S. P. M. Douglass,

Fracture Apparatus.

No. 2,092. Fig. 1 Patented May 15, 1841.

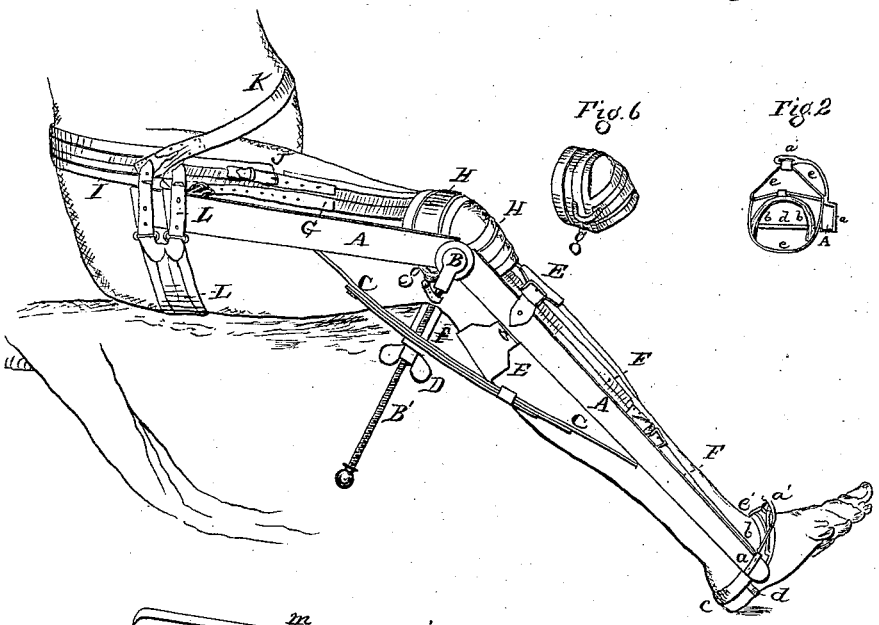

Fig. 6

Fig. 2

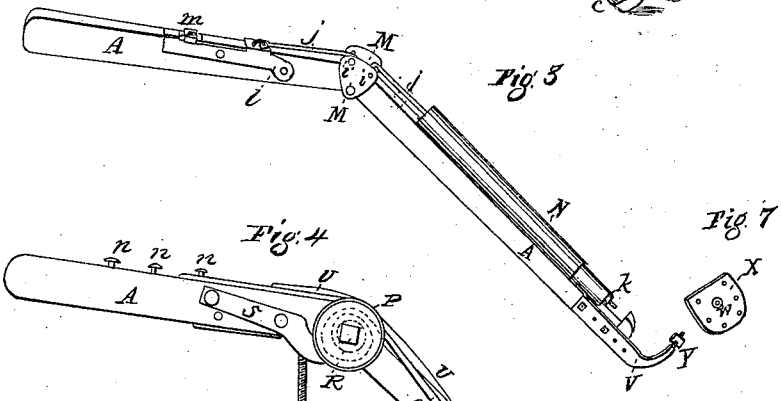

Fig. 3

Fig. 7

Fig. 4

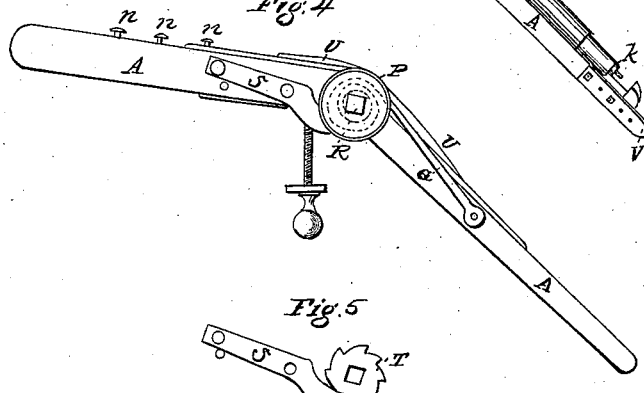

Fig. 5

UNITED STATES PATENT OFFICE.

