(Model.)

3 Sheets—Sheet 1.

J. O'BRIEN.

ARTIFICIAL LEG.

No. 290,915. Patented Dec. 25, 1883.

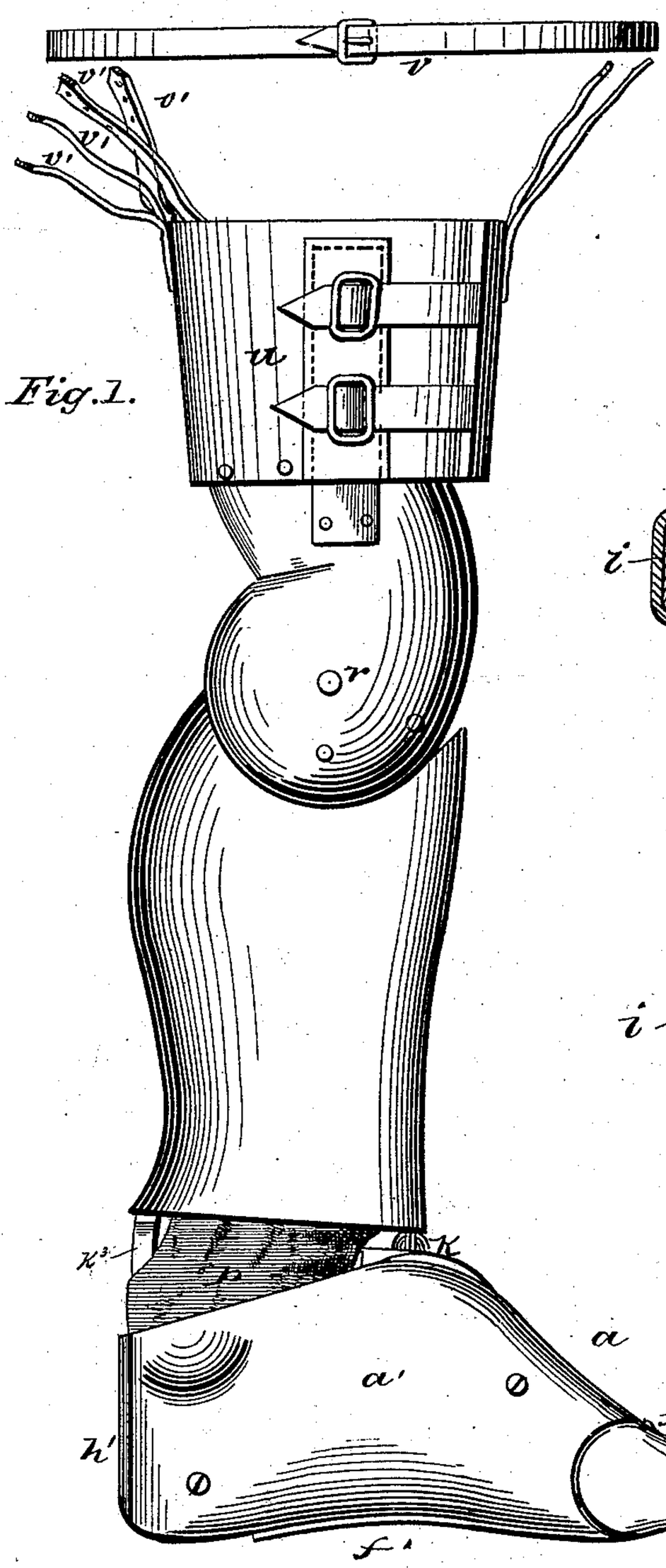

Fig. 1.

