

Recumbency in the treatment of Pott's disease / by John C. Schapps.

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Recumbency in the Treatment
of Pott's Disease.

BY

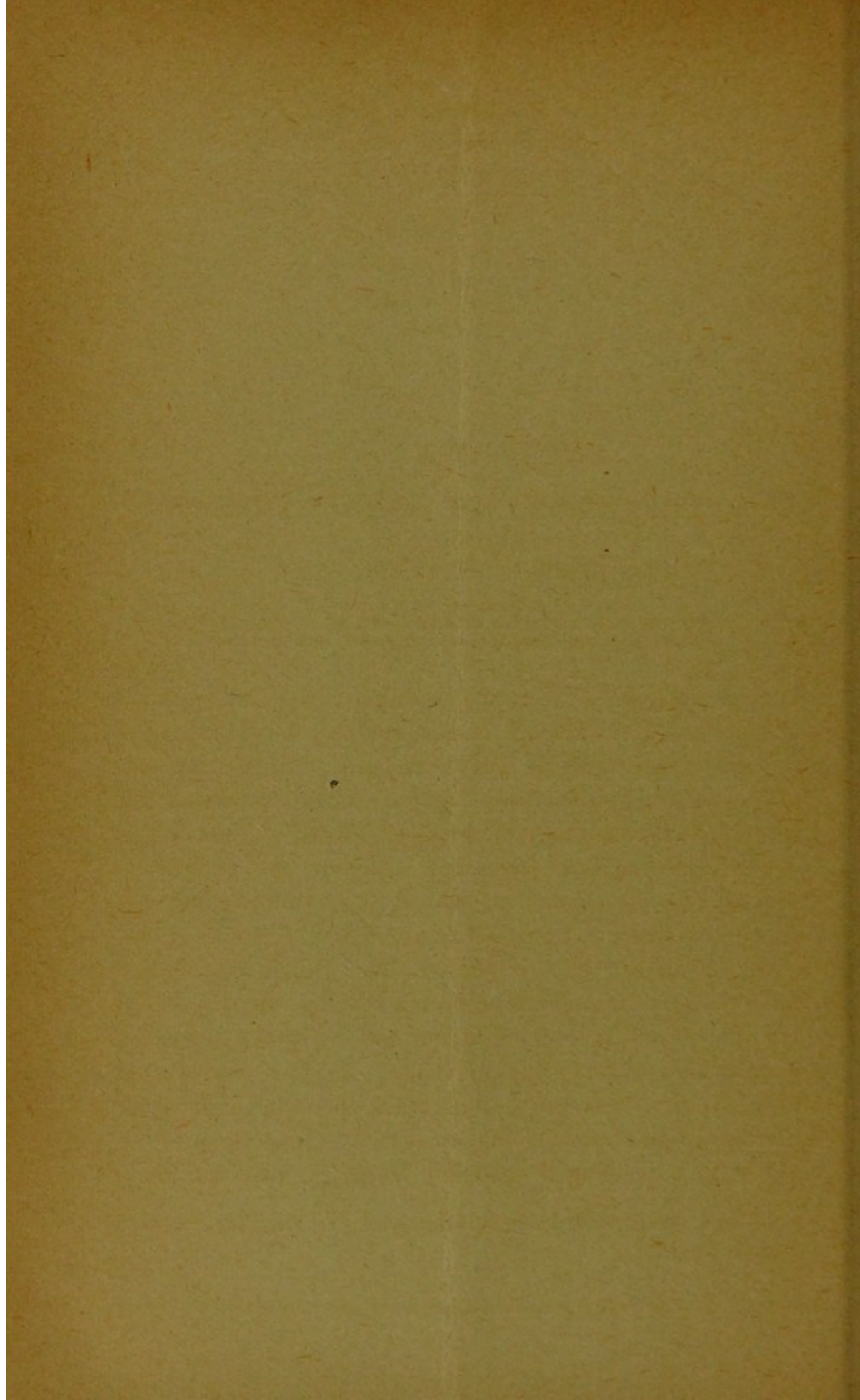
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RECUMBENCY IN THE TREATMENT OF POTT'S DISEASE.*

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THE collapse of a cavity resulting from disintegration of bone and fibrocartilage is not the only local element of the spinal deformity of Pott's disease. During the process of destruction the bone for some distance around that which breaks down becomes greatly softened. This change is not to be regarded as merely a part of the destructive process, but, as a great degree of protection against mechanical violence is thus afforded, it has a positive conservative value. The protection thus gained, however, is liable to be at the expense of change in shape of the softened bone itself, and it is this also, and not the bone destruction alone, which produces the deformity. In those cases which have no very acute symptoms, such as pain, night cries, marked spasm, fever, or impairment of general condition, but with a prolonged tendency to progressive deformity

* Read before the Section in Surgery of the First Pan-American Medical Congress.

more rounded than angular, it is probably the predominating factor.

