W. Hinds,

Artificial Leg.

No. 44,726. Patented Oct. 18, 1864.

Witnesses:
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Fig. 1

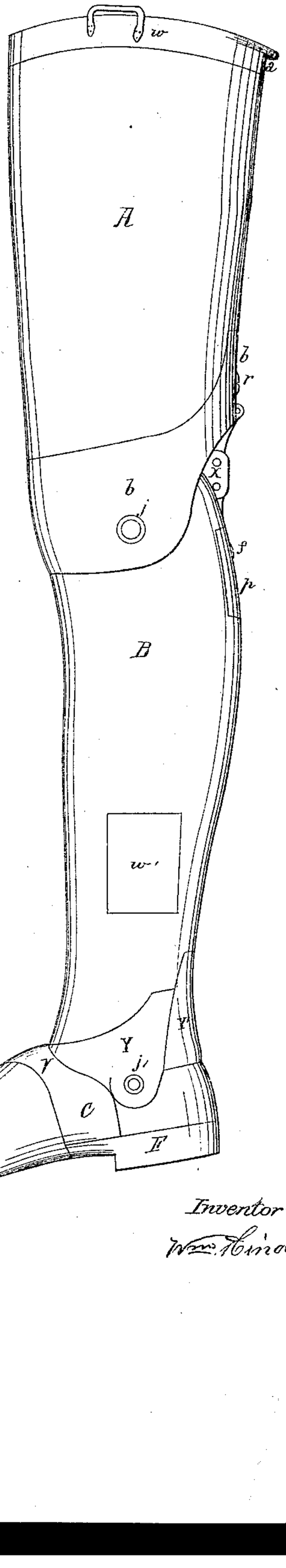


Fig. 2.

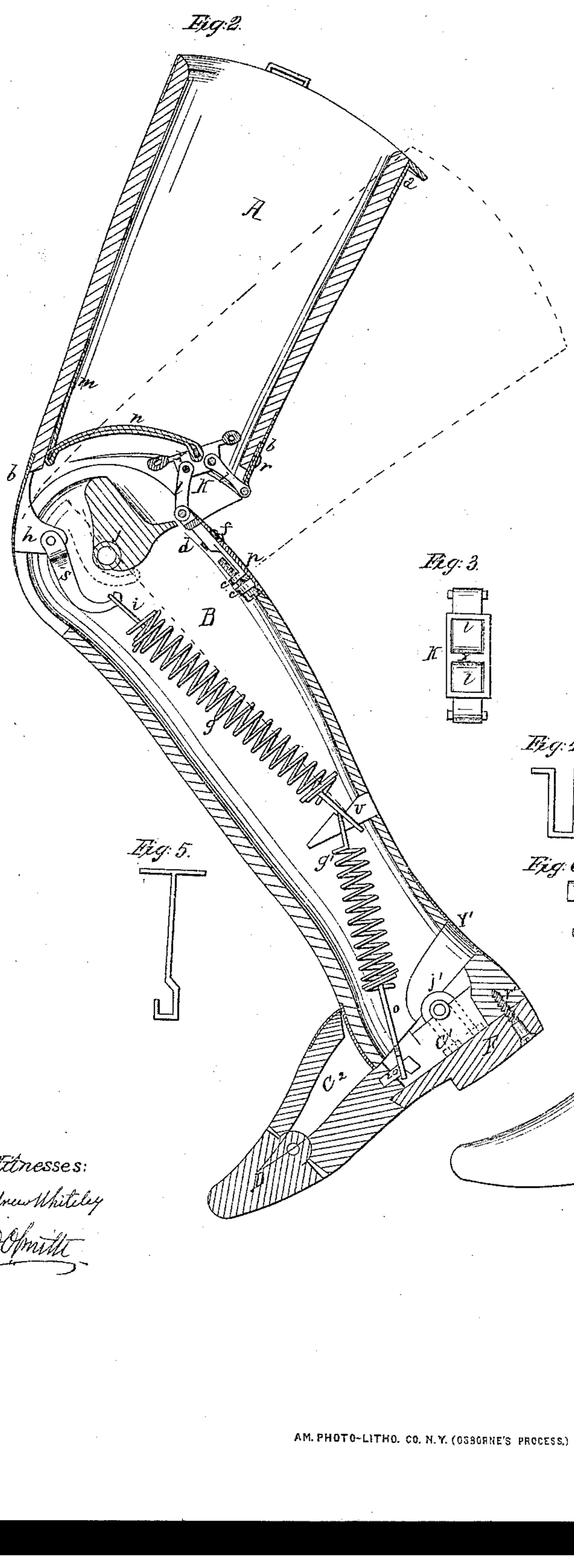
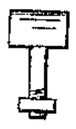