S. P. W. DOUGLASS, OF WILLIAMSON, NEW YORK.

APPARATUS FOR THE RELIEF OF DEBILITY OR WEAKNESS IN THE LEGS.

Specification of Letters Patent No. 2,092, dated May 15, 1841.

To all whom it may concern:

Be it known that I, STEPHEN P. W. DOUGLASS, of Williamson, in the county of Wayne and State of New York, have invented a new and useful apparatus for the relief of persons who are suffering and unable to walk in consequence of weakness or debility in the legs and consequently in the knee and ankle joints; and I do hereby declare that the following is a full and exact description thereof.

The apparatus which I am about to describe I denominate the walking aid. Those persons who are acquainted with the various instruments which have been constructed with a similar intention will perceive that there is a general resemblance between that which is the subject of the present description and those which have preceded it; and, indeed, this must necessarily be the case, as the basis of such supports must be jointed rods, and straps by which they are attached to the limbs. Being myself a sufferer from extreme and long continued debility in the legs and feet, I have sought relief from the use of such instruments as had been invented by others for the purpose of affording it, and having experienced their defects, I have, by successive trials, been enabled to remove them, and to produce one which, as I verily believe, may be worn with greater ease and benefit than any of those heretofore constructed.

In the accompanying drawing Figure 1, I have represented my instrument as attached to the leg, thigh, and body of a patient, by means of the respective straps employed by me for that purpose. A, A, are jointed strips, or pieces, of wood, or metal, or of the two combined; and to these the other parts of the apparatus are affixed. These pieces are jointed together in the part which comes opposite to the knee; a joint pin passing through them, and through the inner end B, of the screw rod B, B′, which at B, embraces and forms a part of this joint. To sustain the knee joint, and at the same time to allow of the required degree of flexure, I employ a spring, which by its tension and elasticity will effect these objects. In Fig. 1, C, C, is such a spring, which, in this instance, consists of several leaves of steel, placed upon each other in the manner of a coach spring. The ends of this spring bear against the edges of the jointed strips A, A, where they have longitudinal play, but are retained in place by pins passing into grooves, or by any other suitable device. The screw rod B, B′, passes through a mortise made in the leaves of the spring C, C, and the thumb screw D, serves to regulate the force of the spring in any required degree. By this means a gradual strain may be kept up on the contracted joint of a crooked limb, and in walking an effectual check is provided to the bending of the knee beyond the greatest flexure intended to be given to it.

The following is the manner of attaching the apparatus to the limb and body. It is, in the first place, confined to the foot. Its second place of attachment is to the leg, below the knee joint. The third is at the knee joint. The fourth is from the upper end of the side strap; which side strap is attached to the patella cap, to be presently described; this fourth attachment is made by means of what is denominated the back strap. The device for making the first, or foot attachment, is as follows. An iron bow, *a*, *a*′, Fig. 1, is attached to the lower end of the jointed strip A; this iron bow forms a little more than a quadrant of a circle, so as to bring its end *a*′, which is furnished with a loop, or eye, directly over the middle of the instep. This is shown separately, with its accompanying straps in Fig. 2. A pad *b*, *b*, bears upon the instep, a strap *c*, passes around the heel, and a check strap *d*, under the foot; *e*, *e*, are straps which serve to sustain the pad *b*, *b*, and its appendages, and from its connection with the eye in the end of *a*′, immediately over the instep, it checks the tendency of the jointed apparatus to twist and move out of place which it would otherwise do.

The second place of attachment is around the leg, a little below the knee, and this is effected by means of a broad strap and buckle in the ordinary way, as shown at E, E, and merely for the purpose of gently steadying the apparatus and keeping it near the leg.

