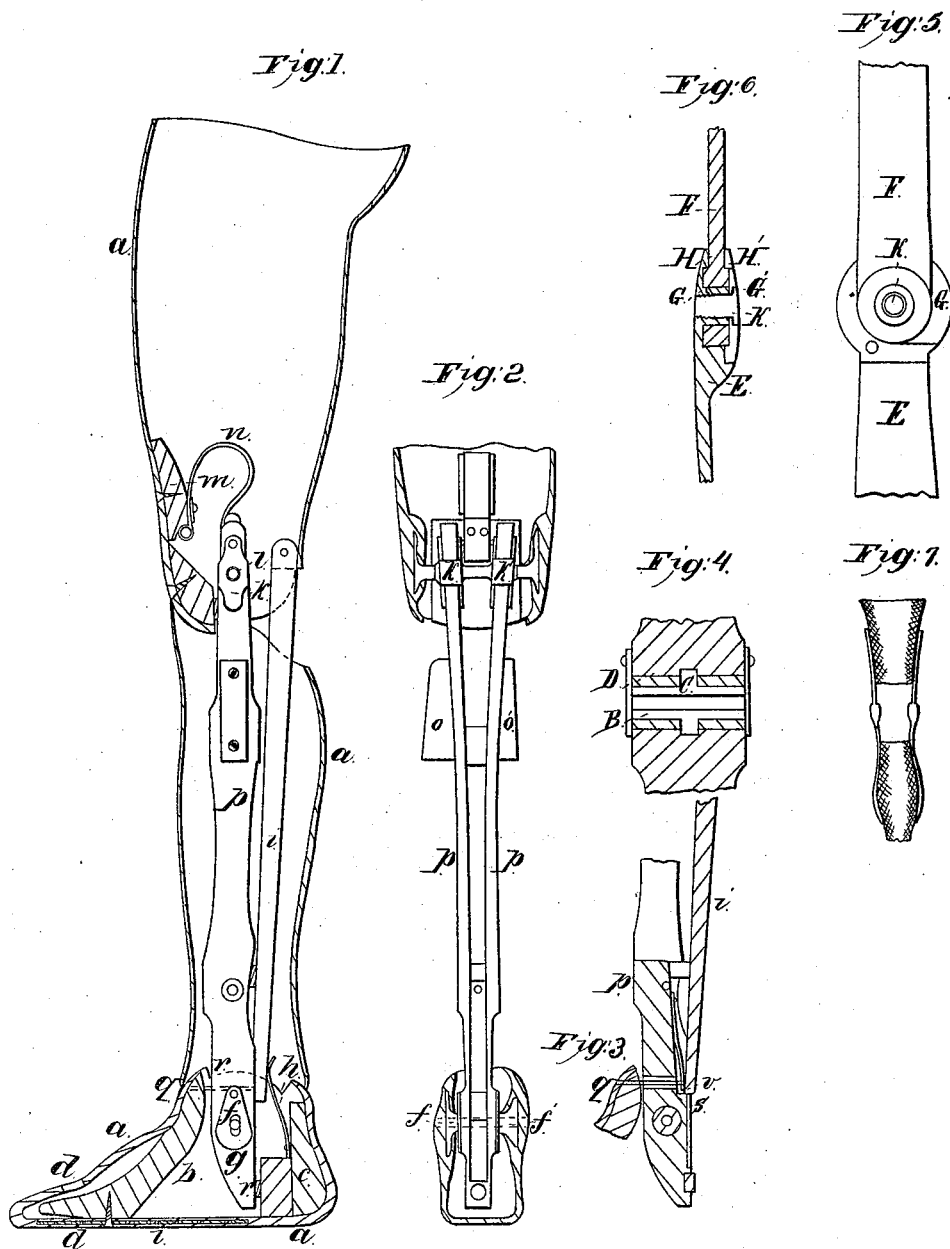


2 Sheets. Sheet 1.  
Kimball & Lawrence,

Artificial Leg.

N<sup>o</sup> 54,364.

Patented May 1, 1866.



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G. E. Buckley.

Inventors:  
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Fig 8.

