

Specification of Joseph Amesbury : apparatus for the relief or correction of disorders of the human spine, chest, or limbs.

Contributors

Amesbury, Joseph, 1795-1864.

Publication/Creation

London : Great Seal Patent Office, 1857 (London : George E. Eyre and William Spottiswoode)

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A.D. 1837 N° 7337.

SPECIFICATION

OF

JOSEPH AMESBURY.

APPARATUS FOR THE RELIEF OR
CORRECTION OF DISORDERS OF THE HUMAN
SPINE, CHEST, OR LIMBS.

LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY:

PUBLISHED AT THE GREAT SEAL PATENT OFFICE,
25, SOUTHAMPTON BUILDINGS, HOLBORN.

Price 2s. 8d.

1857.





A.D. 1837 N° 7337.

**Apparatus for the Relief or Correction of Disorders of
the Human Spine, Chest, or Limbs.**

AMESBURY'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOSEPH AMESBURY, of Burton Crescent, in the Parish of Saint Pancras, and County of Middlesex, Surgeon, send greeting.

WHEREAS His late most Excellent Majesty King William the Fourth, by
5 His Letters Patent under the Great Seal of Great Britain, bearing date at
Westminster, the Fourth day of April, in the seventh year of His reign, did,
for Himself, His heirs and successors, give and grant unto me, the said Joseph
Amesbury, His especial license, full power, sole privilege and authority, that
I, the said Joseph Amesbury, my executors, administrators, and assigns, or such
10 others as I, the said Joseph Amesbury, my executors, administrators, or
assigns, should at any time agree with, and no others, from time to time and
at all times during the term of years therein expressed, should and lawfully
might make, use, exercise, and vend, within England, Wales, and the Town of
Berwick-upon-Tweed, my Invention of "**CERTAIN APPARATUS FOR THE RELIEF OR**
15 **CORRECTION OF STIFFNESS, WEAKNESS, OR DISTORTION IN THE HUMAN SPINE, CHEST,**
OR LIMBS;" in which said Letters Patent is contained a proviso, that I, the said
Joseph Amesbury, shall cause a particular description of the nature of my
Invention, and in what manner the same is to be performed, to be inrolled in
His said Majesty's High Court of Chancery within six calendar months next
20 and immediately after the date of the said in part recited Letters Patent, as in

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Joseph Amesbury, do hereby declare the nature of my Invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the Drawings hereunto annexed, and to the figures and letters marked thereon (that is to say):—

The set of Figures, from 1 to 10 inclusive, is intended to represent my apparatus as applied to the deformity or contraction which I have termed "pointed toe," or that position of the foot in which the foot is placed in the extended posture with the toe pointing towards the ground, and is held in this position from some unnatural state of the parts. Figure 1 shews the limb with the foot pointing towards the ground, and the apparatus as applied for the removal of the contraction or deformity. *a* represents a stirrup of steel passed between the sole of the shoe and the inner sole, in the manner seen at *a*, in Figures 1, 2, 3, and 4, where it is firmly rivetted to the inner sole *b, b*. Figures 1, 2, and 3 are leather links, connecting the stirrup to a branched fork formed at the end of the screw *c*, as shewn in these Figures, and which is spread out over the front of the foot, and bent, twisted, and hollowed at *d*, as shewn in Figures 1, 2, 3, 5, 6, and 7. This particular form is given to the apparatus at this part in order that it may operate upon the instep, or upon the lower part of the leg, through the medium of a pad, without injurious pressure. The screw *c* is received into a metal loop or swivel link *l*, with a screw'd hole, shewn in Figures 1, 2, 3, 8, and 10. This loop or link moves upon a pivot at *f*, as shewn by dotted lines in Figure 8, and in section at Figure 10. This pivot is made of polished steel, and is furnished with a steel collet and a hollow ring, seen at *g* in Figures 8 and 10, which are secured by a small pin passing through the latter and the pivot. The head of this pivot is forked or spread out above into two arms or branches *h, h*, Figures 1, 2, 3, 8, 9, and 10, and is bent, twisted, and hollowed at *i*. This form is given to this part of the apparatus in order that it may rest upon the front of the leg, by the medium of a pad, without injury to the skin. Long loops *b, b*, &c., are formed on each side of the stirrup *a* of the lower fork *d*, and of the other fork *h*, to receive leather straps, as shewn at *b, b*, in Figures 1, 2, and 3. The leather straps *b, b* are stitched to the stirrup *a* and lower forks *d*, as shewn in Figures 1, 2, and 3. The upper loops *k* are furnished with straps and buckles *l, l*, as shewn in Figures 1 and 2. This strap *l* is passed beneath and over a cross strap *m*, which, together with two pads, are buckled around the limb above the knee. I

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

commonly place under the pads a band of wash leather *n*, in order to protect the parts from excoriation still more perfectly; this strap is afterwards passed through a buckle and leather loop in the usual manner, as is seen in Figures 1 and 2. Another cross strap *o* is also affixed to the pads afore described, to
 5 secure them the better upon the limb. When this apparatus is placed upon the limb, as is seen in Figure 1, and the swivel link turned round, it will draw the screw *c* within it, and thereby actions are produced upon the limb above the knee, upon the leg below the knee, upon the instep, or upon the lower part of the leg, and also upon the foot at the lower ends of the bones to which the toes
 10 are joined. The effect of these actions is to turn the foot and bend it upon the leg, as is seen in Figure 2. This apparatus operates by suspending and drawing the front of the foot so as to extend the contracted muscles at the back of the leg, and also to break through or elongate any adhesions which may be formed in the ankle joint. It will be seen that the apparatus is assisted in
 15 bringing round the anterior part of the foot from the position seen in Figure 1, and bending it upon the leg, as seen in Figure 2, by pressing upon the leg below the knee, and upon the lower part of the leg or upon the instep, as the case may be. When the apparatus is made to operate by turning the loops, its effect is to press the leg backward and to bring the anterior part of the foot
 20 forwards, and bend it upon the leg. The combinations of actions produced by the operation of this apparatus are suspension, traction, and pressure, opposing forces, which, combined with medical, surgical, and other proper management, as the state of the case may indicate, restore the foot to its proper place and functions. It is to be observed, that the foot is not to be brought at once, by
 25 violence, into its natural posture, but from time to time, and by gentle degrees, to be regulated by the state or condition of the patient, and of the parts to be restored, which must be watched and determined by the judgment of the operator. It is more especially necessary to be cautious when the stiffness is occasioned by inflammation or other diseased action, as there is always
 30 great danger of reproducing the inflammation or diseased action by any violent measures; but by careful management, under the operation of my apparatus, the stiffness may be generally removed, except where the parts have become united together by the interposition of osseous or bony matter. The set of Figures, from 11 to 25 inclusive inclusive, represent
 35 the apparatus I use in the treatment of stiff or contracted knee and elbow joints. Figure 11 shews a side view of this apparatus, ready to be applied to the leg and thigh of a stiff or contracted knee. Figure 12 shews the same apparatus in action upon the knee, which is shewn with the limb somewhat straightened. Figure 13 shews the apparatus as applied to a stiff or con-

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

tracted elbow joint. *p, p*, in Figures 11, 12, and 13, are portions of beech or other proper wood or material hinged or jointed together; these portions of beech have split deal splints *q, q*, attached to their sides by slips of leather, as shewn in the different Figures. These splints are to assist in protecting the limb from injurious pressure; upon the back of the thigh portion of beech is 5 screw'd or otherwise fixed a piece of metal *r*; another similar piece *r* is also seen on the portion of beech placed upon the upper arm in Figure 13. This piece *r* has two cheeks upon it, with holes through them. A swivel pivot, similar to that described at *f* in Figures 8 and 10, but which is here formed into a part fitted into the cleft or cheeks of the piece *r*, so as to form a joint 10 when a pin is passed through holes made in this latter part and the cheeks of the piece *r*. The screw *c* has also a similar part formed upon it, which fits into another cleft piece *s*, in the same manner as above described, but this piece *s* is constructed with furrows or ridges across its under surface, as shewn in Figure 15, which fit into other furrows or ridges made across the upper 15 surface of another piece of metal *t*, shewn in Figure 16, which is screw'd upon the piece of wood or beech *p*, as shewn in Figures 11, 12, 13, and 14. This piece *s* has also a hole through it to receive a screw *u*, which is shewn in Figure 17 as passed into another sliding piece of metal *v*, which fits into a groove formed in the piece *t*, seen in Figure 14. Into this piece *v* is likewise 20 fixed another screw *w*, shewn in Figure 17, which screw passes through the groove in the piece *t*, and through a hole made to receive it in the piece *s*, and has a nut or female screw *x*, shewn in Figure 18, fitted upon it, by turning which the parts *s*, *t*, and *v*, may be secured or loosened as required, and as will be described hereafter. Figure 19 is an end view of the piece *s*, with the 25 screw *c* jointed to it; and Figure 20 is an end view and section of the piece of wood *p* with the frame *t* upon it; the sliding piece *v* with the screw *w* in it, the upper sliding piece *s* and the screw'd nut *x* upon the screw *w* of the sliding piece *s* and the screw *c*. This apparatus, properly padded, is retained upon the limb in the following manner:—In Figure 12 is seen the apparatus 30 applied to the limb; the upper portion of it is secured to the thigh by means of straps passed over padded splints; the lower portion of it is also affixed to the leg in a similar manner. The joint or knee part is confined in its place by means of a padded leather knee cap *y*, with straps and buckles fastened on the outer part of the knee, as seen in Figure 12. The apparatus as applied 35 to the arm is shewn in Figure 13, the similar parts being designated by similar letters of reference as in the preceding description. The upper and lower parts of the apparatus as secured to the upper and fore arm by straps and padded splints, but instead of a cap at the elbow oblique straps *z, z*, are used, as

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

shewn in this Figure and in Figure 14. Instead of having only one joint in this apparatus when applied under the knee in the manner shewn, I can use two external joints, and affix them to pieces of beech or other wood, as in the former instance, or construct the apparatus wholly of metal, as shewn in 5 Figure 21. A, A, represents the two external joints, and B, B, the metal substitutes for the beech or other wooden parts already described; C, C, C, C, are loops in the frame or apparatus for straps to be passed through, as will be described hereafter. The screw *c* and loop *e* are hinged or jointed to these metal parts B, B, exactly in a similar manner to their union with the pieces 10 of wood, as already described. The looped bars C, C, C, C, of the apparatus are purposely made to apply themselves parallel with the thigh bone and large bone of the leg when in use. Figure 22 represents the pads and straps used with this form of the apparatus. These pads D, D, shewn in Figure 22, with their straps and buckles, are united by means of the elastic woven web E. 15 These pads consist of two, three, or more thicknesses of flannel, covered on the under side with soft leather. Across the flannel are placed the webbing straps F, F, and over these straps are fixed strips of brown holland cloth, which are received into the buckles G, G, and then formed into loops; over these is placed a layer of stout cotton or linen cloth, and upon this leather loops. 20 These two pads are joined together by a doubled piece of elastic india-rubber webbing, the longitudinal or elastic rubber threads of which are placed so as to extend from one pad to the other. When this apparatus is used to extend the limb unnaturally retained in the bent position it is applied as shewn in Figure 23, the leg and thigh parts of the apparatus having been applied to 25 the corresponding parts of the limb by straps, splints, and pads, in the manner before described, and as shewn in this Figure. The pads, with straps and the elastic webbing, are to be applied by passing the straps through the corresponding loops C, C, and buckling them in the manner shewn in this Figure. The apparatus having been thus applied, the loop *e* is to be turned round in 30 such a manner as to protrude or thrust out the screw *c*. This operation must be performed gradually, and from time to time, and with due regard to the condition of the limb. If the intention, however, be to bend the limb, the pads D, D, must be applied under the knee, as shewn in Figure 24; the operator then turns the loop *e* in the contrary direction, so as to draw the screw *c* within 35 the loop *e*, and thus bend the limb. If the intention be either to bend or straighten the limb alternately, then two sets of pads must be applied at once, in the manner shewn in Figure 25. This form of apparatus can also be suited and applied to the arm in a similar manner in cases of stiff or contracted elbows; the principles of action and of application are the same in both cases.

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

As it is necessary occasionally to extend or straighten the limbs beyond the compass of the loop *e* and screw *c*, so the part *s* can be slipped along the part *t* by loosening the nut *x* of the screw *w* until the furrows and ribs are disengaged from each other, when it may be moved as far as necessary, and again be retained in that situation by binding the nut *x* of the screw *w* firmly. 5
Before these furrows and cross ridges were made, as was the case in former apparatus of this kind, on straightening the limbs, the parts *s*, *t*, were apt to slip or slide upon each other beyond the power of the binding screw to prevent them.