It has been shown that after removal of a tuberculous focus from the bones entering into the knee joint the surrounding cancellous tissue remains for some months in a pliable state, so that without renewal of the osteitis it may bend and permit flexion of the limb; that this is corrigible by mechanical means, and that the bone ultimately becomes permanently hard.* The same conditions obtain in disease of the cancellous tissue of the spine, and after the destructive process has expended its energy the deformity may still be easily increased, but it is to a great extent controllable. Given a soft segment in the vertebral column, the kyphos is the mechanical result of weight and muscular action exerted in one or more of the following ways: First, as longitudinal pressure, by which the part is squeezed out; second, as anterior leverage, by which it is bent out; third, as direct backward pressure, such as intra-abdominal or intra-thoracic tension, or, in case of a patient supine upon a yielding surface, visceral weight, pushing out a weak portion of the parietes. It is of importance that these deforming forces be kept clearly in mind in order that counteracting force may be intelligently applied. Sudden, intermittent pressure, such as is produced by jars or twists, affects more particularly the destructive process, while long-continued pressure produces more effect in changing the shape of the surrounding bone. The same force may be destructive or passively deforming according as the active or passive condition of the parts predominates. Cicatricial contraction also plays an important rôle. Although conspicuous as a distorting factor in disease of joints other than spinal, its existence in this connection seems to have

* Deformity following Excision of the Knee. *Brooklyn Medical Journal*, February, 1892.

been generally ignored. An amount of cicatrization sufficient for the firm binding together of the parts adjacent to the bony defect is conservative, and it is fortunately improbable that any force which we can bring to bear can overcome it. But here, as elsewhere, inadequate protection in the acute stage may permit such a degree of disease intensity as will result in the formation of an unnecessarily large amount of scar tissue. This in contracting increases the deformity.

It is evident that inhibition of the destructive process is the most efficient preventive of the deformity, but as the latter is not necessarily proportionate to the former, and as the displacement of parts is traumatic in its effects, the deformity is treated not only for itself, but because it has a marked influence upon the causative destruction and upon the general health of the patient. In any stage of the disease the mechanical treatment consists in protection from traumatism, intrinsic and extrinsic, and antagonism of the deforming forces enumerated. But while no sharp distinction in kind is to be made between the therapeutics of the disease and that of the deformity, there is a very great difference between the degree of protection and of mechanical prophylaxis that is necessary for a spine in which progressive caries is in operation or very great softening exists, and that degree which will meet all the needs of one where, that process having ceased to operate, only a moderately weak place remains. Clinically, accurate determination is impossible and the treatment must be made thorough enough for any possible state. The spondylitic spine when upright is unavoidably in performance of its functions as a support for weight and a base for muscular action. It is subject to a constant succession of traumatisms, accidental, those involved in the use of the limbs and thorax and those consequent upon misplaced muscular ori-

gins and insertions. The demand made by it upon any form of portative apparatus is therefore enormous. Such instruments have demonstrated a great degree of utility. Let us consider their limitations. Their action consists in support (principally antero-posterior) by leverage and in longitudinal traction. Unlike splints applied to a broken long bone or to a joint of a limb, where they act on long stiff levers, they have no direct grasp upon the seat of the disease nor upon the parts immediately adjacent thereto, but they include with the spine the moving thorax, the yielding abdomen with its heterogeneous and mobile contents, and to a limited degree the pelvis. And, in the acute stage, what force reaches the spine is expended not upon the bony defect or the seat of actual disintegration, but upon the soft mass surrounding it. This can not be pried straight while it is under the influence of pressure transmitted longitudinally through the spine. Antero-posterior support is also limited, in mid-dorsal disease, for instance, where the length of the spine above and below furnishes the best opportunity for leverage, by the amount of pressure which the skin over the kyphos will bear. In acute cases it frequently happens that this tolerance is not sufficient to permit a successful resistance to destructive and deforming force. As the back becomes sore the apparatus must be removed or modified to diminish pressure. This is but following up an increasing deformity, not successfully antagonizing it. In disease of the upper spine, where traction is the more essential element, similar limits are encountered. The immature pelvis of a child affords a poor base for traction. The skin covering the chin, back of the head, etc., will permit far less pressure than is involved in the weight of the head alone. Another indication of the inefficiency of portative apparatus is furnished by the convalescent spine. In the acute stage the

area of reflex muscular spasm extends much beyond that of the disease. The extent of this rigidity is a pretty fair criterion of the intensity of the process. Frequently the whole spine is rigid, or may become so when the patient stands. In a case of dorsal disease a posterior brace fitted to a prone patient will either continue to fit when the patient stands or will cease to fit because he straightens his lumbar spine. But when the acuteness diminishes, the area of previous collateral rigidity becomes more flexible, and a brace now fitted to a prone patient does not follow the contour of the upright spine. The tendency of the healthy spine when vertical is to sag into curves, and the patient now lordoses away from the brace. Although some support had been afforded, it had not been sufficient to supplant reflex muscular spasm. It was the patient's muscles, to some extent at least, and not the brace, that had held him up. In some cases the patient has supported the brace more than the brace has supported the patient. These criticisms are applicable to any form of portative apparatus of whatever material constructed. Their use should be confined to the subacute or convalescent stage.

Recumbency as a therapeutic measure means mechanically more than simply putting a patient to bed. It implies protection from traumatism and retention of the whole spine in the best possible position, so that the relations of the separate parts remain unchanged or subject to those changes only which by the use of pressure and traction the surgeon may make. The prone posture is preferred by some surgeons, notably by E. Noble Smith, of London,* for the following reasons: 1. It removes the weight of the body from resting on the spine. 2. It restrains the action of the abdominal and other muscles in front of

* *The Surgery of Deformities.* E. Noble Smith. London, 1882, p. 218.

the spine so that the part of the body above the deformity is not bent forward. 3. It allows free use of the arms for feeding, play, etc., without causing the body to bend forward and press the diseased bones together. I have no experience with this posture, but, as compared with the supine, it would seem to be open, from a purely mechanical standpoint, to these objections: 1. It fails to afford the splintage which, in the supine position, the contact of the spine with the fixed surface of the couch affords. On the contrary, the anterior chest and abdominal walls being stationary, all the traumatisms of respiration and other thoracic or abdominal movements are effective on the vertebræ. 2. Deglutition, especially of liquids, and attention to the other needs of the body, must be much more difficult in the prone than in the supine position. 3. In cases where it is necessary to keep the head fixed in line with the trunk, the patient could not see what is going on, and confinement in this position would soon become very irksome. 4. Suppose the apex of the kyphos to be designated by a and a' , in the accompanying diagrams, the direction of gravity being indicated by the arrows. In the

