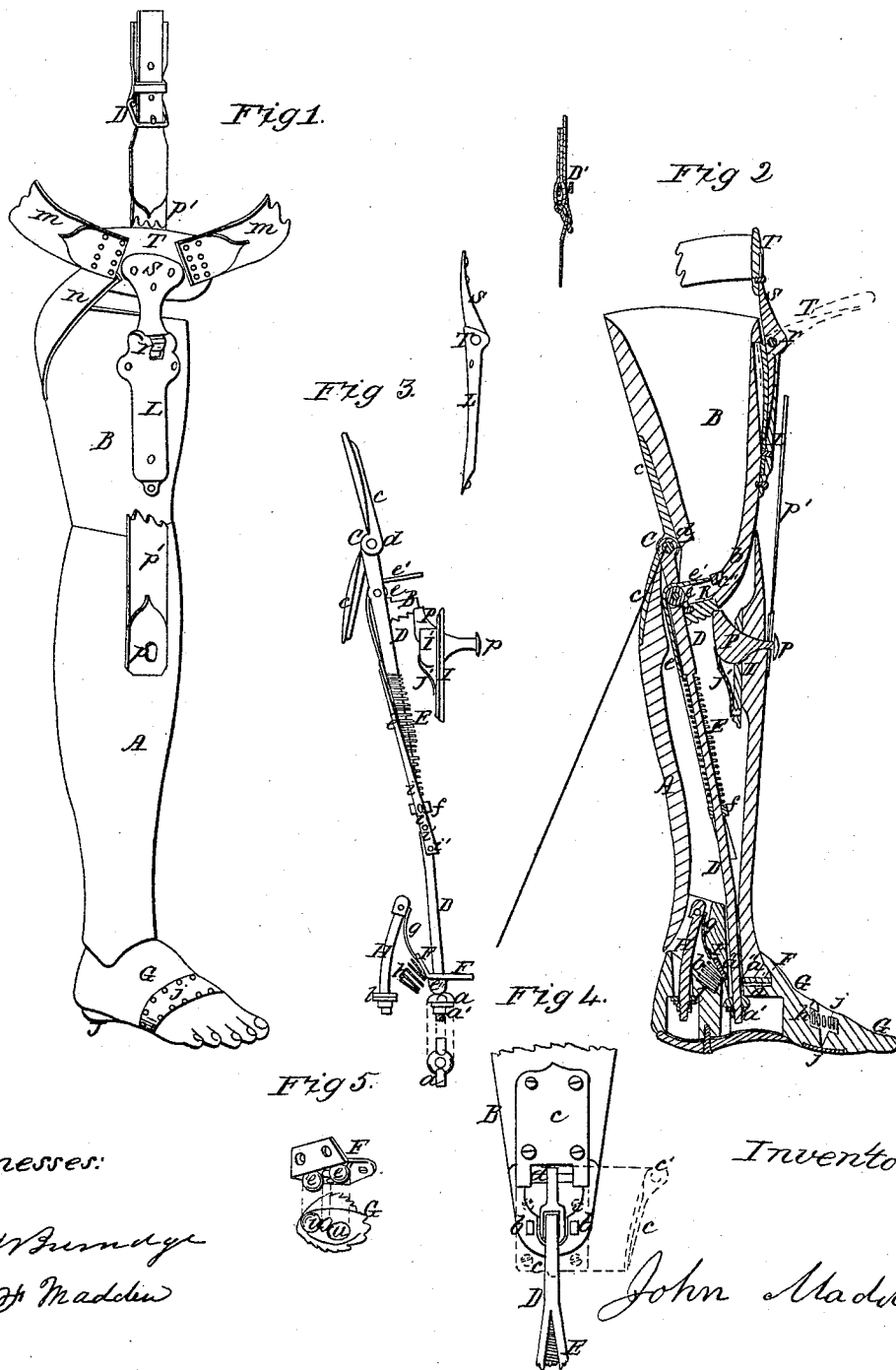


J. Madden,
Artificial Leg,
No 51,953, *Patented Jan. 9, 1866.*



Witnesses:

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IMPROVEMENT IN ARTIFICIAL LEGS.