I shall now proceed to describe an apparatus which I have invented for correcting deformities or weaknesses of the lower limbs. H and I, in Figures 10 26 and 27, are front views of a steel jointed bar, and Figures 28 and 29 are edge views of the same, and Figures 30, 31, and 32 represent the joint on a larger scale. This jointed bar requiring generally to be in an inflexible state, the joint is accordingly made broad and strong; but as it is also occasionally required to bend, and to be retained in a bent position, so I have 15 contrived the following means of accomplishing that object:—Figure 30 represents the compound bar in the straight position, in which position it is retained by the sliding piece J, which moves in a slit or groove K, formed in the part H, and can be slipped into an angular gap formed in the part L to receive it, and as shewn in Figure 30, whereby the compound bar is retained 20 or held in a straight position; when, however, it is required to be placed in the bent position, as shewn in Figure 32, the catch J being slidden out of the angular gap L, and the bars turned upon the joint, the catch J is again pushed down or suffered to fall down until one of two hooks formed upon it catch under another hook formed upon one side of the angular notch L, and as shewn 25 in Figure 32; when, however, it is required to be placed upon the opposite limb it is necessary to provide for its being bent in the opposite direction, and therefore additional hooks are formed, both upon the catch J and upon the opposite side of the angular notch or gap L, to retain it in this second position. Figure 33 is an edge view of the slide or catch J, shewn separately, in which 30 M exhibits a plate of metal screwed or rivetted to the catch J, and which said plate M applies itself to the opposite side of the bar H, in the manner shewn in Figure 31; upon the upper part of the bar H, Figure 26, the piece N is slipped, it having a loop O formed upon its lower end, through which the bar H is slidden, and secured to the upper part N by means of screw'd holes 35 formed in the said upper part, and a screw *p*, which is passed through a hole made in the upper part of the bar H, and entering into any of the screwed holes as required in use. There are also two loops formed in the upper part of the bar N, as shewn in Figure 26, for a purpose which will be described

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

hereafter. A similar contrivance is applied to the lower bar I, for lengthening or shortening that part of the apparatus, and as indicated by the same letters of reference O and P; Q representing the lower slide, the lower part of which is bent at a right angle at R, in Figures 26, 34, and 35; Figure 35 being
 5 a plan of the bent part, with holes in it for rivets. The lower bar, besides being bent at a right angle at R, as above described, is again bent at another right angle at S, as is shewn in Figure 36, and by dotted lines in Figure 29, parallel with the bar Q, and as shewn at T, in Figures 29 and 36. At the upper end of this turned up part T, loops are made for a strap to pass through,
 10 in the case of correcting the deformity of the knee bent inward, as shewn in Figure 28; and where also the ankle is turned inwards, I apply this apparatus in the following manner:—U is a broad strap, which is divided or cleft at V into a broad and narrow strap. The broad part is passed through loops W, formed at the upper end of the bar N, as shewn in Figures 26, 27, 28, 29,
 15 and 37, and may be secured by the buckle X, when applied to the thigh. The upper part N of the apparatus is, however, previously passed through two leather loops Z, Z, of a pad 1, shewn in Figures 27, 28, 29, and 37. The small strap 2 is also passed through the upper one of the two loops Z, Z, as shewn in Figures 27, 28, 29, and 37, after which it is padded through and
 20 secured by another buckle 3. This broad strap U is also padded in its middle or entire part. The knee is confined to this apparatus in the following manner:—4, Figures 28 and 29, is a compound strap, shewn separately in Figure 38, where it is seen as subdivided into eight branches. The strap and buckle 5 is passed around the limb below the knee, as shewn in Figures 28
 25 and 29. The strap 6 is also buckled around the limb above the knee. The other four straps 7, 7, 7, 7, are then passed through one each of two pairs of double buckles 8, 8, 8, 8, which are affixed by means of short leather straps 9, 9, upon buttons or studs 10, 10, fastened in the bars H and I of the apparatus to receive them, and as shewn in Figures 30, 31, and 32, and are
 30 then passed through the leather loops 11, 11, 11, 11; if it be desired, these buckles may, however, be dispensed with. In this case the straps 7, 7, 7, 7, may be brought over the bars H, I, and fastened to the studs 10, 10, which would then be used as buttons. The narrow part of the strap 4, Figure 38, when in use is placed behind the knee. The broader part of a leather strap 13,
 35 shewn in Figure 28, is passed around the inner part of the leg, just above the ankle, being also stitched to the boot worn upon the foot, as shewn in this Figure; the narrower part of the strap being passed around the lower bar Q of the apparatus, and secured by a buckle and loop. The part R of the apparatus, shewn in Figures 34 and 35, being passed between the leathers

Amesbury's Apparatus for Relieving Weakness, &c. of the Chest, Spine, &c.

forming the sole of the boot, and rivetted firmly to the inner or upper part of the sole. The apparatus being applied to the limb, as shewn in Figure 28, operates upon it in the following manner:—The strap U, passed obliquely around the upper part of the thigh to the top of the steel bar N, operates in such a way as to bear as much of the superincumbent weight of the body as 5 may be needful, and communicates it through the medium of the bars of steel to the ground; the bars of steel having been adjusted to a sufficient length to answer this purpose by means of the screws *p, p*. If desirable, a stretching action may be produced between the foot and the body by means of the bar attached to the boot, as described; the boot having been previously firmly 10 secured or laced upon the foot, as shewn in Figure 28. The weight of the body being thus partially supported upon the bar, I can now commence reducing the distortion of the knee by tightening or buckling the straps 7, 7, more or less, as indicated by the state or condition of the parts, and also of the deformity of the ankle. It being thrown inwards may be corrected at the 15 same time by tightening or buckling the strap 13, which is passed around the limb above the ankle and the bar of the apparatus, as is also shewn in Figure 28. These operations may be continued and regulated according to the circumstances of the case. When the deformities are corrected the traction or stretching action upon the limb may be discontinued, and the limb 20 be suffered to bear the superincumbent weight of the body. The limb is to be supported in this manner until the muscles and ligaments have acquired a sufficient strength and firmness to retain the parts in their natural relative situation without artificial aid, in addition to which diet, medicine, exercise, and other proper curative means may likewise be employed. When the ankle is 25 turned outwards, which often happens in cases of this nature, the lower bar Q, besides being bent at a right angle at R, is again bent at S in another right angle, and the bar elongated parallel to the part of it Q, and as shewn in Figure 36; the top of this turned-up part being furnished with two loops, shewn at T, for a leather strap 13, Figure 29, to be passed through, a broader 30 part of which is passed around the inner part of the limb above the ankle, as is shewn in that Figure, and is then passed through the buckle and loop, and may be tightened from time to time as the surgeon or operator may deem advisable. Where the deformity of the ankle mentioned in the last case is but slight, a firm pad, cushion, or compress 14 may be introduced between the bar 35 of the apparatus and the limb, as seen in Figure 27, which will answer the desired object. This Figure 27 also affords an instance or example of the limb and apparatus being in the bent position, and where the slide or catch J has been withdrawn from the angular notch or gap L, previously to bending them.

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

The same letters and figures of reference indicate the similar parts as in the before-described cases. When the knee joint has become weak owing to the unnatural elongation of the ligaments, but without distortion, I can relieve or cure this defect in the following manner:—In Figure 27, 15, 15, represent
5 two straps proceeding from a band 16, shewn in Figure 39, which is applied by being passed around the limb, the narrower part of it being placed behind the knee, and the broader part on the inner side; 17, 17, are holes formed in the band, near the loops and buckles, to affix it upon the steel bars by means of the two studs 10, 10. The straps 15, 15, are brought round in front of the
10 limb, above and below the knee, and secured at a comfortable degree of tightness by means of the buckles. When the knee is tender, a double band 18, 18, Figure 40, is provided, from each portion of which two leather straps, furnished with buckles and loops, proceed. The inner sides of these bands are covered with proper soft materials, in addition to which two portions
15 of india-rubber or elastic web 19, 19, are introduced between them, and the whole are firmly stitched together. The appearance of these bands, when affixed upon the limb, will be seen in Figure 41, holes 20, being made through two of the straps to affix the bands on the studs 10, 10, of the steel bars H, I, of the apparatus. In these cases it is sometimes desirable to support or throw
20 the weight of the body upon the bars of the apparatus. This is only to be done when there is disease or inflammation in or around the joint, but it is at other times also desirable to be able to bend the joint, as in cases of going upstairs, getting into a carriage, or sitting. For this purpose the slide J must be withdrawn from the angular gap L of the lower elongated limb I of the bar.
25 The apparatus may then be bent, as shewn in Figures 27 and 32, but cannot be straightened more than is shewn in that latter Figure, on account of the hooks 21 and 21, the hook 21 upon the corner of the angular gap L, and the hook 22 upon the slide J; the joint may, however, be more bent, at the pleasure of the wearer, and as seen in Figure 27. It is evident that this
30 arrangement allows the patient to remove the limb freely in the bent position, but when the catch is placed in the gap, the limb is fixed in the straight position, the patient then walks with the knee straight, and which he is able to do with facility and ease. Another case of deformity is where the arch naturally formed under the foot is diminished or lost, together with the elasticity or
35 springiness of the foot, it applying itself nearly flat upon the ground. In order to remedy this defect, I place upon the sole of the boot or shoe a pad made of layers of sole leather or mill-board, or other material which will afford equal resistance or support, covered with two or three layers or thicknesses of flannel, when necessary; such a pad or support is shewn in Figure 42, where it is seen

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

as composed of layers of leather parallel to its convex surface, or it may, if desired, be formed like that shewn in Figure 43, or of layers of leather parallel to its lower or flat surface, and be covered on the upper surface with flannel, as before mentioned, and as is shewn in Figure 44, Figure 45 being a section of it through the dotted line at * * in Figure 44. Figure 46 represents a pad 5 or support placed inside the boot upon the sole, with the sole of the foot supported upon it in such a manner that it will in time force the foot to conform to its action, or, in other words, to produce a natural arch; this effort being aided by the weight of the patient; but during this process other curative and strengthening means must likewise be employed. Another case of deformity 10 is where the knees are bent or turned outwards, or "bow-legged." This case I correct in the following manner:—Figure 47 represents a limb shewing this deformity in an incipient state. In this case it is better to dispense with the knee joint in the apparatus, making it inflexible. In the place of the joint, I introduce a pad 23, fixed upon a metal plate, secured to the bar H by rivets 15 or otherwise, as shewn in Figure 48; upon and around this plate and bar I affix the leather pad 23, inclosing an elastic cloth or padding, and combine the whole together by stitching in the usual manner. This pad applies itself to the outside of the knee joint, as shewn in Figure 47, and the limb is bound upon the pad by the cleft band of padded leather 16, similar to that shewn in 20 Figure 39, it being buckled around the apparatus and the limb. The upper part of the limb is bound to the top of the apparatus by means of the cleft band or strap U, V, passed through loops W, and buckled around the limb, as shewn in Figure 47. The lower part of the leg is likewise surrounded by another strap 13, which is sewn to the inner side of the boot, and passed around 25 the apparatus and buckled, a plate, bent at a right angle at R, being inclosed within the sole of the boot, as before described. Tension or traction is then produced upon the upper and lower parts of the limb by buckling the straps U, V, and 13, tighter from time to time, and as indicated by the condition of the parts during the progress of the cure. When the limb is brought up to 30 the apparatus, the knee may be inclined a little inwards to the natural figure by increasing the thickness of the pad 23 at the knee. When the knee is still more bowed outwards, as is shewn in Figure 49, I correct this deformity in the following manner:—Upon the lower part of the bar H, and along its inner side, is formed a shallow groove or channel 24, shewn in Figure 50; in this 35 groove are also several square holes, as shewn in that Figure and in Figure 51. Into this groove is fitted a piece 25, Figure 52, and shewn sideways in Figure 53, having a screw with a square shoulder affixed in it, as shewn in this Figure. To this piece 25 is also hinged or jointed a limb or bar 26, the

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

screw being passed through any one of the square holes 24, shewn in Figure 50, and through a round hole made to receive it in the part Q, Figure 54 and 49, being passed through the loop O, as shewn in the latter Figure, is then secured by the screw'd nut P. The part 26 being lengthened, as shewn in Figure 49, 5 is formed into a plate laid and secured between the thicknesses of leather forming the sole of the boot, as before described, or it may be hinged to the bar 26, as shewn in Figures 49 and 52; in this case the sole of the boot must be extended sideways to lie under and support the bar 26. This apparatus having been adjusted to the length of the limb above and below, in the manner 10 indicated, and secured by the bands or straps 13, 16, and U, V, as shewn in Figure 49, an additional strap 27, shewn in Figures 49 and 54, is affixed upon a stud 28, at the bottom of the bar Q, as shewn in Figure 54, and passed around the bar 26, as is shewn in Figure 49, and by buckling which from time to time tighter, as the case may require, tension or traction may be exerted upon 15 the lower part of the limb, and at the same time also upon the upper part of it, by means of the band or strap U, V. The bar H of the apparatus is bent outwardly at 29, in order to afford room and clear the limb. By this arrangement of the apparatus the same effects of partially supporting the body and extending the limb may be produced, as before described when speaking of 20 cases of the deformity turned "in knee;" but in the case of the knee bowed outwardly, the action of the apparatus is to press the knee inwardly and draw the leg and thigh outwardly. And whereas in cases of "in knees" deformity, the effect is to draw the knee towards the apparatus, and press upon the upper and lower parts of the limb, by which means the bones in both cases are 25 restored to their proper relative positions, and the cure may be also perfected by other curative means, as may be indicated by the varying circumstances of different cases. Where the limbs are deformed by the toes being turned inwards, as in the well-known deformity termed "pigeon-toed," the feet may be brought into their proper positions by the following means:—Upon the upper 30 part of the bar N, Figure 51, I extend that bar sideways, so as to partially surround the hip, and in order to afford a firm resistance to the twisting action to be exerted upon the foot, to correct the deformity and bring it to its natural position. In order to this effect, the plate R, before described, has projecting from its side, at a right angle, a thin elastic plate of steel, as shewn at 30 in 35 Figures 52 and 55; this springing part, as well as the plate R, is inclosed within the thicknesses of leather forming the sole of the boot, but this latter part 30 is not rivetted to the boot, but is allowed to slide or play with the motion of the foot in walking. When this apparatus is fixed upon the limb for this deformity, the power exerted by the part 31 projecting backwards and

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

sideways, a leverage is produced capable of giving the deformed foot its natural posture. When the fore part of the foot is turned outwards, the branched part 31 may be bent into the opposite direction, or be brought forwards and shaped so as to suit that part of the body. This side branch 31 is progressively to be drawn towards the hip by means of the padded strap 32 being 5 passed through loops formed at 33, as shewn in Figure 51, and furnished with a buckle and loop, as usual. Where the deformity is confined to the arch of the foot and to the ankle joint, and when the ankle joint is bent inwards, I do not extend the apparatus to the upper parts of the limb, but simply apply it to the leg and foot in the following manner:—Figure 56 represents an apparatus 10 adapted to this case of deformity; but in this instance I likewise employ the pad or support of the under side of the foot shewn in Figure 46, and which is placed to support the foot between the heel and the ball of the great toe, as shewn in this Figure. The main bar of this apparatus 34, Figure 56, is hinged or jointed to a metal plate 35, and has another joint below at 36, opposite to the ankle 15 joint. To the upper plate 35 a leather pad or cushion is affixed, which is padded on the inner side with elastic materials covered with thin soft leather, as usual. The under part, below the joint 36, is bent at 37 at a right angle, and secured between the leathers forming the sole of the boot. A strap 38 is attached to the plate 35, and buckled around the leg to fix this part of the apparatus to it; 20 another strap 39, sewn or stitched to the inner side of the boot, is likewise buckled around the limb just above the ankle joint and over the bar 34 of the apparatus. By tightening the strap 39, the ankle is gradually raised from its unnatural posture into its natural position, the arch being gradually formed by the operation of the pad above described; other curative means, calculated to 25 strengthen the muscles, &c., may also be employed to perfect the cure. Where the bones of the leg or thigh are bent without being accompanied with any yielding of the joints, the apparatus shewn in Figure 26 should be employed; the principal object in these cases is to remove the weight of the body from the affected limbs, and to throw it upon the apparatus, which is accomplished by 30 adjusting the apparatus to a sufficient length to support the body by the medium of the strap U, V. The limb may be confined to the apparatus at the knee and ankle, as may be required. Where, however, the deformity of the bones and of the joints both occur in the same case, suitable positions of the apparatus above described must be employed. 35