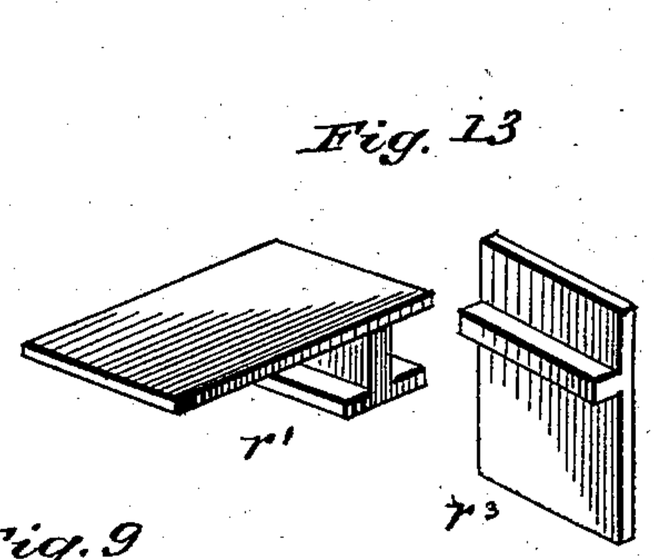

Fig. 13

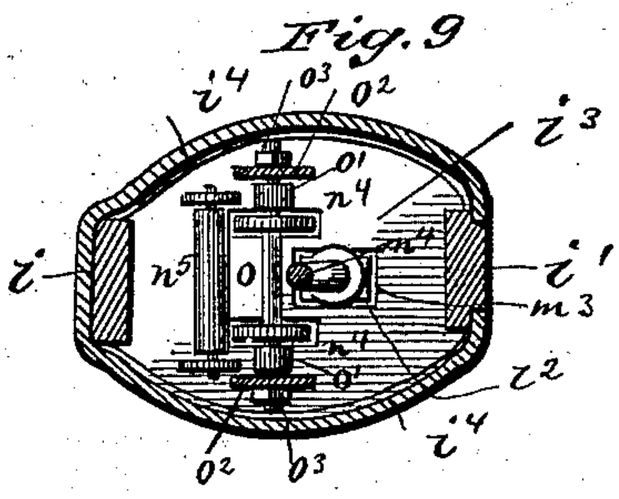

Fig. 9

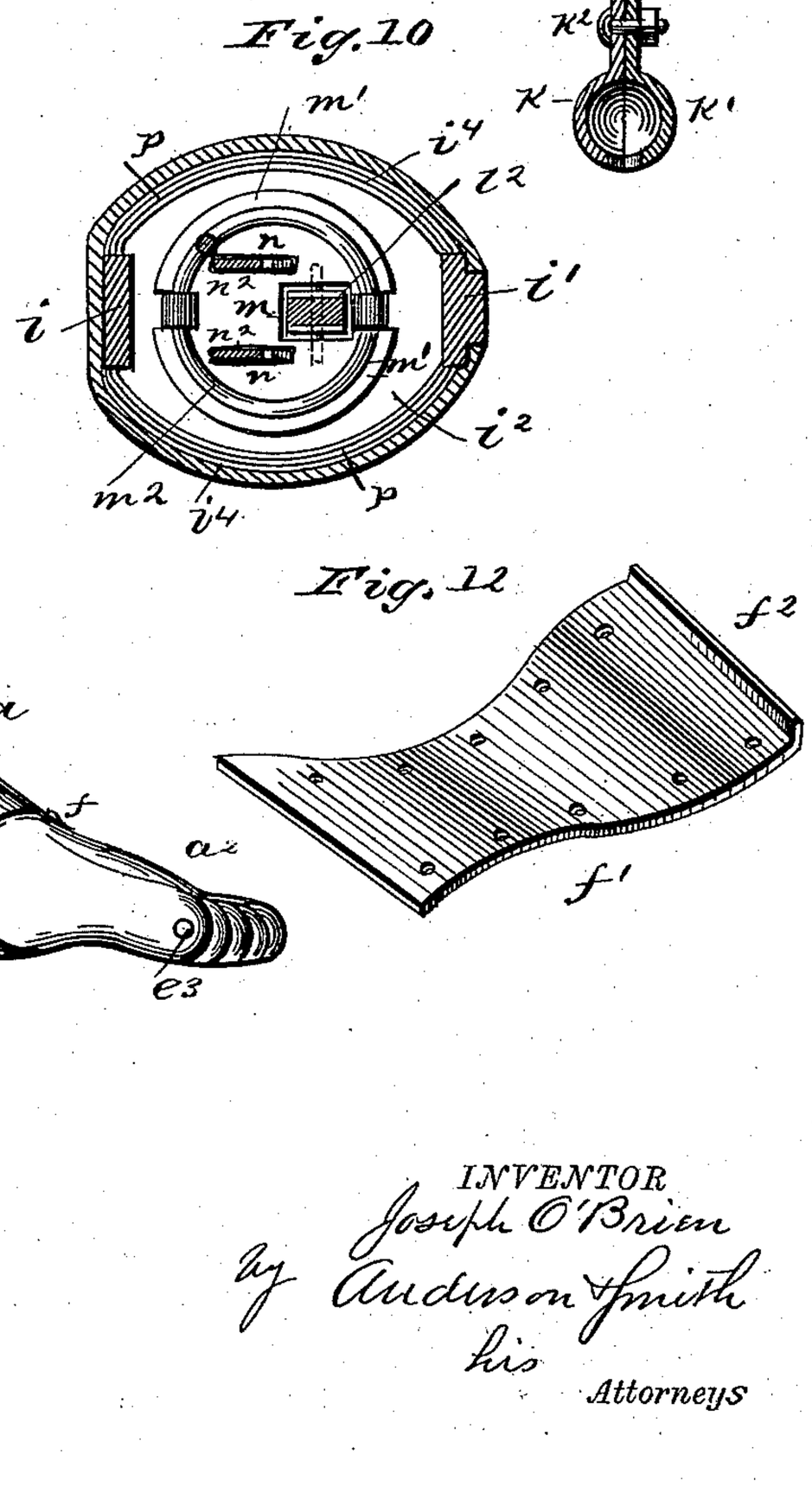

Fig. 10

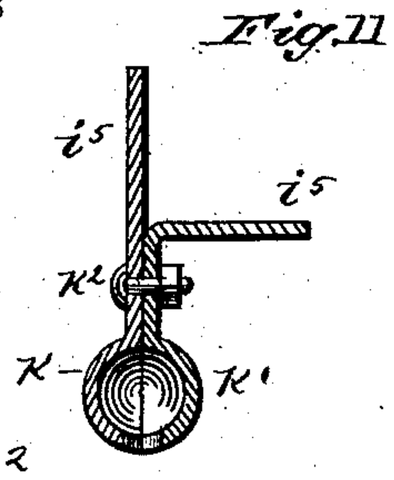

Fig. 11

Fig. 12

WITNESSES

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Attorneys

(Model.)

3 Sheets—Sheet 2.

J. O'BRIEN.

ARTIFICIAL LEG.

No. 290,915. Patented Dec. 25, 1883.

