the body as if to get out of the way of the irritant. In this manner you will sometimes be able to spell out cases which cannot be easily explained in any other way. And also by the delicate surface thermometer, recently devised by Dr. Seguin, of this city, you will be able to detect an elevation of temperature over the inflamed part that you could not discover in any other way.

Partial or complete paralysis, of one or both lower extremities, sometimes occurs during the progress of Pott's disease, but occurs more especially when the disease is in the lower portion of the spine, so that the nerves which are given off to supply the lower extremities become involved. It depends either upon effusion into the cord, or pressure upon it by the distortion of the bones, and in the first instance will gradually improve, as absorption of

the effusion takes place; but, in the latter instance, prognosis, so far as restoration of power is concerned, is very unfavorable.

As to the theories relating to this form of disease, I think it hardly worth while to consume your time in discussing them, for you can read them at your leisure in all the text-books upon surgery. I simply wish to make these points: that it is the result of injury in almost all cases; that this injury is followed by inflammatory action; that it can be diagnosticated by making extension and counter-extension upon the spine, and by pressure upon the sides of the vertebræ; also by symptoms referable to the distal extremities of the nerves involved in the disease, long before the deformity is produced; and being detected in this early stage, can frequently be cured without any deformity occurring.

Mistakes need not be made in diagnosis, and it is also of the greatest importance that the disease should be detected early, before deformity appears, for, once having taken place, it is generally irreparable. This brings us to the subject of *treatment*.

Treatment.—In the earlier stages (and it is during this period that treatment is most important) there is nothing which can compare with *rest*, absolute and complete, in the horizontal posture. For pressure upon the parts diseased, when the patient is in the upright posture, causes more rapid softening, degeneration, and absorption, and in this manner a permanent deformity may be very rapidly developed, such as you see in the specimens before you. (*See* Figs. 217 and 218.)

If the disease is situated low down, as in the lumbar region, rest in the horizontal posture is especially required. If it has progressed far enough to produce any distortions, you will be obliged to prepare a bed that can accommodate itself to the projecting spinous processes. This indication is met by either the air or water bed; but I prefer the air-bed, because it can be emptied and filled with much less trouble. When you have placed your patient upon one of these beds, if there be tenderness along the spine, or any evidences of active inflammation, ice along the spine, by means of ice-bags placed upon either side opposite the seat of the disease, will be of the greatest service. If the pain is acute, a half-dozen leeches may be applied, and repeated every eight or ten days, and then followed by the ice-bags. If the skin

is too sensitive to the influence of cold to bear the immediate contact of the ice-bags, a few thicknesses of muslin may be interposed.

But *rest* is the great feature of the treatment. You must remove all pressure upon the parts involved, and the best possible

Fig. 217.

Fig. 218.

manner in which that can be done is to place the patient in the horizontal posture upon a water or air bed.

At best, however, it will take a long time for these patients to get well; therefore some means must be devised which shall not only afford the benefit derived from rest, but at the same time permit them to have the benefit of fresh air and sunlight. This can be accomplished by placing the bed upon wheels, so that it can be rolled about to suit the convenience of the patient. Another excellent method for accomplishing the same thing is, to dress the patient in the wire cuirass; in other words, make this apparatus take the place of the bed. In order that the cuirass may be worn with ease and comfort, I have an India-rubber bed made to fit the instrument accurately, and this is filled with air, and makes an elastic cushion for the patient to lie upon. Of course you must not forget, while using this dressing, to remove the patient occasionally, and give free movements to the joints of the lower extremities, lest anchylosis take place.

Give your patient all the good food that he can properly assimilate; and doubtless he will also require some remedies to regulate the stomach and bowels, and invigorate the appetite, such as some of the ordinary stomachics and tonics, and perhaps a little champagne or brandy. Cod-liver oil, cream, milk, are all serviceable; in short, everything should be done which is of possible service in building up the system. These measures are resorted to, not with the idea that there is constitutional taint to be overcome, but because it is the only way in which the system can be brought into the condition which best favors the process of repair.