Another very common case of malformation or deformity is familiarly known by the term of "club foot." This deformity commences in early infancy or before birth. In these cases the front or fore part of the foot is usually turned inwards, and the sole more or less upwards, in conse-

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

quence of the distortion of the tarsal and metatarsal bones, the toes being carried round with those bones to which they are attached. This state of the bones is, probably, produced by a loss of balance of power, in the muscles attached to the foot, in consequence of which preternatural contraction
5 of some of the muscles takes place, and the foot is thereby retained in an unnatural position, where it becomes more or less fixed, and its proper functions diminished and sometimes lost. The means which I have invented for remedying this defect are as follows :—Figure 57 is a side view, and Figure 58 a front view of the apparatus ; the same letters and figures of reference
10 indicating the similar parts as in Figure 28. Upon the lower bar or limb I, I have mounted an additional limb 40, which is passed through the loop O and secured by the screw P, in the manner before described. Figure 59 is a side view of this apparatus, Figure 60 a plan of it, and Figure 61 a perspective view thereof. This frame is furnished with loops all round it, as shewn in
15 Figure 59, for the purpose of passing bands, strings, tapes, or straps through them, agreeably to the purposes in contemplation ; and below the frame, and in a line with and under the leg, I have fixed a support 41, for the weight of the limb and body to rest upon. Figures 57, 58, and 62 represent this additional frame and apparatus as affixed upon a limb having the contorted foot, and
20 which it is the object of this contrivance to remedy. Figure 63 is a pad, furnished with strings, tapes, or ties 42, and also a leather strap 43, furnished with a buckle and loop. Two of these pads, furnished with their appendages, must be provided, to be used as the circumstances of the different cases may require. Another pad or pads, suitable to the nature of the cases,
25 must also be employed, such an one is shewn in place at 44, in Figures 57 and 58. After the upper part of the limb is fixed to the apparatus, with the outer part of the leg resting against the pad 44, as seen in Figures 57 and 58, the operator places another pad 43 on the outer sides of the bones of the foot, so as to bear upon the outer side of the ankle joint ; the purpose of this pad is to
30 form, with the pad 44, a soft and easy bearing, against which the upper and outer part of the tarsal bones may rest while the surgeon is turning round the foot by slow degrees, and bringing the sole of the foot towards its natural relative position. In order to produce these effects, the operator should place the pads upon the foot, previously covered with soft leather, in such a manner
35 as will best suit the particular case, bearing in mind that the object is first to bring the foot within the bars of the frame, and which he will be enabled to do gradually by fastening the straps, tapes, or ribbands to some of the different loops in the frame with a sufficient degree of tightness to produce firm yet gentle pressure upon the parts, and tightening them, and altering their lines

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

of action from time to time, as the state of the parts may require. When the foot is brought round so that the sole of the foot presents itself fairly to the ground, it may be desirable to dispense with the use of the long apparatus, and employ instead of it the shorter apparatus, Figure 56, which may be placed on the inner side of the leg and foot, so as to keep the foot in its place, 5 with the sole presented towards the ground. If the arch of the foot is flattened or lost, the pad, Figure 42 or 43, should be used, as before described, with the apparatus for the deformities of the ankle turned inwards or outwards. If the foot, however, remains in a position pointing towards the ground, the apparatus shewn in Figure 1 should be employed, in conjunction with the two just 10 mentioned. By these several means, judiciously employed, these malformations may be frequently removed, and the feet be made to perform their proper functions. It may be observed, that as these cases vary, the particular shapes of the frame of the apparatus, Figure 59, should be of course varied, so as to suit the special circumstances of every case. The methods of the treatment 15 having been established, the modifications of the means must depend upon the judgment and discretion of the operator.

In cases of deformity in the spine and chest, accompanied more or less with weakness, rigidity, or stiffness of the parts, I employ the following curative means and mechanical apparatus:—Figure 64 is a perspective view 20 of my “prone exercising plane,” and Figure 65 an elevation of the lower end of it. 45, 45, &c., represent the feet and legs upon which the stout frame 46, 46, rests or is supported; 47, 47, in Figure 64, represents two of four brackets with which the frame is additionally strengthened, and it is also still further strengthened by the cross stays 48, 48, &c., as 25 shewn in section in Figures 66 and 67. Figure 68 is a plan of the frame; 49, 49, are slides formed upon the sides of the frame in the following manner:—Figure 69 is a section of the rails 46, 46, shewing also one of the cross bars 48; 50 represents a section of a thin plank or covering extending across the frame; 51, 51, represent two strips of flannel and leather laid 30 over them; upon this leather 51, 51, which extends the length of the inside of the frame, there slides a cushion 52, shewn in the different Figures, and which is formed as follows:—53, Figure 66, shews a section of a wooden frame, which is pannelled, and supports the materials forming the cushion 52, which is filled or stuffed with horsehair or other elastic materials, 35 and covered with cloth or leather, as usual; under the lower part of the frame are mounted or affixed four brass or gun-metal solid rollers or friction wheels, turning upon polished steel cylindrical pins, which pass through the cheeks of metal frames, and are rivetted externally; in order, however, to

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

prevent the noise of these rollers, caused by their rapid revolutions in use, I introduce between the ends of the rollers and the cheeks of the metal frames leather collets, as is seen in Figure 70, and with a further view of preventing the noise, are likewise lined the surfaces, on which they run in the frame, with
5 flannel covered with leather at 51, 51, as before described, and as shewn in Figures 64, 68, and 69. These rollers are shewn in their places by dotted lines in Figures 66, 68, and 72. There are besides metal pulleys, mounted in metal frames 55, 55, &c., mounted on each side of the lower end of the frame 46, as shewn in various Figures. There are likewise three other pulleys,
10 mounted in frames 56, 56, and affixed in the centre of the frame, also shewn in various Figures in their places. All these pulleys are likewise furnished with leather collets to lessen the noise, in the same manner as in the rollers. A line 57, 57, being fastened to the frame in the middle of the upper end of it, is passed underneath a pulley 58, which is mounted in the middle of a weight
15 box 59, and is then passed over another pulley 56, which, as before said, is affixed in the centre of the main frame, as shewn in Figure 67, and is then affixed to a loop or staple mounted on the under side of the cushion, Figure 52. The effect of this disposition is that when the cushion is carried down by the action of the patient lying upon it, it is brought again into the situation shewn
20 in Figure 67, by the action of the weight box 59, aided also by the assistance of the patient. When the line is thus attached to the head cushion, the cushion is drawn upwards towards the pulley with a force equal to one-half of the weight of the box. The cushion 52 may likewise be forced higher up, as shewn by dotted lines in Figure 67, the patient lying with the front of the body resting upon the
25 cushion 52, with his feet pressed against the foot-board 60, and at the same time grasping the handles 61, 61, he can by his exertions carry the cushion 52 into the position shewn in Figure 67, when the line will be received upon the opposite pulley adjoining 56; then the patient, by a thrusting action upon the handles 61, 61, can force the cushion into the situation indicated by the dotted
30 line, and at the same time raise the weight box 59 into the position also indicated by a dotted line. It is evident that in order to accomplish this, instead of being aided by the weight box, he is actually exerting his own muscular power to raise it, and consequently the stretching action upon the trunk is thereby rendered equal to the resistance occasioned by the weight of the body and the resist-
35 ance of the weight box. When the patient has gained sufficient strength, instead of employing the weight box 59, I bring on the action of a spiral spring and lever 62, shewn in Figure 64, which said spring is affixed to the under part of the frame upon one of the cross bars. Upon the longer end of the lever two loops are affixed, upon the outermost of which loops a pulley 63, mounted in a

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

metal frame, is hooked, and another line 64, affixed to the foot of the frame 46, is passed around the pulley 63, and is then fastened to the middle of a wooden cross bar or spreader 65, shewn separately in Figure 73. To each extremity of the cross bar 65, two other lines 66, 66, are affixed, and which are passed underneath the two lower pulleys 55, 55, and over the two upper ones 55, 55, 5 they are then formed into loops 67, 67. In Figure 64, are two leather pads with leather loops at their backs, through which are passed two leather straps, furnished with buckles and loops 68, 68, as before mentioned, in the references to Figures 1 and 2. These pads or cushions 67, 67, have likewise affixed to them two other straps 69, 69, with buckles and loops, and 10 which are passed around one of the two straps 68, 68, and are then passed through the loops formed in the ends of the lines 66, 66, and are then secured by buckling them. This belt and pads 67, 67, so formed, is then to be buckled around the hips of the patient when exercising upon the plane. In securing this belt around the hips of the patient, he being laid upon the cushion 52, 15 with his feet resting against the foot-board 60, and which said cushion 52 is prevented from descending too low upon the inclined plane 46 by a check line 70, which is fastened to the outside of the cushion, as shewn in Figure, 68, and passed around one of the handles 61, as shewn in that Figure, or otherwise. The straps 69, 69, are then to be adjusted by buckling, so as to bring the lines 20 66 and spring 62 into tension. While the patient lies upon the cushion 52, with his feet against the foot-board 60, and his hands upon the handles 61, 61, he is to exert his muscular force in overcoming the force of the spring and lever 62, and which is a constantly increasing force, till the head of the cushion arrives at the top of the plane, when the lever 62 will have attained the position 25 shewn by the dotted line. When he is able to do this, then I increase the power of the spring by shortening the lever 62, which is accomplished by hooking the pulley 63 to another loop 71, mounted upon the lever 62, nearer to the spring. When he is able easily to overcome this increased resistance of the spring, I introduce an additional resisting agent, by causing him to raise the 30 weight 59, which is effected by attaching the line 57, by tying it to the outer link of the lever of the spring at 62, and thus the resistance of the spring and of the weight are brought into action, and the weight may be increased from time to time, according to the increasing strength of the patient, and according to the judgment of the operator. It is, however, important to observe that if 35 the labour be increased beyond a certain point, the progress of the cure will not only be delayed, but the strength of the patient will decrease instead of increase. The weight box 59 must be so contrived that an aperture may be provided for adding to or diminishing the leaden balls, shot, or other weights at

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

pleasure. The inside of the bottom of the box ought also to be made concave, in order that the shot, balls, or other substances may arrange themselves centrally. The pulley is lowered down into the box in order to gain a greater space or height for its motions. The resistance of the spring and weight may
5 thus be easily regulated from time to time, and according to the state of the patient and the circumstances of the case. Other modes of varying the resistance may also be employed, for instance, in Figure 67, a lever 72, shewn separately in Figure 74, may be hung or jointed to one of the cross bars of the frame, and be furnished with holes along it, as shewn in Figure 67. Into
10 these holes hooks may be inserted, having lines affixed to them as follows:— To the longer end of the lever 72, the line 64, proceeding from the cross bar 65, is hooked, the two other lines proceeding from the outer ends of the cross bar 65, one of which is shewn at 66, passing under two pulleys 55, affixed at the lower end of the frame, and over two others 55, as in the before-mentioned
15 instance seen in Figure 64, where they are shewn as attached to the belt 67. To another of the holes in the lever 72, and nearer to its joint, another hook is hung, from which a line 73 proceeds, and is tied to a staple fixed in another weight 74, and from which an angularly bent wire 75 proceeds, the two limbs of which are hung in two leather loops 76, 76,
20 shewn in Figure 75, and which loops are themselves hung upon studs fixed in the frame 46, as shewn in Figure 75. There are also two quadrantal plates 77, 77, divided into degrees, in order to point out the various inclinations of the wires 75, 75, and as shewn in Figure 67. The weight so suspended between the line 73 and wire 75 is raised by means of the
25 lever 72, and as the motion of that lever raises the two supports towards a horizontal position, the power of the weight increases as it rises, according to a well-known law, and which increase of resistance is shewn on the quadrants by means of the index wires, as before described. The weight 74 may be occasionally suspended, when not in use, by a line 78, which is to be hung upon a
30 pin 79, affixed in the frame, as shewn in Figure 67. The resistance of this weight 74 may be varied by hooking the line 73, or by hooking the line 64, into the different holes in the lever 72. Another mode of producing resistance is shewn in Figure 66, where the lever and spring 62, and lever 72, and weight 74 are omitted. Here the weight box 59 is hung by the line 57 passing under
35 the pulley in the weight box, and over one of the two pulleys 56, 56, and under the other, from whence it is passed under a guide pulley 80, affixed to the frame 46, and from whence it passes to the cross bar 65, and from whence two other lines, one of which is shewn at 66, pass under and over pulleys 55, 55, to be attached to the belt 67 in the manner before described. In this

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

case, however, the resistance is constant, and only to be varied from time to time by adding or diminishing the weight in the weight box 59. Hitherto the actions in exercise have only been exerted upon the trunk and limbs, the head being supported by its natural muscular powers. In order, however, to increase the power of the muscles of the back of the neck attached to the head, and also to make extension upon the neck as occasion may require, I employ the following means:—In Figures 67 and 68, 81 is an arm or branch, carrying a pulley 82, mounted in a covered frame to prevent the line from slipping off it. The opposite end of the bar 81 is hinged or jointed to the middle of the upper part of the frame 46, as shewn in the Figures above mentioned, and beyond the joint the arm is extended inwards, and is furnished with a male and female screw 83, by which the elevation of the pulley 82 may be effected, the screw acting against a metal plate affixed in the frame. The head of the patient in this case being enclosed within the usual or well-known apparatus, straps or bandages provided for the purpose, or similar to that shewn in Fig. 67, and to which a line 84, passing over the pulley 82, may be attached by tying, or otherwise, a weight box 85, furnished with a loop, is hung to the other end of the line 84. When the patient is exercising upon the cushion 52 and frame 46, as before described, and has attached to the head by means of the line and straps above alluded to the line 84 and weight 85, the latter will move up and down, and keep up a constant tension upon the head and neck of the patient; and in order that the muscles of the back of the neck may be made to act more powerfully than is necessary simply to bear up the head, the pulley 82 must be lowered or adjusted by the means above provided, so as to be a little below the line of the bones of the neck; in this way, the two objects in view, namely, increasing the muscular power of the muscles of the back of the neck, and extending the bones, with their attachments, may be effected, as the case may require. In Figures 76 and 77, additional cushions, supported upon rollers, are shewn, 86 being designed for the head to rest upon, and being hollowed to receive it; 87 is another sliding cushion, intended for the upper part of the trunk to rest upon; 88 is also another sliding cushion for the legs to rest upon, and 52 being the cushion, above described, for the hips of the patient to rest upon. In the upper end of the wooden support of the cushion 87, two staples are affixed, to which are fastened two padded leather straps 89, furnished with buckles and loops, as shewn in Figure 76, to inclose the shoulders of the patient, also shewn separately in the adjoining Figure 76*. Two other staples 90, 90, one of which is shewn in Figures 76 and 77, and both in Figure 72, are likewise affixed in the sides of the wooden frame of the cushion 52, to which is buckled the belt 91, shewn in Figure 72; the belt being

