

(No Model.)

H. S. SWANK.
ARTIFICIAL LIMB.

No. 433,497.

FIG. 1

Patented Aug. 5, 1890.

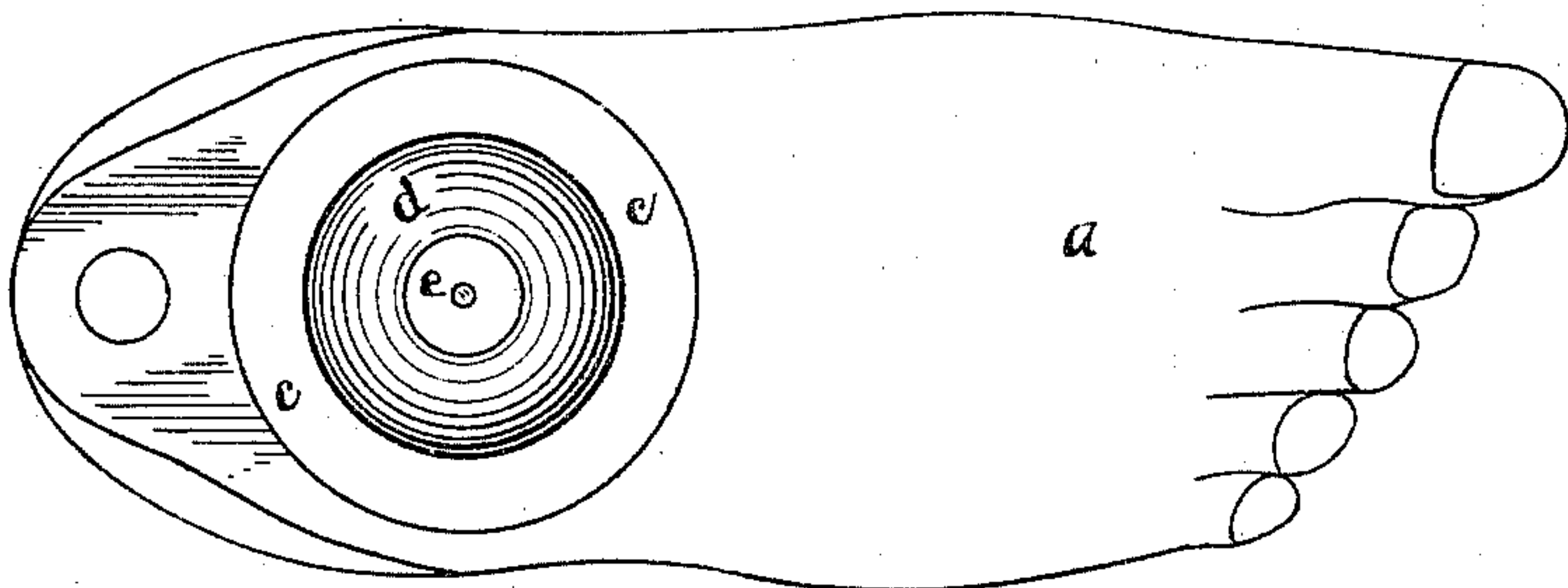


FIG. 3

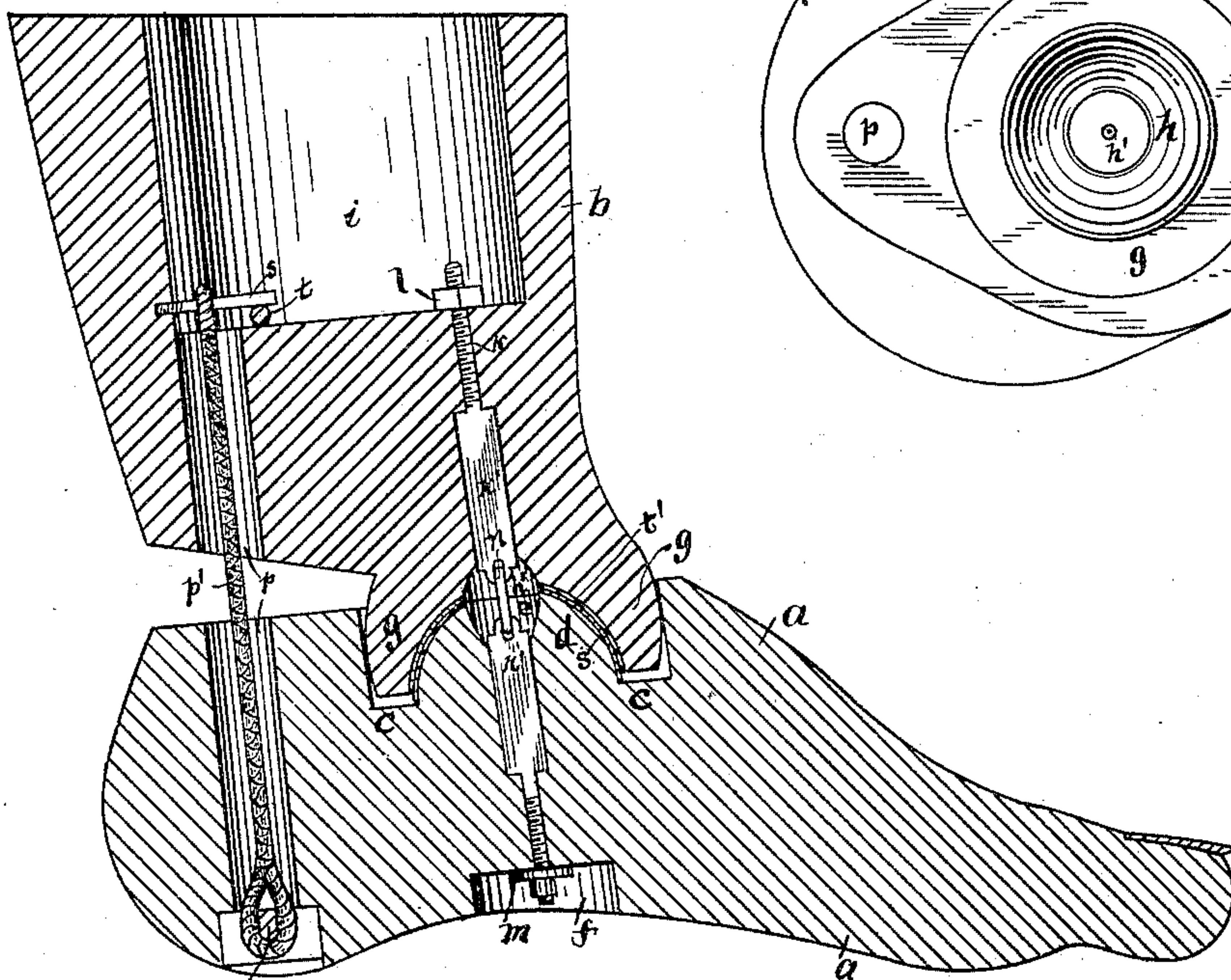


