Weston, Buchner & Boeklen,

Artificial Leg.

No. 53,931. Patented Apr. 10, 1866.

Fig. 1.

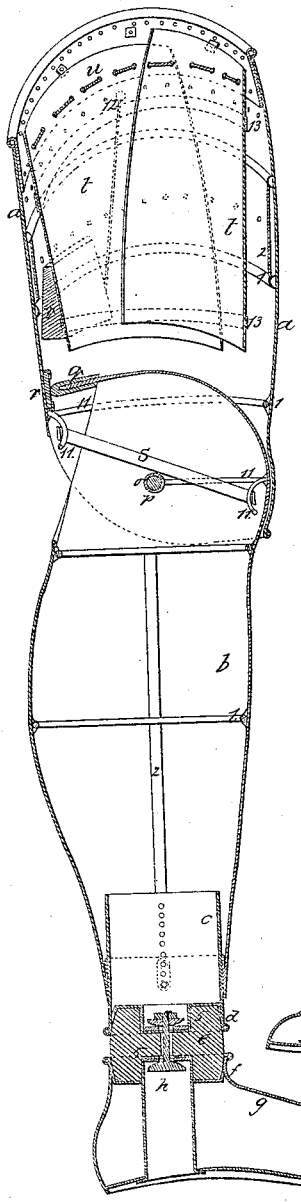


Fig. 6.

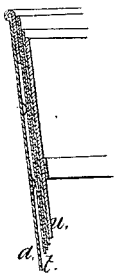


Fig. 2.

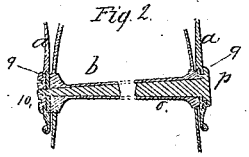


Fig. 4.

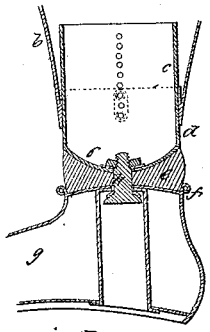


Fig. 5.

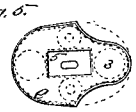
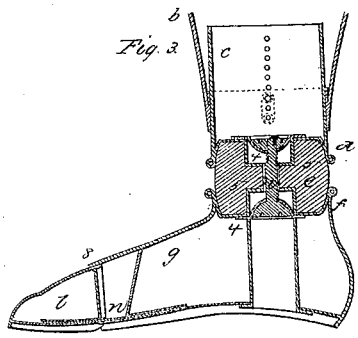


Fig. 3.



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IMPROVEMENT IN ARTIFICIAL LEGS.

Specification forming part of Letters Patent No. **53,931**, dated April 10, 1866.

To all whom it may concern:

Be it known that we, JAMES W. WESTON and FRIEDRICH BÜCHNER, of the city and State of New York, and REINHOLD BOEKLEN, of Brooklyn, in the county of Kings and State of New York, have invented, made, and applied to use certain new and useful Improvements in Artificial Limbs; and we do hereby declare the following to be a full, clear, and exact description of the said invention, reference being had to the annexed drawings, making part of this specification, wherein—

Figure 1 is a vertical section of a leg and foot formed with our improvements. Fig. 2 is a section of the knee-joint. Figs. 3 and 4 represent slight modifications in the construction of the ankle-joint. Fig. 5 is a detached plan of the spring introduced at the ankle-joint. Fig. 6 is a section representing the mode in which our leg is made to suit different sizes of stumps.

Similar marks of reference denote the same parts.

Our invention relates to a mode of strengthening the limb by ribs and rings on the inside, when said limb is made of smooth sheet metal; also to a mode of forming the ankle-joints of a peculiar spring, the parts being held together with a round-ended bolt. We form the knee-joint, stops, and hooks for the spring in a peculiar manner, and make provision for the leg fitting any size or taper of stump.

In the drawings, *a* represents the sheet metal forming the case or upper joint of the artificial limb, and *b* is the smooth sheet-metal case, shaped to correspond to the lower limb, and forming the lower joint of the artificial leg.

Within these parts *a* and *b* we introduce metallic rings at suitable places to strengthen the same, as represented at 1 1, and also use longitudinal ribs, as at 2 2, said rings and ribs being secured by soldering or brazing. These rings and ribs enable us to make the limb much lighter by using thinner sheet metal, and at the same time we obtain sufficient strength.