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

passed around the hips of the patient in the form shewn in Figure 72. Figure 78 is a separate view of the belt 91. Any particular part of the upper surfaces of these cushions may be raised by pads, in order to act by any particular projection in the trunk of the individual through the influence of the
5 superincumbent weight, while the patient lies upon the cushions. Each of these cushions moves upon four friction rollers, as above described, and their movements are determined, when in action, by the force of the weights, which are made to operate upon them according to the intention and arrangement of the operator. If it be desired to extend the whole spine equally, the lower
10 end of the plane may be raised as high as the upper end, so as to convert the inclined into a horizontal plane, and then the head resting upon the cushion 86, a line connected with the loop, affixed to the head by straps in the manner before mentioned, is conveyed around the standard 92, Figures 66 and 67, to which it is fastened above one of the hooks upon that standard, and which
15 standard is capable of being raised or lowered, and retained in any situation required, by means of a pin being passed through one of the holes made in the standard for that purpose, and as shewn in Figure 66. The shoulders of the patient are placed upon the cushion 87; the hips resting on the cushion 52, & being confined thereon by means of the belt 91 being passed around the
20 body and buckled to the staples 90, 90, in the manner shewn in Figure 72; and the legs resting upon the cushion 88, Figures 76 and 77; the two latter cushions 52 and 88 being linked together by a line tied to the staples provided in those cushions for that purpose. Another weight 93, Figure 76, which is hung to the foot end of the frame 46 by means of a line which is fastened to
25 the frame and passed under a pulley mounted in the weight box itself 93, in the manner before described, and the line is then passed over the pulley 56, and attached to another staple provided in the frame of the cushion 88 for that purpose, the body and limbs being then supported upon the moveable cushions 87, 52, and 88, and the head resting upon the cushion 86, and fixed to the
30 standard 92. The weight 93 operates so as to make extension or traction upon the spine and other parts of the trunk, as the case may require, with a power equal to one-half of the weight 93. If the object be to extend the neck only, then the cushions 87, 52, and 88 must all be linked or tied together, as described, the head being affixed to the standard 92, as before stated; the
35 cushions 86 and 87 are left free to move and separate from each other; and when the body is resting upon the moveable cushions 87, 52, and 88, it will be pulled or drawn by the action of the weight 93, which weight will be made to operate in this way in extending the neck of the patient only according to the intention of the surgeon or operator. If it be desired to

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

extend the spine below the neck only, I proceed in the following manner:—
 The cushions 86 and 87, upon which the head and shoulders rest, being connected together, as shewn in Figure 76, and the shoulders being secured upon the cushion 87 by means of the straps and buckles 89, before described, the cushions 86 and 87 are operated upon by means of another weight 94, a line 5 from which is passed over a pulley 56, and attached to the cushion 86 at that end of the cushion which lies underneath the neck of the patient, whilst the cushions 52 and 88 are linked together and the hips of the patient secured upon the cushion 52 by the belt 91 in the manner above described. The spine is extended by the action of the weight 93 upon the cushions 52 and 88, upon 10 which the hips and legs of the patient rest with a power equal to the weight employed and which may be varied, according to the state of the case, at the will of the operator. If it be desired from any cause to produce passive extension of the whole spine with the plane in the inclined position (but which, however, is not generally so good a mode of operating), the plane must be restored to its 15 originally inclined position, the head resting upon the cushion 86 may be secured to the standard 92 by means of the usual straps, loop, and line, in the manner before described, the head resting upon the cushion 86, the shoulders upon the cushion 87, the hips upon the cushion 52, and the legs upon the cushion 88, traction will now be produced upon the spine by the body lying in 20 the inclined position. In this case the traction or extension will be made upon the bones of the neck principally. If, however, the traction upon the neck be too powerful, it may be lessened by detaching the weight 94 from the cushion 86, and affixing it to the cushion 87, upon which the patient's shoulders rest. In this way the traction upon the neck may be diminished at pleasure. If it 25 be desired to extend the neck only with a given force, this may be effected by a weight 95, with a line attached to it, and passing over a pulley 96, mounted in a frame at the upper end of the standard 92, as shewn in Figure 77, and from thence to the loops affixed to the head of the patient by straps or bandages, as before said. The cushion 87 for the shoulders should be 30 connected by means of a line to the cushion 52, and this cushion to the cushion 88. The cushion 87 must be attached to one of the handles 61, Figures 64 or 68, by a line 70, by which the cushions 87, 52, and 88, will be prevented from sliding downwards by the weight of the body of the patient resting upon them. If the object be to extend the back only between the 35 neck and hips, then a separation should be made between the cushions 87 and 52; the first and second cushion 86 and 87 being attached to one of the handles 61, as just described. The two lower cushions 52 and 88 must in this case be operated upon by the action of the weight 93, according to the

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

intention of the operator and condition of the patient. The inclined plane above described, with its cushions, pulleys, lines, weights, &c., is used to assist in removing unnatural curvatures in the spine, both during exercise and rest. It can be used to produce extension or traction upon the spine, either when
5 the body is in exercise or when it is at rest in the manner already mentioned, and while it is operating upon the spine it also has a tendency, in cases where the chest is likewise deformed, to separate the ribs which are lying too close together, and to bring those ribs which are too far separated nearer together, which last-mentioned effects are aided by the occasional use of weight
10 judiciously employed according to the state of the deformity and the part in which it exists, and having respect also to the physical strength of the patient. These effects are also to be further aided by the hands of the operator, which may be made to act upon parts where more mechanical forces cannot be brought safely into action. When the patient is exercising upon the plane the
15 muscles or moving powers of the body are brought into action, but especially the muscles of the trunk and neck, the exercise being performed in that position most favorable for strengthening the muscles of the back and of the back of the neck, and also for diminishing the curvatures by traction, not exceeding what the parts are able to bear without injury, whilst the body is so
20 placed that the superincumbent weight is removed from the spine. However advantageous the means above described are found to be, they are nevertheless inadequate to enable the surgeon to combat with the different varieties of these very complicated cases. It is not only desirable that the distorted parts should be brought into their natural positions, but it is also most important
25 that they should be retained in those positions in whatever posture the body may be placed. If this be not accomplished, the bones will be either prevented from acquiring their natural bearings one upon another, which happens when the body is kept in the horizontal posture, or they will be thrust out of place by the superincumbent weight. To provide for these difficulties, and to
30 enable the patient to take exercise upon the feet without retarding his recovery, I make use of the following portable apparatus, which completely answers these purposes, and also places the bones of the trunk very much under the command of the surgeon, and thereby enables him to carry on the curative measures in whatever posture the body might be placed, and
35 whether the person be exercising on the plane, or in the open air, or elsewhere. This portable curative apparatus consists of two plates or standards of hardened and tempered steel, inflexible sideways, but capable of yielding in back and front to the motions of the body of the patient. These plates or standards may be also composed of two or more pieces variously bent and connected to

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

suit the circumstances of the various cases for which they are designed. One of these, as made of one piece of steel, is shewn separately at 97, in Figure 79. These plates may be made of steel, thicker or thinner, agreeably to the state of the case, the age of the patient, or other circumstances. These plates are curved or bent so as to suit the particular form of the back or front of the 5 body of the wearer; Figure 80 being intended for the back, and Figure 81 for the front of the body. This plate 97 is first to be clothed or encased within soft leather all over it. There is likewise prepared a clothing for the trunk or body of the wearer, & likewise to include or inclose these springs 97, 97, in the following manner:—The main portion of this clothing 10 is composed of two thicknesses of woven cloth, of cotton, or other material, which may be strengthened when needful by introducing a layer of the stout hempen or linen cloth commonly known by the name of brown holland. In general I prefer to use the cotton fabric known by the name of jean. These pieces are stitched together in the manner commonly practised in staymaking, 15 with gores if required; and a parallel groove or case is made to receive the spring in a situation so as to be placed in the centre of the front of the body of the patient; previous however to their being stitched together, the parts beneath the springs which are to be lodged or brought into contact with the body of the wearer must have interposed between them and the body two, 20 three, or more layers of soft woollen cloth or flannel, and be additionally strengthened with two layers or slips of stout brown holland cloth, the whole must then be stitched together so as to leave a space fit to receive the spring covered with leather for the front of the body, as before mentioned. This spring is secured in the clothing by it being stitched or sewn together at top and 25 bottom; the situation of the front spring 97, 97, is shewn in Figure 82, and also in Figure 83. The clothing so described is not, however, made in one entire piece, but is formed in two or more portions, agreeably to the nature of the case. In Figure 82, it is shewn as separable about the middle, the upper portion of it 98, 98, overlapping the lower part 99, 99, about 30 one inch and a half, and is furnished with loops which can be attached to buttons affixed upon the parts 99, 99, to receive them. These loops are formed of slips of india-rubber, elastic cloth, or webbing, the lower parts of which have leather loops sewed or otherwise attached to them. These portions of india-rubber web are lodged within cavities formed within the 35 thicknesses of the clothing, so as to allow them a degree of motion in order to accommodate them to the required and varying circumstances. These particulars are shewn by dotted lines in Figure 82. To the upper part of the spring 97 three or four straps formed of webbing are to be placed across the front part

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

of the spring over the brown holland, and previous to the different thicknesses of the clothing being all stitched together. When this apparatus is to be worn by a female, then, instead of the lowest straps above-mentioned, I substitute two metal buckles and leather loops, as shewn in Figure 83, the buckles resting
5 upon pads or cushions provided beneath them. There are likewise provided two shoulder pieces 100, 100, shewn in Figure 82, and one of which is shewn separately in Figure 84, but which, however, is adapted to the female clothing, and is connected with the upper part of the spring 97 by the straps and buckles shewn in Figure 83; the clothing shewn in Figure 82 being designed for a
10 male. The shoulder parts 100, 100, have each four buckles attached to the front parts of them, as shewn in Figure 82. The fore part of this clothing having been thus described, I shall now proceed to shew how the back or hinder part of the apparatus is formed. Another steel spring plate or standard 97, which is also inclosed, is provided, and is shewn separately in Figure
15 85. Here it is seen furnished with ten metal buckles and loops on each side, and also with nine eyelet holes on each side above them; underneath the buckles and eyelet holes there are placed two pads or cushions, which are in fact extensions, of the coverings which form the pad and other parts lining the inner part of the steel spring. These are shewn in section on a larger scale and
20 as ready to be stitched together in Figure 86, and as combined together by stitching in Figure 87. This back portion of the apparatus is united with one side of the fore part of it in the manner shewn in Figure 82, the right side of which shews the fore part of the clothing buckled and laced to the back part or standard, whilst the other straps in that Figure are shewn ready to be
25 so buckled. These straps are laid between the thicknesses constituting the part 98, 98, and are fixed by double rows of stitching. The parts 100, 100, which are shewn separately as for the the female, Figure 84, are to be covered where they come in contact with the armpits when in use, in the manner shewn in Figure 82 at 101, 101, or by a section on a larger scale in Figure 88,
30 where is seen a piece of thick soft leather 101, stitched along the outer side and then turned over the stitching and brought down to the part 100, and again secured by stitching, and thus leaving a pipe or tube through which is to be passed one of the rounded parts of two leather straps 102, 102, Figure 82, one of which is shewn separately in Figure 89, and both are
35 shewn as lying in the pipes in Figure 82. These rounded parts, enclosing within them short pieces of thin cord or twine for the purpose of giving substance and roundness to those parts; the ends of both these straps 102 are joined to the back piece 97 in the manner shewn in Figure 90, and they are buckled to two short straps, one of which is shewn at 103 in

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

Figure 82, and both are seen as buckled in Figure 83. One of these short straps and buckles 103, is also shewn separately in Figure 91, passing over the upper end of the steel spring or standard 97, where the manner of its attachment is indicated. Two other straps 104, 104, Figure 82, are shewn as attached to the front clothing by buttons, and are brought 5 round each thigh in the manner of the straps applied to trusses, and are then fastened or secured by the buckles 105, 105, and as shewn in Figure 92. In order to prevent excoriation they are covered with soft leather, as shewn in Figure 92. There is likewise provided a cloth flap 106, which is affixed at the lower end of the spring 97 at the back, and is furnished with 10 tapes or strings by which it can be secured to the back so as to cover the buckles, and is further secured by a button hole made to receive the button affixed just above the buckles. Each side and the upper parts of this flap 106 are likewise stiffened by means of slips of whalebone introduced within pipings or tubes or places provided to receive and retain them. Figure 93 is a front 15 and side view of a plate of steel or other proper material, which is affixed upon the upper end of the steel bar 97, Figure 80, by means of two screws and screwed nuts, Figure 94, the screws being passed through elongated slits or holes made in the upper part of the bar 97, in order to allow of adjustment, and are then secured in place by the screwed nuts, Figure 94, being bound 20 upon the screws. Figure 93 shews two longitudinal holes or loops made in the middle of this plate 93, for a purpose to be described hereafter. This bar 97, Figure 80, is applied at the back of the patient. The front of the bar 97 and the inside of the plate 93 are grooved or furrowed across, in order to secure the parts when bound together, and prevent them from moving upwards or down- 25 wards. The bar 97, Figure 81, is likewise furnished with another metal plate, shewn sideways in Figure 95, and in front in Figure 96, and which is secured to the upper part of the bar 97 by screws and nuts, Figure 94, in the same manner as the plate, Figure 93, just described, and as shewn in Figure 96. This plate, however, Figure 96, is furnished with three rows of loops, holes, or 30 slits, instead of one row only as in Figure 93, besides which there is a row of small holes running along near the top of it for the better securing of a soft covering or lining to prevent it from galling or excoriating the throat of the patient. These additional parts, Figures 93 and 96, are both to be used to act upon the bones of the neck sideways through the medium of the pad and straps, 35 Figure 97, and in connection with the two springs 97, 97, Figures 80 and 81. The pad, Figure 97, is constructed of a pad or cushion formed of layers or thicknesses of woollen cloth, covered with soft leather or other proper material, and is furnished with two webbing straps, with buckles and loops, as shewn in