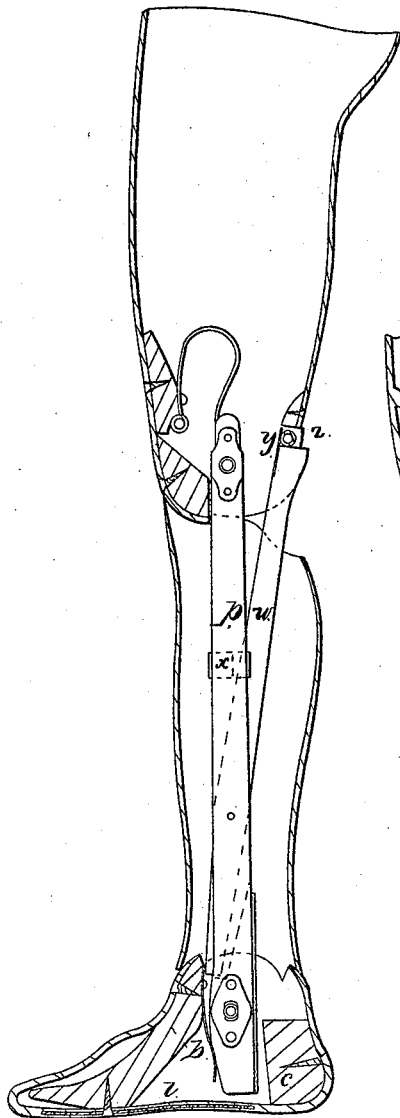


Fig 9.

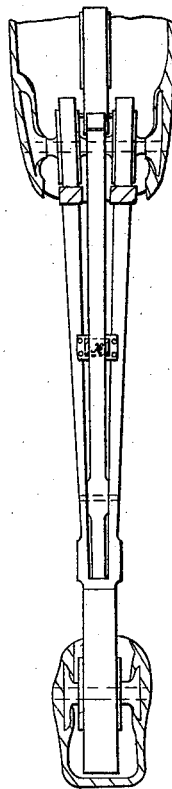
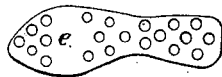


Fig 10.



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## IMPROVEMENT IN ARTIFICIAL LEGS.

Specification forming part of Letters Patent No. 54,364, dated May 1, 1866.

*To all whom it may concern:*

Be it known that we, HIRAM A. KIMBALL and ANDREW J. LAWRENCE, both of the city of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Artificial Legs; and we 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, forming a part hereof, in which—

Figure 1 is a longitudinal section of a vulcanized rubber form of a full-length leg, including the mechanical arrangements to be used in cases where the natural leg is amputated above the knee and near the body; Fig. 2, a front view of the mechanical arrangements detached; Fig. 3, detached view of parts, showing the catch employed to hold the knee-joint stiff; Fig. 4, a section, showing the construction of the ankle-joint; Fig. 5, a side view of a side knee-joint, corrugated, to be used where the natural leg is amputated below the knee; Fig. 6, a section of the joint; Fig. 7, a front view of the said side knee-joint, showing the manner of its attachment to the upper and lower portions of the vulcanized form; Fig. 8, a longitudinal section of a vulcanized rubber form of a whole-length leg, including the mechanical arrangements, showing a simpler arrangement of lock knee-joint than is represented in Fig. 1; Fig. 9, a front view of the last-named mechanical arrangements detached; Fig. 10, a top view of a steel plate applied to the sole of the foot, the same being shown in section in Figs. 1 and 8.

These improvements are designed to be used in connection with the vulcanized gum form for which Letters Patent were granted to said Kimball August 18, 1863.

To enable others skilled in the art to make and use our improvements, we will proceed to describe their construction and mode of operation.

*a*, Fig. 1, represents the exterior form of vulcanized rubber; *b*, a block of hard wood, extending from the instep to the ball of the foot, and thence to the toe. *c* is a block of hard wood in the heel. *d* is a piece of pure soft rubber, running around the foot, and which, together with the steel plate *e*, Figs. 1 and 10, form an elastic toe-joint; *f* *f'*, Figs. 1, 2, and 4, are two steel plates holding the ankle-joint

in position; *g*, Fig. 1, the ankle-joint pin; *h*, a spring which lifts the toe. It is fastened at its lower end to the block *c* in the heel, and its upper end presses against the brace *i*, which is made of hard wood and jointed at its upper end to the form, back of the knee.

