

J. Fravel,

Artificial Leg.

N^o 39,912.

Patented Sep. 15, 1863.

Fig: 1.

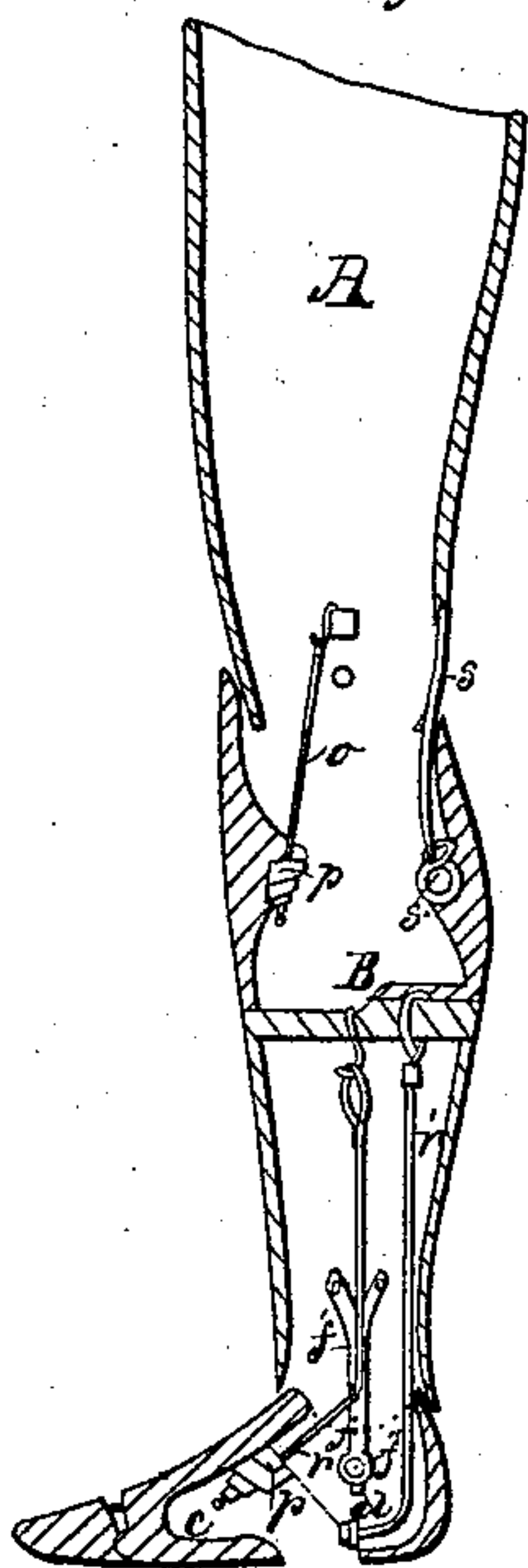


Fig: 2.