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

that Figure; Figure 98 represents by dotted lines these additional parts as applied in use

Having thus described this apparatus, I proceed to shew its applications :—
 I connect the different parts of the apparatus together in the manner shewn in
 5 Figure 82, lacing the two parts 100, 100, on each side of the upper part of
 the back spring or standard 97, as also shewn in Figure 82. One side of one
 of the upper portions 100 is also to be buckled to the front standard 97, as is
 also shewn in that Figure; the parts 98 and 99, having also been buckled on
 one side to the hinder standard or spring 97, as shewn in Figure 82. The
 10 arms of the patient are now passed through the apertures contrived in the
 upper parts of the clothing 100, 100, made to receive them, and which are
 lodged around the shoulders, the rounded parts 101, 101, being lodged beneath
 the armpits. The remainder of the straps and buckles are then to be fastened
 together, and thus secure the apparatus around the body of the patient and, as
 15 shewn in Figures 83, 92, 99, and 100. The front spring or standard must be
 placed in the centre of the front of the body, as seen in Figures 83 and 100.
 Figure 83 is, however, a front view of the apparatus as applied to the body of
 a female, where the breasts are included within parts of the clothing 98, 98,
 purposely shaped to receive them; and Figure 100 representing it as applied
 20 upon a male patient, and in which case the straps and buckles have been
 brought to the front standard or spring instead of being applied to the back
 one, as above stated, and which is done for the patient's convenience in tightening
 or slackening them at pleasure. This latter mode, however, I do not generally
 recommend to be adopted. The back steel plate or standard, Figure 85, is placed
 25 along the centre of the back of the patient as seen in Figure 92, crossing the
 curvatures of the distorted spine as shewn by dotted lines in Figure 98, and
 where the distorted spine is represented; the distorted spine is also shewn by
 a dotted line in Figure 99, where also the back standard 97 is seen as crossing
 it. I then buckle the straps 104, 104, which are buttoned to the part 99, 99,
 30 of the clothing, and passed underneath the thighs to the corresponding buckles
 and loops 105, 105; I then connect the arm piece 100, by means of the
 straps and buckles provided, and placed at the upper part of the front spring
 or standard 97, as shewn in Figure 83, where are also represented the straps
 102, 102, Figure 82, as secured to the short straps and buckles, one of which
 35 is shewn in the latter Figure 82, and separately in Figure 91. The loops and
 buttons represented in the parts 100, 98, and 99 are then to be connected
 together; the purpose of these buttons and loops, with the springing web attached
 to the latter, is to allow greater freedom of motion to the patient when the
 apparatus is properly adjusted and regulated, according to the intention of the

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

surgeon or operator and nature of the case. In order to prevent the points of the buckle tongues from pricking or catching in the ordinary clothing worn by the patient, I cover them with the flap 106, before described, by buttoning it up and tying it around the body of the wearer by the two sets of strings provided for that purpose. The portable apparatus just described may be 5 either used alone with considerable advantages in many cases where the object is simply to alleviate and support the parts and not to cure ; but if the intention be to restore the distorted spine and chest to their natural forms and functions, it will be commonly found needful to use it in connection with the prone exercising plane above described. In very recent or incipient cases the prone 10 exercising plane, judiciously employed, with careful attention to the positions and movements of the patient, may be found sufficient ; but if the case has existed some time, it is better to use the prone exercising plane in connection with the portable apparatus which I have called my "spine support," either successively or together during the treatment. The prone exercising plane, also described 15 above, may be used to give strength to the patient, and with the use of weights, aided by the hand of the operator, &c., the curvatures may be reduced ; but in order to prevent the bones from being again thrown out of their proper relative positions by the superincumbent weight of the body, the patient must be, in this case, confined either to an inclined or horizontal posture, which is attended 20 with two evils, videlicet, in the first place, it is very irksome to the patient to be so confined, and, secondly, the confinement itself tends to hinder the bones from acquiring their natural bearing one upon another. Again, when the spine support is used alone, it can be made to operate in such a manner as to bring the bones into their natural relative position ; but while the forces are so 25 operating, the natural moving powers of the trunk would become weaker rather than stronger, seeing that there is no provision made in this apparatus when used alone for exercising them, and the consequence would be that the patient would require the continued use of this apparatus, the powers of which are too varied and too extensive to be generally intrusted to individuals, as in 30 the case of common stays. Where the case is slight and recent, the plane only, in connection with the use of weights, and also attending to the general health and strength of the patient, may be sufficient in some cases, as before stated ; but when the curvature or curvatures have made any considerable progress, then the prone exercising plane, together with the spine support, 35 should be employed. In some cases it might be also desirable to use topical applications, calculated to weaken the preternatural adhesions between the bones, and in all cases such general and topical means should be employed as may be suitable to the particular circumstances of the patients, so far as they

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

may be calculated to promote the general strength and restore the balance of power in the muscles, or in any way assist in the restoration of the natural form and functions of the parts. I have found in the course of my practice that deformities, weaknesses, and other affections of the lower limbs frequently
5 accompany distortion, weakness, or stiffness of the spine and chest. In such cases it is desirable to carry on the curative process in the trunk and in the limbs at the same time, and to use the various parts of the apparatus which I have described, combining them according to the nature and circumstances of the case. In some cases this is especially necessary, in order to remove the
10 distortion, weakness, or stiffness in the trunk, for it sometimes happens that these latter affections are the consequences of some malady existing in the limbs, and therefore it would be difficult to remove the affections of the trunk without at the same time or previously removing the affections of the limbs by which those of the trunk have been occasioned. For instance, if the curvature
15 of the spine be attended with the deformity termed "flat foot," or, in other words, a loss of the arch of one or both of the feet, the operator should use the apparatus shewn at Figure 46, and if at the same time there exists that condition of the foot where the foot is preternaturally retained with the toe pointing downwards or towards the ground, the apparatus shewn at Figures 1
20 and 2 should also be employed, and if these deformities be also attended with the deformity of the ankle turned inwards, the apparatus shewn at Figure 56 should be used at the same time. If there be the deformity termed "knock knee," or where the knees are bent inwards, the apparatus shewn in Figures 26, 27, and 28 should be employed; and if there exist at the same
25 time also the deformity of the ankle turned outwards, then I likewise employ the additional parts shewn at the lower part of Figure 29, or in slight cases introduce the pad shewn at 14 in Figure 27. If, however, the ankle be turned inwards, then I apply the additional bandage or strap shewn at 13 in Figure 28. If the toe be turned inwards, forming the deformity commonly
30 known by the term "pigeon toed," I make use of the additional parts shewn at 31 in Figure 51, and at 31 in Figure 57, and also at 30 in Figure 55, and likewise at 30 in Figure 52. If the knee be turned slightly outwards, as indicated at Figure 47, I employ the apparatus shewn in Figures 37 and 47, in the manner before described; but if the deformity be in an aggravated form,
35 as shewn in Figure 49, I then employ the additional means indicated in that Figure and in the manner before described. Should the deformity, however, be chiefly confined to the foot, and constitute the case well known by the term "club foot," then I employ the parts of the apparatus shewn at 40, 41, and 44, in Figure 58, 40, 41, and 44 in Figure 57, and likewise at 40 in Figure 62,

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

and at 43 in Figure 63, and likewise at 40 and 41 in Figures 59, 60, and 61, &c., as the case may require. If there be stiffness of the knee joint, I use the apparatus shewn at Figures 21, 22, 23, 24, and 25, or in certain cases the apparatus shewn as prepared for application in Figure 11, and in use, as secured to the limb by splints, straps, and pads, as shewn in Figure 12, and the 5 knee-cap *y* may be also added, as seen in that Figure. The apparatus shewn in Figures 11 and 12 may be employed; but where there is inflammation, or tenderness, or danger of producing it by pressure upon or underneath the knee joint, it is better to have recourse to the apparatus shewn in Figures 21, 22, 23, 24, and 25, by which that evil is completely avoided. This apparatus also better 10 allows the surgeon to use topical applications calculated to weaken unnatural adhesions of the parts of the joint, and also such as are calculated to assist in the removal of inflammation, tenderness, or disease. In cases of stiffness of the knee joint, the patient should not be allowed to use the feet in exercising upon the prone exercising plane, Figure 64, except the stiffness, condition, and position 15 of the point will allow of it with impunity. In cases of affections of the elbow joint requiring the use of this apparatus, such as stiffness either in the bent or straight position of the arm, arising from inflammation or disease, or from preternatural contraction of the muscles, the apparatus shewn in Figure 13 may be employed, or one with an open frame and joint, similar to that shewn in 20 Figure 21, but adapted to the difference of the form of the limb. The principles regulating the use and the application of the apparatus are the same as above described, when treating of the affection of the knee joint. When these affections of the elbow joint exist in connection with deformity, weakness, or stiffness in the spine or chest, it is desirable to remove the affection of the 25 elbow joint before the prone exercising plane be brought into operation for the purpose of strengthening the muscles. The other purposes for which this plane, Figure 64, is employed, while the patient is resting upon it, may, however, be carried on while the elbow joint is under treatment. The patient may also use the spine support shewn in Figure 82, with its various modifications 30 and applications in connection with the purposes just alluded to, for which the prone or inclined exercising plane may in this case be employed. When all danger of reproducing disease in the elbow joint is removed, the patient may exercise himself upon the prone or inclined exercising plane 64, with advantage to his general health, for the purpose of strengthening the muscles to assist in 35 removing the deformity, weakness, or stiffness of the spine or chest, and also to assist in perfecting the cure of the affection of the elbow joint. The particular apparatus to be used in order to meet the deformities above-mentioned, weaknesses or stiffnesses in the spine, chest, or limbs, that may be found in

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

any particular case, must be selected or chosen according to the nature of the case, and be also constructed of sizes and of materials suitable to the patients for whom the apparatus may be designed. The apparatus must also be used with due regard to the natural conformations and functions of the human spine, chest, 5 and limbs, and with respect also to the vital or physical powers of the system, and of the different parts in health, a state of deformity, and in disease, for in the treatment of stiffness, muscular weakness, or deformity, it is needful to employ all the powers of nature, of science, and of art, which, in various contrivances and combinations, can be suited to and made to operate in accordance 10 with and in assistance to the growing and repairing powers of human life. I now proceed to declare,—

Firstly, that I disclaim the right to the exclusive use of any part or parts of the said apparatus separately, and which part or parts were previously known and in use.

15 Secondly, I disclaim the exclusive right to the use of any of the various parts of the said apparatus, however variously constructed, and which are herein-mentioned and described, that were previously known and in use, except when I use the said part or parts in new and useful combination or combinations.

20 Thirdly, I disclaim the exclusive right to the use of any of the material or materials of which the various parts of the said apparatus are composed, excepting so far as the said material or materials are used by me in the construction of such part or parts of the said apparatus as are new in principle or in new and useful combination or combinations.

25 Fourthly, I claim the various apparatus or parts of apparatus herein described, in new and useful combination together, or in various new and useful combination or combinations suitable to the circumstances of each particular case; and such of the said apparatus or parts thereof as I am entitled to claim to use separately, I claim so to use separately and exclusively, as 30 well as in new and useful combination or combinations with other part or parts of the said apparatus herein mentioned and described.

Fifthly, I claim the exclusive right to the use of the old or known part or parts of the said apparatus, so far as the same are or may be used in new and useful combination or combinations with the said newly constructed parts 35 thereof herein described.

And, sixthly, I do hereby declare that the apparatus, as the same are herein described, made, used, combined, and constructed, do together make up my apparatus for the relief or correction of stiffness, weakness, or deformity of the human spine, chest, or limbs.

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

Having thus described the construction of the various apparatus, and the manner of their application in use, I now proceed to distinguish those parts which I claim, as believing the same to be new, and with the exception of those parts which I do so claim, I expressly disclaim the other portions of the said apparatus, except when in new and useful combination, as before-men- 5 tioned, of the apparatus shewn in the Figures from 1 to 10 inclusive. I claim the improvements made in the parts indicated at *d*, in Figures 1, 2, 3, 5, 6, and 7, which is so formed as to enable the surgeon to pad the apparatus and diffuse or extend the pressure produced by it in the commencement of the treatment of aggravated cases, either upon the instep or upon the 10 front of the lower part of the leg, according as either of these parts may be required to bear the pressure, which can be regulated by the change of form now made in this part *d* when properly padded, as seen in the Figure, so as not to be productive of injury to the patient. I also claim the alterations of form made in the part *i*, shewn in Figures 9 and 10, the object of this altera- 15 tion or improvement (*i*) is to enable the surgeon to diffuse the bearing of the apparatus upon the shin, so that it may not injure or excoriate the skin of the patient where the apparatus bears upon the skin. In using this apparatus as it was formerly made, I was sometimes obliged to throw it out of its proper bearing at the knee, by bringing the straps *l, l*, Figure 1 and 2, further forward, 20 in consequence of which the apparatus was made to act more upon the knee-cap, which being a moveable part, was less fitted to form a point of resistance, and thus the operation of the apparatus was rendered less favorable. This arrangement of the apparatus I was obliged to adopt, in order to avoid injurious pressure, which otherwise in some cases became so great as to lead to 25 a discontinuance of the use of the apparatus for a time, and consequently the recovery of the patient was retarded. The evil here mentioned can be entirely avoided by the improvement in the form of the part *i*, Figures 9 and 10, now made by me, when properly padded, as shewn at *h*, Figures 1, 2, and 3.