Fig. 15.

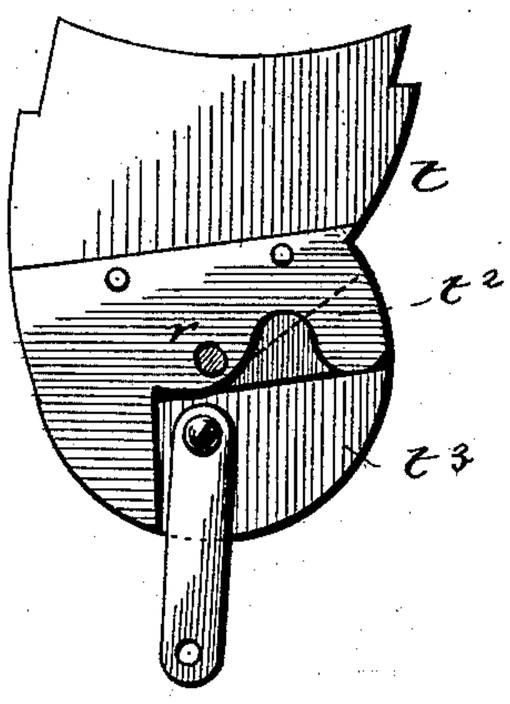


Fig. 14.

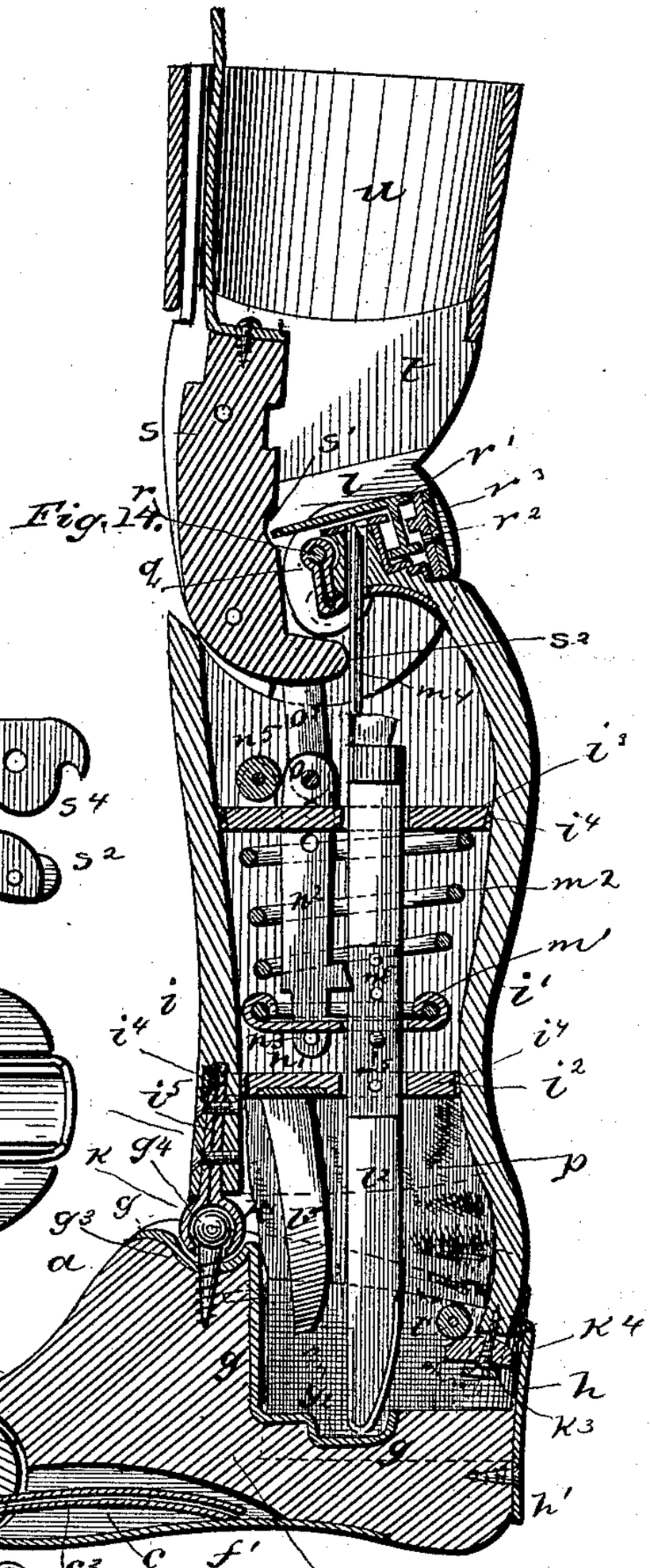
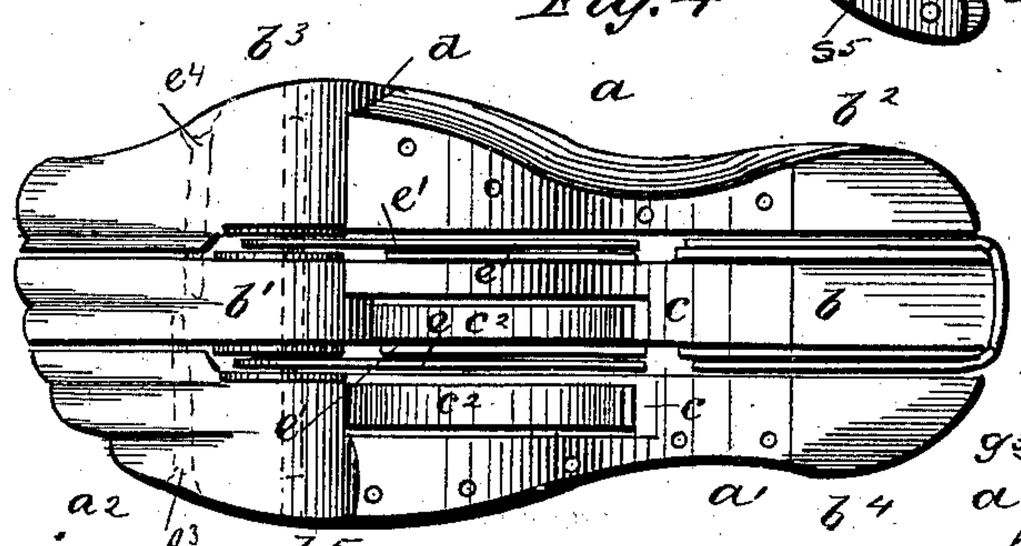