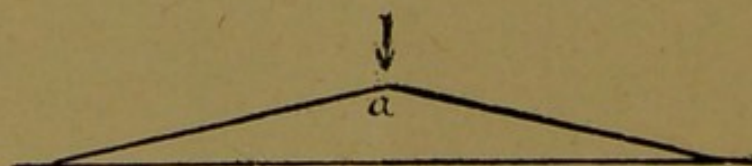


FIG. 1.

prone position (Fig. 1) such of the parts as underlie the kyphos are supported by the bed, and are themselves supporting the spine in its deformed position; there is nothing to prevent the soft bone from being thrust out. In the supine position (Fig. 2) the trunk rests, in part at least, upon a' , and the weight of the spine above and below the kyphos, together with that of the superincumbent parts, is reforming in its tendency.

That this last consideration is not a mere matter of theory, the accompanying tracings (Fig. 3), taken from an

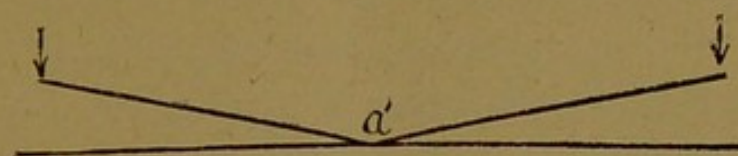


FIG. 2.

old case of dorsal disease, will very strikingly show. The first (*a*) was made by means of the lead strip applied to the spine while the patient was prone. When cut out of cardboard, the edge fitted the spine accurately. The sec-

ond (*b*) was thus obtained: Several thicknesses of plaster-of-Paris bandage were applied to the mid-line of the back and closely secured by a muslin bandage. The patient was placed in the supine position upon a firmly padded table and kept quiet until the plaster had become hard. The muslin bandage was then cut away, and the patient lifted carefully out of the cast. By means of the lead applied to



FIG. 3.



FIG. 4.

the impression the contour of the cast was obtained, cut out of cardboard, and tested. These tracings have been placed together for comparison. While the general straightening of the spine is in part due to compensatory lor-

doses above and below the kyphos, even this change is a very desirable one; for, as emphasized by Whitman,* spinal deformity derives its importance chiefly from the resulting misplacement of the head, shoulders, chest, etc. The lordoses must, moreover, exert some straightening force upon the kyphos. The patient could by no means have tolerated, in the upright position, a brace that would have produced such a change. In a similar case were determined in both positions the transverse outlines of the projection. Fig. 4 shows the comparison. The upper is the profile in the supine, the lower in the prone position. The greater forward inclination of the ribs in the latter position is serious because it effects a projection forward of their sternal ends, and thus causes the characteristic pigeon breast.

The thorough support of the spine is not possible if the patient lies upon a soft or yielding material or upon a canvas-covered frame placed upon a bed from which it is raised several times daily; for the contour of the spine is not the same when the frame is suspended as when it is on the bed. Although no pain may be caused by thus changing the relations of the inflamed or softened vertebræ, such change tends to produce reflex spasm and is not surgical. The supporting surface should be quite firm, and the whole spine should be comfortably fitted. When the posterior projections of the occiput and the buttocks are greater than that of the kyphos, a pad tightly stuffed with curled hair, cork shavings, hair felt, or similar firm elastic material, should be placed under the latter. The hollows of the cervical and lumbar regions should also be filled in. On the other hand, care should be taken that the kyphos does not bury itself in the bed so that the

* *Transactions of the American Orthopædic Association*, vol. v, 1892.

pressure above and below, or upon the ribs at either side, is greater than at the apex. The backward projection of the diseased area should be at all times directly antagonized by as much force as is practicable. It is essential that this force be subject to accurate adjustment without exciting reflex muscular spasm by interrupting the general condition of rest. This adjustment is not possible when the patient lies upon a board or other surface where no access is had to the spine. It is then due to slight deformity and good fortune if he does not have to be repeatedly taken up and the padding modified to meet the changing contour or to relieve some part of too concentrated pressure. Comfort is an essential criterion, and the same rule that applies to almost any kind of orthopædic instrument holds good here. When it is a source of pain or discomfort it is not only not doing good, but is probably doing harm. Bathing (not rubbing) the parts with alcohol and water, equal parts, and the application of talcum, Fuller's earth, or a similar drying powder, are very necessary when sores form or are imminent. A very little turning of the patient will suffice for this purpose, but even this should, by a careful adjustment of the pressure, be avoided as much as possible, and should always be done by two persons—one at the head and shoulders, the other at the pelvis—working together so as to keep the relations of the parts unchanged. This is particularly necessary in cervical disease. In these cases the patient will not usually try to turn his head or lift it up.

Traction is particularly efficacious in cervical or high dorsal disease, and usually may be applied by means of a head sling similar to that employed in the Sayre suspension apparatus (Fig. 5). To the rings of this is attached a stout cord, which passes over a pulley and is fastened to a weight. It is well to have several of these slings made of drilling

and lined with Canton flannel, or made altogether of the latter, and with straps of webbing instead of leather. They can be washed when soiled, and are more comfortable.

