D. B. N. Hard,

Truss.

No. 4,052. Patented May 16, 1845.

Fig: 1.

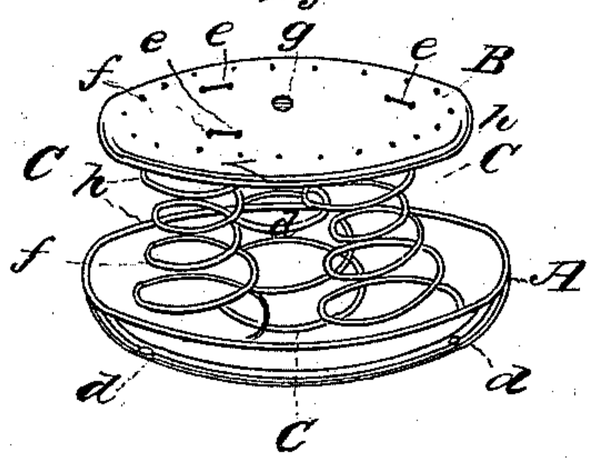


Fig: 2.

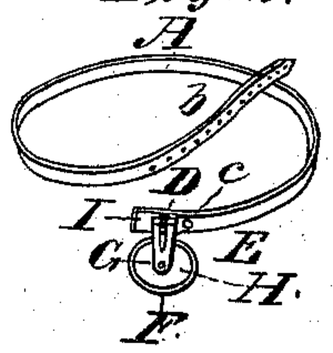
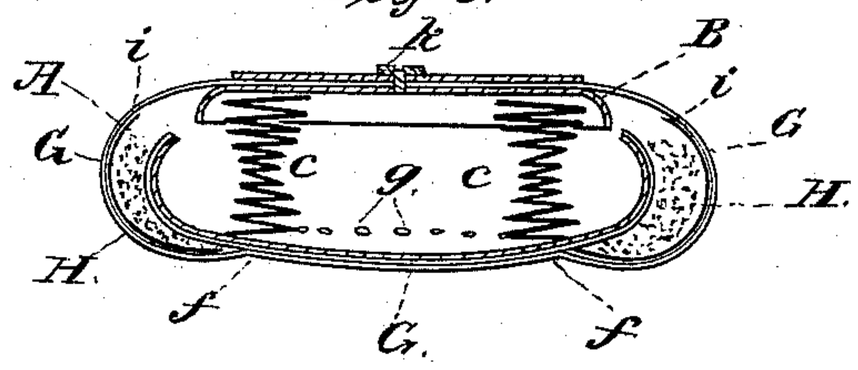


Fig: 3.



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UNITED STATES PATENT OFFICE.

DAVID B. W. HARD, OF BETHLEHEM, CONNECTICUT.

TRUSS.

Specification of Letters Patent No. 4,052, dated May 16, 1845.

To all whom it may concern:

Be it known that I, DAVID B. W. HARD, of Bethlehem, county of Litchfield, State of Connecticut, have invented a new and useful Improvement on a Machine Known by the Name of "Truss," a Surgical Instrument Used in Hernia; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 gives a plain and clear view of the parts I claim to have invented and Fig. 2 the kind of truss to which I have adapted my improved pad, Fig. 1.

Plate A, Fig. 1, is a circular metallic plate, which by being struck in a die, is brought into a concave-convex form, being convex on one side and concave on the other, and in this form is about two inches in its greatest diameter, and the greatest perpendicular depth of its concavity is rather more than half an inch. At one third of the distance from the edge of the plate to its center, it is perforated with small holes extending around it in a circular form for the purpose of passing through stitches to attach to it the cover hereafter to be described. These perforations are seen at *f*. At *d*, *d*, the plate is perforated to receive the end of the spiral springs *c*, *c*. These perforations are made at $\frac{1}{4}$ of an inch from the edge of the plate A, and placed at equal distances with respect to each other so that where three springs are used they would be made in the angles of an equilateral triangle drawn within the concavity of the plate A.