Fig. 4



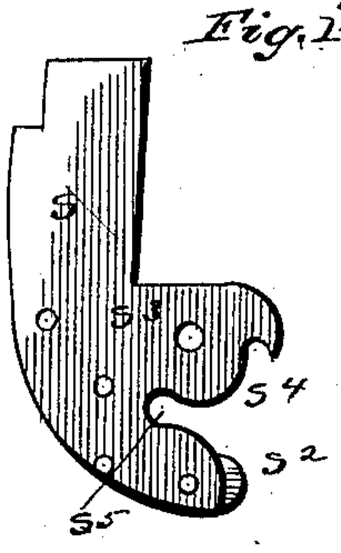
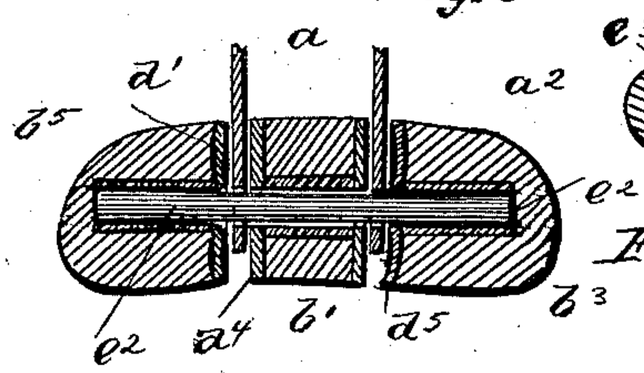


Fig. 6



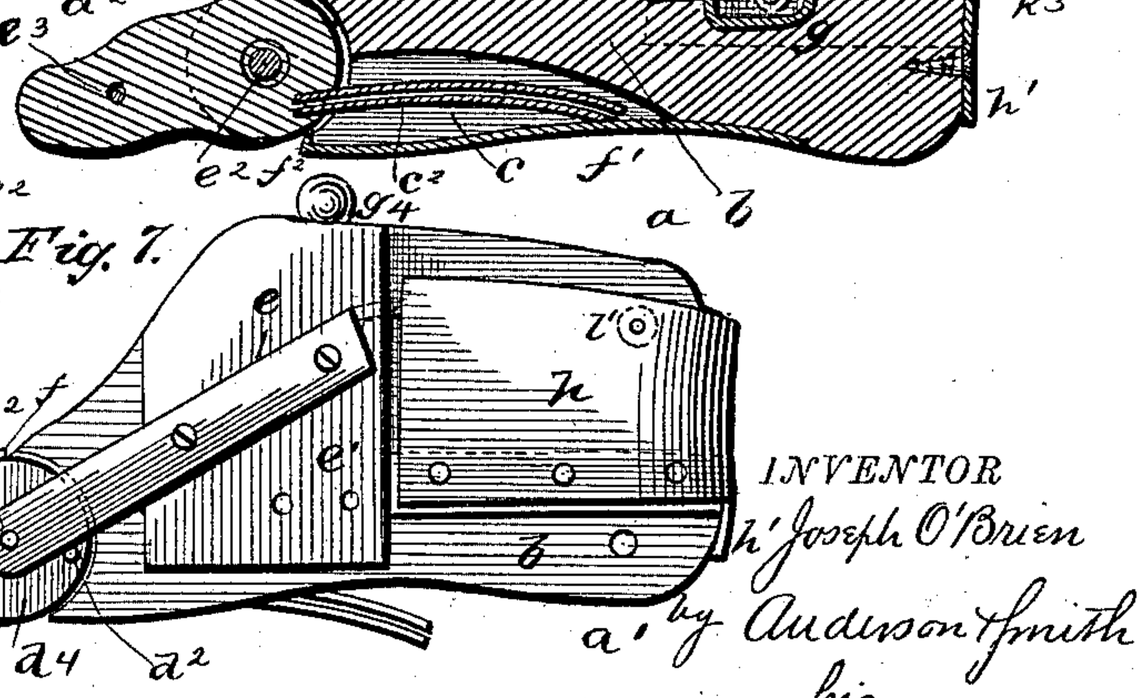


Fig. 7.

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J. O'BRIEN.

ARTIFICIAL LEG.

