

C. D. LEACH.  
Artificial Legs.

No. 154,689.

Patented Sept. 1, 1874.

Fig. 1.

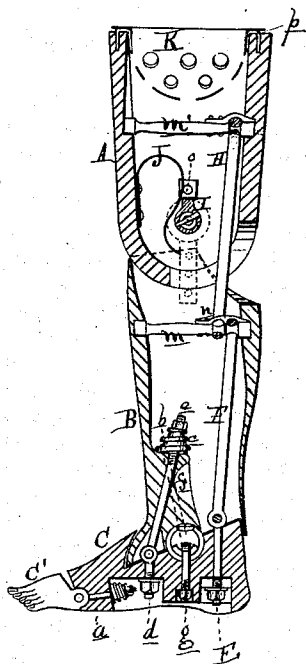


Fig. 2.

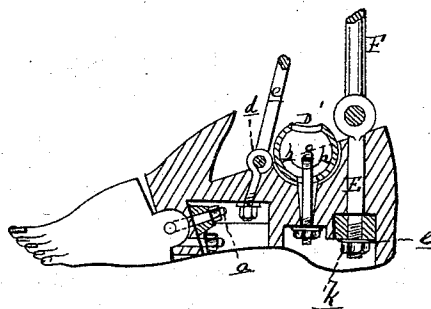


Fig. 3.

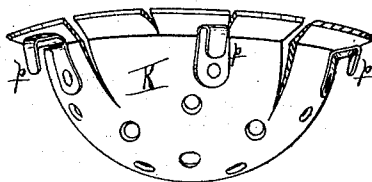


Fig. 4.

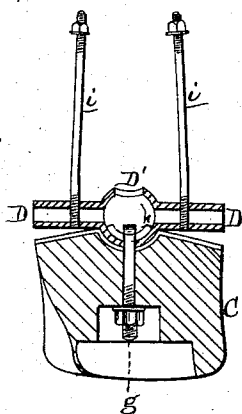


Fig. 5.

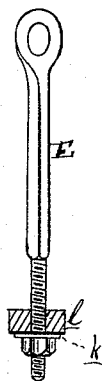


Fig. 6.

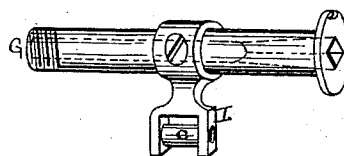
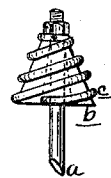


Fig. 7.



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# UNITED STATES PATENT OFFICE.

CORNELIUS D. LEACH, OF UNION CITY, MICHIGAN, ASSIGNOR TO JOSEPH W. SPENCER, OF SAME PLACE.

## IMPROVEMENT IN ARTIFICIAL LEGS.

Specification forming part of Letters Patent No. 154,689, dated September 1, 1874; application filed February 24, 1874.

*To all whom it may concern:*

Be it known that I, CORNELIUS D. LEACH, of Union City, in the county of Branch and State of Michigan, have invented an Improvement in Artificial Legs, of which the following is a specification:

The nature of this invention relates to certain improvements in the construction of artificial legs, having for their object to adapt a leg to support the weight of its wearer upon the extremity of the stump by the employment of a leather socket of suitable form; to render the action of the knee and ankle joints more free and elastic and life-like in their movements; also, to give the foot a natural side motion or a partial oscillation in the longitudinal axis of the foot, and generally to strengthen the working parts; and my invention consists in the construction and arrangement of the various bolts and heel-tendon, their fastenings, and combination with all the operative parts of the leg.

Figure 1 is a central vertical section of my artificial leg and foot. Fig. 2 is a similar view, enlarged, of the foot alone. Fig. 3 is a side elevation of the stump-socket. Fig. 4 is a cross-section of the foot and ankle-joint at *x x*, Fig. 2. Fig. 5 is a perspective view of the heel-bolt, nut, and elastic washer. Fig. 6 is a perspective view of the knee-bolt and lever. Fig. 7 is an elevation, showing, in an enlarged form, the compound elastic washer used under the nuts of the instep and toe-piece bolts.

In the drawing, A represents the thigh, B the leg, C the foot, and C' the toe-piece, of my improved artificial limb as constructed for a thigh amputation, the material used being willow or any light and strong wood adapted to the purpose. The toe-piece is secured to the foot by three bolts, the central one, *a*, having a spring under its nut, as seen in Fig. 7, the spring referred to being a cone of india-rubber, *b*, enveloped by a spiral-wire spring, *c*. When the spring is compressed under the flexure of the toe-piece its office is to straighten or return the latter to its normal position when free. The top of the foot is sloped from the top of the heel to a point under the instep, similar to a shoe-last. The leg-section is hollow; but in the lower front part there is left