The lower portion of the artificial limb *b* is formed with an interior extension-piece, *c*, that is provided for regulating the length of the limb, and is substantially the same (so far as the adjustment) as the device shown in the patent of T. F. Engelbrecht, R. Boeklen, and W. Stacklen, granted January 6, 1863.

On the end of this extension-piece *c* (or it might be at the end of the piece *b*) we provide a socket, *d*, for the reception of the rubber spring *e*, which sets at the lower side into a socket, *f*, on the foot *g*. These portions *d* and *f* are formed of the required shape for receiving the spring. We prefer that the spring should be shaped narrower toward the back part, as seen at 3, Fig. 5, and that this part come to the rear of the ankle-joint, and, being smaller, will compress more freely to let the foot come down on the ground flat as soon as the heel touches; but said spring might be of an oval form, as shown by dotted lines in Fig. 5. We connect the portions *d* and *f* to each other by means of the bolt *h*, and thereby secure the foot to the limb. This bolt *h* is to be made with rounded under sides to the head and nut, as shown, so as to allow the foot to move as the spring *e* is compressed. These rounded heads and nuts may set upon leather washers, as in Figs. 1 and 4, and the nuts be kept from working off by set-nuts above, as in Figs. 1 and 6; or said heads and nuts may be formed hemispherical, as seen in Fig. 3, and be received into correspondingly-shaped sockets 4, made of steel or other suitable material, and attached to *d* and *f* respectively. The object of these sockets is to take a more extended bearing against the heads of the bolts, and thus increase their durability. In all instances the hole in which said bolt is contained is slightly larger than the bolt, to allow of the motion to which the parts are subjected.

The spring *e* allows the foot to yield in any direction in walking, so as to conform to the surface stepped upon, as well as to the motion of the ankle required in the act of walking.

It is, however, necessary that the foot should be prevented from turning around horizontally on the bolt *h*. For effecting this we provide recesses in the spring itself to receive corresponding projections on the parts *d* and *f*. We have represented the recess 5 in the spring *e* as a square depression in Figs. 1, 3, 5, and 6, while in Fig. 4 we have shown the depression as curved from one side to the other of the spring at 6, receiving the correspondingly-shaped projections on *d* and *f*. In all cases

the foot will not have a stiff or constrained movement, but a certain limited horizontal turning motion may be given to the foot, compressing the spring at the sides of the recesses, and said spring bringing the foot back again to its place.

The spring *e* may be made of any suitable material. We prefer and use india-rubber but layers of cloth or felt might be used, or a stuffed cushion employed, the same being of the external shape of *e*, filled with hair or other yielding material, and in such characters of springs circular blocks or balls of india-rubber or sections of rubber pipe may be introduced, as shown by the dotted lines, Fig. 5. In all cases the spring should be stronger at the front portion than at the back, so that the toe will come down with but little pressure upon the heel in stepping, while the elasticity in the front part of the spring, being much greater, will exert the force necessary to give a natural movement to the foot and lift the heel off the ground as the knee is moved forward in walking, thus lifting the artificial foot in a corresponding manner to the natural foot.

We construct the foot *g* of sheet metal, of the proper size and shape, and also form the toes of sheet metal, as at *l*, and said toes may be hinged to the foot, as at *m*, and allowed a certain amount of motion by a rubber spring at 7, or a plate spring may be employed to connect the parts and allow the motion, (as seen at *n*, Fig. 3,) said spring sliding into cases made on the respective parts for the reception of its ends.

In all instances the back edge of the toe-piece is to set below and within the projecting front end of the foot, *g*, as at 8, and as the toes move the back part of *l* slides under this projection 8, so that the boot cannot become injured by the movement at this part, and there is no opening at this joint, as heretofore usual.