No. 290,915. Patented Dec. 25, 1883.

Fig. 3.

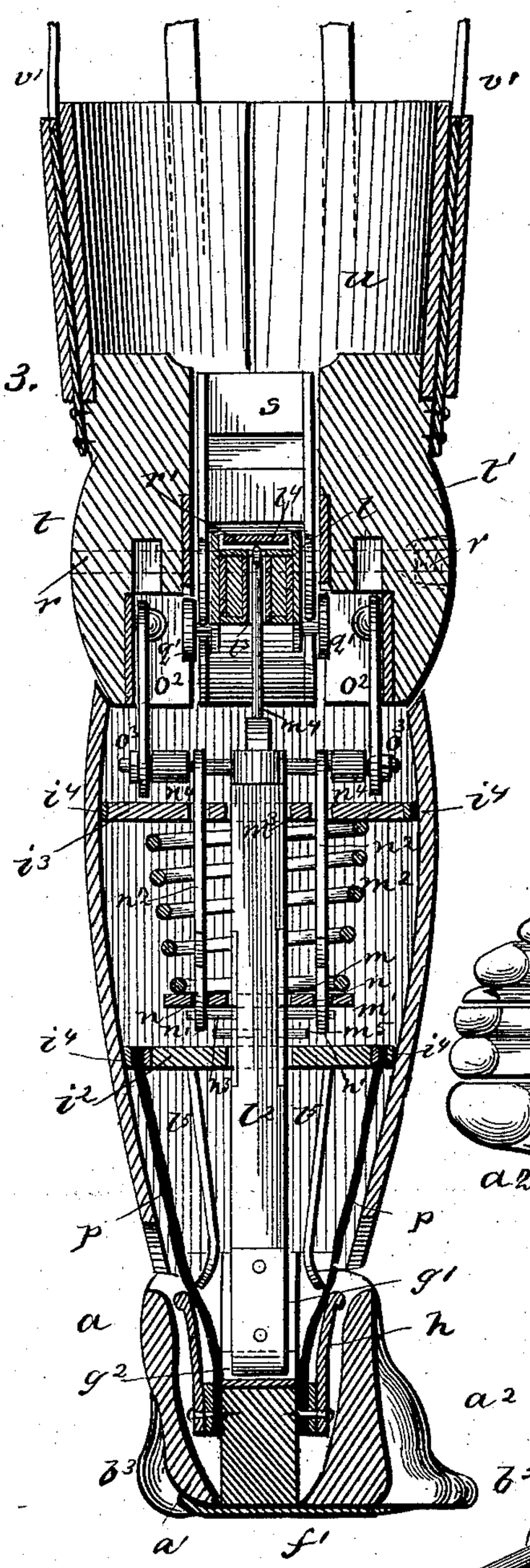


Fig. 16.

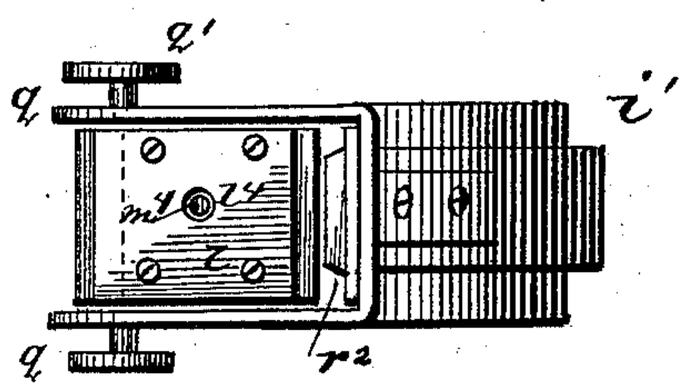


Fig. 5.

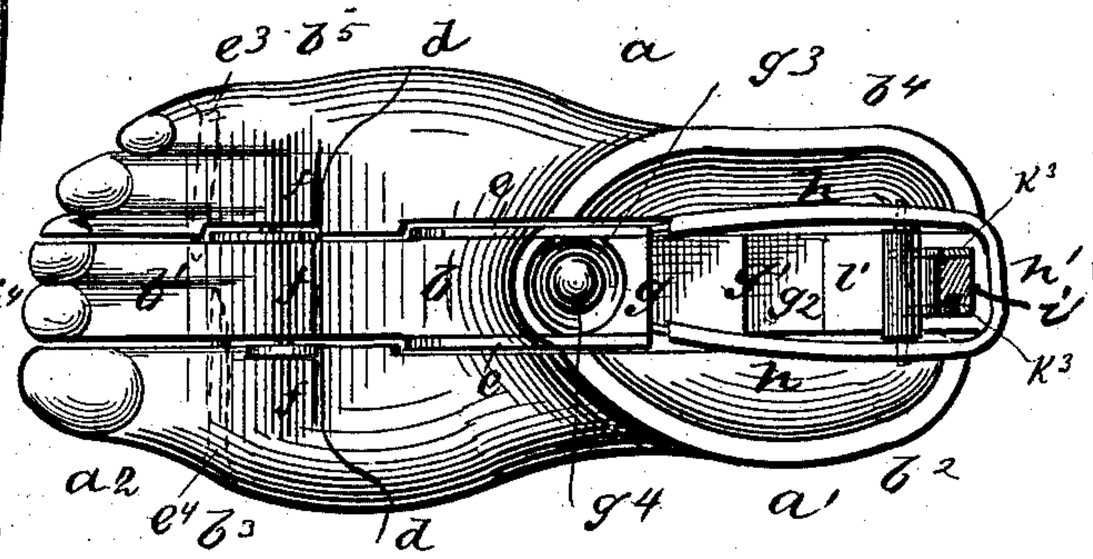


Fig. 17.