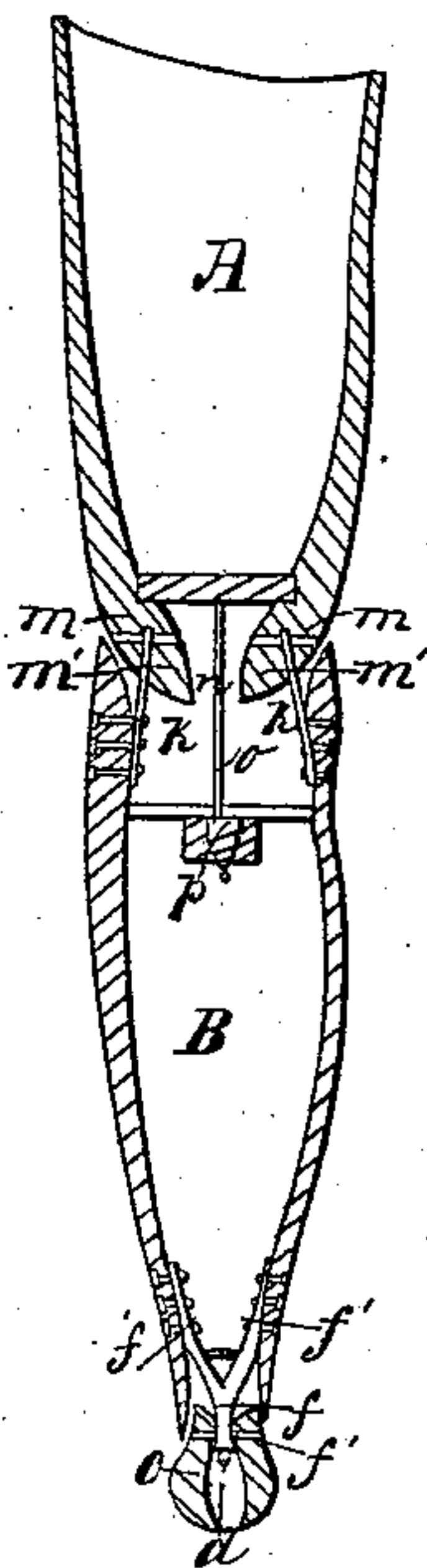


Fig: 3.

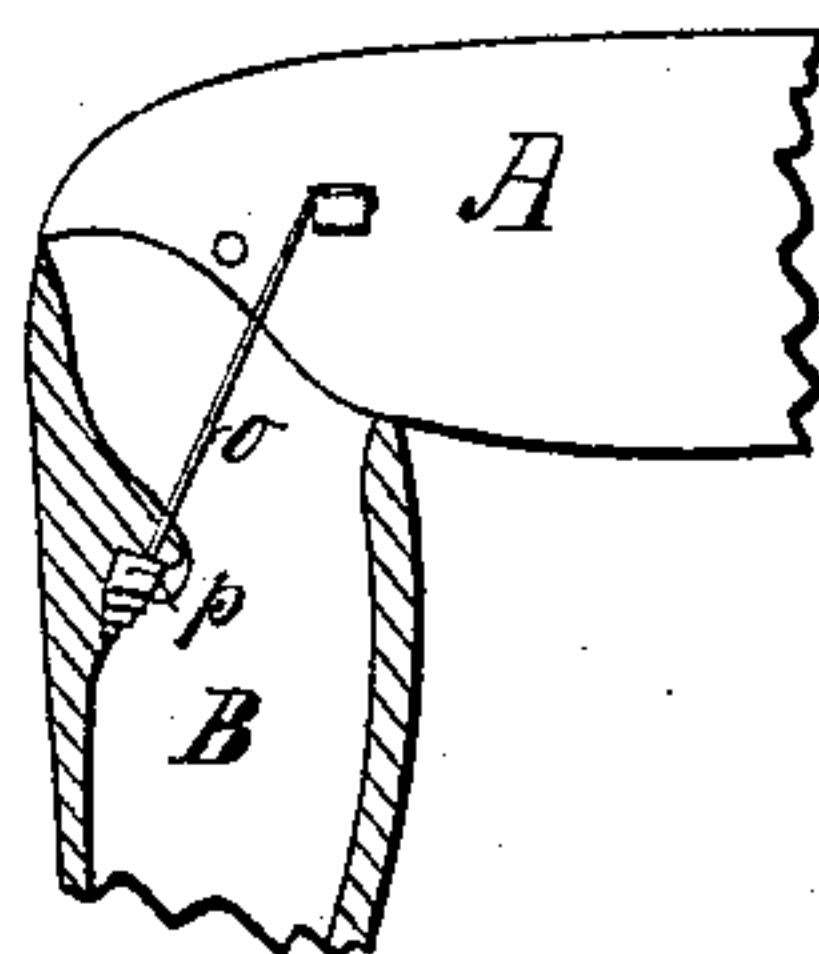


Fig: 4.