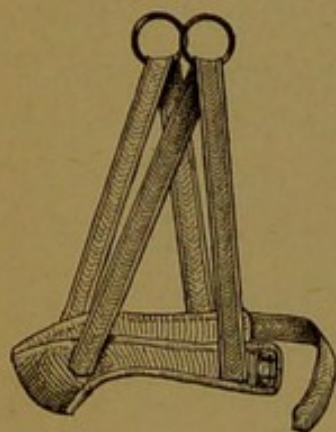


FIG. 5.

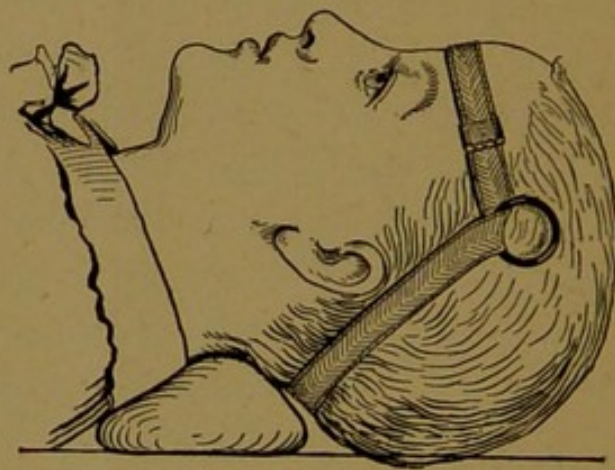


FIG. 6.

Fig. 6 shows a form of headpiece which is easily made, and answers very well in cases when a light weight is to be used and the occipital projection is well developed; it has the merit of not interfering with the lower jaw. It consists simply of a piece of webbing an inch wide, a buckle, and two inch-and-a quarter iron harness rings. So long as the weight is pulling, the web has a good hold. After the ring has adjusted itself, the two layers of webbing are to be stitched together where they cross. I sometimes add a strap to pass from ring to ring under the chin. It can be removed, so that the patient may eat, without entirely intermitting the traction. As compared with the other headpiece, this one has the disadvantage that the patient can slip it off when the nurse is not looking. When the case is acute, however, he is not likely to do so. The feet are placed from an inch and a half to four inches lower than the head, so that the greater mass of the trunk and lower extremities affords a good base for countertraction. The amount of weight is to be regulated by the patient's feelings. From half a pound to four pounds, in case

of a young child, is sufficient to counteract muscular spasm and render him comfortable. In the middle and lower dorsal disease, traction is not so efficient. The patient should be nearly or quite horizontal, because the amount of pressure involved in drawing the upper segment of the trunk up hill is greater than the chin and scalp will long stand. In these cases, if attempt at much traction is made, the pelvis should be secured by adhesive plaster applied to both lower extremities, as for hip disease, or by the belt shown in Fig. 7. This is made of canvas or drilling, and padded where it lies on the crest of the pelvis. It is laced on and buckled to straps passing to the foot of the bed, and also to those around the side bar of the stretcher frame. But, as stated,

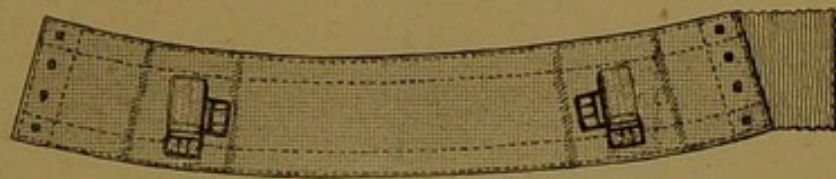


FIG. 7.

the undeveloped pelvis of a child offers a very poor hold for traction. The belt is of more service in securing the pelvis so that the patient can not turn over. While the amount of weight should be all that the patient can tolerate, it is evident that the leverage illustrated in Fig. 2 is a more powerful agent than traction in these most formidable cases. In lumbar disease the head should be placed a little lower than the feet. The pelvis is to be fixed as before, and the extending force consists of the head and thorax with as much additional weight as is comfortable. When psoas contraction exists, an adjustable inclined plane is used, with traction on the flexed limb.

At the annual meeting of the American Orthopædic Association held in New York, in September, 1892, I presented an orthopædic couch which seemed to be all that was

necessary for its purpose. Further experience has demonstrated its inadequacy, and impelled me to make experiments in devising a bed which will more fully meet the requirements already outlined. The surgical cot which I now present comprises a modification of the familiar canvas-covered frame, with provision for supporting it and maintaining uninterrupted rest, fixation, and accurately adjusted pressure and traction. Fig. 8 shows it open; Fig. 9, closed. It consists of a rectangular frame of iron, a canvas bottom, and an iron support, upon which the frame is adjustable at any convenient height or incline. The rectangular frame must be stiff