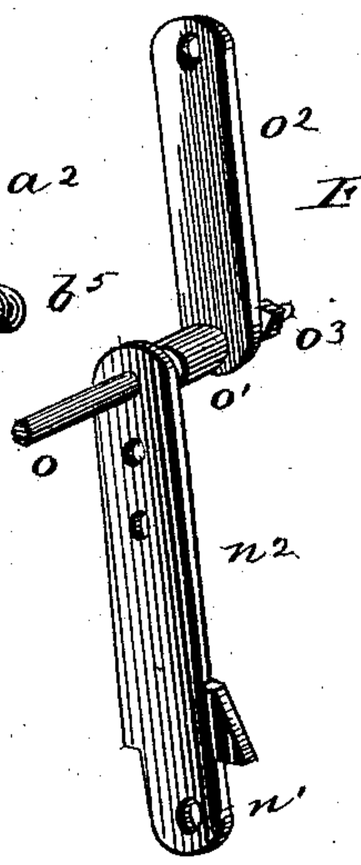
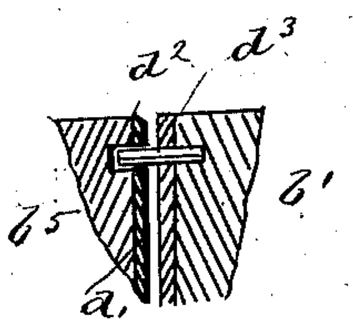


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOSEPH O'BRIEN, OF KALAMAZOO, MICHIGAN.

ARTIFICIAL LEG.

SPECIFICATION forming part of Letters Patent No. 290,915, dated December 25, 1883.

Application filed September 17, 1883. (Model.)

To all whom it may concern:

Be it known that I, J. O'BRIEN, a citizen of the United States, residing at Kalamazoo, in the county of Kalamazoo and State of Michigan, have invented certain new and useful Improvements in Artificial Legs; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a representation of a side view of my artificial leg; Fig. 2, a vertical central sectional view from front to rear of the leg. Fig. 3 is a vertical lateral section of the leg. Fig. 4 is a bottom view of the foot. Fig. 5 is a top view of the foot. Fig. 6 is a lateral sectional view of the toe-section. Fig. 7 is a side view of the central section of the foot. Fig. 8 shows the plates and pin between the toe-sections. Figs. 9 and 10 are horizontal sections near the knee-cap. Figs. 11, 12, and 13 are detail views. Figs. 14, 15, and 16 are details at the knee-cap, and Fig. 17 is a detail view of the hinged arms connecting the knee and lower leg.

This invention has relation to artificial legs; and it consists in the construction and novel arrangement of devices, as will be hereinafter fully described, and particularly pointed out in the claims appended.

The objects of this invention are to produce an artificial leg that will be capable, when worn, of assuming very nearly the flexions of the natural leg at the knee-joint, the ankle-joint, and the ball-sections of the toe-joints; also, of automatically stopping the knee flexion to bear the weight of the body of the wearer, and even an additional weight, while the artificial knee is in the bended position assumed in taking the steps while walking.

To properly use the leg the wearer will need some little instructions at first. The disciplined soldier throws the weight of the body on the fore part of the foot and leans forward in marching. At the first step the weight of the body is transferred to the heel of the advanced foot and the knee of the rear leg bends in making the step. To bring the rear leg forward, the weight transferred to the heel of the advanced leg causes the improved artificial knee to bend to a point where it is automatically stopped before passing to a position that will permit the wearer to take a sitting position with the knee bended, this position being that which is required in making the natural step. The ankle has also a laterally-swinging movement and a hinged vertical movement at the joint, and the toe-sections are elevated at the points while the foot is at rest, and will bend similarly to the natural foot when the heel is raised, thereby enabling the wearer after a little practice to make a nearly natural step in walking.

Referring by letter to the accompanying drawings, *a* designates the foot, which is made in two transverse sections—viz., the body-section a' and the toe-section a^2. These sections are made, respectively, in three horizontal vertical sections—viz., the middle sections, *b* b', and the outer sections, b^2 b^3 and b^4 b^5. The middle section *b* has a curved recess, *c*, in a portion of its under face near its forward end for the reception of a flat spring or springs, c^2, connected to the middle-toe section b'. The outer foot-body section, b^4, which is on the side of the foot in alignment with the little toe, is also recessed in its under face for a portion of its width for a similar purpose. The great-toe section has no spring. The front edges of the three body sections of the foot *a* are curved out rearwardly, as at *d*, to receive the rounded rear ends of the toe-sections. The little-toe section is recessed in its inner face, near the rear end, for the reception of a wear-plate, d', which is depressed below its upper edge, and has a perforation, d^2, for the reception of a dowel-pin, d^3, projecting from the adjoining wear-plate d^4 of the middle-toe section. The middle-toe section has a similar wear-plate, d^4, and dowel-pin on its opposite face, and the great-toe section has a wear-plate, d^5, similar to the wear-plate d' on the little-toe section. The middle-toe section is bored entirely through axially of the wear-plates, and the bore is metal-lined. The little-toe and great-toe sections are bored partially through axially of their wear-plates, and metal-lined. Bearing-plates of flat metal, *e*, are secured to each side of the middle section of the body