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.



UNITED STATES PATENT OFFICE.

WILLIAM HINDS, OF LITTLE FALLS, NEW YORK.

IMPROVEMENT IN ARTIFICIAL LEGS.

Specification forming part of Letters Patent No. **44,726**, dated October 18, 1864; ante dated October 6, 1864.

To all whom it may concern:

Be it known that I, WM. HINDS, of Little Falls, county of Herkimer, and State of New York, have invented new and useful Improvements in Artificial Legs; and I hereby declare the following to be a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, and to the letters of reference marked thereon.

A good substitute for the l ss of the natural leg has always been a very intricate and difficult piece of mechanism to produce. In its construction are involved some very formidable antagonisms or opposing principles that are hard to overcome or obviate. One of these is that legs to be easy and expeditious to walk upon should be very light, and in opposition to this it is found that artificial legs come to a good deal of strain, and are liable to many casualties—such as breaking, splitting, wearing out, &c.—to obviate which it is necessary to make them of strong and weighty materials, which will greatly increase their weight. Another difficulty of this kind is that the knee-spring, to draw the leg to a straight position and assist in its locomotion, should strain the hardest while the leg is straight or being straightened; but the reverse of this is that the strain of springs now in use for this purpose is greatly intensified in flexing the leg. These difficulties, however, are greatly removed or modified in my leg, as I shall endeavor to show.

The devices that will be claimed as new are the band at the top of the leg, the knee-band forming the knee-joint, the ankle-band forming the ankle-joint, the metallic belt to stop and hold the leg in a straight position, the spring for actuating the knee-joint, and the changeable heel.

To enable others to make and use my invention, I will now describe its construction and operation.

Figure 1 of the drawings is an exterior view of the leg in its completed state. Fig. 2 is a sectional elevation made in the direction of its locomotion to show the interior machinery. Fig. 3 is an inside view of the belt. Fig. 4 is a kind of bail to work in the coiled spring *g*. Fig. 5 is a rod to work in the spring *g'*, and Fig. 6 is a side view of the staple-bolts.

The main body of the leg (represented by A and B) is to be made of light wood, and the foot C of the same or of vulcanized india-rubber or other material. The bands, bolts, belt, &c., for connecting the wooden parts are to be made of iron or other metal, springs to be made of steel, iron, or brass.

A, Fig. 1, is the thigh piece or socket, made hollow and open at each end. The upper end is secured and protected by a light band, (marked *w*,) made in two parts and connected at the ends by rivets that are first inserted through the part A and then through the ends of the parts forming the band. The inside half of the band has a turn outward and nearly at right angle to the band and leg, as is shown at *a*, Figs. 1 and 2, to stiffen and protect the leg against splitting, and also to support a pad or cushion for the seat of the wearer to rest upon. The turn (or "flange," as it may properly be called) has holes in the out edge thereof to sew the pad to. The use of this flange is to furnish a wide bearing for the seat of the wearer to rest upon, and also to provide a way for adjusting the socket to the stump as it shrinks in size, which is a consequence peculiar to amputated legs. When legs do not fill the socket, the act of walking is very difficult and burdensome.