Blisters, issues, and setons, applied for the purpose of keeping up a long-continued counter-irritation and *discharge*, are positively injurious, and under no circumstances whatever should such measures be adopted; but the actual cautery, applied as near the diseased vertebræ as possible, will, by its stimulating action on the deep-seated vessels, be of the greatest service; but when this is used always allow the wound to heal before it is reapplied, and never keep open a running sore. In the first place, the child is already sufficiently disturbed and prostrated by the pain attending the disease, without tormenting him any more by agents which, from their very nature, will produce pain; and he is also already sufficiently emaciated, without establishing a suppurative process to make him more so.

Rest in the horizontal posture, and continued until you can bring the diseased surfaces of bone together without producing pain, is the only safe rule to guide you in giving the patient permission to assume the upright posture. When he is permitted to assume this posture, it must always be attended by some artificial support which shall remove all pressure from the bodies of the vertebræ. This can be given by straightening the spinal column in such a manner that the weight of the body is borne by the *transverse* processes, and not by the *bodies* of the vertebræ, for these processes, having a denser structure, can bear pressure without much danger of producing erosion.

For this purpose, Dr. C. Fayette Taylor, of this city, has devised a brace which possesses some elements of great practical value. The important feature of the instrument is the hinge-motion, afforded at a point opposite the disease in the vertebral column, so that the weight of the upper portion of the column

can be transferred from the bodies of the vertebræ to the transverse processes. (*See* Fig. 219.)

The idea involved in the construction of some instruments, namely, that of lifting the bodies of the vertebræ apart by placing a belt about the hips, and a support under the arms, is simply absurd, because the mobility of the scapulæ is so great that they can be lifted up, as far as the endurance of the patient will permit, without relieving the weight of the body upon the spine. In fact, this can only be done by an accurately-fitting apparatus applied to the body itself when extended, like the plaster-of-Paris jacket which I have recently used.

If the disease involves the cervical vertebræ, an additional support to the head can be given by the use of Dr. Davis's instru-

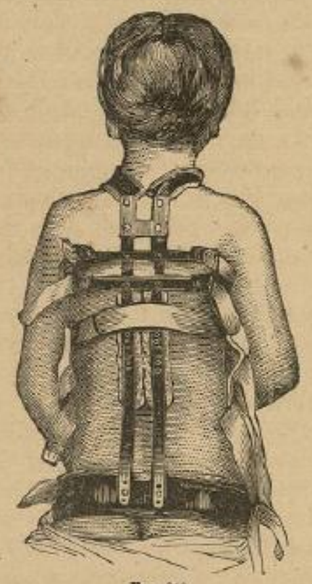

Fig. 219.

Fig. 220.

ment for that purpose. (*See* Fig. 220.) This consists of a steel rod (*D*), running over the head and resting on two shoulder-caps (*G*, *G*), which are well cushioned, and retained in place by being attached to a pelvis-belt by a rod (*B*), in front and rear of the body. From the top of the rod is suspended, by an *elastic* band,

the wire (*F*), to which is attached an inelastic webbing running under the chin and occiput. And, by making the elastic at the top longer or shorter, the cervical vertebræ can be extended at will.

If you are not able to obtain any of the apparatus described, you may take a piece of ordinary sole-leather, dip it into cold water until it becomes perfectly soft and flexible, and, after the child has been straightened out as much as can be done with safety, mould it upon the body, and secure it by means of a roller-bandage.

Again, they may be dressed with plaster of Paris, as you would a fracture.

The thought had occurred to me that this might be done, but I had hesitated through fear that respiration would not be properly sustained if the child were completely enveloped in such a fixed apparatus.

However, a child, four years of age, was brought to my office six weeks since, from the country, with Pott's disease, or posterior angular curvature of the last two dorsal and first lumbar vertebræ, unable to stand, very much emaciated, and the right limb paralyzed—probably from the pressure upon the spinal cord. The child had suffered the usual symptoms of this disease for more than a year past, having been treated for worms, incontinence of urine, and pain in the stomach, the disease of the spine never having been suspected until a few weeks ago, when a physician was called to see him, who immediately recognized Pott's disease and sent him to me.