FIG. 2

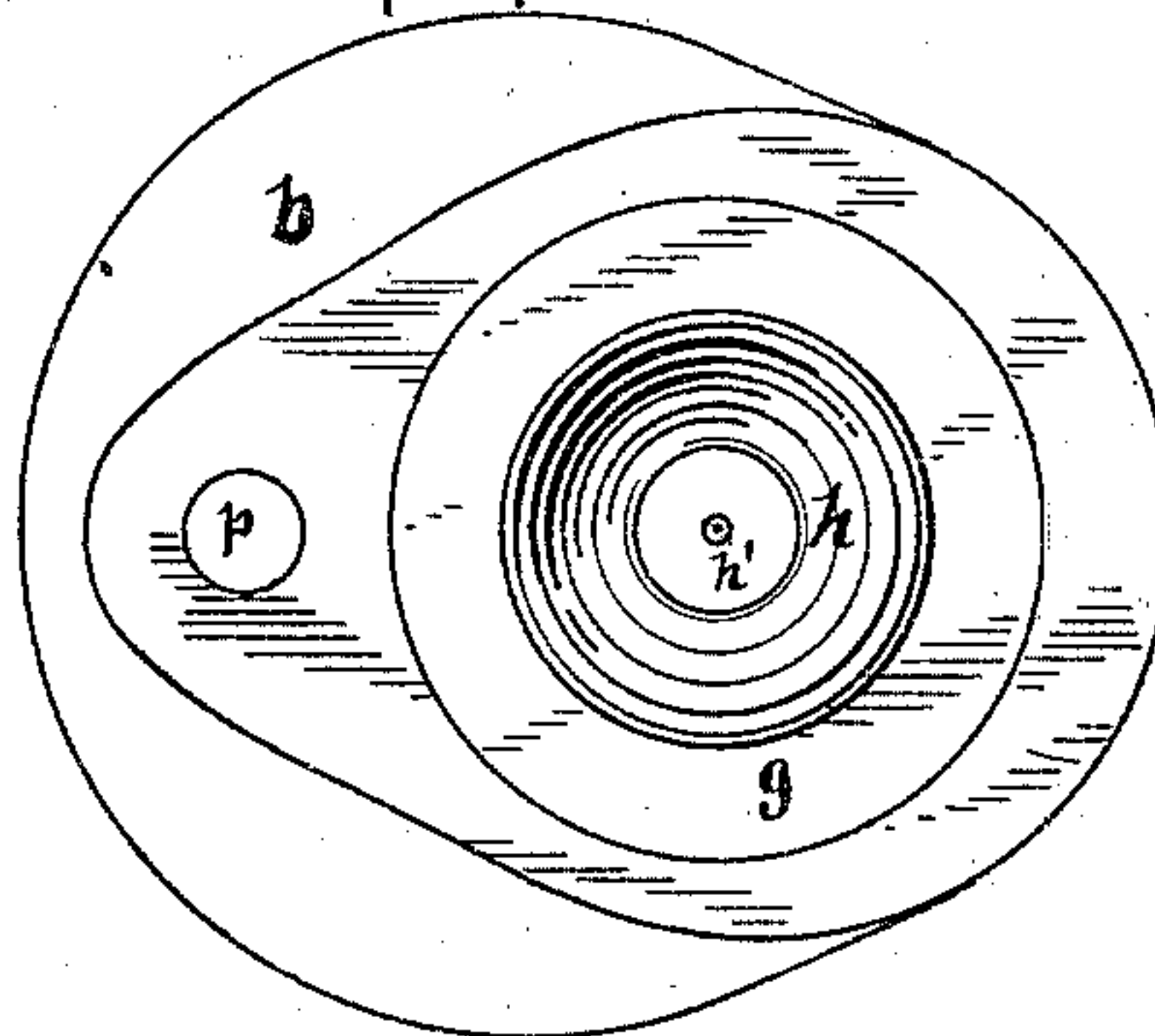


FIG. 4