I have worn artificial legs for the last fourteen years, have made my own, and worn out four. The keeping of the socket properly adjusted to the stump of my leg has been a matter of much difficulty, especially with those I have worn out. Those were made after the fashion of the best legs I had then seen; but they could not be packed to prevent them from slipping up and down on the stump, as the flesh upon the bone would slip enough for that. I am now wearing a leg that I have had on nearly four years. It has had no repairs yet, and probably will need none for as long a time to come. It is banded around the top, around the knee, and around the ankle, and has the flange for the seat of the wearer to rest upon, and the part coming in contact with the pad is so near the bone that there is but little slipping on the stump. When the socket becomes loose from the shrinkage of the stump,

it can be packed under the pad, or the pad can be taken out and a thicker one put in. This method of diminishing the size of the socket dispenses with the use of cloths, that heat, irritate, and gall the stump, and render the act of walking almost impracticable in hot weather.

b, Figs. 1 and 2, is a thin band to support the lower end of the socket A. It is shaped to form the knee-joint, and has the ears *j* with holes through them in which to secure the knee-bolt. Connected to the front part of the band is a hook, *h*, projecting inward. The band is riveted to the socket A.

k is a jointed belt or suspender, some like a chain, for stopping and holding the leg in a straight position.

l are links secured by belts within another kind of link, (marked *x*,) that has cross connections at the ends and in the middle. The cross-connections at the ends of *x* are covered with leather or other material to prevent them from giving off sound or clucking as they come in contact with the links *l*, which they will invariably do if the belt is straightened without this protection. A further use of this arrangement is to stop the belt before it becomes straight to insure the folding of the belt into the leg, whereas if it were permitted to become straight without this check or stoppage it would be as likely to fold out as in in flexing the leg. The middle connection is for attaching a leather strap or cord, *n*, to a spring, *m*, in the front part of the socket. The strap is made short, so as to strain considerably on the spring *m* to prevent the belt from making any jerking or clucking noise as it becomes straight.

The end of the link *l* at one end of the belt *k* connects with a plate that is secured under the band *b* by a screw, *r*, inserted through said band. The link at the other end connects to a plate, *d*, that is secured to another plate, *p*, and that in turn is secured to the outside of leg B by wood-screws. On the outside plate is an arm, *c*, through which a screw is inserted that screws into an arm, *e*, for the purpose of lengthening or shortening the belt, as convenience may require.

f is a screw that goes through plate *p* and screws into plate *d* to hold that more firmly in place.

g and *g'* are coiled springs, the lower one for lifting and holding up the toe of the foot, and the other one is to assist the wearer in swinging the leg forward in the act of walking. At the end of each is a loop to go over the arm *v*. The upper one has a bail, *i*, (see Fig. 4,) with outward turns on the ends of the prongs to work over the coils of the spring, and by turning it round in either direction it will move to and fro, making it answer the purpose of a screw for adjusting the upper and lower leg for the better convenience of walking. The lower spring has a rod, *o*, (see Fig. 5,) connected with it that loops over the pin *u*, and at the other end is a cross in a T form to screw into the coils of the spring *g'* to adjust it to the tension or strain necessary. The bail *i* goes over a hook on the stirrup *s*, which is secured to the arm *h*. The arm *h* and stirrup S work in a slot in the front part of the knee, while the leg is being flexed and straightened.

B is the lower leg, made hollow and open at the bottom end. The top end is rounded to form the knee, and has a slot in the front side for the arm *h* to work in. The bottom end of B is secured by a thin band made in two parts, the part *y* overlapping the part *y'*, for the purpose of being connected by rivets that first pass through the wood and then through the ends of the parts forming the band. The front part of the band is shaped to form the ankle-joint, and has the ears *j*, through which the ankle-bolt is inserted. The ankle-bolt and knee-bolt are both made hollow to secure lightness and a large bearing-surface.