The patient's parents were too poor to buy a Taylor's brace which I intended to put upon him, and the disease, in fact, had so far progressed as to require of the child the recumbent position for some time before even a Taylor's brace could be used to advantage. As I before said, they were too poor to buy any mechanical apparatus, and as perfect quiet of the spinal column was requisite, I had the child held up by the arms (the weight of the body acting as an extending force), pinned his little flannel shirt around his thighs, stretching it over his body smoothly, and, commencing at the pelvis, applied rollers saturated with plaster of Paris over his entire trunk, the same as you would to the thigh in dressing a fracture.

The only fear I had in making this application was of constricting the chest so as to interfere with respiration; but, as the child cried lustily during the whole operation, this fear was removed. He appeared able to press the diaphragm down so as to give plenty of room for respiration, notwithstanding that the dressing was entirely around the thorax.

He was held in this position, suspended by the arms, for twenty or thirty minutes, until the plaster became set. Then the cuirass, as it might properly be called, was divided in the median line from the sternum to the pubis, when, of course, his respiration became perfectly easy. The lower portion around the pelvis was then secured by a roller, making it a firm support, and the upper portion of the dressing was tied at various points by an elastic bandage, allowing it to expand for respiration; and, as his parents say, he has been perfectly comfortable ever since, has grown quite fleshy, and is now able to walk about without resting his hands upon his knees.

This child was returned to me only an hour ago, and I present him to you to show the practical effect of the application of this plaster-of-Paris dressing, as it is the first time I have used it in this way. I have frequently employed the plaster extending two-thirds around the body, which I have termed "turtle-shelling," but never before carried it clear round, encircling the entire body. As you all know, the streets are nearly impassable from the small icebergs interspersed here and there, and therefore we have been jolted in the most severe manner while coming in a carriage from my office to the college, and yet the child has never complained at all, although the parents say that it was impossible to move him before without using the greatest care.

We will remove the cuirass, for the first time since I applied it six weeks ago. The angle of the curvature is very much less sharp than when the instrument was applied, and the child's general health has improved immensely. [The professor then showed the plaster-cast to the class, the mother holding the child in her lap in the mean time. It was then readjusted, when the mother remarked that the child could now sit up, but when the dressing was off it could not sit up at all—which, as the professor mentioned, was the best proof of the efficacy of the treatment.]

The advantages of this plan are these: Its simplicity, its economy, the material for its construction being attainable anywhere, its ease of application, the readiness with which it can be readjusted as the growth of the child requires, and the accuracy of the

fit, giving the child more comfort than any instrument which could be made, unless over a plaster model, which would be very expensive, and even those that are made over a model to fit in the most accurate manner, when they come to have the trimmings and padding applied to them, have lost their accuracy of fit and, therefore, make uneven points of pressure. The objection to the use of plaster is that it is not very clean; but this can be obviated by using starch, flour and eggs, silicate of sodium, or anything else that will assume the shape of the body and retain its form.

It is not altogether improbable that this simple dressing may yet supersede all the complicated and expensive apparatus we have heretofore employed in the treatment of this disease.

When the deformity has been produced and become anchylosed the position is fixed, and any attempt to completely correct it, or to break up the partial consolidation that may be present, is unjustifiable. All that can be done under such circumstances is, to hold the body as well as possible in the position which it is made to assume, and permit the bones to get well with the deformity remaining.