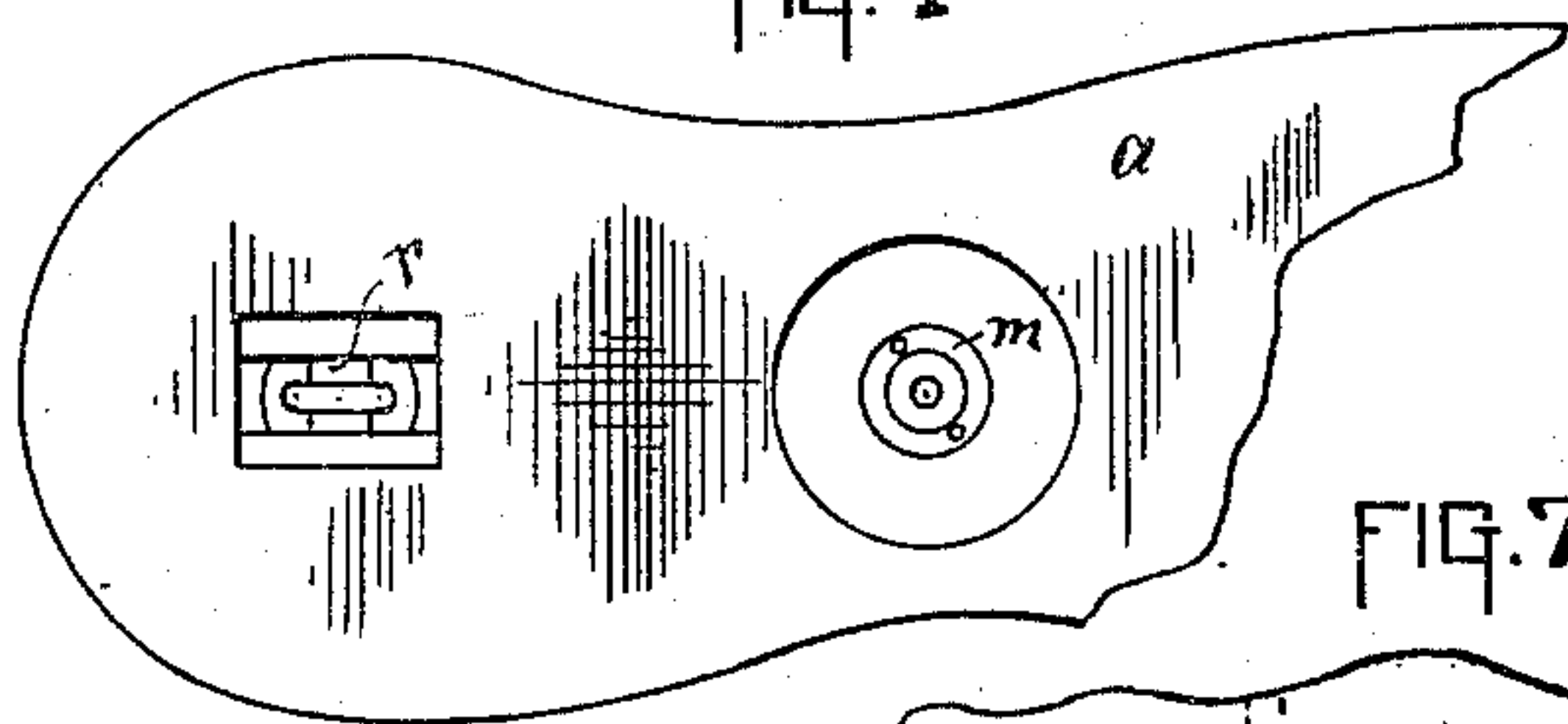


FIG. 5

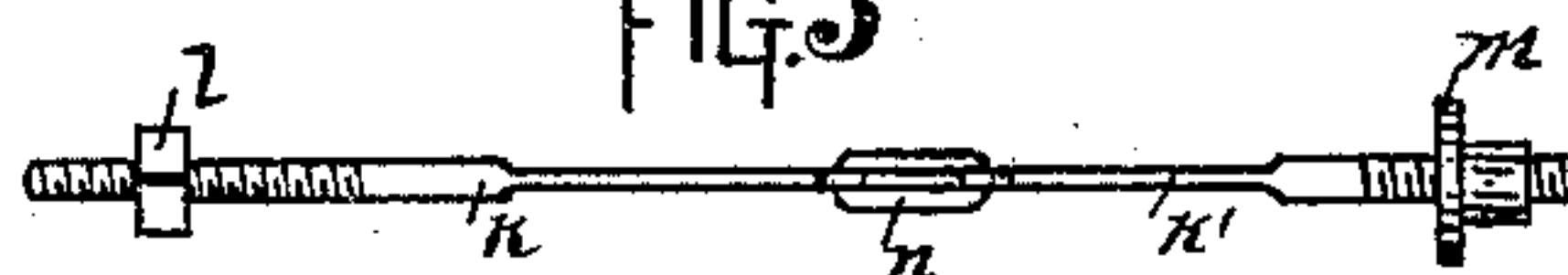


FIG. 6