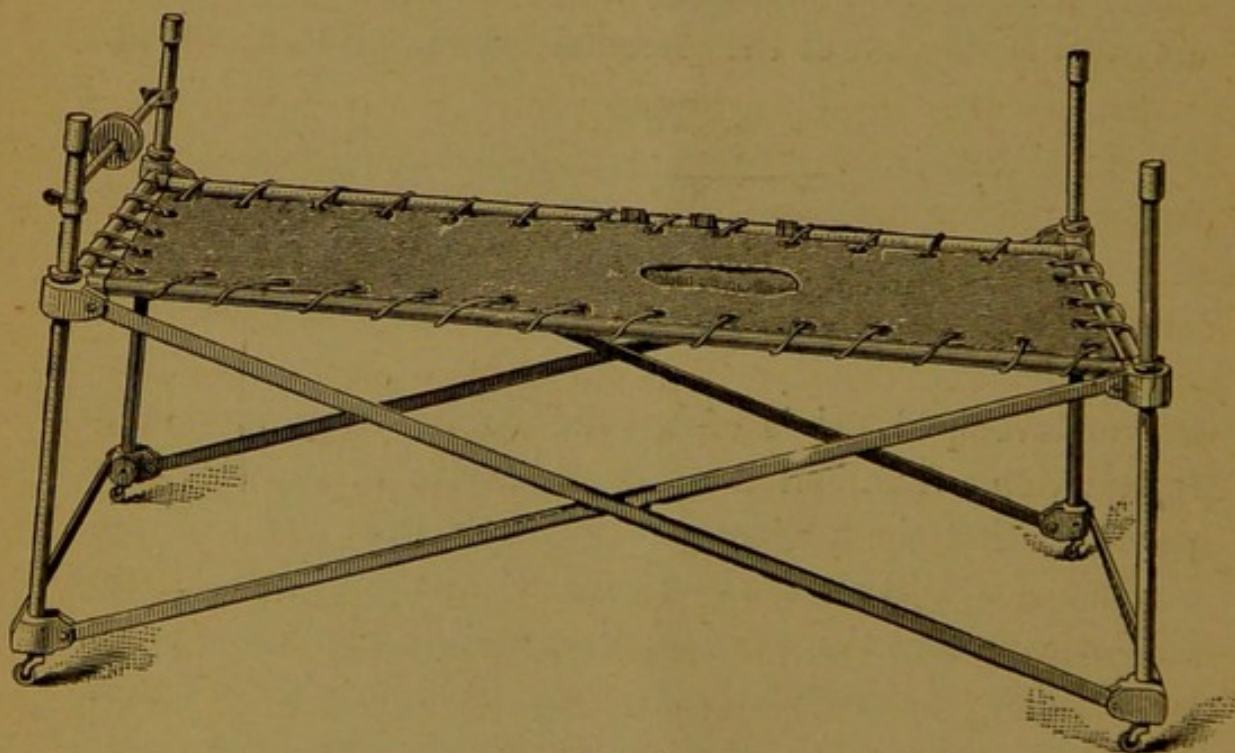


FIG. 8.

enough to stand, without bending, the patient's weight and the strain involved in stretching tightly a heavy canvas. It should be from four to six inches longer than the patient (forty-eight by fifteen inches inside will be found a convenient size for children under five years old), and it should be made of three-eighths inch pipe. Larger sizes should be made heavier. The canvas should be No. 2 for sizes under

forty-eight inches ; thicker for larger sizes. It is to be hemmed and made a little shorter and narrower than the frame to allow for stretching, and provided with eyelets through which pass stout cords by which it is laced to the frame. Warming the canvas will assist in getting it tight. A hole, preferably a narrow oval, is provided for the purposes of micturition and defecation. It should measure, for a child under five years of age, six inches by three inches and a half. Its long diameter coincides with the longitudinal median line of the canvas, and the center should, when the spine has not been shortened, be about three fifths distant from the top. When the spine has been much shortened, a special canvas will have to be made. The edges of the opening must be strongly and neatly bound and hammered flat. The vessel is placed underneath, supported at the proper height by a stool, box, pile of books, or in some such manner. It is brought to the patient, and not the patient to the vessel. The opening is closed by an under flap a little broader than the hole is long. One end of it is sewed to the edge of the canvas, and the other secured by three or more stout straps arranged to buckle around the side of the frame.

The patient is laid upon the couch in the position he is to occupy, so that the anus is placed at the upper end of the opening. The locations of the neck and axillæ are marked upon the canvas, and marks are also made by means of which the situation of the kyphos can be determined. He is then removed. Padded straps of webbing, arranged to pass around the shoulders and through the axillæ and provided with buckles, are sewn to the canvas. The buckles should be placed close to the sides of the neck, where they will be least accessible to the patient, and the straps diverge. The sewing can best be done with a sailor's palm and needle. A strap to lie loosely across the chest

and having in each end a loop through which the shoulder-strap passes will prevent the slipping off of the latter. If the case be one of cervical or high dorsal disease, loose