In respect to the apparatus shewn from Figures 11 to 25 inclusive, I now 30 proceed to declare that I claim, first, the introduction of the cross furrows and ridges formed in the under surface of the part *s*, Figure 15, and also the furrows and ridges formed in the upper surface of the other plate of metal *t*, Figure 16. Before I invented this addition of the furrows and ridges, the part *s* slid or slipped upon the part *t*, when the apparatus, Figures 11, 12, 13, &c., was in 35 action upon the limbs, beyond the power of the screwed nut *x* to prevent, and this evil increased in proportion as the limb was brought towards the straight position, and consequently the action of the loop *e* and screw *c* was thereby rendered very imperfect. By these furrows and ridges formed in the parts

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

Figures 15 and 16, this movement of the piece *s*, Figure 16, upon the part *t*, Figure 16, may be prevented when they are bound together by the screws. The part *s*, Figure 15, however admits of being moved to and also of being readily fixed upon any part of the plate *t*, Figure 16, that may be deemed
5 advisable, and thus the evil found in the use of my former apparatus of this description can be readily and entirely avoided.

I also claim the improved form of the metal frame shewn in Figure 21, and in use in Figures 23, 24, and 25, but I do not claim the joints A, A, by which the metal bars C, C, C, C, are connected together. The novelty in this
10 Invention consists in placing the metal bars C, C, C, C, parallel with the thigh bone and also with the large bone of the leg; the advantages of this arrangement are such as to enable the surgeon to use the apparatus without producing painful pressure upon the knee joint, which in some cases is a matter of great importance to the patient, especially where the knee is tender
15 or diseased. It also enables him to keep up an equal and easy bearing upon the limb, through the medium of the pad, Figure 22, both behind and in front, according to the direction in which the limb is made to move at the knee joint. The bars being arranged parallel to the bones of the limb, as above stated, the action of the apparatus when upon the limb is but little varied
20 from the natural movement of the limb itself, and the needful pressure is diffused over a large surface during the movements of the limb, either towards the straight or the bent position. This apparatus also admits of the use of topical applications to assist in weakening or loosening preternatural adhesions formed in or around the joint, and also of other measures calculated to assist
25 in removing inflammation or disease which may exist in the joint without interfering with the action of the apparatus. In former apparatus of this description, made by other persons with an open joint, the direction of the bars C, C, C, C, have been arranged obliquely to the line of the large bones of the limb, and consequently the action of the apparatus with the bars so formed
30 has been thereby rendered very imperfect, and in some cases altogether nugatory.

I also claim the pad shewn in Figure 22, with all its appendages, used in combination with the apparatus last described, as shewn in Figures 23, 24, and 25.

35 With respect to the apparatus shewn in Figures 26 to 63 inclusive, some parts of them having been already used in my own practice, I only mean or intend hereby to claim,—

Firstly, the joint angular gap and locking bolt minutely described in Figures

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

30, 31, 32, and 33; the hooks or catches, as shewn in Figure 32, K, 21, and 22, and which are also shewn in operation in various of the Figures from 26 to 58. This part of the apparatus is used to admit of an easy adjustment of the parts H and I in Figures 26, 30, 31, and 32, in the straight and also in the bent position. It is important in the treatment of the cases for which this apparatus 5 Figure 26 is used, that the bars H and I should admit of being fixed and retained in their straight position at pleasure, but there are periods when it is desirable that the patient should have the liberty to alter its position or bend it occasionally, and have free motion of the limb in the bent position, as, for instance, to go upstairs, to ride on horseback, or to get into a carriage; for 10 these and similar purposes, the arrangements here made allow the apparatus either to be fixed in a straight position, or, when bent, allows a certain degree of easy motion approaching towards the straight position, but catches or stops it at a certain point, as shewn in Figure 32, and thereby the patient is enabled to walk with freedom with the limb in the bent position; the locking bolt or 15 catch J, Figures 30, 32, being so arranged and formed as not to impede his progress, and there being no danger of the said parts H and I becoming fixed in the straight position except at the patient's will.

Secondly, I claim the compound bandage or straps 4, shewn in use in Figures 28 and 29, and separately in Figure 38; the improvement consisting 20 in the addition of the straps 5 and 6, and whereby I am enabled to secure the bandage firmly upon the knee of the patient, when it is to be connected with the apparatus shewn in Figures 28 and 29, as without the straps 5 and 6 it was frequently slipping from its place.

Thirdly, I claim the compound bandage, shewn separately in Figure 40, and 25 in use in Figure 41; the arrangement of the straps, with the elastic webbing 19, 19, introduced between them, allows the knee to be retained in its proper position with respect to the apparatus H and I, with only a slight pressure upon the knee joint, an arrangement which is very useful when the bandage is used with the apparatus shewn in Figure 26. For weak knee joints, 30 and especially where the knee is tender, the elastic rubber webbing keeps the two parts 18, 18 in their proper relative positions with respect to the knee joint, and whether the limb may be in the straight or bent position. Another advantage derived from the use of this bandage is that it allows the knee to bend without impediment when used in combination with this 35 apparatus.

Fourthly, I claim the apparatus shewn in Figures 50 to 55 inclusive, and shewn in application in Figure 49. The leather strap 13, Figure 52, the upper

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

adjusting joint O, P, Figure 51, the mortices W, Figure 51, the strap or bondage U, V, Figure 49, the pad Y, Figure 49, and the strap or bandage 16, Figure 49, I do not claim as being new except as used in combination with the other parts of this apparatus. By this arrangement of the parts, as
 5 described in the before-mentioned Figures, the surgeon is enabled to adapt the apparatus to any degree of the deformity of the knee turned outwards by the operation of the parts 30, 31, and 32; the fore part of the foot, when needful, can be turned outwards by reversing the position of the part 31, or bringing it forwards through the action of the strap 32, placed or bound round
 10 the body, and which acts through the bars and other parts of the apparatus upon the foot of the patient; the front of the foot may be turned inwards, if required. The pad used with this apparatus 23, Figure 51, may be used with the apparatus, Figure 37, in incipient cases, in the manner shewn in Figure 47 of this apparatus.

15 Fifthly, I claim the frame 40, shewn in Figures 57, 58, 59, 60, 61, and 62, affixed to the lower branch I of the apparatus above described, and intended to alleviate or cure the defect or deformity known by the name of "clubbed foot," by turning or bringing the distorted foot gradually into its natural posture by means of the compound bandage, Figure 63, which is attached to the frame 40,
 20 and made to act upon the foot in the manner shewn in Figures 57, 58, and 62, or otherwise, as the case may require. In the after stages of the treatment, the apparatus shewn in Figures 1, 46, and 56 may be used, either together or separately, as the case may require.

The series of Figures from 64 to 78 inclusive refer to a prone inclined
 25 exercising plane, and the apparatus connected with it, or a plane employed for exercising the patient with his face downwards while the body is placed in the inclined position, and which is also used for other purposes, hereafter to be described, in the alleviation or removal of deformities, weakness, or stiffnesses of the spine and chest. I am aware that an inclined
 30 plane has already been made, and therefore I disclaim the Invention of such inclined plane, but I hereby claim the following additions and improvements. And, first, the introduction of the two pulleys 56, shewn in Figure 64 and in various other Figures, and the intent of which is first to cause the weight 59, shewn in Figure 64, to act upon or assist in drawing up
 35 the cushion 52, with the patient lying upon it, as far as the lowermost of the two pulleys 56 will enable it to do so; but afterwards, upon the patient thrusting against the two handles 61, 61, with his hands and arms, the line attached to the weight 59 is removed from that said lower pulley, and applied upon the

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

uppermost pulley, and in that case the weight 59, instead of assisting the patient, requires itself to be lifted by lines, in order that the cushion 52 may be carried up to the top of the plane, and in this way the weight is made to operate alternately in two different ways, first, as an assisting, and then as an opposing agent, both of which effects advantageously contribute to the curative process while the patient is exercising upon the plane. In the progress of the case, and as the strength of the patient will allow, I remove the line connected with the weight box 59 from the cushion 52, and connect it with the lever of the spring 62, and in this way I can still increase the resistance as the patient approaches the head of the plane, and thereby keep up the same curative effects just described, which are to extend the trunk while the patient is exercising with a force equal to his strength, and supply a resistance varying from time to time, as the patient's strength increases, by adding more weight to the weight box. The manner of attaching the weight over the pulleys to the cushion 52, and also to the lever of the spring, has been already described. I claim the two pulleys 56, in connection with the weight 59 and the cushion 52, or in connection with the spring and lever. Instead of the variable action of the spring, I can employ the lever shewn at 72 in Figure 67, with the weight 74 attached to it in the manner above described, the weight 74 and lever 72 being substituted in place of the spring, which mode I also claim. It will be seen by these arrangements that the resistance to the patient is changed or made to increase as he reaches the top of the plane, and that the resistance can also be accommodated to his strength with great nicety, so that the resistance can always be adapted to his muscular power of overcoming it, which is the aim or intent of these arrangements of the apparatus. I claim also the use of the weight 59, in connexion with the pulleys 56, shewn in Fig. 66, where the spring or variable lever is omitted. I likewise claim the application of the variable lever 81 and pulley 82, so as to employ the weight 85, by means of the line 84, hooked or otherwise attached to the head of the patient in the manner before alluded to, so as to exert a threefold action upon the neck of the patient, namely, firstly, when the muscles of the back of the neck are too weak to enable the patient to support the head in exercising upon the plane by elevating the pulley 82, the action of the weight 85 may be made to assist in raising the head or supporting it, and this effect continues constant during the whole extent of his motions upon the plane; secondly, where it is desirable to increase the labour of the muscles of the back of the neck, in order to increase their power as the patient is able to bear it, this may be effected by lowering the pulley 82 below the line of direction of the bones of

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

the neck; and thirdly, where it is desirable to produce extension of the neck, this may be accomplished at the same time by increasing the weight 85.

I also claim the additional sliding cushions 86, 87, and 88, with the shoulder straps 89, as applied to the cushion 87, before described, and their uses, combined together or separately, agreeably to the intention of the operator, and as described in the references to Figures 76 and 77, as likewise the adjustable standards 92, its pulley 96, and weight 95, as applied at the highest or upper part of the inclined plane, and the use of which has been before described. I likewise claim the application of the weight 93, and pulley within it as applied and used by means of the line passing over the pulley 56 at the bottom of the inclined plane, and connecting it with the sliding cushions by lines or otherwise, as also before described. By the arrangement of the cushions, pulleys, and weights last mentioned, I can produce extension of the neck only, or of the trunk only independent of the neck, or of the whole spine, as the case may require, and while the patient is lying upon the plane, either in the inclined or horizontal posture.

The series of Figures from 79 to 101 inclusive relate to that part of my apparatus which I term my spine support, and which I claim as a new Invention. The various parts of this apparatus have already been described in the description already given and by reference to the last-mentioned Figures. Having already shewn the manner of applying this apparatus to the body, I now proceed to point out its operation:—The action of this apparatus must be regulated according to the number and nature of the curves, with due regard to the bodily condition of the patient, and the character and situation of the curves. It is to be observed, that the two springs which have been described form two standards, inflexible sideways, whether each or either be composed of one or several parts variously formed or connected, and that these standards convey the weight that may be thrown upon them down to the pelvis, or to some of the bones and other parts situated below those projections upon which they exert a suspending action, and that they at the same time afford firm points of resistance, towards which the unnaturally convex parts of the trunk may be drawn in the manner shewn in the diagram, Figure 101; when the straps situated on the right side of the standards, as seen in this diagram, are tightened, both of the standards are drawn towards the right side of the body; when the straps on the left side of the standards are tightened, the springs or standards are drawn back again. In this way it will be seen that the unnatural curves of the body will be made to act one against the other, and thus all the convex parts of the unnatural curves of the trunk will be drawn

Amesbury's Apparatus for Relieving Weakness, &c. of the Chest, Spine, &c.

towards the standards, or, in other words, will be operated upon in a manner which tends to bring the different distorted parts of the spine into their natural relative positions, whilst the concave parts are left free from pressure. Figure 102 represents an incipient curvature of the back; Figure 92 represents an instance where the curve is nearly removed by the application of the apparatus; Figure 99 5 represents a case in progress of cure. In this case nearly the whole of the bones of the spine are curved in one direction. In some instances there are several curves, as shewn in Figure 98, but whether the curves be one, two, three, or more, the principle of operation is the same; the projecting parts form antagonizing fulcra, and are acted upon by antagonizing forces, as seen in the diagram, 10 so that in whatever position the body may be placed these forces continue their operation in such a way as to resist and effectually check the deforming process. The deformed parts cannot be displaced beyond what the apparatus will allow; if they move otherways, their movements must be towards their naturally straight position. If the bones of the spine are not become fixed in their unnatural 15 position, the spine is speedily brought up to its natural line; but if the spine has become stiff, the operation of the apparatus will be more strongly resisted; but I know not of any resistance which may not be overcome, except where the stiffness arises from unnatural bony or osseous union. The beneficial operation of this apparatus depends upon the right application of the forces, which by its 20 means can be brought to act upon the spine and chest. It affords a general support to the trunk, and sustains part of its weight, tending, however, to cause the bones to bear the weight that is above them; it draws those parts asunder which are too near together, in the manner seen in the diagram, Figure 101, and also in Figure 98, on the right side of which the straps are seen running 25 obliquely upwards at the upper part, and obliquely downwards at the lower part, drawing the ribs away from the pelvis, to which they are unnaturally approximated. On the upper part of the last Figure, on the right side, the apparatus is seen producing a suspending action, on the lower part it is seen producing a depressing action; on the left side of this Figure it is seen producing a sus- 30 pending action and also a compressing action, which however is more especially produced by tightening the straps which are placed opposite each other, which is sometimes required; on the left side of the neck it is also seen producing pressure through the additional parts shewn in Figures 93, 96, and 97. If parts of the spine be twisted so that the sides of some of the bones be turned unnaturally 35 backwards, and the same sides of other bones are brought unnaturally forwards, the apparatus can be made to produce a counteracting effect by the introduction of pads or compresses, as seen in the diagram, Figure 101. By these means

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

these projecting points are also converted into antagonizing fulcra, and the apparatus is made to act upon them with a force varying according to the thickness of the pads, tension of the straps, &c. If the ribs project unnaturally forwards in any one or more points, the operation of the apparatus has a
5 tendency to bring them into their proper situations, either through its own action, or still more powerfully through the introduction of soft pads or compresses between it and the projecting parts of the body. This effect may be also further aided by the use of springs adjusted so as to operate upon the projecting parts in the manner of truss springs, and also by the use of weights, as
10 a few pounds of shot secured in bags placed so as to operate upon the projecting parts while the patient lies upon the prone exercising plane. The principle of this apparatus is to enable the operator to bring into action upon the body of the patient the following forces, namely, suspension, traction, depression, pressure, compression, support, resistance, and antagonization or counteraction, either at
15 the same time or in various combinations and with various degrees of power suitable to the circumstances of the case or the condition of the patient upon whom it is made to operate. The manner of manufacturing this apparatus may be varied, as by systems of laces instead of the straps, which can be variously attached and made to produce similar results. I also claim the entire use and
20 application of my spine support, not only to the various cases of distortion or weakness of the spine and chest before enumerated, but also to such other cases of the same description to which this apparatus is applicable. I do not mean or intend hereby to limit or confine myself to the particular forms or proportions of the different parts of the various new apparatus, but I claim the power of
25 varying the different parts agreeably to the age of the patients and the particular circumstances attending their cases; neither is it to be understood that my apparatus is applicable to every variety of deformity, stiffness, or weakness which is found to occur in the human spine, chest, or limbs, nevertheless it is generally applicable to relaxations of the ligaments, muscular weaknesses, and
30 to the deformities consequent upon the occurrence of these evils, and also to stiffness arising from preternatural adhesions of the joints and preternatural contractions of the muscles.