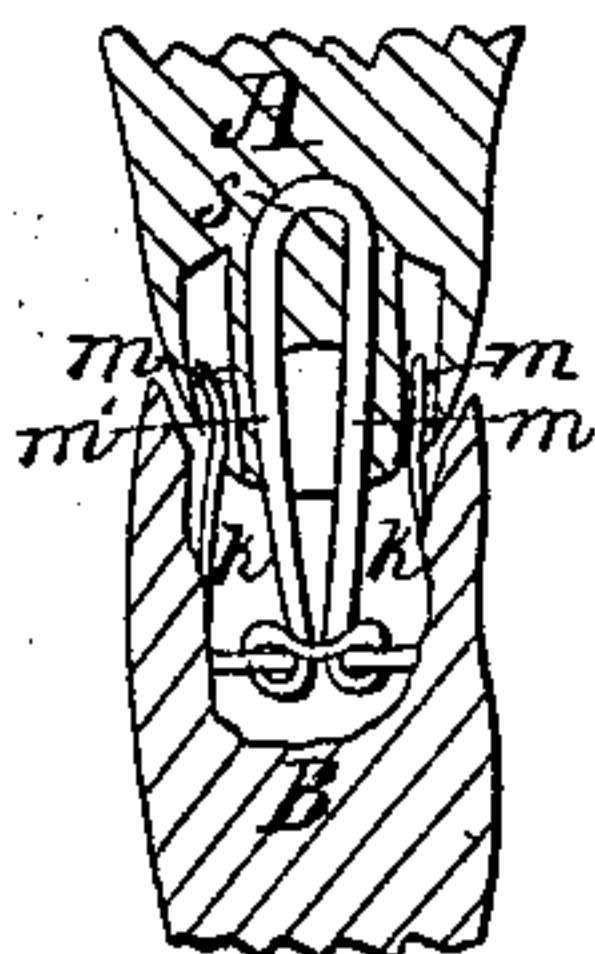


Fig: 5.

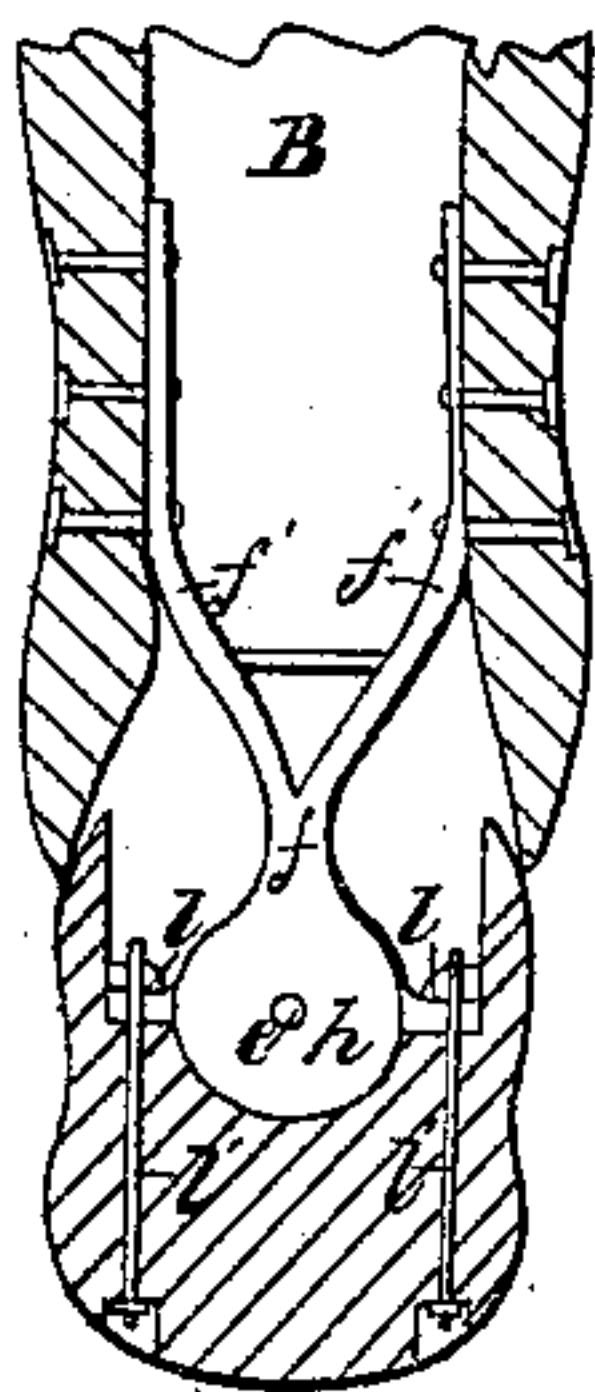


Fig: 6.

