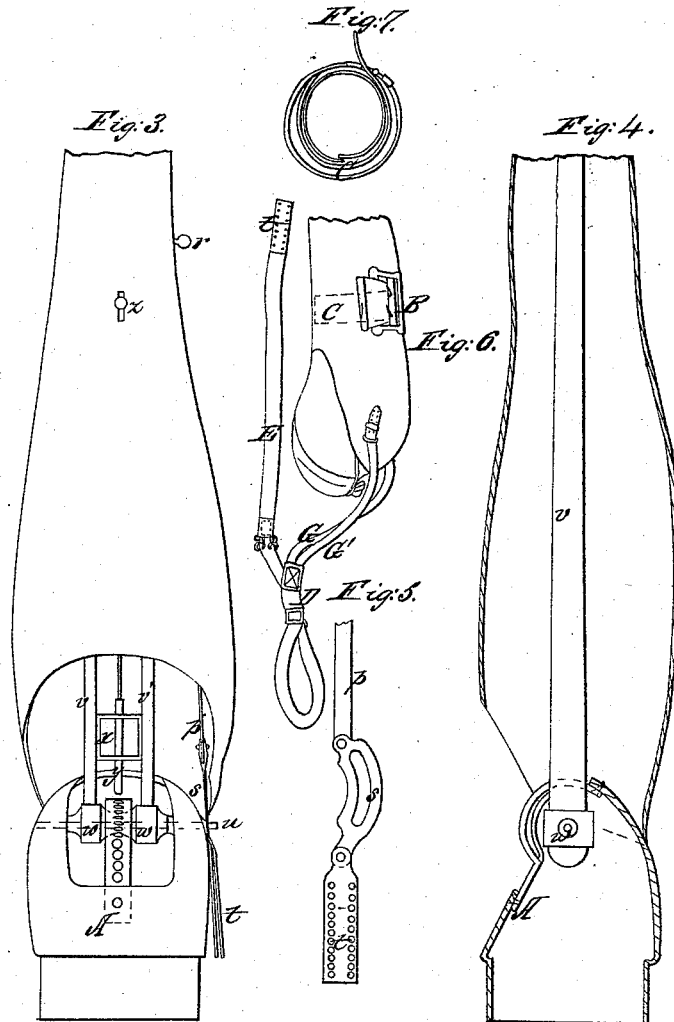


2 Sheets-Sheet 2.
Kimball & Lawrence,

Artificial Arm.

N^o 47,835.

Patented May 23, 1896.



Witnesses:
J. E. Thad.
G. C. Buckley.

Inventors:
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UNITED STATES PATENT OFFICE.

HIRAM A. KIMBALL AND ANDREW J. LAWRENCE, OF PHILADELPHIA, PA.

IMPROVEMENT IN ARTIFICIAL ARMS.

Specification forming part of Letters Patent No. 47,835, dated May 23, 1865.

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 Limbs; 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, making a part of this specification, in which—

Figure 1 is front view of the hand; Fig. 2, a side view of the same; Fig. 3, a front view of the elbow and forearm; Fig. 4, a side view of the same; Fig. 5, a front view of the elbow-lever detached; Fig. 6, a view of the shoulder and fastening straps detached; Fig. 7, a sectional view of the socket, showing the strap in a red color, and showing also the mode of applying the strap to the socket.

Our improvements are designed to be used in connection with the application of vulcanized gum to the exterior natural forms of artificial limbs for which Letters Patent were granted to the said Hiram A. Kimball on the 18th of August, 1863.