In witness whereof, I, the said Joseph Amesbury, have hereunto set my hand and seal, this Fourth day of October, One thousand eight hundred
35 and thirty-seven.

JOSEPH (L.S.) AMESBURY.

Amesbury's Apparatus for Relieving Weakness, &c. of the Spine, Chest, &c.

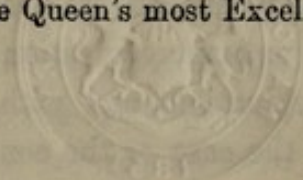
ROUPELL.

AND BE IT REMEMBERED, that on the Fourth day of October, in the first year of the reign of Her Majesty Queen Victoria, the said Joseph Amesbury came before our said Lady the Queen in Her Chancery, and acknowledged the instrument aforesaid, and all and every thing therein contained and specified, in form above written. And also the instrument aforesaid was 5 stamped according to the tenor of the Statute made in the fifty-fifth year of the reign of His late Majesty King George the Third.

Inrolled the Fourth day of October, One thousand eight hundred and thirty-seven.

LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1857.



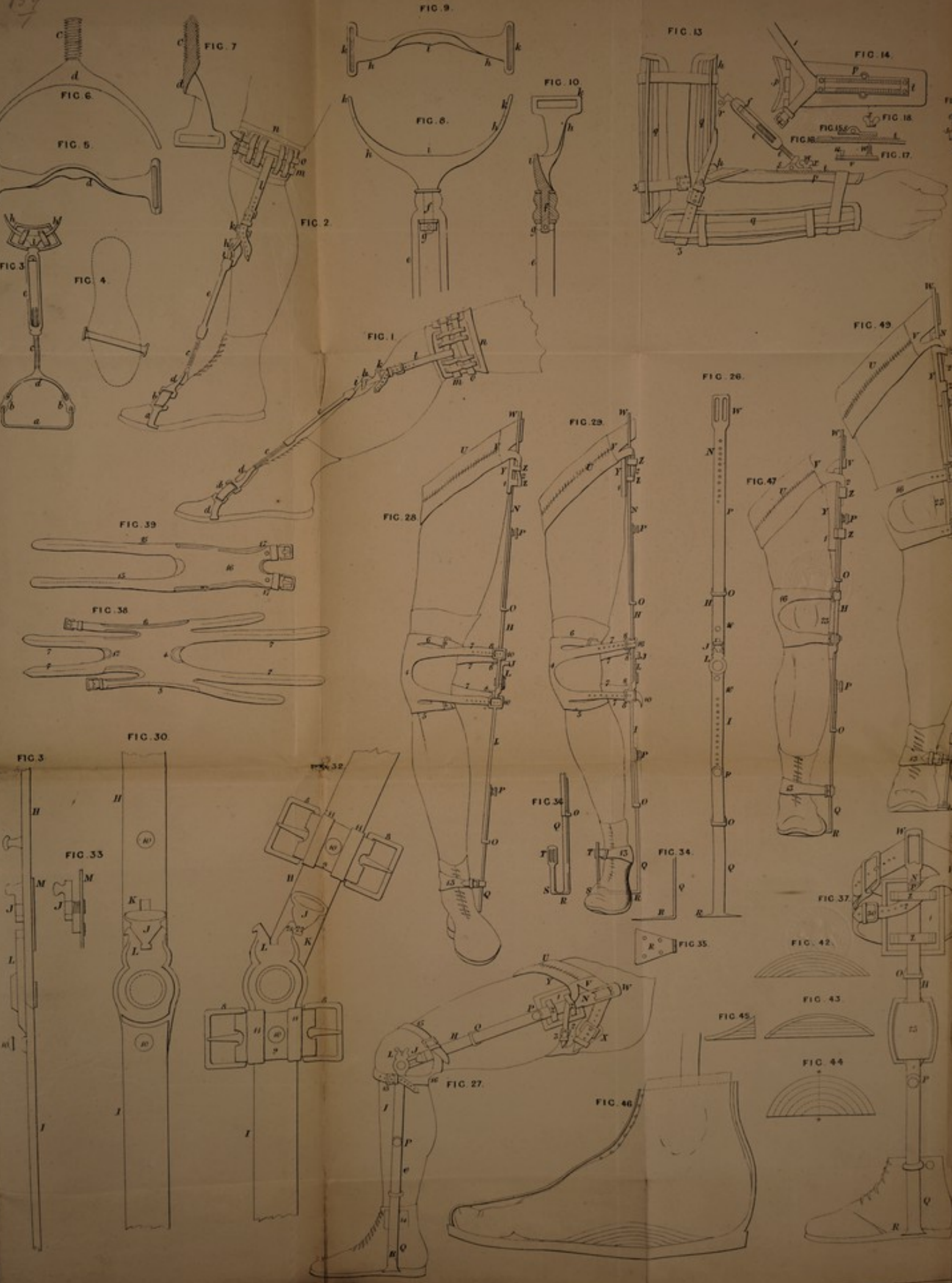


FIG. 22.

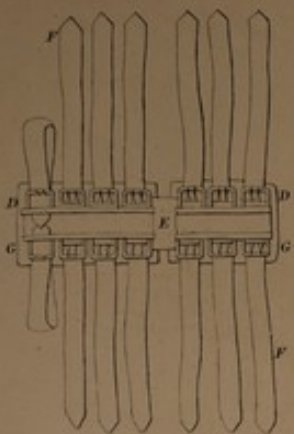


FIG. 23.

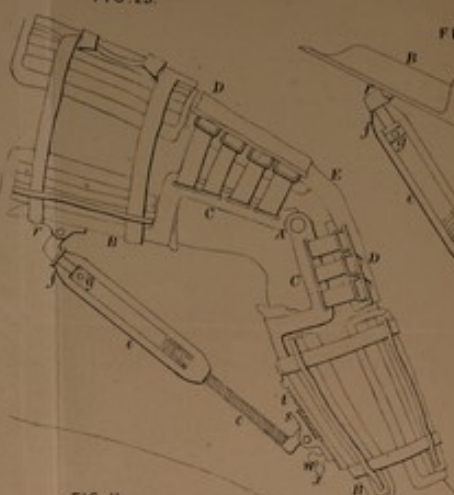


FIG. 21.

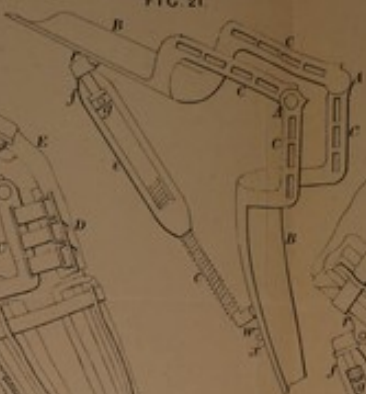


FIG. 25.

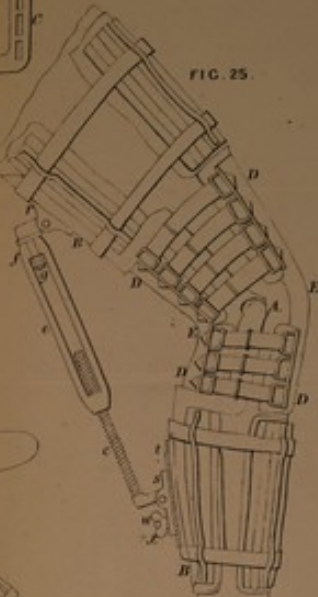


FIG. 11.

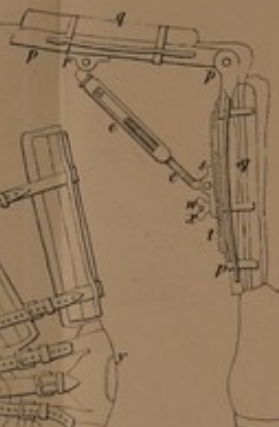


FIG. 12.

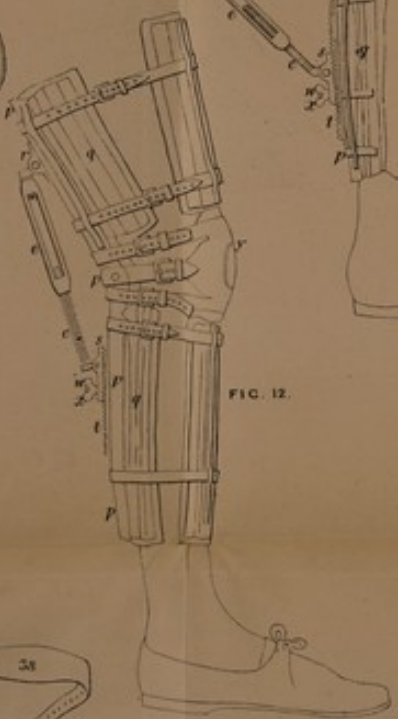


FIG. 24.

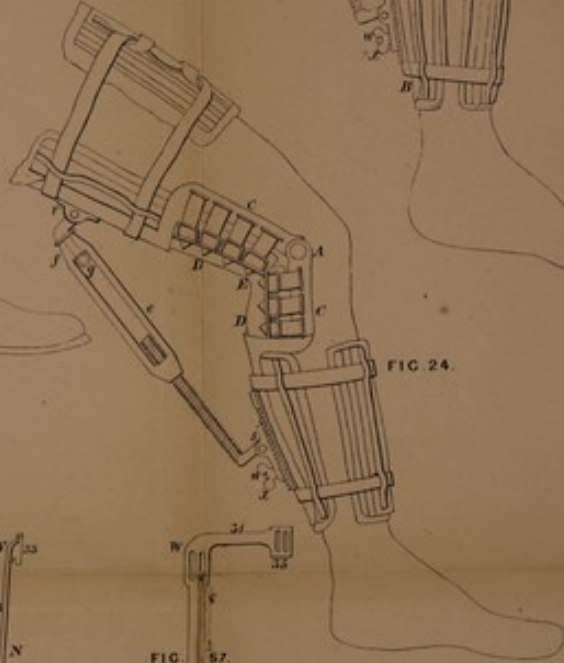


FIG. 51.

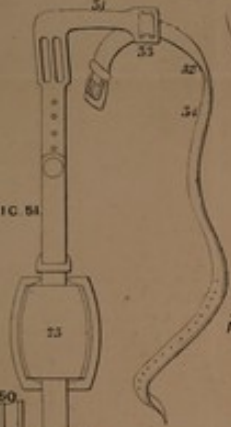


FIG. 50.

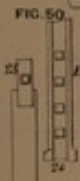


FIG. 53.

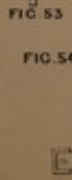


FIG. 54.

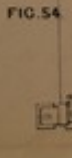


FIG. 52.

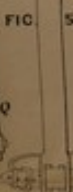


FIG. 55.



FIG. 56.

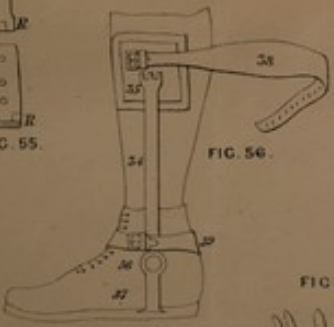


FIG. 63.



FIG. 62.



FIG. 58.



FIG. 57.



FIG. 61.



FIG. 59.

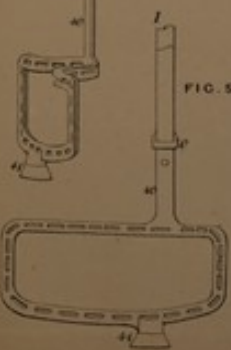


FIG. 60.