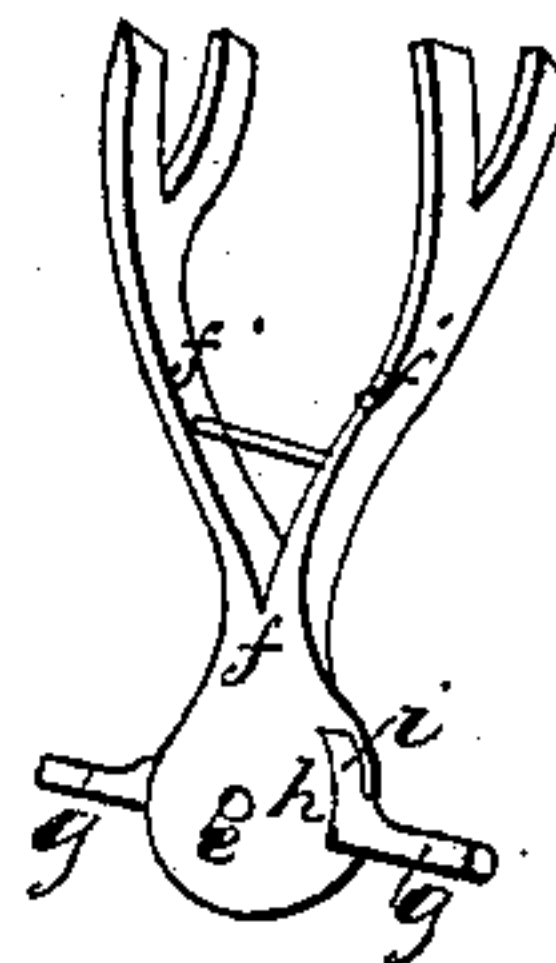


Fig: 9.

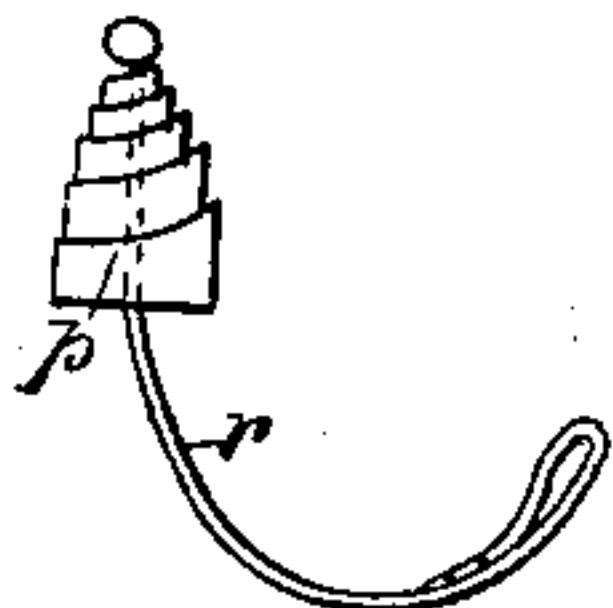
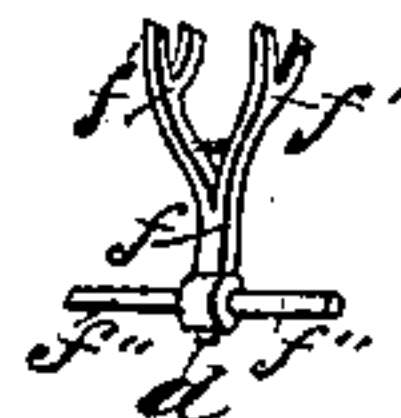


Fig: 7.