C is the foot with a slot through it at C', Fig. 2, and a cavity or hollow in the inside at C^2, reaching to the toe-piece to secure lightness. Over the instep is a thin plate, Z, to maintain a good joint against the ankle. The toe piece D goes into the foot with a single tenon, and shows in the drawings the form of the joint, which needs no spring or other device to keep it in place, as the shoe or boot will do that. The foot is connected to the leg B by wide staples or loops, (see Fig. 6,) the prongs terminating in bolts that go over the ankle-bolt, then through the foot, and are fastened on the under side by screws. The ankle-bolt turns in boxes bushed with leather, secured on the foot and under the staples. At *w'* is an opening in the leg, through which to put in the springs, and may be closed by a plate or left open.

F is a removable heel-piece, fastened to the foot by wood-screws, and made in the form shown to provide for the repair of the heel by substituting new ones, as the heel is the first thing in artificial legs to wear out. It is made in the form of a shoe-heel for the purpose of wearing shoes over it made like overshoes, with a box for the heel to rest in, to prevent the foot from pushing forward against the toe of the shoe, as they are generally very sure to do.

The knee-bolt, and bolts for using the belt, and all metal parts that come in contact should be bushed with leather or some like material to prevent creating sound. This I believe fully describes the construction.

By way of explaining its utility or usefulness, I will say a few words more on its operation as compared with other legs. Light legs are supposed by many to be indispensable for walking easily, but there is not so much in this as supposed. A few pounds in a leg supported on the shoulders by suspenders is but little felt, but a pound or half-pound in the foot, suspended at the extremity of a long lever, worked by the stump, is a fatiguing annoyance. Therefore the extremity of the leg

and foot should be made as light as possible and retain sufficient strength.

A good spring to actuate the knee-joint has always been of great service in walking easily; but hitherto I believe no springs have been used in artificial legs that have endured long before breaking. The coiled spring presents the longest space for the spring to bend through, and consequently is the least liable to break; but heretofore they have been made to draw around the circumference of the joint, making the space through which the spring has to traverse or spring so great that they soon break. My spring acts across the diameter, and within the shell of the log, so that the traverse of the spring is not more than one-third of those which draw around the circumference.

On reviewing the drawings, it will be seen that the line of the draft of the spring from the knee-bolt will be the greatest when the leg is straight, thereby giving it the greatest leverage power while in that position. As the leg is being flexed, the line of the draft will be constantly approaching the knee-bolt, and thereby constantly shortening the leverage power until it reaches the center of the bolt, where it will have no power to flex or straighten the leg. After passing the dead point, the draft of the spring will act to flex the leg, but with so short a leverage that it will exert but little resistance to the straightening of the leg. From these conclusions it is clear that the greatest strain of the spring will be exerted while the leg is straight or being straightened, which will be the exact place for it.

The joints of artificial legs have heretofore been hinged by straps riveted to the parts that are open, and, being supported only by a thin covering of parchment or leather, they soon swell, shrink, split, and become loose and shackling. The bands used in my leg support and protect the sockets and joints against all these casualties, and always maintain good joints.

What I claim as my invention, and wish to secure by Letters Patent of the United States, is—

1. Constructing the inside half of the band securing the top of the socket A with a wide flange, as partly shown at *d*.

2. The band *b*, with the hook *h* and ears *j*, fitted to form the knee-joint.

3. The ankle-band *y* and *y'*, made with the ears *j*, to hinge it to the foot and shaped to form the ankle-joint.

4. The belt *k*, spring *m*, and strap *n*, arranged and connected to the parts A and B.

5. The appendages *s* and *i*, in combination with the spring *g*, arranged as described, and operating across the diameter of the joint, as set forth.

6. The heel-piece F and rod *o*, all of which is constructed substantially as and for the purposes herein set forth.

WM. HINDS.

Witnesses:

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