Specification forming part of Letters Patent No. 51,953, dated January 9, 1866.

To all whom it may concern:

Be it known that I, JOHN MADDEN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Artificial Legs; and I do hereby declare that the following is a full and complete description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of the leg. Fig. 2 is a sectional view. Figs. 3, 4, and 5 are detached sections, representing the working parts, that will be referred to in the description.

Like letters of reference denote like parts in the different views.

My improvement relates to a leg so constructed that the knee will not flex or bend only when the position of the body and limb require it, thereby preventing the flexing of the knee-joint when the weight or gravity of the body is in rear of the joint, as artificial limbs are so liable to do, causing the person to fall.

My improvement relates, also, to the manner of connecting the limb to the body by the use of a truss or support that comes against the lower part of the abdomen, whereby the movement of the body will aid the stump in operating the limb, rendering its action more natural and easy; and my improvement likewise relates to the structure and arrangement of devices for operating the leg, by which, also, the upper and lower sections of the limb and foot are all connected together and can readily be detached from each other.

In Figs. 1 and 2, A represents the lower section of a leg jointed to the socket or thigh B, at C, forming the knee-joint, that consists of plates *c*, secured to the back part of the thigh and section A, as shown in Figs. 4 and 5, the lower plate being indicated by dotted lines in Fig. 4, connected together so as to form a flexible joint, which can readily be dis-jointed at any time, from the manner in which the lower plate is secured on the pin *d*, being open, as noted at *e'*.

To the joint C is connected a rod, D, by the pin *d* passing through the upper end. This rod is represented detached in Figs. 3 and 4. In the upper part of the rod is arranged a small pulley, *e*, over which passes a strap, *e'*,

that is attached to the knee on the inside, at *e''*. The strap extends down, is divided, and comes round on the sides of a spiral spring, E, on the rod, and is connected to a slide, *f*, on the rod D, by hooks *i* being put through holes in the strap. The slide *f* is on the rod, under the spring, and moves up more or less on the rod by means of the spring as the limb is bent, which draws up the strap *e'* over the pulley, contracting the spring. The rod D, with the spring E and strap *e'*, as arranged, performs the functions of the flexor-cord in the action of the limb. The tension of the spring can be increased or diminished by adjusting the holes *i* in the strap on the hooks *i* of the slide. The rod D is inclined forward as it extends down into the ankle, where it passes through a plate, F, secured on the lower part, *a''*, of the section A, and down through a part of the foot, through a cross-piece, *a*, and is fastened, by a screw and nut, *a'*, under the cross-piece *a*, as represented. This rod, being connected to the joint C and extending down through the lower section into the foot, forms a connection between the upper and lower parts of the limb and foot, which is very desirable in operating the limb, and by removing the screw-nut *a* the foot can be detached, and by disjuncting the limb at the knee the rod and its connections can be removed with the thigh from the lower section.

The plate F is shown detached in Fig. 5, representing its form and the part of the foot with which it is connected. On the under side of the plate are balls *e''*, that fit and move in socket *u* in the foot, forming a double ball-and-socket joint where the foot G is connected to the ankle. Below this joint in the foot, at the middle of the cross-piece, where the end of the rod D passes through it, it is rounded and fits up into a socket in the foot, which, in connection with the other joint, renders the movement of the lower end of the rod D more flexible. In a space in the ankle is pivoted a tension-rod, H, that a spring, *g*, attached to the part *a''* of the ankle rests against. The rod extends down into the foot, as represented, and is secured in place by a screw-nut, *l*, with a washer above. This tension-rod keeps the back part of the foot and ankle in place, and at the same time yields sufficiently to the movement of the ankle or tarsal joint.

h is a spiral spring between the foot and an-

kle, fitting into a hole in the foot, and presses against the plate F, back of the socket-joint, which gives a more elastic movement to the joint.

The front part or toe, g' , of the foot is rendered flexible by being connected to the back part by leather or elastic strips, j, j' , on the top and bottom, and also by a spiral spring, h' , as seen in Fig. 2. Underneath the back part of the foot is packing J, fastened in place by a screw, o .