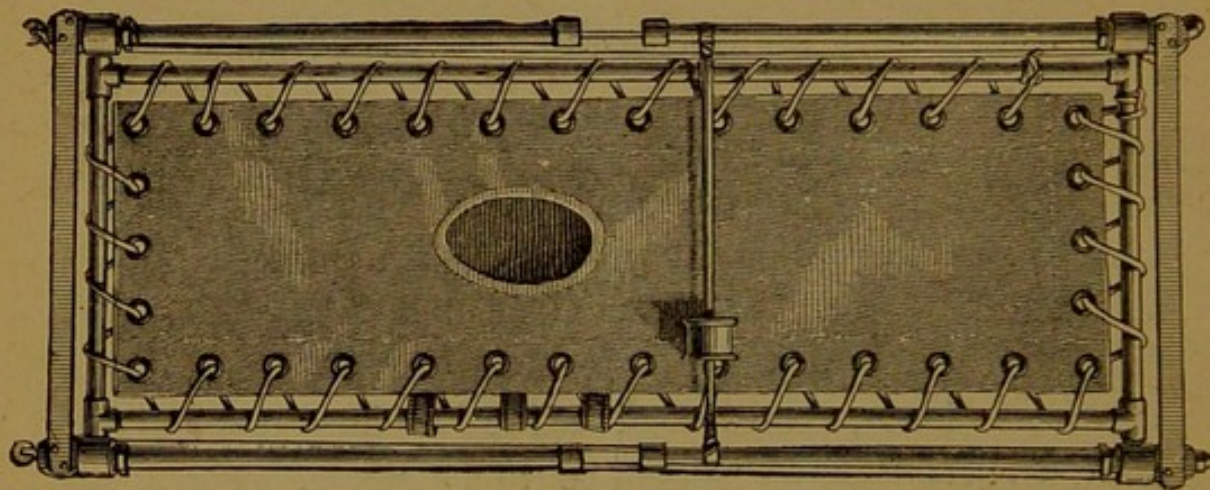
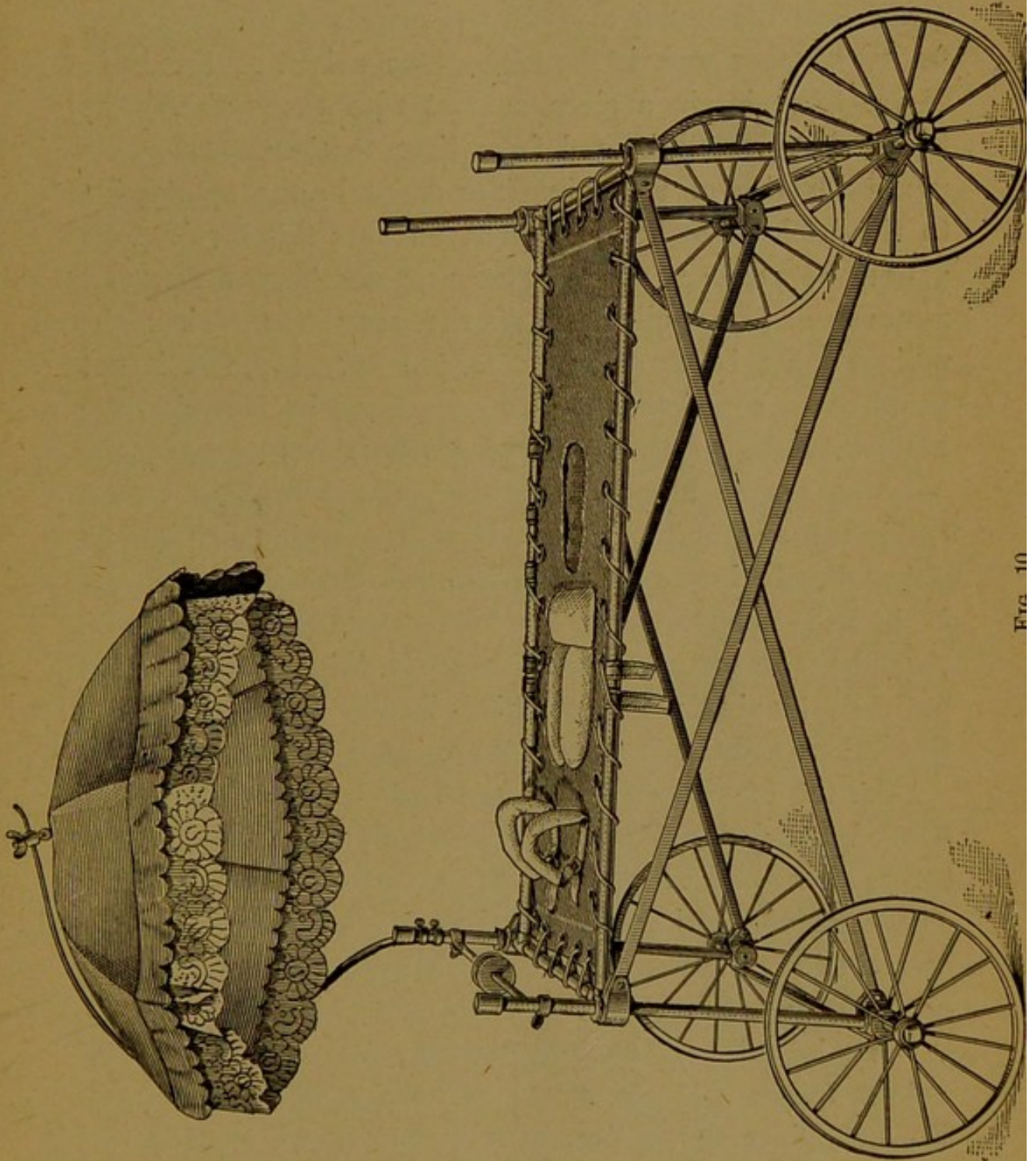


FIG. 9.

pads of kersey, hair, felt, or some similar elastic material covered with linen can be easily placed under the neck. But for lower spondylitis the pads should be sewed to the canvas (Fig. 10). They should be about six inches wide, long enough to extend an inch or two above and below the projection, and be a half to three quarters of an inch thick, except at the ends, where they are flattened. They are placed longitudinally each side of the middle, so that a groove about a half to three quarters of an inch wide exists between them. Their object is to press upon each side of the prominent spines, and to protect the bony projection. The patient is replaced upon the canvas and the shoulders are secured by the straps. To exert a pressure upon the kyphos in such a way that it may be accurately regulated, there is the following arrangement: Two, three, or more straps of webbing are placed side by side transversely under the canvas and across the kyphos so as to buckle at each end around the iron frame. By the use of these straps, which constitute a most important feature

of the apparatus, the reforming pressure is always under control, while the weight of the parts anatomically above and below is brought into play to secure a backward



leverage. The cervical and lumbar hollows should be filled by small pads without groove sewed on. The sagging of the canvas results in the formation of a shallow

trough which interferes with lateral motion, and as the material yields to the warmth and pressure of the prominent parts after a few days, the back is generally accurately fitted. By feeling the under side of the canvas it may be ascertained whether such is the case. The weight of the body serves to maintain a close contact with the couch. The lacing should be tightened from time to time. The most perfect fixation of the spine is secured by the application to the back of some rigid material; but this involves the danger of pressure sores, or, to prevent them, a frequent removal and reapplication of the apparatus. Thus the patient must be turned over frequently. In most if not in all cases sufficient fixation is attained by fastening the patient to the couch by means of the shoulder straps by webbing passed around the side bar and buckled to the pelvic belt and by the use of traction. A pillow should be put under the lower extremities to prevent pressure on the heels and also to relax the flexors. A towel fastened around the rectangular frame and the thighs prevents the patient's kicking. The covering is also wrapped around the patient and the frame and so keeps the back warm.