A most excellent and serviceable adjuvant to all these supports is the wheel-crutch, invented and manufactured by Mr. Darrach, of Orange, N. J. (Fig. 221). The idea involved in the construction of the crutch is to keep the patient in an upright position, with support under the arms, and avoid the intermitting strain and swinging action attending the use of the ordinary crutch. By sustaining the body of the patient in a pendent position without fatigue, the diseased parts are relieved of pressure, while the patient can have all the benefits of exercise without injury. The erect posture, however, is not desirable except so far as is absolutely necessary to permit exercise and obtain fresh air; but, when the erect posture is assumed, the trunk should be supported by artificial means, applied in such a manner as to remove all pressure from the bodies of the diseased vertebræ, until complete consolidation has taken place. This crutch, therefore, answers a very good purpose; but I believe there is nothing that can take the place of

Plaster of Paris as a Dressing in Pott's Disease.—Since this lecture was delivered, the prediction then made has been fully realized (January, 1876) by the application of the plan suggested, in more than sixty cases, with the happiest results. I

therefore feel quite justified in proposing it as a proper plan of treatment. At first I was afraid that the thoracic compression would interfere with respiration, and therefore divided the cuirass in the median line as soon as the plaster was set; I

Fig. 221.

then secured the lower or pelvic portion with a firm, non-elastic roller, and the upper or thoracic portion with *elastic* bands to allow more free lateral expansion of the chest. Practical experience, however, has demonstrated that this is not necessary—but, on the contrary, is injurious, particularly if the disease involves the sides of the bodies of the dorsal vertebræ—and that the complete circling of the thorax in the immovable plaster bandage in these cases gives the greatest relief, as by this means the ribs are held absolutely motionless, and the respiration is compelled to be diaphragmatic and abdominal. When the thorax is thus firmly secured, the anus and perinæum will rise and fall synchronously with the diaphragm, and the respiration be carried on

without difficulty, as long as these parts are free from pressure. Pressure upward against these parts with the hand produces a feeling of suffocation. It is therefore necessary, when the thorax is thus secured, that the patient should sit upon a chair with a hole in the seat, like a close-stool, or use an inflated India-rubber ring, like the ordinary life-supporter.

As it is difficult for an assistant to hold these patients suspended long enough to apply the dressing and have it set properly, Mr. Reynders has contrived a very convenient apparatus for that purpose, which I have found most useful. (*See* Fig. 222.) It consists of a curved iron rod, with a hook in its centre and at each end. From the end-hooks loops pass down under each axilla, and also to the chin and occiput, to support the head. To the centre hook is attached a pulley, and, the opposite pulley being secured to the ceiling or some other safe attachment of sufficient height, the patient is easily elevated by the bands under the axilla, chin, and occiput, until the heels cannot touch the floor.

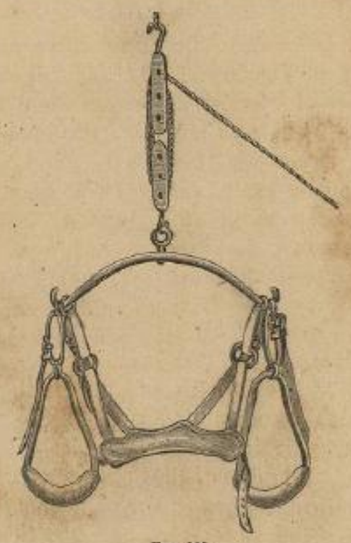

Fig. 222.

In some cases of an adult, or even very heavy children, the pressure on the axillary plexus of nerves produces numbness of the fingers. In such cases I have found great relief from apply-

ing an additional roller-bandage from the axilla across the chest, front and rear, to the opposite hook, as seen in Fig. 224.

This plaster-dressing can be changed or removed as often as necessary to accommodate the increased growth or development of the patient.

The ease of application in any section of the country without the trouble and expense of resorting to any specialist or instrument-maker; the perfect comfort given to the patient by protecting the diseased parts from pressure, without galling or chafing any other part, as is almost always done even by the best-fitting instrument; and the absolute immobility which can be obtained by the plaster-bandage, will, I feel confident, give this plan the preference over any yet adopted for the treatment of Pott's disease, or caries of the spine.