The third place of attachment is at the knee joint, and the manner of combining and arranging the parts concerned in this attachment is a point of primary importance. A cap is formed of webbing, cloth, or other suitable material, which I denominate the knee or patella cap, as it is to cover, and to be confined in place, immediately above the patella, or cap of the knee. The patella

cap is attached to, and may be said to constitute a part of the strap, which I call the side strap; this side strap extends along both the jointed strips A, A, and is affixed to them by means of buckles, at points near their extremities, allowing them to be shifted so as to adjust the patella cap perfectly to its place. F, F, is the lower section of the side strap, which is attached to the inner side of the lower section of the jointed strips, or pieces, A, A; while the upper section of said strap G, is in like manner attached to the upper part of the upper section of the jointed strips. It is a point of primary importance that, at the knee joint, the jointed portion of the strips A, A, should stand off from the limb, so as not to come into contact with, so as to make pressure upon it. Without this precaution there will be a frequent chafing, irritation, and obstruction, produced in and about the knee joint, such as has caused the disuse of the apparatus heretofore employed for sustaining weak limbs, in a very great number of cases. H, H, is the patella cap, and from the inner or far side of this a strap passes around under the knee joint, and is buckled, as seen at *f*, to the screw rod B at a sufficient distance to prevent the strap from touching the back side of the knee or leg, or to any other appendage to the jointed strips so situated as to produce a like result. The jointed strips are, of course, so connected with each other at the part forming the joint, as to tend to stand off from the limb, in the manner described. To keep the patella cap in place a strap is attached to a loop *g*, near its outer edge, and extends, like that from its inner edge, to the screw rod B, after being carried down within the joint of the jointed strips, so as not to tend to draw this part toward the knee joint. By this arrangement of the patella cap, and its straps, the outside and back side of the knee joint is left free, there being a space between it and the joint of the jointed strips and the straps, into which the hand may be readily passed. The manner of attaching the loop to the outside of the patella cap is shown by Fig. 6.

The fourth attachment of the apparatus to the limb, and body, is made by means of the back strap, shown at I, I, Fig. 1. The back strap is connected to the upper end of the side strap, by a buckle, as shown at J. The back strap should be made wide so as to give it a good and easy bearing. The abdominal strap K, is attached to it by buckles, at each end, and serves to prevent the upper ends of the jointed strips from moving back out of their proper places on the sides of the thighs. In some cases I have attached shoulder straps to the back strap, to prevent all danger of the descent of the apparatus, but there are very few cases in which this will be found necessary, as the side strap, besides its other uses, prevents the lower end of the jointed apparatus from descending, and coming in contact with the ground, and thus throwing the wearer off of his balance. L, L, is the seat strap, which is attached to the apparatus a little below the hip joint. Its length must be so regulated as to cause the upper end of the jointed apparatus to stand a little in advance of the hip joint, and consequently the abdominal strap K, draws in a more direct line, with a light pressure upon the abdomen, as it is also attached at each end, by a strap and buckle, to the upper ends of the jointed strips A, A, besides being attached to the back strap, as described, and which preserves a steadiness to the whole of the upper part of the apparatus. The seat strap L, L, should be made quite wide, as the weight of the body, while standing or walking, rests thereupon.

Now it will be seen that these several parts in combination, as described, each part having its respective connection, are so arranged that the "walking aid" becomes attached to the limbs and body, in such a peculiar manner, as to avoid encircling the limb entirely by any one strap, where there is a heavy bearing, by which means the circulation of the blood is not impeded, all the large blood vessels being left unobstructed, by pressure, the circulation of the blood is free, and the limbs do not become numb by the continued use of the apparatus, as in other cases of similar articles. Thus, by examination, as described, the first attachment being at the foot, by a strap behind the heel, a check strap under the foot, and a padded strap on the instep, which leaves the ankle free; and the second attachment below the knee, by a broad strap, slightly touching only on the inside of the leg, merely to steady the machine. The third attachment at the knee is the patella cap, and the respective straps, which do not touch the back side of the leg or knee, the pressure being only in front. The remaining points of pressure are at the seat and back of the body, which are both provided with broad straps, that give an easy bearing on one side of the limb and body, which renders the attachment complete.

The jointed strips A, A, should be padded the whole length on the side next to the limb, excepting at the knee, which should be left, to preserve a distance between the joint and the knee for the purposes described previously.