For the purpose of applying traction there is a broad, flanged, wooden pulley which turns on a steel bar placed across either end of the apparatus at any convenient height. The cord connecting the head-sling and the weight is passed two or three times around this drum, and so can not be thrown off. Should the patient move his head laterally, as may be allowed in convalescent cases, the pulley and weight follow the movement. I have sometimes secured the headpiece to the top of the frame and allowed the weight of the parts below the disease to act as the tracting force. Steele, of St. Louis,* fastens the side rings of the headpiece to uprights placed at a considerable distance

* *Medical Fortnightly*, St. Louis, February 1, 1891.

apart in the head of the frame which he employs, and thus secures some lateral fixation of the head. By the use of the cot I have been able to keep up an absolutely uninterrupted rest with traction, and render the patient perfectly comfortable for months at a time. The addition of rubber-tired wheels and a parasol has contributed to the comfort of the patient and the convenience of the friends. The cot is made in sizes up to fifty-six inches by W. F. Ford, of New York.

It is evident that when the patient is recumbent all the indications may be more perfectly met than in any other position. The force of gravity, which by leverage and by longitudinal pressure acts upon the upright spine as a powerful destructive and deforming agent, can now be converted into a reforming force. Direct backward pressure can be accurately antagonized. Muscular action and interosseous pressure, now greatly reduced by the general condition of inactivity, can be counteracted by fixation and by far less traction than would be required to raise the weight of what were superincumbent parts. The spine, relieved of the performance of all its active functions and saved from all traumatisms, except that of respiration, is thus placed in the best possible condition for repair; and what is of great importance, fever and the drain of muscular spasm, pain, and perverted nutrition are met by a state of systemic rest.

A feature about this measure in chronic bone disease which is surprising to all to whom it is not familiar is the way patients thrive under it. It is true that while a gain in weight is the rule, the muscles soon become soft, and a loss of muscular strength may occur. This loss is a gain; to the spondylitic spine muscular strength is a menace. So long as the nerve connections are preserved the muscle remains capable of restoration, and no permanent damage by

rest is possible. Nature never makes the mistake of demanding as a condition of recovery the use of any parts (as in this case bones and muscles) which are unable to perform their functions. When the fixation and traction are efficient, patients are relieved of pain, sleep well, and soon lose the drawn, old, tired expression so familiar upon the faces of those suffering from the great drain of prolonged muscular spasm. I believe that the amount of caries is thus materially limited, that much deformity is prevented, and that the duration of the disease is materially shortened. Another merit of this therapeutic measure is that its employment does not demand the exercise of the mechanical skill and experience which are necessary to the successful employment of a portative apparatus. In places where a spinal support can not be readily obtained, recumbency with regulated pressure and traction may be adopted until other arrangements can be made. Patients may, if necessary, be moved long distances, and with safety and comfort, upon a frame.

Recumbency is indicated as routine treatment as soon as the diagnosis of spondylitis has been made, or even when it is probable; for the intrinsic tendency of the disease to progress is in each new case such an unknown quantity that no time should be expended during the developmental stage by experimenting with less thorough methods of treatment. In case of a patient wearing a support, progressive deformity or the persistence of pressure sores should be regarded as demanding recumbency. It is, of course, presumed that the brace had been skillfully designed and applied, that pressure had been diffused over as much surface as the case will permit, and that by cleanliness and dryness every care had been taken to protect the skin. While no method can claim to prevent in all cases an increase of deformity, such increase should in no case be re-

garded as inevitable until it is ascertained what can be done by the careful use of mechanical force applied to the passive horizontal spine. Marked psoas rigidity denotes a considerable degree of activity of the disease, and probably abscess. When the patient walks or stands with the thigh flexed, the forward inclination of the trunk causes the weight of the mass above to act at a great mechanical advantage in the production of deformity. Support is thus made very difficult and uncertain, and femoral movement exerts, through the shortened muscle, a direct traumatism upon the diseased spine. These cases should be treated in the horizontal posture, and the limb elevated upon an inclined plane sufficiently to relax the psoas muscle. By means of adhesive plaster a weight is attached to the limb and traction made as in hip disease. As the muscle relaxes the plane is to be lowered. Pott's paralysis, even a slight dragging with exaggerated reflex, should be regarded as an unequivocal indication for recumbency with all possible traction. Many very brilliant results, even when there were present incontinence of urine and fæces and large bedsores, have thus been obtained. Patients with abscess should generally be treated in the horizontal position; always if the abscess is new or increasing. Night cries, a grunting respiration, peripheral pain referable to the spinal nerves coming from the seat of the disease, an inclination of the patient to lean on chairs, etc., indicate an insufficient support and the need of recumbency.

It is evident, however, that confinement to the cot can not be continued during the whole course of a spondylitis, nor is this necessary. When, by the absence of pain, fever, and progressive deformity and by a diminution of the area of spinal rigidity, we are led to conclude that the acute or actively destructive stage of the disease has passed, the

patient may gradually be allowed more freedom under the protection of an apparatus carefully adapted to the needs of the case. This is *always* done tentatively with watchful supervision; and the slightest increase of deformity, or an occurrence of pain or irritability, or the evidence by face, attitude, or gait that he is not getting the proper support, should be the indication for a return to the horizontal position. This holds good at any time in the course of the disease, and any intercurrent change which makes it doubtful whether the case is doing as well as it should may be regarded as an indication for recumbency.