To illustrate the advantage of this plan of treatment, as well as to point out some modifications in its application in certain peculiar cases, I will narrate a few of the cases in which it has been applied:

Case. *Pott's Disease.*—John J., aged five years, of perfectly healthy parents; in January, 1873, Pott's disease appeared, in the lumbar region, for which no cause could be assigned. A wheel-crutch was used until April in the same year. In May, 1874, a raw-hide jacket was fitted to the child, which gave great relief. The child was again seen in 1874, when he looked well. He continued to run about until June 4, 1875, during which time he had outgrown the jacket, which was removed and a plaster-of-Paris dressing applied. The child was held out as straight as possible by two assistants pulling, one from the shoulders and the other from the ankles, a flannel shirt having been adjusted to his body; then a bandage, saturated with plaster of Paris, was carried around the pelvis and up to the axilla.

The plaster dried readily, and the child was sent home feeling perfectly comfortable.[1] I was sent for that evening in great haste, the mother saying he could not "lay or sit," and found him suffering from too great compression of the thorax. I therefore made an incision of about three inches from the top, through the plaster-of-Paris dressing, which gave instantaneous and per-

[1] Experience has taught me that suspension of the body in the sling makes more comfortable adjustment of the plaster-jacket than when applied with extension in the horizontal posture.

fect relief. This dressing was worn until July 26th, when it was found that a fold in the shirt had produced uneasiness. It was then taken off, and a slight abrasion over the crest of the left ilium discovered. The child came to the office on the 30th, when the abrasion was found healed, and was told to return the next day, when the dressing would be reapplied.

July 31*st*.—Another dressing was applied, the child being placed in the sling, the body being the extending power. The plaster of Paris was applied as before. After the plaster had dried, the child walked about the office, feeling very comfortable.

On the following Tuesday he went on an excursion, and, up to this day (August 12th), has suffered no pain.

September 22, 1875.—Was present at the clinic; his jacket, that had been applied July 31st, was removed. The boy could bear concussion, even when the instrument was off, without pain, and appeared to be perfectly well, the dorsal and lumbar vertebræ being anchylosed and without deformity. Another plaster-jacket, however, was applied (before the class), to guard against any possible accident.

November 1*st*.—Jacket sawed open and removed. Boy apparently perfectly well, firm consolidation having taken place. He is allowed to wear his jacket, as a matter of convenience—to satisfy himself—although not necessary.

January 1, 1876.—Perfectly well, and needs no support.

Case. *Pott's Disease, from Injury*.—Mr. W. was brought to me, July 26th, by Dr. Arrowsmith, of Keyport, New Jersey. The patient gave the following previous history:

Was out riding and thrown from his wagon, striking on his left side and back; was unable to move for a short time; about two hours afterward regained perfect control of himself. One week later, as he did not feel very well, sent for a physician, who said he thought he had inflammation of the bowels, caused by his injury. Was treated for some time, and got no relief. Latterly he was examined by other physicians, who differed in their diagnosis, and, not being satisfied with their opinion, he went to St. Luke's Hospital, where he remained and had a "Taylor's brace" applied for Pott's disease; was brought to my office, when I examined him and confirmed this diagnosis.

Present Condition.—Patient very much emaciated. Position as seen in Fig. 223. The sensation of constriction around

the abdomen is the most marked feature of his suffering. He cannot walk, or lie on his back with any comfort; can only lie on the abdomen; *even then* requires to be pulled out to free him

Fig. 223.

from pain. Suspending the body, the arms being thrown over the shoulders of another person, gives relief.

I applied the plaster-dressing, as before described, in presence of Drs. R. Taylor, A. A. Smith, and others, and, when it was dry, he said he was more comfortable than he had been for twelve months. The next day he called, and said: "The principle is correct, but it has been applied imperfectly; my back has a vacant space on each side of the spinous processes the entire length, and it requires filling up."

He was so very thin that the spinous processes projected to such a degree that the bandage bridged over a vacant space on each side, and he felt the want of this support. Not having time to apply it on this day, I made an appointment for the following Friday.

When he came on Friday, he stated that he had made another discovery: that he had no room to put his dinner, and wished me to fold a pad over the abdomen, and bandage over it, so that,

when the plaster had become set, it could be pulled out, and the rest of the dressing not be disturbed.