Fig: 8.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOHN FRAVEL, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN ARTIFICIAL LEGS.

Specification forming part of Letters Patent No. **39,912**, dated September 15, 1863.

To all whom it may concern:

Be it known that I, JOHN FRAVEL, of the city and county of St. Louis, and State of Missouri, have invented a new and useful Improvement in Artificial Legs; and I do hereby declare that the following is a full and clear description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, and made to form a part of this specification.

This invention relates, first, to the construction and arrangement of ankle-joints; second, to a new method of constructing the knee-joints.

In reference to the accompanying drawings, Figure 1 is a vertical sectional side elevation of an artificial leg constructed in accordance with my invention. Fig. 2 is a sectional posterior view of the same. Fig. 3 is a sectional side view of the thigh and leg, showing the position of the knee spring and its tendon when the leg is flexed. Fig. 4 is a sectional posterior view of the thigh and leg, showing specially the arrangement of the check-cord, a portion of the leg being broken out in order to show the mode of securing said cord therein. Fig. 5 is a sectional posterior view of the leg and foot, showing the construction and arrangement of the ankle-joint. Fig. 6 is a perspective view representing said joint as detached from the leg. Fig. 7 is a side elevation of the pin or journal of said joint, shown by itself. Fig. 8 is a perspective view of the ankle-joint, varied slightly in construction from that shown in Fig. 6. Fig. 9 is an elevation of the spring employed at the knee and foot of the leg.

A represents the thigh, B the leg, and c the foot, of the limb.

My improved ankle-joint will be formed of steel or other suitable metal, with side straps, *f'*, (which will be rigidly secured to the lower portion or ankle of the leg,) a shank, *f*, and a pin, *f''*. The said pin passes through the shank *f*, where it may be secured by means of set-screw *d*, and is adapted to fit and work in suitable bearings formed in the sides of the foot to receive it. Said bearings may be bushed with suitable material to insure durability. This construction of the ankle-joint is clearly represented in Figs. 1, 2, and 8.

In cases wherein it may be desired to combine lateral with the forward and backward

motion of the leg, the ankle-joint may be varied so as to accomplish that object without departing from the spirit of my invention—viz., the base of the shank *f* may be enlarged and made so as to form a ball, *h*, (shown clearly in Figs. 5 and 6,) which will have made through it an opening, *i*, (shown in Fig. 6,) adapted to receive the pin *g*. Said pin will be secured in the ball *h* by means of a screw, *e*, and will have provided for its ends suitable bearings in the sides of the foot *c*, when it may be secured by means of caps *l* and rods *l'*, as shown in Fig. 5. A proper socket may be formed in the foot to receive the ball *h*, by means of which the said ball will be made to act in conjunction with the pin *g* in sustaining the weight brought to bear upon the leg. The pin *g* is made to fulfill precisely the same office as the pin *f''*—namely, allowing forward and backward motion to the leg while the foot remains stationary, and assisting to secure the foot to the leg, while the opening *i* allows lateral motion to the ball *h*, and consequently to the leg.

Among the many advantages secured by means of this improvement in ankle-joints it may be proper to mention that the foot *C* may be made much stronger and more durable than those in common use, the steel shank *f* working as it does in the center of the foot, the bearings and connections of the pin *f''* or *g* being at the sides of the same, thereby permitting the external ankle to overlap the instep, sides, and back of the foot, gives strength to that part of the foot immediately in front and over the said pin, whereas, in cases where the ankle-joints are formed with side straps connected with the sides of the foot the external ankle must necessarily work inside the foot, thereby involving the necessity of cutting away the instep and that part of the foot immediately in front and over the bolt used to secure said side straps, thus seriously weakening that part of the foot and causing it frequently to break.