portion of the foot, and extend forward and downward from the instep-plate e'. These plates e are perforated near their forward ends to align with the bores of the toe-sections, and a rod, e^2, is passed through the bore of the middle-toe section into the bore of the little-toe section, which is secured to the middle-toe section by a screw, e^3, and the great-toe section is then slipped to place on the rod e^2, and a screw, e^4, connects it with the middle-toe section. At the commencement of the curves of the toe-sections at their lower portions shoulders f are provided, to limit the downward movement of the toe-sections at their juncture with body-sections of the foot. A sole-plate, f', having a transverse rearwardly and upwardly inclined flange, f^2, engages the lower edges of the body-sections of the foot, and is secured in place by screws, and forms a bearing for the springs of the toe-sections, which return the toe-sections to their normal position after they have been bent in using the foot. The spring is omitted from the great-toe section to permit it to be slipped to place. The instep-plate g is secured to the middle section, which is cut away angularly at its upper rear portion from about the instep-joint downwardly and rearwardly. The plate g covers the vertical rear edge of the cut-away portion, and extends forward on each side thereof to near its front edge at its lower portion, and clear to and along the curve of the instep at its upper portion. An integral arm, g', extends from the instep-plate g rearwardly over the heel portion of the middle section b of the foot portion. This middle heel portion has a depression or recess, g^2, in its upper face, which is preferably metal-faced to prevent wear of the parts at this point. The upper portion of the instep-plate is provided with a centrally-perforated concave seat g^3, through which the shank of a ball-head screw, g^4, passes into the wood of the middle body-section of the foot, as shown in the drawings. A wire-rimmed metal counter, h, having a downwardly-projecting rear arm, h', at its rear end, is secured to the rear edge and side portions of the middle heel portion of the foot, the wires of the rim portion of the counter extending into perforations in the rear edge portion of the instep-plate. The front and rear central or vertical middle portions of the shin and calf of the leg are made of sassafras wood, the pieces i and i' being properly curved to impart symmetry of outline. The pieces or standards i i' are secured to nearly oval-shaped wood connecting-plates i^2 and i^3 by metal edge-bands i^4, which also prevent the wooden plates from splitting, as I use very light wood for these plates. The lower end of the shin-strip i is kerfed vertically and laterally for a short distance for the reception of the tangs i^5 of two half-sockets, k k', which incase the ball-head of the screw g^4, and form the ball-and-socket joint for the ankle, the tangs i^5 being secured in place by the lower metal band and screws.

Instead of the two tangs i^5 entering the kerf in the shin-strip, one only may enter the shin-strip, and the other, which is bent midway at right angles to the first one, may be secured to the under face of the lower wooden plate by screws, that portion of the wooden shin-strip below the lower wooden plate in the former instance being cut away flush with the wood plate i^2 in this instance, and a bolt, k^2, and nut being used to secure the tangs together. The lower end of the wooden calf-strip i' is curved inwardly, is reduced in size near its lower end in its width, and is metal-faced at k^3 to prevent wear. The metal facing extends around and below its point, and secures a leather tip, k^4, in place to prevent rattling at this point.

To the upper end of the wooden calf-strip, which curves inwardly over the hollow lower leg, is secured a hollow metal box, l, to which the upper or knee portion of the leg is pivoted. Springs l^5 l^5 extend downwardly from the under side of the lower wooden plate, i^2, to which they are secured by metal plates, and enter the metal counter to control the lateral articulation of the ankle-joint. The metal counter is provided with an internal friction-roller, l', in front of the lower end of the wooden calf-strip and in rear of the lower end of a laterally-perforated wooden push-rod, l^2, having its lower end metal-faced, its middle perforated portions metal-faced, and provided at its top with a metal rod, m^4, which passes through vertical perforations l^3 l^4 in the bottom and top walls of the hollow rectangular box l. The push-rod l^2 rests in the depression or recess g^2 in the heel portion of the middle section of the foot, and passes up through the lower wooden plate, i^2, thence through a recess, m, in a metal plate, m', secured to the lower coil of a spiral spring, m^2, thence through a recess, m^3, in the upper wooden plate, i^3, where it connects with the metal rod m^4, before described.

Below the metal plate m' a transverse pin, m^5, is passed through one of the lateral perforations m^6 in the push-rod l^2, to form a seat for the plate m', and cause it to be carried up to compress the spiral spring m^2 when the weight of the body is thrown upon the heel of the artificial leg. The metal plate m' is provided with two recesses, n n—one near each side—to receive the shouldered tenons n', at the lower ends of two metal strips, n^2 n^2. The tenons n' are perforated beneath the plate m', and are connected by a transverse bolt, n^3. The metal strips n^2 n^2 are perforated at their upper ends, and are passed through two recesses, n^4 n^4, in the upper wooden plate, i^3. The wooden plate i^3 is provided on its upper face with a friction-roller, n^5, against which the edges of the metal strips n^2 n^2 bear. A rod, o, is passed through either pair of perforations in the upper ends of the metal strips n^2 n^2, above the upper wood plate, i^3, and sleeves o' o' are slipped on the projecting ends of this rod o, and short metal arms o^2 o^2 are slipped upon the rod outside of the sleeves, and secured in place by nuts o^3 o^3. An ankle-shield,

p, of buckskin, is secured to the exposed edges of the lower wooden plate, i^2, by plates and screws, encircles the rear edge of the metal counter, and is secured at its lower edges along the lower edges of the metal counter by plates and screws.