We make our joints between the parts *a* and *b* by means of a pipe, *o*, running across the lower limb *b*, (see Fig. 2,) and through this the joint-pin *p* passes, which also passes through the lower part of the stump-socket *a*. Said pin is tapering and formed with a head, and square at the larger end, to cause the said pin *p* to move with the part *a*, and a nut is provided at the other end of said pin to tighten up the parts. It has been usual, heretofore, with joints of this general construction, to have the outer surface of *b* in contact with the inner surface of *a*. These rigid surfaces coming into contact are liable to greater friction at one time than at another, being affected by changes of temperature, lack of lubricating material, &c., and sometimes a noise is the result of a movement of the leg.

To overcome these difficulties we form a recess on the inside of *a*, around the joint-pin, and containing a washer, as at 9, Fig. 2, one such washer being provided at each end of the pipe *o*, and said washers are to be formed of leather, and will act as lubricators when greased, and they produce a uniform friction and prevent any noise in the knee-joint.

Upon the back and upper portion of the lower limb, *b*, where a hemispherical end is formed for the knee, we introduce an elastic stop-block, *q*, taking against the interior surface of the socket *a*, or a second block of elastic material, *r*, the object being to stop the movement of the lower limb as it swings forward by the action of a contractile spring, *s*, that is hooked upon the hooks 11 11, formed of wire bent up to shape and running around the inside of the artificial limb, as shown, and soldered or brazed to the sheet metal, so as to strengthen the same and prevent the action of the spring drawing the parts out of shape. These hooks might be formed upon a bent piece of metal instead of being made from wire.

In order to adapt our limb to different sizes and shapes of stumps we provide a lining, *t*, (see Fig. 1,) that is made of sheet metal or a sheet of veneer upon strong cloth. Said sheet is cut out to fit within the leg, with the edges lapped, as seen in Fig. 1. The upper part of this lining is perforated, so that it can be laced to the limb, as at *u*. We provide one or more curved wedges, *v*, introduced between this lining *t* and the leg *a*, with cords passing up from them and through holes, as shown by dotted lines at 12. The object of this is to press the lining *t* tightly to and around the stump by drawing up said curved wedges *v* by the said cords, the lining *t* closing around the stump, after which the ends of the cords from *v* may be secured in any convenient manner.

If desired, the lining *t* might be taken out of the leg and placed around the stump and retained in the form given by rings 13, drawn upon the lining in its conical form, and then said lining be taken off and laced into the artificial leg.

It often occurs that the stump becomes smaller and the leg sets too loosely thereon, or the stump may slide too far into the artificial limb. To provide for this contingency we form conical filling-pieces or linings, made of veneers or thin pieces of wood, that when introduced within the leg adjust or determine the point to which the stump shall pass down into the artificial limb. A section of three of these filling-pieces is represented at *w*, Fig. 8, introduced within the lining *t*.

What we claim, and desire to secure by Letters Patent, is—

1. An ankle-joint formed by a spring of rubber or other suitable material, provided with recesses in its top and bottom surfaces, in combination with corresponding projections on the foot and limb, substantially as specified, so that the foot is allowed a limited motion in any direction, but is brought properly back to its place by said spring, as set forth.

2. Forming the ankle-joint spring in the manner specified, with the front portion thereof more rigid than the back portion, in order that the

foot may conform to the surface stepped upon, as set forth.

3. A connecting-bolt with rounded heads or nuts, in combination with the elastic ankle-joint, substantially as and for the purposes specified, and in combination therewith, the sheet-steel socket for the heads, as set forth.

4. The elastic stop block or blocks, applied as shown, to arrest the forward movement of the lower limb, as specified.

5. The hooks 11, formed of a bent piece of metal passing around the limb at the joint to strengthen the same, in combination with an elastic contractile band or spring applied between said hooks to throw the lower limb forward, as specified.

6. Adjusting the limb to the conical shape of the stump by the lining of veneer or other suitable material rolled up with the edges lapping, and attached at the upper end to the artificial limb, in combination with the curved adjustable wedge, or its equivalent, as and for the purposes specified.

7. The conical filling-pieces introduced into the artificial limb, as specified, to adjust the limb to the stump, as set forth.

In witness whereof we have hereunto set our signatures this 29th day of December, 1864.

JAMES W. WESTON.
FRIEDRICH BÜCHNER.
R. BOEKLEN.

Witnesses:

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CHAS. H. SMITH.