I redressed him, assisted by Drs. R. Taylor, Yale, Rose, and

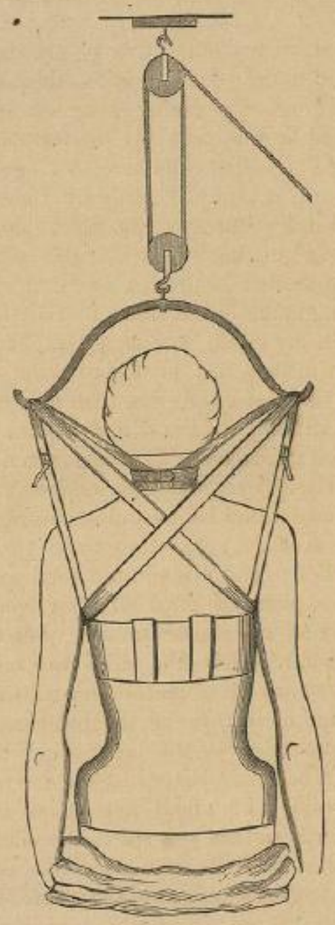

Fig. 224.

my two sons. On account of the pain from pressure in the axilla, I applied additional support by carrying a roller-bandage through the axillæ across the chest, front and rear, and securing it to the

hooks at each end of the curved iron rod, as seen in Fig. 224. I then placed several strips of bandage, saturated with plaster, on each side of the spine.

I then dressed it as usual, after padding the abdomen as suggested.

Patient called at my office five or six days afterward, and stated that he had never been so comfortable since he was hurt.

He has now gone on a fishing-excursion, and the last heard from him was that he was perfectly comfortable.

CASE. *Pott's Disease.*—Michael N., aged three years, of healthy parents. Was always healthy till December, 1874, when his mother noticed a stiffness of the right side. He was treated for hip-disease, in an institution in this city, without relief. March, 1875, the mother noticed a swelling on the right side of the spine, which gradually increased to the size of a hen's-egg. Was examined in my clinic, and aspirated. I found pus, and a free incision was made; also, on examination, found Pott's disease in lumbar vertebræ. He was then dressed with plaster of Paris, and a fenestra left for the escape of pus.

The child wore the dressing six weeks, when he began to complain of pain. The plaster was then removed, and it was found that an abscess had formed below and to the right of the old one. A free incision was made, connecting these two abscesses, which afforded great relief. The wound was filled with Peruvian balsam and oakum, a piece of oiled silk put over it, and his shirt drawn firmly over all and made smooth, when the plaster-jacket was applied as before, while the child was suspended. A pin, passed through a folded bit of pasteboard or card, was placed over the wound, so that each turn of the bandage, passing over the pin, made a certain guide to the point over which we wished to cut a fenestra. When the plaster had become nearly set, a fenestra, three inches wide and about five inches in length, was cut around the pin, until we came down to the oiled-silk. This was then starred in lines from its centre, and the edges of it turned over the plaster-bandage, and the space carefully stuffed with oakum, to prevent burrowing of pus, made a nice drain for the discharges of the abscess (as seen in Fig. 225).

The dark and dotted lines (Fig. 226) show the relative position of the spinal column before and after suspension.

The wound was kept clean with oakum and Peruvian-balsam

dressings, and a tight roller passed over it every day. The child was able to walk about without any assistance on the day after the last dressing was applied, since which time he has been perfectly comfortable and free from pain.

Fig. 225.

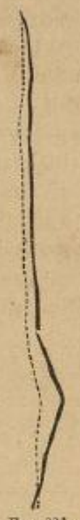

Fig. 226.

October 20th.—The child was brought to the office, the mother saying that he was getting so fat that his jacket was too tight. The wound had stopped discharging for more than a fortnight, and the child had the appearance of almost robust health.

Case. *Pott's Disease; Injury.*—Minnie O'B., aged three years, of healthy parents. About November, 1874, she fell downstairs. Shortly after she began to complain of a pain in her stomach. The mother found that the abdomen was very hard and swollen. The child has not been able to stand erect since; the mother states that she was always comfortable when lifted by the arms. Three months ago a small lump appeared in the lumbar vertebræ, about the size of a hickory-nut. July 28, 1875, she was brought to me, and on examination I pronounced it Pott's disease. Child was suspended in the apparatus and I applied the plaster-of-Paris dressing on the 4th day of August, in the presence of

several physicians, since which time the child has been perfectly comfortable and free from pain.