All openings in the exterior ankle through which dust or other refuse matter might reach the interior of the foot, and thereby injure its working parts, are avoided by the aforesaid improvement. I may also state that my improved ankle-joint forms its own stop—that is, it prevents the ankle from being forced too far forward or backward, the construction

and arrangement of the said joint being such that the striking part of the joint which is at the junction of the side straps, *f'*, and shank *f* will be brought to bear against the instep and back part of the foot at the proper time to preserve the ankle from excessive motion, and even in case of extreme tension or breakage of the heel-cord the forward motion of the ankle will be arrested at the proper time to prevent injury to the limb or inconvenience to the wearer.

k represents the side straps of the knee-joint, which will be formed of suitable metal and firmly riveted to the leg B. They will be made to extend upward in such manner as to be adapted to fit and work in proper mortises prepared for them in the posterior part of the knee, as shown distinctly in Fig. 4. In the upper ends of said straps *k* are formed holes adapted to receive the bolts *m*. The said bolts passing through the straps *k* are made to fit and work in suitable bearings in the knee. Thus the leg 13 and thigh A may be connected and the knee-joint formed in the most perfect and substantial manner, leaving the center space, *n*, of the knee free for the action of the tendon *o*, so that when the leg may be flexed as required for a sitting posture, the said tendon *o* may pass to the rear of the axis of the knee, as represented in Fig. 3, by means of which the said spring and tendon may be made to hold the leg in a flexed position. At the same time they will be allowed partial relaxation, which tends to preserve the strength and durability of the same. The bolts *m* may be secured and prevented from rotating in the side straps, *k*, or working laterally by means of set-screws *m'*. Many other advantages are gained by this mode of constructing the knee-joint, among which may be named the fact that by means of the straps *k* working in mortises in the knee and acting as stops to the leg by coming in contact with and bearing against the solid portions of the knee in front of the mortises. The thigh is prevented from being forced too far forward with reference to the knee-joint, thereby preventing the danger of crushing the upper front edge of the leg 13 even in case the check-cord should be broken.

p p represent conical coiled springs formed of sheet metal of suitable character, with the coils separated sufficiently to prevent friction or noise in their operation. As a metal best adapted to the construction of said springs, I prefer sheet-steel, (but little tempered,) which may be cut in strips varying in width and

length to secure the desired action and power to the springs. They will be made in the form of a cone and operated from the smaller end. These springs are peculiarly adapted to the knee and ankle joints of artificial limbs from the fact that they are more durable, lively, and life-like in their action from first to last than any spring now in common use for a like purpose. They are equally adapted to the knee and ankle joints, and are easily adjusted to their proper places for operation. The office of the spring *p*, arranged in the foot *c*, as shown in Fig. 1, in connection with the tendon *r*, and the tendo Achillis *r'*, is to sustain the foot in a normal or proper position for walking. If desired, this spring may be secured in the leg 13 and the tendon *r*, attached to the foot. The office of the said spring at the knee is to extend the leg in walking, and it may be located in the thigh instead of the leg; but I prefer the arrangement herein described both at the knee and ankle.

s represents the auxiliary check-cord formed endless, so that it may be readily looped, around, or detached from the cross bar *s'*, seen in Fig. 4, without deranging or defacing any part of the limb. The upper portion of said cord is fitted in a groove formed for it in the rear part of the thigh, and its office is to check the forward motion of the thigh or leg, as the case may be, and thus prevent the parts of the knee-joint from coming together or in contact suddenly, thereby avoiding noise in the operation of the joint.

Having thus described my invention sufficiently to enable others skilled in the art to make and use the same, what I claim as new, of my own invention, and desire to secure by Letters Patent, is—

1. The within-described ankle-joint, composed of the parts *f f' h g*, all being constructed and arranged to operate substantially as and for the purposes set forth.

2. Constructing the knee-joint in such manner that the side straps, *k*, may be made to work in mortises in the knee, and to act as stops, and so that the space *n* may be afforded for the free action and movement of the tendon *o*, substantially as herein described, for the purposes set forth.

In testimony whereof I have hereunto set my hand and seal this 11th day of May, 1863.

JOHN FRAVEL. [L. s.]

Witnesses:

H. E. CLIFTON,
HERRM BOERKE.