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

a a', Fig. 1, are two pieces of spring-brass running from the end of the finger to a point below the center of the first joint and between the ends of two pieces of brass, *b b'*, running from the first joint of the finger to the palm of the hand. A small turned brass cylinder, *c*, is riveted into the levers *a a' b b'*, at each joint of the levers, as shown, and through each of these cylinders a steel pin, *d*, inserted through the gum shell of the finger, and at the center of each joint and through the ends of the levers described, locks the parts together. From the front side of levers *a a'*, in the first joint of the finger, protrude two short projections, *e e'*, of which *e* is shown in Fig. 2. Between the extremities of the projections there is riveted one end of a bar, *f*, which is fastened at the other end in the back of the knuckle of the hand, as shown at *g*, in Fig. 2. A steel spring, *h*, Fig. 2, fastened at one end by a rivet between the levers *a a'*, passes over the back of the cylinder *c* and in front of the pivot in the lower lever, *b b'*. This completes the description of the system of fore-finger

levers with their necessary appendages. There is a similar arrangement of parts for each finger and for the thumb. Two bell-crank-levers, (marked *j j'*), pivoted at the wrist, one arm of each lever extending into the palm of the hand, have fastened across their ends the bar *k*, Fig. 1. The ends of the levers *b b'* from each finger come in contact with the back of the bar *k*. The other arms of the levers *j j'* extend across the wrist, and have fastened to their ends, at *l l'*, Fig. 2, two bars, *m m'*, the extremities of which are riveted to a lever, *n*, which crosses the wrist, having one end pivoted at *o*, Fig. 1, and to the other end of which there is attached the metallic strap *p*, which runs up the arm to the motive power. It is manifest that a pull on the strap *p* will pull the lever *n*, which, through the aid of the bars *m m'*, operates the levers *j j'*, which in turn operate the levers *b b'* and *a a'* and shut the fingers. The spring *h* opens the fingers as soon as the levers are relieved. The thumb is operated in like manner, but in an opposite direction, producing a grip like that of a pair of ice-tongs.

q, Fig. 1, is a spring-catch fastened at one end to the shell of the hand, extending up the wrist, and through the end of which passes the rod *r* from the outside of the forearm. By means of rod *r* the catch *q* is so operated that when the movable end of the lever *n* is drawn up the arm the catch *q* falls into a notch in said lever and holds the hand closed. Whenever power is applied through the strap *p* the lever *n* is freed and the hand opened.

s, Figs. 3 and 5, is a lever jointed at one end to the upper extremity of the strap *p*, and at the other end to the strap *t*, which extends outside of the arm to motive power. The lever *s* has a curved slot by means of which it is allowed to slide on the end of the elbow-pivot *u*, Fig. 3, and caused to operate in such a way that at whatever angle the forearm is bent a motive power applied at one end, through *t*, directly affects the other end, and thence the machinery of the hand.

v v' are two bars of wood, each fastened at one end to the shell of the wrist, their other ends extending through the bearing *w* of the elbow-joint, as seen in Figs. 3 and 4. These bars perform an office for the artificial arm similar to that of the bones in the natural arm.

x, Fig. 3, is a block of wood fastened to and

between the bars $v v'$. This block x forms a bearing for the slide-catch y , which is operated by lever z near the wrist.

A, Fig. 3, is a curved metallic rest, perforated with holes, into which the slide y may be moved, thus fixing the forearm at any desired angle.

In Fig. 6, B is a buckle, to the cross-bar of which is fastened one end of the strap C, which passes inside of the exterior form and outside of the lining of the socket, the buckling up of which strap tightens or loosens the socket.

The mode of applying the strap to the socket is seen distinctly in Fig. 7.

E, Fig. 6, is a non-elastic strap attached to the middle strap, t . F is a non-elastic strap intended to pass around the shoulder opposite the shoulder bearing the artificial arm, and having one end buckled to an elastic attachment, D, which is fastened to the straps G G', which are buckled to the socket.

We are well aware that levers have been long used to move artificial fingers, and do not desire to claim such, broadly; but

Having thus described our improvements,

what we claim, and desire to secure by Letters Patent, are—

I. The arrangement of the levers $b b'$, $j j$, and n , in combination with the spring h , to open and shut the fingers, in the manner substantially as above described.

II. The lever s , by means of which the motive power acts upon the fingers when the forearm is in any position, said lever being constructed and arranged substantially as described.

III. The bars $v v'$, in combination with the catch y and rest A, whereby the forearm is set and held in any desired position, the whole constructed and arranged substantially as described.

IV. The employment of the elastic strap D, by which the artificial arm is held in position without chafing or confining other parts of the body, substantially as described.

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Witnesses:

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G. E. BUCKLEY.