In the upper part of the section A of the leg, on the inside of the front, is secured a plate, I, with lugs I', between which is pivoted a catch, P, that extends out through the front, with a button, p , on the outer end, on which is placed a strap, p' .

R is a rack secured in the knee on the outside, and the catch P is in such a position that it comes and catches into the notches when the limb is straight, as in the drawings, thereby preventing the knee from flexing or bending when the position of the body does not require it.

J' is a spring attached to the plate I, that keeps the catch in the rack. On the front part of the thigh or socket is secured a plate, L, to the upper part of which is jointed, at r , an arm, S, that is secured to a truss or support, T. By means of the joint the arm and truss can be bent more or less into the position indicated by the dotted lines T' in Fig. 2, which is drawn back when the pressure is removed by an elastic spring, n , fastened to the truss and the back part of the thigh, or it can be operated by a spring, t , under the plate L, as seen in Fig. 2. To each end of the truss are attached straps m , that are designed to extend up around the loins.

The manner in which this leg as constructed is connected to the body and operated is as follows: The socket is fitted to the stump, and the strap m adjusted up around the loins of the body, the truss coming against the lower part of the abdomen. The strap p' , connected to the lower section of the limb, extends up and is buckled at D' to a strap attached to the waist or shoulder strap, as may be desired. This strap is adjusted to the proper tension, or so that in walking or sitting down, when the limb is bent backward, as indicated by the red line in Fig. 2, or flexed at the knee, the strap p' will draw on the catch P, so as to disengage it from the rack R, when the knee will be allowed to bend as much as the motion or movement of the limb may require; but when the limb is straightened out, or in the position that the weight of the body is more directly upon it, the strap p' becomes slack, when the catch P springs into the rack on the knee, thereby locking or holding the knee-joint when the position of the leg and gravity of the body require that the knee should not bend, operating, in this respect, like the natural leg, and in lifting up the foot, bending the lower part of the limb to step forward, the tension of the strap p' causes the knee at once to flex in the desired manner; but as the foot is set down,

and it is required by the position of the limb and gravity of the body that the knee-joint should be unyielding, the spring-catch and rack, as before stated, accomplish this object.

The great failing of artificial legs in ordinary use is the liability of the leg bending at the knee in such a manner as to endanger the person's falling, and the working and slipping of the knee-joint in this manner is very unpleasant and straining to the body.

The truss or support T, coming against the lower part of the abdomen, connects the limb more to the body, by means of which the motion of the body will aid the stump in using the limb, producing a more easy and natural action. This relieves the stump from undue strain. When in a sitting posture the truss adjusts itself into the position indicated by the dotted lines T', which accords with the position of the body by means of the joint r and spring, as before stated. In bending the knee more or less in walking or sitting down the strap e' is drawn up by means of the spring E on the rod D, the tension of which is adjusted by holes in the strap, and, by means of the double socket-joint in the ankle-spring b and tension-rod H, as before described, the ankle or tarsal joint is rendered most easy and natural in its action, and the entire limb and foot, being connected by the rod D, as before stated, produces a more firm and connected movement of all the parts. The limb is thus rendered most perfect in structure and operation, having much of the ease and facility of natural action.

There are springs (seen at b in Fig. 4) on the inner part of the knee, that prevent any jarring in flexing the knee.

What I claim as my improvement, and desire to secure by Letters Patent, is—

1. The strap m , truss T, connected to the socket by the jointed plates S L, with the spring in the said joint, or its equivalent, when constructed and arranged as and for the purpose set forth.

2. The strap p' , catch P, rack R, and spring J', when arranged in combination with an artificial leg and operating substantially as and for the purpose set forth.

3. The rod D, joint C, roller e , and strap e' , in combination with the spring E, slide f , and leg, substantially as and for the purpose set forth.

4. The tension-rod H and spring g , in connection with the double ball-and-socket joint on the plate F, and cross-piece, a , when constructed and arranged substantially as and for the purpose set forth.

5. Connecting the sections of the leg together by means of the rod D, forming a jointed connection at each end of said rod, when arranged substantially as herein set forth, for the purpose specified.

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Witnesses:

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