The hollow metal box l has side walls, with rounded edges q at front and lower portions. and near their lower rounded corners they are provided with short laterally-projecting headed studs q' q'. The top wall of the hollow metal box l is slightly depressed between the side walls. The upper ends of the calf-strip enters the hollow metal box l from the rear and below, and is secured in place by screws passed through the lower wall, side walls, and rear wall. The seat for the pivot-rod r of the knee-sections is also made laterally through the metal box l, near its front upper corner. A projecting stop-plate, r', for the knee-cap, is hooked into a recess, r^2, in the top plate or wall, r^3, of the metal box l, so that its front edge may be elevated by the metal rod on the push-rod l^2, without detaching the stop-plate from its recessed seat. The middle section, s, of the knee-joint is also made of sassafras wood, which is light, but very strong. It curves downwardly and inwardly, and is notched laterally at s' to receive the point of the stop-plate r' when the weight of the body has been shifted to the fore part of the foot and the wearer has assumed a sitting position without bearing on the heel portion When the weight is borne upon the heel portion of the foot, the punch-rod l^2 compresses the spiral spring, and the metal rod lifts the front edge of the stop-plate above the transverse notch s' and causes it to meet the projection s^2, which locks the knee-cap and sustains the weight while the wearer is making the step with the natural leg. The middle section of the knee is provided with metal plates s^3, covering its sides. These plates s^3 are perforated for the securing-screws, and have perforated hook-arms s^4 and slots s^5 for engaging the laterally-projecting headed studs on the sides of the metal box l while the knee is being operated. The side sections, t t', of the knee are recessed on their inner faces, near their lower ends, as at t^2, and are metal-faced at their wearing-points. They are pivoted near the corners of the angular recesses t^3 to the upper ends of the pivoted metal arms o^2 o^2. The section t of the knee is perforated for the main pivot, and the section t' is also perforated for the same, and provided with a threaded nut for the reception of the main pivot, which, when in place, does not protrude from the perforations in the outer knee-sections, and does not turn in the nut when the knee is operated.

The socket u is of oak-tanned leather, and is secured to the knee-sections by steel strips and screws. The lower leg portion is covered with light sole-leather, and is secured to the calf-strip at the back. The socket is provided with tongueless buckles and unperforated straps, in order that it may be accurately adjusted to the stump. The straps are of buckskin, buckled to the waist-belt v. The rear straps, v' v' v' v', pass from the back of the socket, over the shoulders, and down to the waist-belt. The two front straps pass from the front of the socket to the waist-belt.

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

1. In an artificial leg, the combination, with the middle-toe section having the perforated wear-plates carrying dowel-pins on its opposite faces at the ball-section of the foot, and having a metal-lined axial bore through it, and the wear-plates of the great and little toe sections having depressed wear-plates on the inner faces opposite the wear-plates of the middle-toe section, the axial rod and securing-screw for holding the toe-sections together, and the flat metal bearing-plates extending from the foot-section to the axial rod between the wear-plates, the springs connected to the middle and little toe sections working in recesses between the foot section and sole-plate, substantially as specified.

2. In an artificial leg, the lower leg-section having the wooden connecting-plates, recessed as shown, and bound with metal, the recessed metal plate secured to the lower coil of a spiral spring resting against the upper wooden connecting-plate, the perforated metal arms having shouldered tenons on their lower ends passing through recesses in the metal plate, secured therein by a connecting-bolt, and having bearings on a rod above the upper connecting-plate, the perforated push-rod, with the adjusting cross-bolt beneath the recessed metal plate, and metal rod on top for operating the hinged stop-plate against the middle section of the hinge knee-section, connected by pivoted arms to the transverse rod above the upper wooden connecting-plate, substantially as specified.

3. In an artificial leg, a vertically and laterally articulating foot secured to the leg by a ball-and-socket joint, and having a metal counter and lateral regulating-springs, in combination with a push-rod and a spiral spring between a stationary and a movable plate, said push-rod having a metal rod at its upper end for operating a hinged stop-plate in the knee-cap by pressure upon the heel of the foot to lock the knee-cap at the half-turn of the knee, to sustain the weight of the wearer in this position while making a step, substantially as specified.

4. In an artificial leg, a foot having a toe-section that will bend upwardly, and a knee portion having a hinged central section having a transverse notch in its inner curved face below a locking projection on the same face, and hook-stops on its metal face-plates to engage headed studs on the sides of a metal box at the upper end of the calf-strip, whereby a

sitting posture may be assumed without operating the push-rod or stop-plate, substantially as specified.

5. In an artificial leg, the ankle-shield of buckskin secured to the exposed edge of the lower wooden connecting-plate, extending around the rear of the metal counter, and secured along the lower edges of the metal counter between middle and outer foot-sections, substantially as specified.

6. In an artificial leg, a removable metal counter secured to the middle foot-section and provided with a friction-roller, in combination with the calf-strip carrying the metal facing and the leather tip at its reduced end, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH O'BRIEN.

Witnesses:

JOHN M. ABRAHAM,

HIRAM UNDERWOOD.