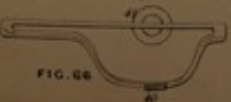
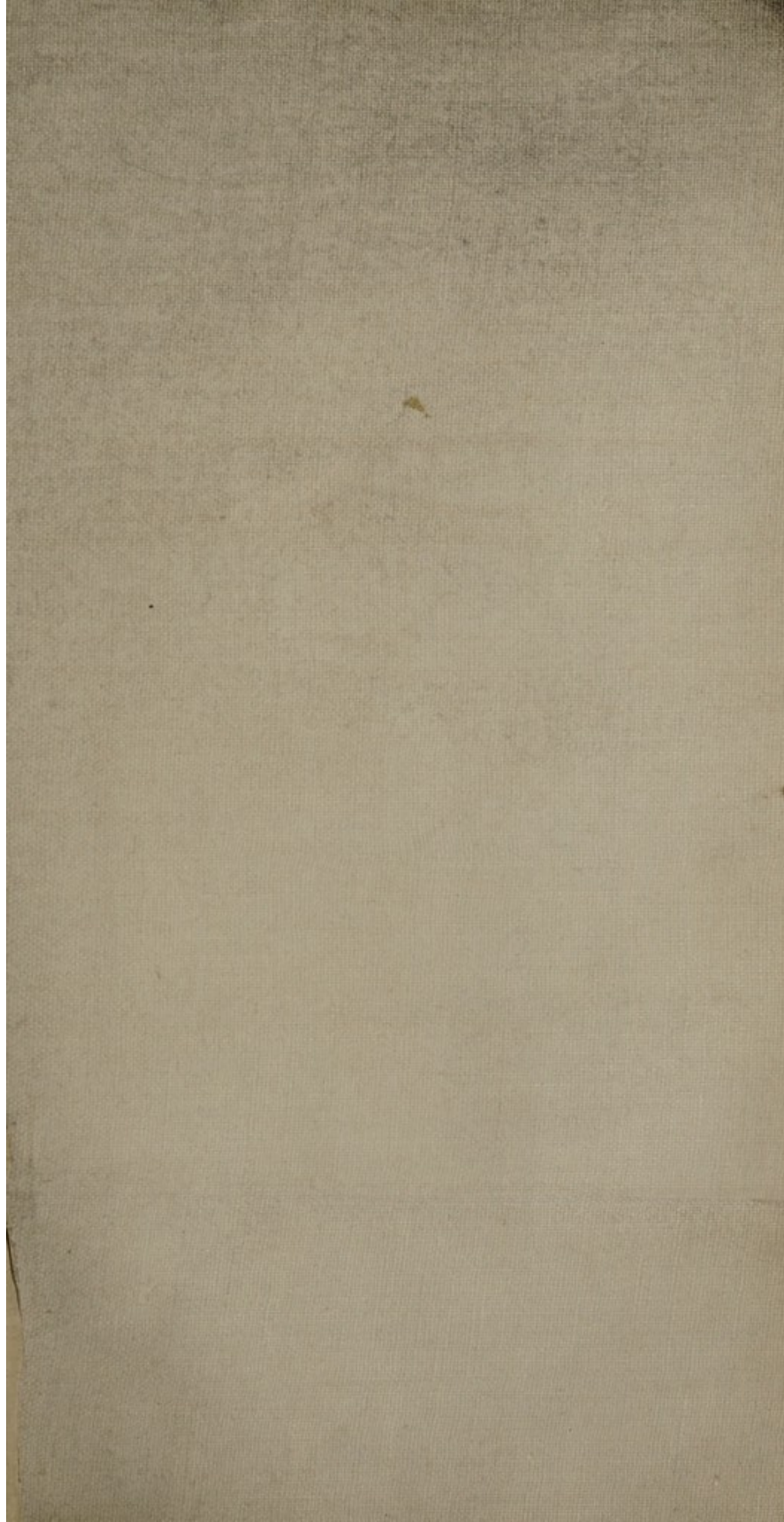


FIG. 40.



FIG. 41.





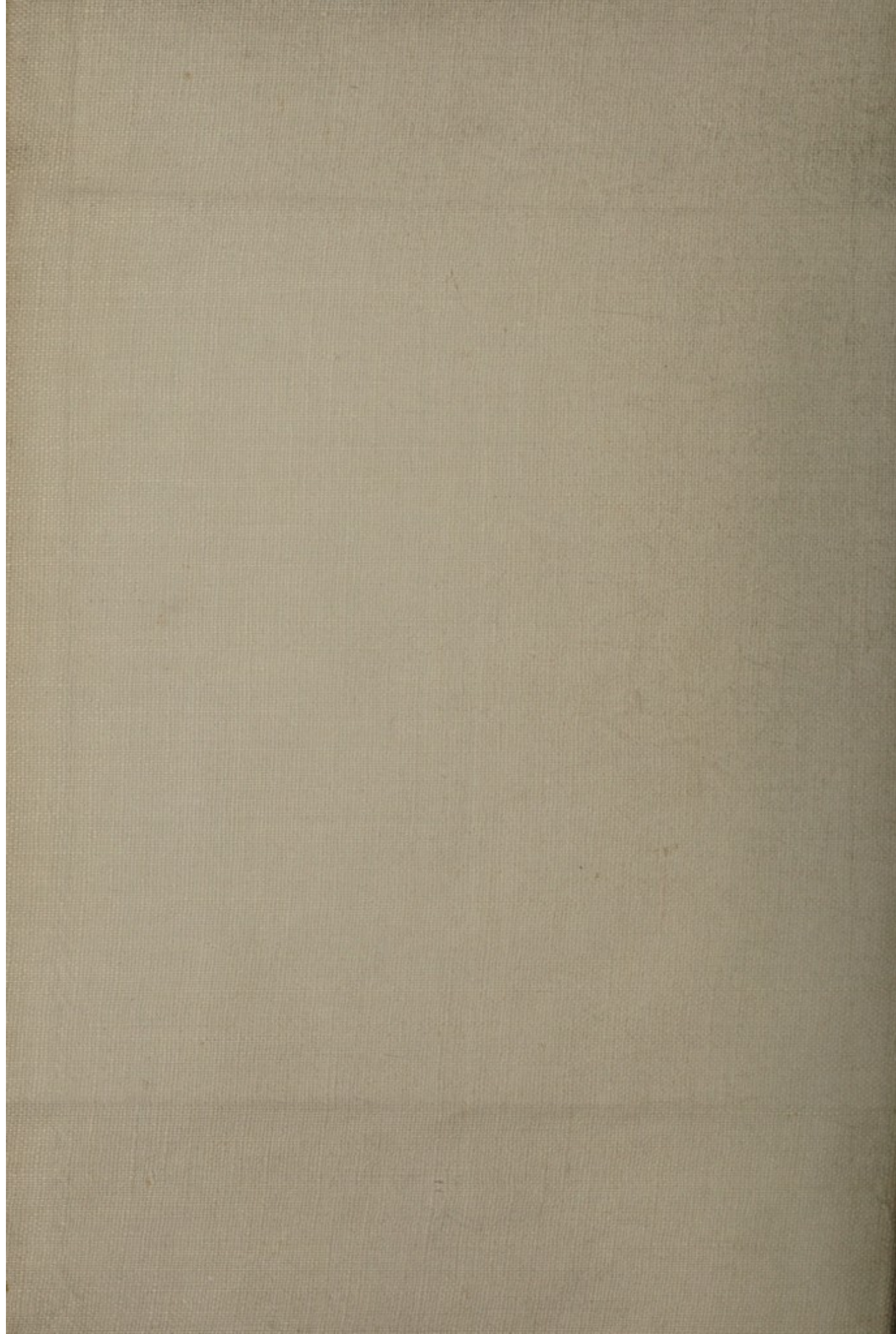


FIG. 75.

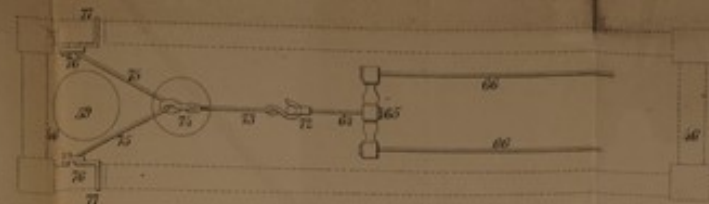


FIG. 92.



FIG. 76*



FIG. 77.

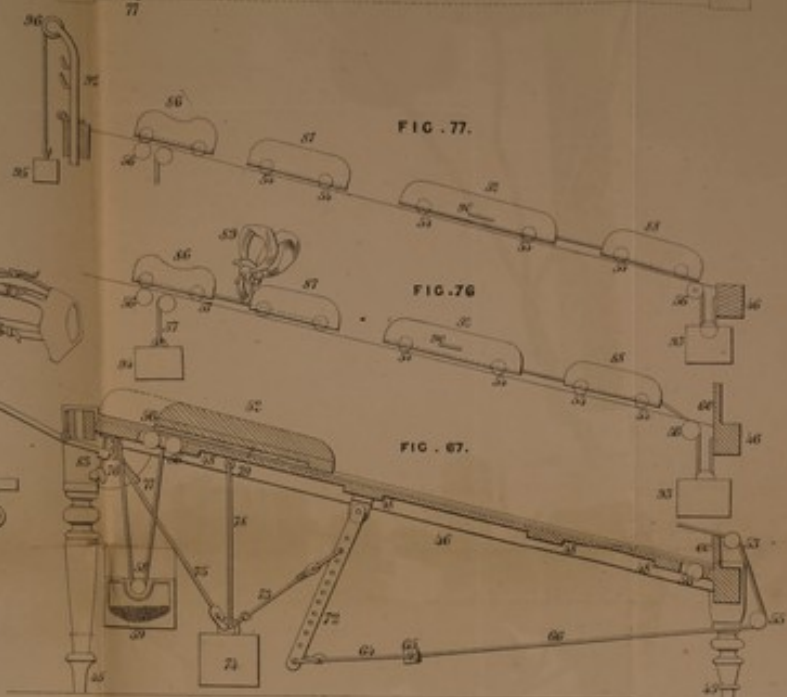


FIG. 78.



FIG. 79.

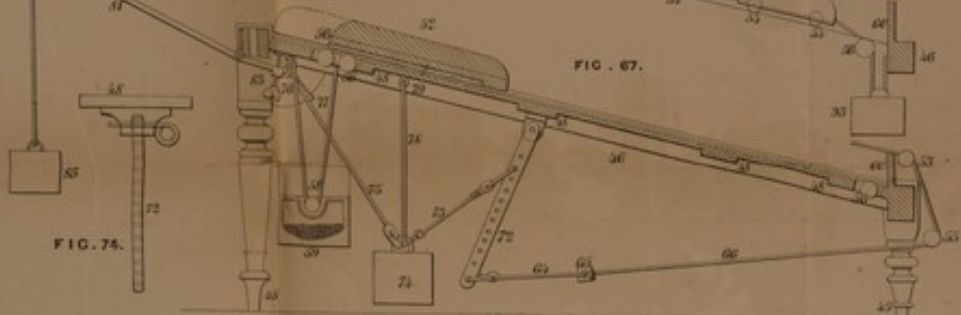


FIG. 74.

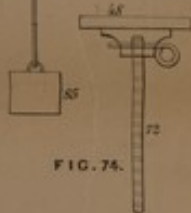


FIG. 80.

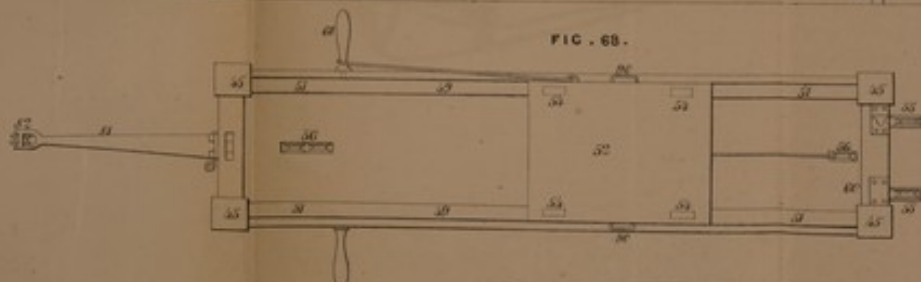


FIG. 75.

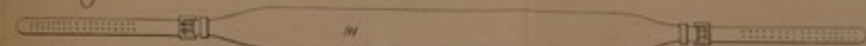


FIG. 86.

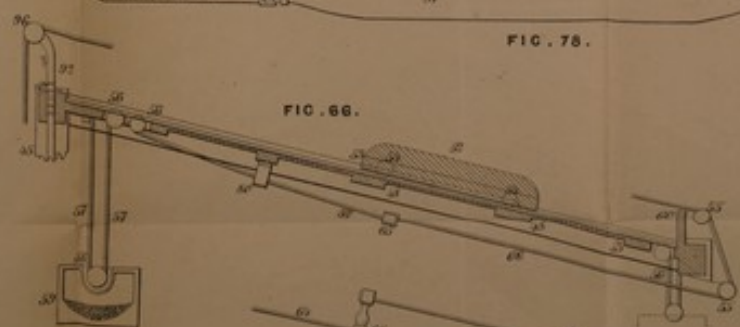


FIG. 73.



FIG. 84.

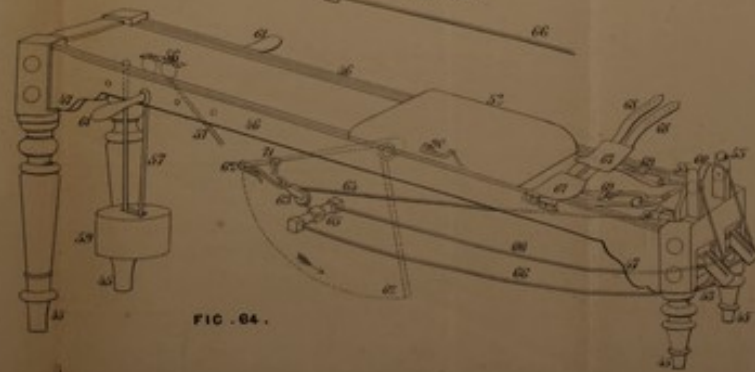


FIG. 70.

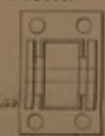


FIG. 71.



FIG. 72.



FIG. 63.

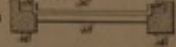


FIG. 65.



FIG. 82.



FIG. 83.



FIG. 90.



FIG. 84.



FIG. 91.



FIG. 88.

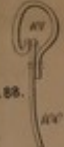


FIG. 89.

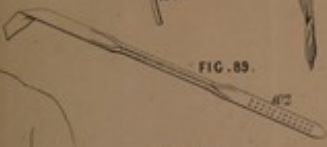


FIG. 79.

FIG. 93.

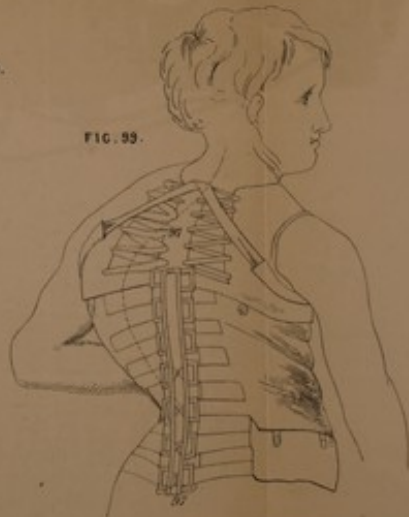


FIG. 80.

FIG. 81.



FIG. 87.

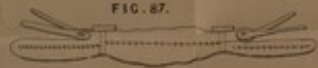


FIG. 104.



FIG. 102.



FIG. 38.