At B, Fig. 1, is represented a circular metallic plate, about an inch and three fourths in diameter. The whole circumference of its edge (by being struck in a die) is turned downward to the depth of about $\frac{1}{8}$ of an inch, as is seen at the shaded margin of the figure at *h*, *h*, forming a flat circular plate with a narrow edge turned downward around its whole circumference. Near the edge of the plate, extending all the way around it, the plate is perforated with small holes as is seen at *f*. *g*, is a female screw in the center of the plate at *e*, *e*, *e*, is represented where the springs *c*, *c*, *c*, are made fast to the plate. The plates A and B are made of sheet brass, the thickness of which is equal to one thirty second part of an inch, but any other thickness may be used that may be thought proper, or any kind of metal or other substance that may be deemed suitable to construct out of which either the plates A and B or the springs *c*, *c*, *c*. The spiral springs *c*, *c*, *c*, are made of wire, the size of which wire is represented in the drawing, but if springs of greater strength are needed wire may be used one, one and a half, or two numbers larger, or even larger still, which, however, I think will be seldom needed. These springs are made an inch and a half in length from one extremity of the coil to the other. The coil of the spring is smaller in the middle and larger at each extremity, as is shown in the drawing, so that each successive coil (when the spring is pressed together) may pass one without the other. This form of spring is adapted so as to obtain a more extensive action by its admitting of being compressed in a narrow space. These springs are joined to the plate A, by bending the end of the wire at a right angle on itself and passing it through the perforations *d*, *d*, where it is fastened by riveting. The other extremity of the springs are joined to the plate B, at *e*, *e*, *e*, but instead of one, two perforations are made through the plate B, separated one fourth of an inch from each other, so the end of the wire which terminates the coil being bent at a right angle is passed outward through one of the holes and immediately bent and passed inward through the other and beat down upon the inside of the plate B. This arrangement may be clearly understood by the inspection of *e*, *e*, *e*. The forked dotted lines show the two perforations $\frac{1}{4}$ of an inch apart and the straight dotted line indicates the wire passing between them which is beat down on the inside of the plate B. This mode of connection between the plate and springs has sufficient strength and is convenient, but they may be fastened together by soldering or any other contrivance. The foregoing description relating to size and admeasurement of the parts therein described very nearly relates to the dimensions of the model accompanying this specification, but in the practical application of the instrument different sizes are needed to suit individual cases. Consequently I construct various sizes, some larger and some smaller than the admeasurements of the parts herein described. Under some circumstances to suit particular cases of inguinal hernia I

vary the form of the plates from a circular to an elliptical or oval form.

To the convex surface of the plate A is applied one or two thicknesses of flannel blanketing or other cloth or any other suitable substance that will serve as padding. This is fastened to the plate by stitches passed through the holes *f*. This is cut in a circular shape and extends one fourth of an inch beyond the edge of the plate. To form the cover of the pad I use any suitable material, as linen or other cloth, buckskin or other soft leather. I cut two circular pieces of unequal size, the largest three inches and three eighths of an inch in diameter and the smallest 2 inches and two eighths in diameter. Both of these pieces are sewed to the plates A and B by stitches passed through the holes *f*, *f*, the largest to the plate A and the smallest to the plate B, and these two circular pieces sewed together at their edges shaped to approximate the edges of the two plates A and B as to be separated by a space not exceeding $\frac{1}{4}$ or $\frac{1}{3}$ of an inch.

My pad Fig. 1 I attach to a truss in common use shown at Fig. 2, in which A is a strap of iron or steel passing from the inguinal region in front around the back and terminating on the hip opposite to the one it passes around. This is inclosed in a belt padded or wadded on its inner side and is lengthened so as to pass entirely around the body and terminates in the lighter strap *b* which is perforated with button holes, to button on to the knob *c*. G is a plate of brass about $2\frac{1}{2}$ inches in length by $1\frac{1}{2}$ inches width. Moving at D upon the pivot I is a hinge joint. E is a ratch with a spring catch fitted to it which graduates the movements of G. F is the pad Fig. 1, attached to G by the male screw H. The convex surface of the pad is applied on the integument immediately exterior to the rupture or opening through which the viscery descends to form the hernia, the requisite degree of pressure is obtained by pressing (with the hand) the pad upon the part to which it is applied in which precise situation it is retained by the ratchet (before described) with which it operates in connection. The pad is so constructed that when applied in this manner that the arrangement of a plurality of spiral springs of small dimensions within itself admits of every variety of movement and motion of the body in all the varied occupations among individual persons without displacing the convex surface of the pad, but all the shocks and impulses given to the pad, by sudden or energetic movements of the individual to whom it is applied, is received by and compensated for, by the action of the springs, while they all the while exerting a steady pressure upon the convex plate maintain it in its required position after it has been placed there by the wearer. So that by being steadily maintained in its correct position without being liable to slide or being otherwise moved about on it; or rudely to compress the integument—(all of which takes place where a hard pad is used) it with great certainty prevents the descent of the hernia, is free from the liability to chafe, irritate or excoriate the surface upon which pressure is made. And by the certainty of its action in preventing a descent of the intestine, increases therein an indefinite degree the prospect of radical and permanent cure.