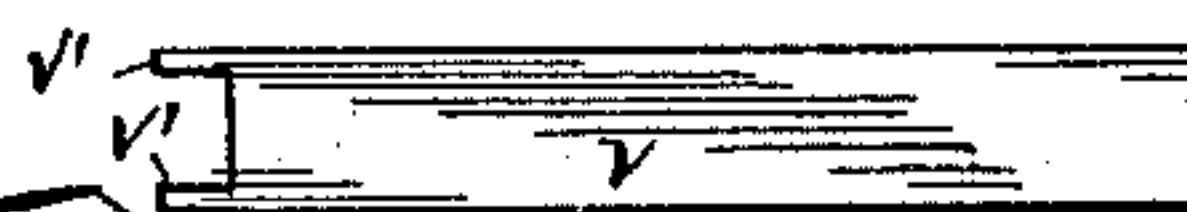
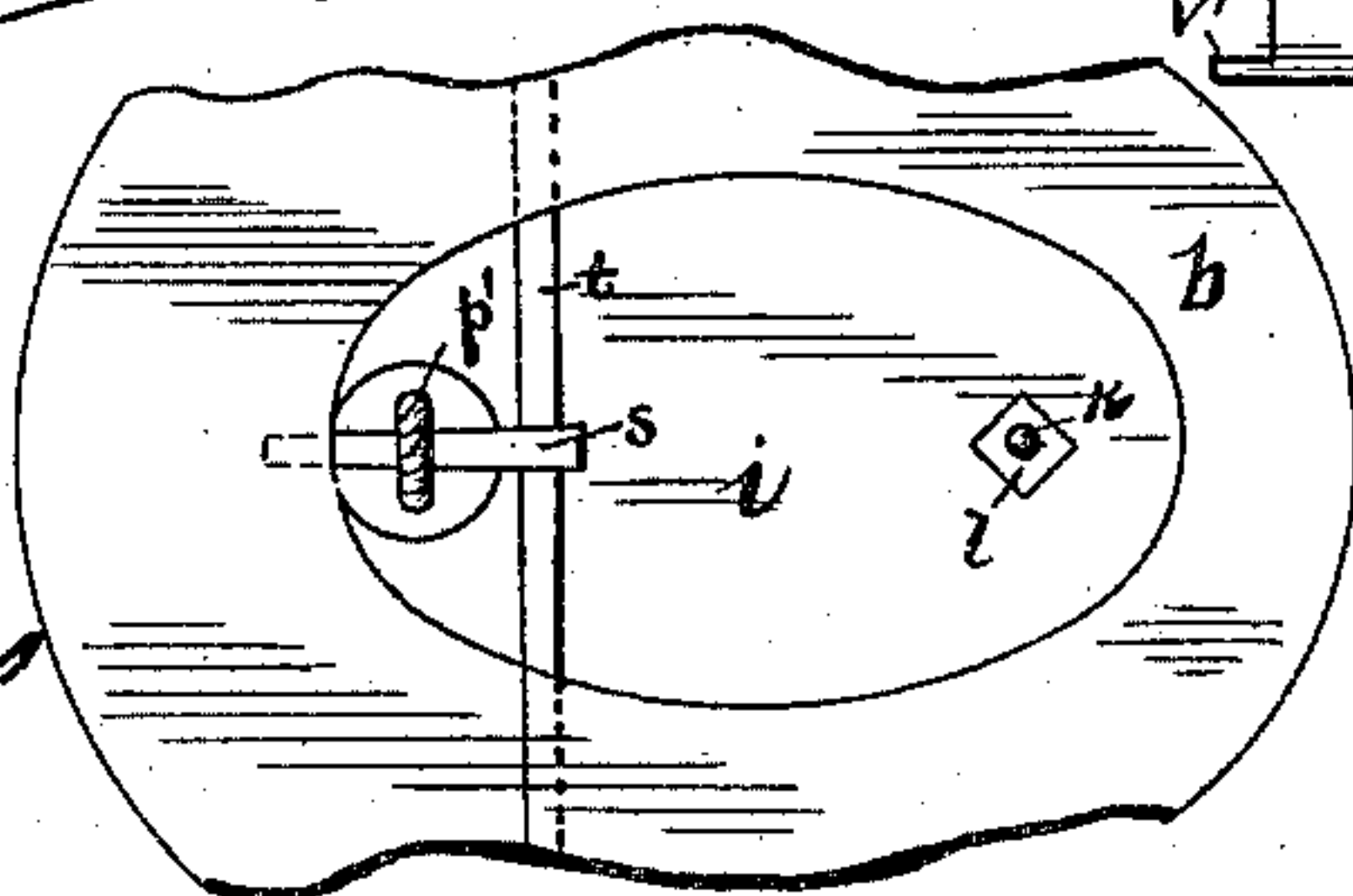