*k*, Figs. 1 and 2, is the bearing of the knee-joint. *l* is the knee-joint pivot, passing through the middle of the bearing *k* and through the exterior form. *m* is a block of hard wood, to which is attached one end of the balance-spring, *n*, the other end of which spring is free and presses against the upper end of the pitman *p*, Figs. 1 and 2. The upper end of the pitman *p* is forked, and its two prongs pass through the brass bearing *k* of the knee-joint, as shown in Fig. 2. The lower end of the pitman is not forked, and into it the ankle-joint, Fig. 4, is inserted.

*o o'* are two blocks of wood, fastened to the prongs of the pitman *p*, and to which that part of the exterior shell forming the calf of the artificial leg is fastened.

*q*, Figs. 1 and 3, is a screw-pin inserted through and fastened to the block *b* and through the pitman *p*, coming in contact with the end of the brace *i* at *v*, Fig. 3.

It is evident that when the foot is thrown forward, as in the act of stepping, the spring *h*, Fig. 1, presses the lower end of the brace *i* into the notch *s*, Fig. 3, holding the knee stiff, while, as soon as the limb comes directly under the body, and the points of contact *r r'* of the pitman *p* come against the blocks *b* and *c*, the pin *q* presses the lower end of the brace *i* out of the notch *s*, and thus allows the knee to bend as the weight of the body is removed from the limb.

A better plan of mechanism for the lock knee-joint is represented in Figs. 8 and 9. This arrangement differs from that above described in this, that instead of the brace *i*, Fig. 1, there is substituted a lever, *w*, of strong wood, jointed between the prongs of the pitman *p* at a point measuring from the ankle-joint one-third of the length of the pitman from the ankle-joint to the knee-joint. The lower end of the lever *w* comes in contact with the wooden brace *b* at the instep, the upper end being slightly pressed back by the soft-rubber packing *x*, so that as the limb is straightened, as in the act of stepping forward, the upper end of the lever *w* is pressed back, pass-

ing under a roller, *y*, which is packed with soft rubber and pivoted to a block of wood, *z*, back of the knee, so that as the upper end of the lever *w* passes under the roller *y* in the act of walking, the toe is lowered, and, as the weight of the body comes forward on the foot, the knee is unlocked and allowed to bend.

We will now proceed to describe the construction of the ankle-joint shown in Fig. 4.

B is a metallic spool, having its middle part enlarged into the rounded rib C. This spool is inserted into a cylindrical hole in the pitman *p* and the two spaces between the rib C, and the outer ends of the spool are packed with soft-rubber tubing D, allowing a slight stiff lateral motion of the ankle-joint.

E, Figs. 5 and 6, is the female portion of the side knee corrugated joint. F is the male portion of the same. The jointed end of F has two raised circular projections or corrugations, G G', and the jointed end of E has two depressions or corrugations, H H', in which the projections G G' turn. The hollow bolt or pivot I of this joint, instead of being independent, is a part of the female portion E, and the screw K passing through the middle of the pivot I holds the several parts together.

The soft rubber *d* above described is inserted into the body of the vulcanized gum in molding the exterior form, and, in conjunction with the steel plate *e*, form a frictionless joint. The

same construction may be used in forming other joints in artificial limbs.

Having thus described our invention, what we claim and desire to secure by Letters Patent, is—

1. Forming a frictionless joint, *d*, in artificial limbs, by combining pure soft rubber with vulcanized gum, in the manner and for the purpose substantially as described.

2. The two blocks *b* and *c*, in combination with the prolongation of the pitman *p*, producing two opposite points of contact, *r* and *r'*, thereby relieving the ankle-pin from the strain or leverage of the foot, the same being constructed and arranged substantially as shown and described.

3. The combination of the lever *w* with the soft packing *x*, and the roller *y*, for locking and unlocking the knee and lowering the toe, the several parts being arranged and constructed substantially as shown and described.

4. The combination of the metallic spool B, rubber packing D, and the steel-plates *f f'*, to produce a slight stiff lateral motion of the ankle-joint, the whole constructed and arranged substantially as shown and described.

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