a shelf or abutment, *f*. An eyebolt, *d*, is passed down through the instep and secured by a nut in a hollow in the sole. The eye ranges lengthwise or parallel with the foot to transversely receive the eye at the lower end of a bolt, *e*, which passes up through the leg-abutment *f*. Under the nut the compound spring *b c*, Fig. 7, is sleeved on the bolt, its base resting upon the abutment. When the foot is thrown forward and the weight thrown on the heel, as in the natural gait, the fore part of the foot is depressed and compresses this spring *b c*. As the knee is flexed and moved forward this spring *b c* raises the foot, turning on the ankle-joint until arrested by the substitute for the *tendo-achilles*, hereinafter described. The ankle-joint is a metal tube, D, with a hollow sphere, D', at its middle, seated in a leather-lined socket formed at the ankle-point of the inclined foot-top. In the bottom of this sphere is a slot running lengthwise of the foot, through which is inserted the shank of an eyebolt, *g*, which passes through the foot to a recess in the hollow thereof, where a nut secures it in position, the top of the sphere being cut away to pass the bolt through, also to admit of a metal segment-key, *h*, being transversely inserted in the eye. The top of the foot is sloped downwardly toward the sides, under the arms of the ankle-joint, as shown in Fig. 4, to permit the foot to vibrate or oscillate on its longitudinal axis, while the foot is also allowed to oscillate on the axis of the ankle-joint, each arm of which has the lower end of a bolt, *i*, tapped into it, which arm-bolts extend up through the abutment *f*, and are secured thereto by nuts at each side of the bolt *e*. E is the heel-bolt, having an eye at the top ranged lengthwise of the foot. It is square in cross-section, and is passed down through a square hole in the heel to prevent it from turning, with a nut screwed on its lower end in a socket in the heel. Next above the nut is a metal washer, *k*, and between that and the wood an elastic rubber washer, *l*, is sleeved on the bolt. F is the heel-cord or *tendo-achilles*, made of strong linen thread incased in buckskin, with a loop at each end. The lower loop engages with the eye of the heel-bolt, while the upper

loop is slipped over the rear end of a wooden bar, *m*, dropped in sockets formed in the upper part of the leg, where it is secured by a wooden clamp, *n*, fastened by screws to the top of said bar. When the weight of the wearer in walking is thrown upon the ball of the foot the entire strain of his weight is thrown upon the *tendo-achilles* and heel-bolt, both of which must have sufficient strength to resist the strain, which is sudden or quick in its application; hence the employment of the elastic washer *l* to ease the shock upon the loops of the cord, and thus prevent their tendency to cut. The eye of the heel-bolt permits the foot to turn a little on its longitudinal axis or have side motion. At the top of each side of the leg is secured a metallic eyebolt, (shown in dotted lines in Fig. 1,) between which is inserted the rounded lower end of the thigh-section, which is pivoted thereto by the tubular knee-bolt *G*, as heretofore. A tendon, *H*, of similar construction to the *tendo-achilles*, has its loop, at the lower end, slipped over the bar *m*, and its upper loop slipped over a similar bar, *m'*, dropped in sockets cut in the walls of the thigh-section, to limit the motion of the knee-joint in permitting its flexure from a perpendicular line in but one direction. The knee-bolt passes through the eye of a crank or lever, *I*, which is secured to the middle thereof by a screw tapped through both. The extremity of this lever is forked, and has a friction-roller, *o*, journaled between the jaws of said fork. A curved leaf-spring, *J*, of the peculiar form seen in Fig. 1, is secured to the lower inner front wall of the thigh-section, against which the roller *o* presses in the movement imparted to the lever by the rotation of the knee-bolt, which is rigidly secured with the leg-section. The office of this spring *J* is, when the foot is lifted from the ground, to throw the leg and foot forward, while, from its peculiar form, it

will exert little or no force upon the lever to move the leg when the knee is bent, as when sitting down. *K* is a cup-socket, of leather, designed to fit the stump, and perforated for ventilation. To the outside, near the rim, is riveted a series of metal clips, *p*, whose outer ends are inserted in sockets formed in the top of the thigh-section.

When the stump is supported by this socket there will be more or less soreness for a short time, until the end of the stump becomes tough and callous, after which the wearer experiences no more pain from that source; in fact, the sensation is about the same as experienced in standing upon the sole of his foot, if he have one to stand upon.

Practical experience, based upon a personal use of this form of socket in an artificial leg, enables me to state that the step is firm, unwavering, and reliable, and the use of the leg much less fatiguing than where the ordinary method of supporting the stump is resorted to.

Every bearing is bushed with leather to prevent noise or rattling when in use.

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

1. The eyebolts *d e*, inserted through the instep of the foot *C* and the abutment *f* of the leg *B*, the said bolt *e* being provided with the compound spring *b c*, substantially as described.

2. The heel-bolt *E*, provided with the elastic washer *l*, and in combination therewith the heel-tendon *F* and bar *m*, as and for the purpose set forth.

3. The ankle-bolt *D D'*, constructed as described, the eyebolt *g*, segment-key *h*, and bolts *i i*, for securing the foot *C* to the leg *B*, substantially as set forth.

CORNELIUS D. LEACH.

Witnesses:

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H. S. SPRAGUE.