FIG. 7



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ARTIFICIAL LIMB.

SPECIFICATION forming part of Letters Patent No. 433,497, dated August 5, 1890.

Application filed October 10, 1889. Serial No. 326,623. (No model.)

To all whom it may concern:

Be it known that I, HIRAM STREEBY SWANK, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Artificial Limbs, of which the following is a specification.

My invention relates to the improvement of artificial limbs, and has particular relation to the ankle-joint.

The objects of my invention are to provide an artificial limb with a superior form of ankle-joint, by means of which the lateral, forward, and other natural motions of the foot and connected limb may be attained easily by the wearer; to accomplish the same at a reasonable cost of manufacture and without complication, and in so doing produce a safe, durable, and reliable joint, and to so form said joint as to obviate the necessity of using cords other than the heel-cord. These objects I accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of my improved foot with the leg and connections removed. Fig. 2 is a view of the lower end of the leg. Fig. 3 is a central vertical section taken through the connected foot and leg. Fig. 4 is a bottom view of the rear portion of the foot. Fig. 5 is a detail view, in elevation, of the joint-rods. Fig. 6 is an elevation of the key which I use for adjusting the joint-rods to regulate the play of the same, and Fig. 7 is a plan view of the leg-section.

Similar letters refer to similar parts throughout the several views.

a represents the foot, and *b* the lower portion of the leg, said foot and leg being formed of any suitable material. The upper side of the foot, at a point vertically opposite the hollow thereof, is provided, as shown, with a circular depression or socket *c*, from the bottom and center of which is made to project upwardly a bearing-piece *d*, having, as shown, approximately the form of a half-ball. Said half-ball is of such circumference at its base as to form between the same and the wall of the socket *c* a circular channel.

Formed in the upper half of the bearing *d* is a socket *e*, which communicates with a depression *f*, formed in the bottom of the foot by a joint-rod hole, as hereinafter described.