September 1st.—Child complained of pain; dressing removed and found a small abrasion from a fold in the shirt.

5th.—Re-dressed in plaster-jacket; perfectly comfortable.

October 7th.—Child has been in the country since last report. Returned to-day, very much improved in general health, feeling well, running around without cane or crutch, and the mother saying that it is impossible to keep her quiet.

Having put up some sixty cases in the plaster-jacket, almost all of which had previously worn instruments for a greater or less period of time, and every one of the patients giving the preference to the plaster-jacket to any other mechanical support which had been applied to them, I feel quite confident in recommending it as a plan of treatment, and will merely quote one more case as an illustration of the improvement that can be made in the

Fig. 227.

Fig. 228.

position, by suspending the patients before the permanent dressing is applied.

Case.—C. E. G., five and a half years old, sent to me from West Virginia, by Dr. Campbell, September 1, 1875, suffering

from Pott's disease in the seventh, eighth, and ninth dorsal vertebræ.

She was unable to stand without support, either upon her crutches, or hanging on to chairs or tables, or sustaining herself by her hands upon her bent thighs.

The disease began to develop itself after an injury, having fallen upon her back early in the spring of 1874. In the month of June, 1874, she was taken to the National Surgical Institute, Indianapolis, where she had an iron brace applied to her, and which she had worn from that time until the present, and, although a remarkably well-fitting instrument, it had not prevented the curve from taking place, as seen in Fig. 227.

By having a piece of lead rolled out in the form of tape, I was enabled to accurately mould it to the curve in her back (as seen in dark line, Fig. 228), and after the child was suspended under the axilla and from the chin and occiput, in the usual way, for a few moments this leaden tape-measure was again applied the entire length of the spine, and the change in position is seen by the dotted line, Fig. 228, thus proving with a positive mathematical certainty the change that had taken place in the curve of the spine.

The plaster-jacket was then applied over a nicely-fitting shirt, and the following day she ran without any crutches or cane, very much to the father's surprise, and returned to her home in West Virginia.

Six weeks afterward I received a letter from her father, stating that she had improved both in health and spirits, and that her relatives and friends were perfectly astonished at the great change in her form and carriage. She simply suffered after eating, and he feared that the jacket was growing too tight, and suggested the propriety of its removal, and the application of cotton-batting over the stomach, which was to be removed after the jacket had set, an almost exactly similar suggestion to that made to me by Mr. W., upon whom I first applied a pad under the jacket.

November 3d, I received another letter, reading as follows:

"Charleston, West Virginia, *November* 1, 1875.

"My dear Doctor: The case you put on my little girl became so tight and uncomfortable that I got our family physician, and we tried our hands at a removal. I am glad to report our operation a perfect success.

"Our patient is quite lively to-day, and a marked improvement in her breathing is discernible, as we put the cotton-batting over her stomach before putting her up, afterward extracting it, thus giving her plenty of room for breathing and eating.

"I send a picture of her present condition, and you can see how much straighter she is than when you first saw her. (*See* Fig. 229.)

"We feel confident from the improvement that has been made, and the comfort that she has enjoyed by the use of the jacket, that her recovery will be perfect and complete.

"Gratefully yours, John W. G."

If there are any cases in which it would be justifiable for the application of the actual cautery, this can easily be done by mak-

Fig. 229.

ing a fenestra over the place where the cautery has been applied, the same as in the case above reported where an abscess existed.

It is possible that a flat India-rubber bag placed over the abdomen for the purpose of being inflated during the time that the plaster is being applied, and which can have the gas let out of it after the plaster has set, will accommodate the digestive process, similar to the cotton-batting that these two patients have instinctively suggested for themselves. Doubtless many other improvements may be made in the application of this principle before it is brought to perfection.