I will now describe more particularly the motions and action of the spiral springs described in the foregoing instrument. When a hard pad is used where pressure is obtained by the ratchet truss described at Fig. 2 it is necessarily "dead pressure." Where my pad Fig. 1 is used with truss Fig. 2, the pressure by the interposition of the spiral springs is elastic pressure. Equally important with the elastic pressure is a diversified variety of motions made and allowed by the spiral springs. 1st a limited circular motion of the plate B backward and forward as if on an axis passed perpendicularly through its center. 2nd a lateral motion, permitting the edge of the plate B to pass without and beyond the edge of the plate A. 3rd a motion of the springs which admits the edges of the two plates on one side to be brought one within the other forming a kind of angular junction while the edges opposite are proportionately separated and in this oblique position of the plates A and B this angular junction may be progressively formed around the entire circuit of their edges. All the above described movements of the springs take place in a greater or less degree when the instrument is applied and in use, giving ease, comfort, and security to the individual who wears the instrument. By fastening the base of the springs, near the margin of the concavo-convex plate, as is seen at *d*, *d*, Fig. 1 aids essentially (as I have ascertained from experiment) in preserving this plate steadily in its required position while the springs and plate B are in action and motion, the force of the springs being more sensibly felt around the circumference of the plate and the leverage power being greater than if inserted at any point nearer the center. By constructing plate B Fig. 1 smaller than plate A it will pass within and somewhat below the circular concave opening of the edge of plate A gaining by this arrangement a more extended action of the springs and obtaining a better form to the pad. The convex plate A has connected with its peculiar shape and size a two fold object one of which is a convex surface which forms a suitable foundation, upon which to arrange

the covering, cushioning and stuffing thereof in manner herein before and hereinafter described. And the other object is that the side plate A being larger in its diameter than the plate B and its edges projecting beyond the edges of plate B while at the same time the concavity of the said plate A having considerable depth and consequently raising its edge higher, the said edge is made to approach (when the cover before described is applied) within about one-fourth of an inch, to the edge of plate B which is turned toward it. The effect of this arrangement is it closes the space between the edges of A, and B, so nearly as effectually to prevent the cover from falling in between the edges of the said plates. By attaching the cover and padding to the convex surface of plate A by passing stitches through the holes *f*, as before described, all that part of the cover and padding included within the said circle of stitches being firmly pressed in contact with the plate is hard. When pressure is made on the two plates A and B so as to bring them nearer together the cover and padding exterior to the circle of holes and stitching *f* separates and falls away from the plate A and presents a soft yielding surface like a cushion, everywhere surrounding the hard central surface before described. I increase the fullness and softness of the said cushioned part if I deem it proper by adding thereto stuffing of wool or other suitable material attached to the padding already described.

The object and purpose of the combined hard and soft surface connected with plate A as before described is the hard central portion I apply on the integument directly exterior to the hernial opening, by its hardness it excites adhesive inflammation in the ruptured part and causes it to heal—but when a hard pad is used in the treatment of hernia—which has no soft exterior margin the hard pressure will terminate abruptly around the edge of the pad—and at that place leave the skin suddenly without support—the consequence is that by a law of the animal economy the integument puffs up with swelling around the edges of the pad where the hard pressure terminates—and this swelling becomes sore and ulcerates. This painful result I prevent from taking place by applying a soft outer margin to a hard pad so constructed that it can be prevented from becoming hard by use and so arranged that the hard pressure is relieved by a gradually diminished degree of hardness and pressure extending out to the exterior margin of the pad—by thus exerting a gentle pressure on the skin exterior to the hard pressure—it gives such support to the integument as prevents it from swelling—and by preventing swelling the surface of the integument is preserved in a state of health and soreness and ulceration prevented. Fig. 3 shows a section of my pad when it is in operation, A the concavo-convex plate with its edge projecting beyond the edge of the plate marked B, which has its edge turned toward its fellow plate A. G, G, G, the cover with the blanket pading *i i* and the wool stuffing H, H, loosened and separated from plate A, by pressing the two plates A and B nearer together. *f f* circle of stitching made through the holes *g*—between *f f* showing the cover in contact with plate A. C the springs—*k* the screw.

I do not claim the manner of effecting the elasticity of my pad by means of spiral springs as that has before been done; but

What I do claim as my invention is—

1. Combining with a pad so rendered elastic, the cushion and stuffing thereof, in such manner that the central portion of the pad shall present a hard surface, while the portion exterior to said center shall be of a soft yielding nature and at the same time exert a gentle pressure.

2. And I further claim in combination with the above pad and cushion, making the concavo-convex plate A project beyond the edges of the plate B, so as to effectually prevent the cover of the pad from coming between the two plates in the form and manner set forth.

DAVID B. W. HARD.

Witnesses:

T. C. Donn,

Joseph Harbaugh.