The under side of the forward portion of the leg-section *b* is, as shown, provided with a downwardly-extending bearing projection *g*, of such circumference as to admit of its being loosely seated within the foot-socket *c*, and provided with a depression *h* on its under side, of such shape as to receive and form a seat for the half-ball bearing-piece *d*, upon which it rests. The leg-section is provided with the usual hollow or socket *i*, which terminates at a point a short distance—preferably about three inches—above the lower end of the said leg-section. Formed in the lower side of the leg, at the center of the concavity forming the leg-socket *h*, is a smaller upwardly-extending socket *h'*, corresponding in size with the socket *e* of the ball *d* and producing a continuation of the same when said ball and socket are brought together.

k k' represent, respectively, the upper and lower joint-rods, which, as shown, are flattened throughout a portion of their length and have the form of a screw throughout their remaining portions. The lower flattened portion of the upper rod *k* terminates within the leg-socket *h'* in the form of an eye, as shown. From this point the rod *k* is continued upwardly through the solid portion of the leg and has its screw-threaded upper end terminating within the socket *i*, where it is held by a nut *l*. The flattened upper portion of the lower joint-rod *k'* terminates within the depression *e* of the ball in the form of an eye, as shown. From this point said rod is continued downward through the foot and its lower screw-threaded portion allowed to terminate within the depression *f* in the foot-bottom. The lower end of this rod *k'* is provided with a disk-shaped nut *m*, which fits loosely within the depression *f*. The eye in the lower end of the joint-rod *k* and the eye in the upper end of the rod *k'* are connected by a link *n*, which passes loosely through said eyes.

Formed in the rear portion of the leg-section and communicating at its upper end with the leg-socket *i*, is a cord channel or hole *p*, which, passing downward through the leg, has a continuation *n'* through the heel of the foot. Through these cord-holes is made to pass an ordinary flexible heel-cord *p'*, having its ends terminating in loops, said loops projecting,

respectively, within the leg-hollow *i* and within a suitable depression in the foot-bottom. The lower end loop is held by a transverse pin *r*, which passes through said loop. The upper
 5 end loop is supported by a pin *s*, which passes therethrough and which has one of its ends resting upon a cross-pin *t*, fixed across the lower portion of the socket *i*, and which has its remaining end inserted in the wall of said
 10 socket. The outer surface of the ball *d* is provided with a thin metallic plating *s*, while the concavity forming the socket *h* is lined with leather or other suitable material *t'*.

I am aware that various means have been
 15 heretofore employed to impart to the foot the desired lateral and other motions; but these devices differ from mine in many points of construction and operation.

The link-connection between the foot and
 20 leg-joint rods herein described will not only afford a backward and forward movement, but will afford such lateral and other movements as the astragalus in the natural ankle. The half-ball bearing-piece *d* and its surrounding channel will afford a perfect seat for
 25 the leg-socket, admitting of the desired play or rocking motion with perfect safety. The joint-link is round in cross-section and the eyes of the joint-rods are of such size as to
 30 admit of the free movement of the link ends therein. As shown and described, the center of the joint-link is central between the foot and leg, it being partially within the leg-socket and partially within the ball-socket,
 35 thus giving the joint and foot and leg con-

nection a common center from which all movement will be made.

By the herein-described construction and operation it will be seen that the jointed connection of the foot and leg being made
 40 through the center of the ball-bearing piece the use of cords other than the heel-cord is obviated, and that the freedom of the joint may be regulated by turning the nuts *l* and *m*. The latter may be readily turned by insert-
 45 ing the points *v'* of the key *v* (shown in Fig. 6 of the drawings) in holes formed in said nut on opposite sides of the center. The flattened portion of the joint-rods will serve to prevent
 50 a rotary motion of the foot and leg.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

In an artificial limb, the combination of the
 55 foot *a*, having a circular depression *c* in the top thereof, and a half-ball *d*, projecting from said depression, and a socket *e* in said half-ball, with the leg-section *b*, having the bearing-extension *g*, provided with the socket *h*, and the depression *h'* in said socket, the joint-
 60 rods *k k'*, linked together at their inner ends in the depressions *h'* and *e*, formed, respectively, in the recess *h* and the half-ball *d*, and adjustably secured at their outer ends in the leg and foot, substantially as described.

H. STREEBY SWANK.

In presence of—

BARTON GRIFFITH,
 C. C. SHEPHERD.