I trust that this cot, aside from its employment in Pott's disease, may be found of service in any case, surgical or medical, when prolonged rest is necessary. It has proved very serviceable in rhachitic spinal curvature. For hip disease with flexion the inclined plane may be used, as in psoas contraction from spondylitis. In fracture of the femur the railroad splint may be employed. It should extend well up to the buttock and is a very perfect means of preventing eversion. The tops of the uprights, at what might be termed the head and the foot of the couch, may be joined by steel rods adjustable to any height, and across these may be placed longitudinally, like a ridge pole, a bar. This is located over the middle or at either side, and is intended to support by slings an arm or a leg (Fig. 11). It has been used to secure both lower limbs in a vertical position for fracture of the thigh. It is not recommended in spinal disease, as the patient may try to raise himself by it. This ridge pole and the uprights may be useful to hold up a mosquito net. A tray is easily added, or a light sewing table may be placed over the patient. I think by the use of this couch, which does not occupy much more floor space than the patient, a helpless child or young person may be quite easily handled, and may

be readily moved about the room, placed near the window, or taken out into the sunlight and fresh air. The little invalid's world would be thus greatly enlarged. When

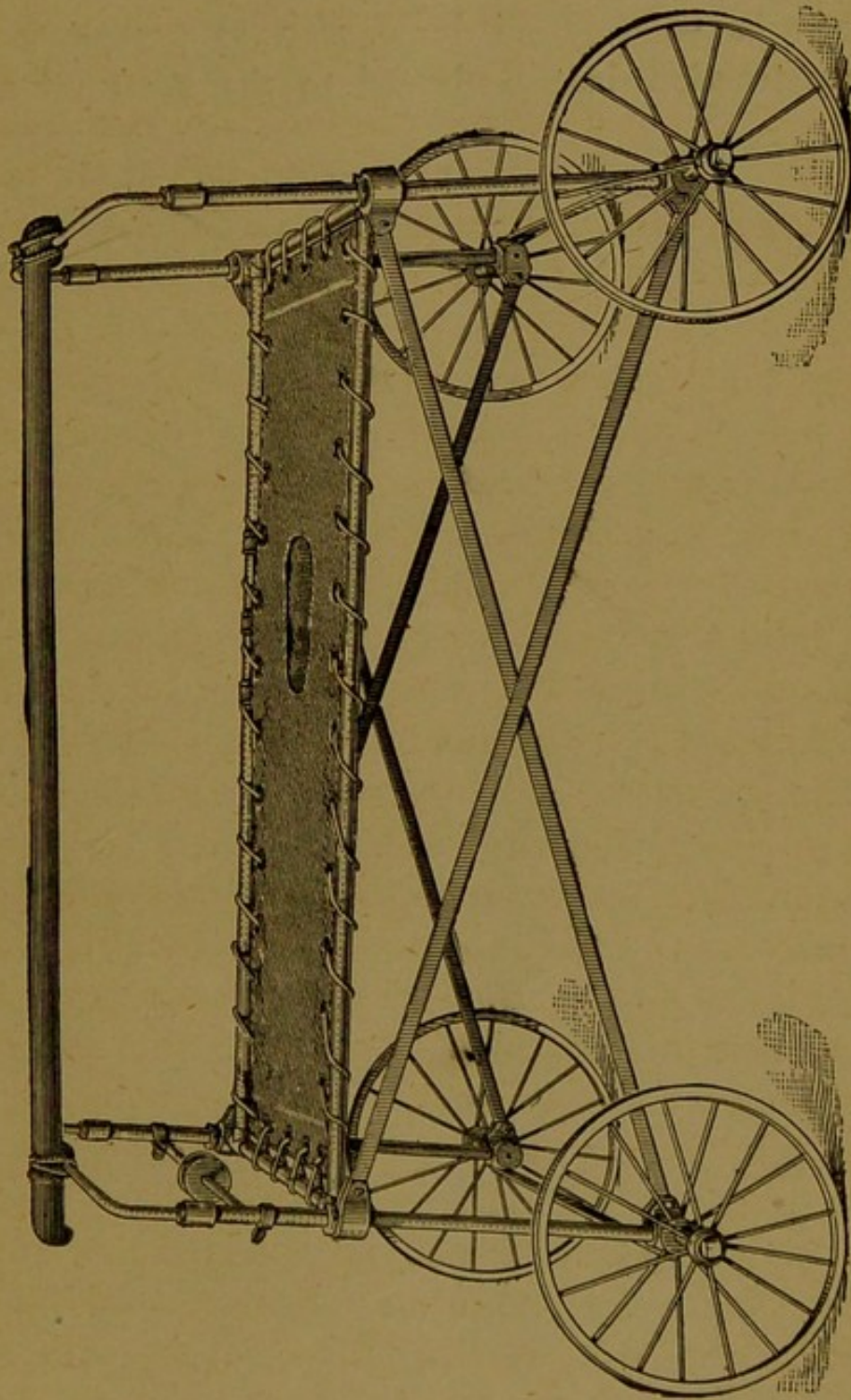


FIG. 11.

the opening in the canvas is not to be used, a water or air bed or any kind of mattress may be employed, or the can-

vas may be replaced by iron springs. When the cross-pieces and the ridge pole are taken off and the uprights folded down, the couch may be converted into a stretcher with or without wheels; or the rectangular iron frame alone may be so used. I hope soon to present a bed of a construction better adapted to the needs of adult patients.

auth.