For such cases, where weakness in the ankles will not allow of the attachment to the foot, as heretofore described, I provide another mode, as shown in Fig. 3, by an iron or steel bow V, attached to the lower end of the jointed strips A, A. This iron bow is so bent as to clear the ankle and outside of

the foot, and to pass directly under the center of the foot, where it is rounded to enter the eye of the staple W, as shown in Fig. 7, where the staple is represented attached to the plate X, by a head on the side opposite to the eye, but the staple W, is suffered to play in the plate X so as to allow the natural motion of the ankle when walking. The plate X is to be firmly attached by screws to the shoe or boot, before the heel is put on, and the staple should be just in front of the heel; the dotted line across the plate represents the place of the heel, in rear of the staple. A nut Y screwed on the bow V, keeps the staple in place.

In Figs. 3 and 4 are represented spiral and helical springs attached at the joint of the jointed pieces A, A, for the purpose of obtaining a more gentle, easy and lengthy tension and flexure, which some cases require, instead of the straight springs, (as described,) and which render the apparatus more compact and suitable to wear inside of the pantaloons, being so attached as to effect the same ends as the straight springs represented in Fig. 1, while the other parts remain without any substantial change.

A, A, Fig. 3, represents the same parts as in Fig. 1. M, M, are plates forming a part of the joint, and having pins *i*, *i*, through them on which the rods, or wires *j*, *j'*, hook. N, is a tube containing a spiral spring, the tension of which may be augmented or lessened by means of the nut *k*. This spring draws upon the rod *j'*, and the rod *j*, being attached to the upper portion of the jointed pieces A, A, the action is to draw them into a line with each other. The rod *j*, is made fast to the turnbuckle *o*, which has a joint pin at *l*, and is confined down by a button *m*. When it is desired to take the tension off the spring and to allow the knee joint to bend, this will be effected by turning the button *m*, and relieving the turnbuckle.

Fig. 4 shows the application of a helical spring for the same purpose. P, is a box containing the spring, which is represented within it by dotted lines, and one end of it is shown on the outside of the box at Q. It may be wound up, so as to have its tension increased, by the head R, of its center arbor. S, is a pall taking into a ratchet T, Fig. 5, on the opposite side of the box. The manner of attaching, and the action of, such a spring, are too well understood by machinists to require further description. U, U, is a strap which may be made fast to the lower section of the jointed pieces A, A, and may hitch upon pins *n*, *n*, *n*, on the upper; this will serve to check and to regulate their flexure, and prevents the spring from bending too far and becoming destroyed by the weight of the body in its sudden action thereon.

Having thus fully described the nature of my invention, and shown how the respective parts operate, and having in so doing included parts of the said apparatus which are not new, I now proceed to designate those parts, or combinations which I believe to be new, and which I desire to secure by Letters Patent.

I claim—

1. The application of the spring as shown at *c*, *c*, in Fig. 1, or of the springs as shown in Figs. 3, and 4, for the purpose of keeping up a continued tension on the knee joint, and of checking the flexure of the jointed pieces A, A.

2. I claim the manner of forming and arranging the parts by which the apparatus is attached to the foot, that is to say, the combination of the iron bow, *a*, *a'*, with the piece A, and with respective straps appended thereto, as herein set forth.

3. I claim the manner of combining the side strap, the patella cap, and the jointed pieces with each other, for the purposes, and in the manner described. I claim, also, in combination therewith, the manner of connecting the patella cap by straps, with the screw rod B, or with some analogous fixture, by which the jointed parts of the pieces A, A, are allowed to stand off from the knee joint, as set forth, not intending, however, by these claims, to limit myself to the precise manner of arranging the respective parts as herein designated, but to vary these as I may think proper, while the same ends are attained by means substantially the same. I claim in connection therewith the manner of attaching the apparatus to the foot to favor weak ankles, as described in Figs. 3 and 7.

4. Finally I claim the manner of forming and arranging the several parts in the peculiar combination as herein set forth, by means of which the apparatus is attached to the limbs and body, without entirely encircling the limb at one place; consequently without obstructing the free circulation of blood, which prevents the apparatus from causing a numbness, or paralyzing effect upon the limbs or body. In short, I claim the manner of attaching the apparatus to the limbs and body, in combination with its other parts, being constructed and operating substantially as herein described.

STEPHEN P. W. DOUGLASS. [L. S.]

Witnesses:

HOMER DANFORTH,

GEORGE NICHOLS.