

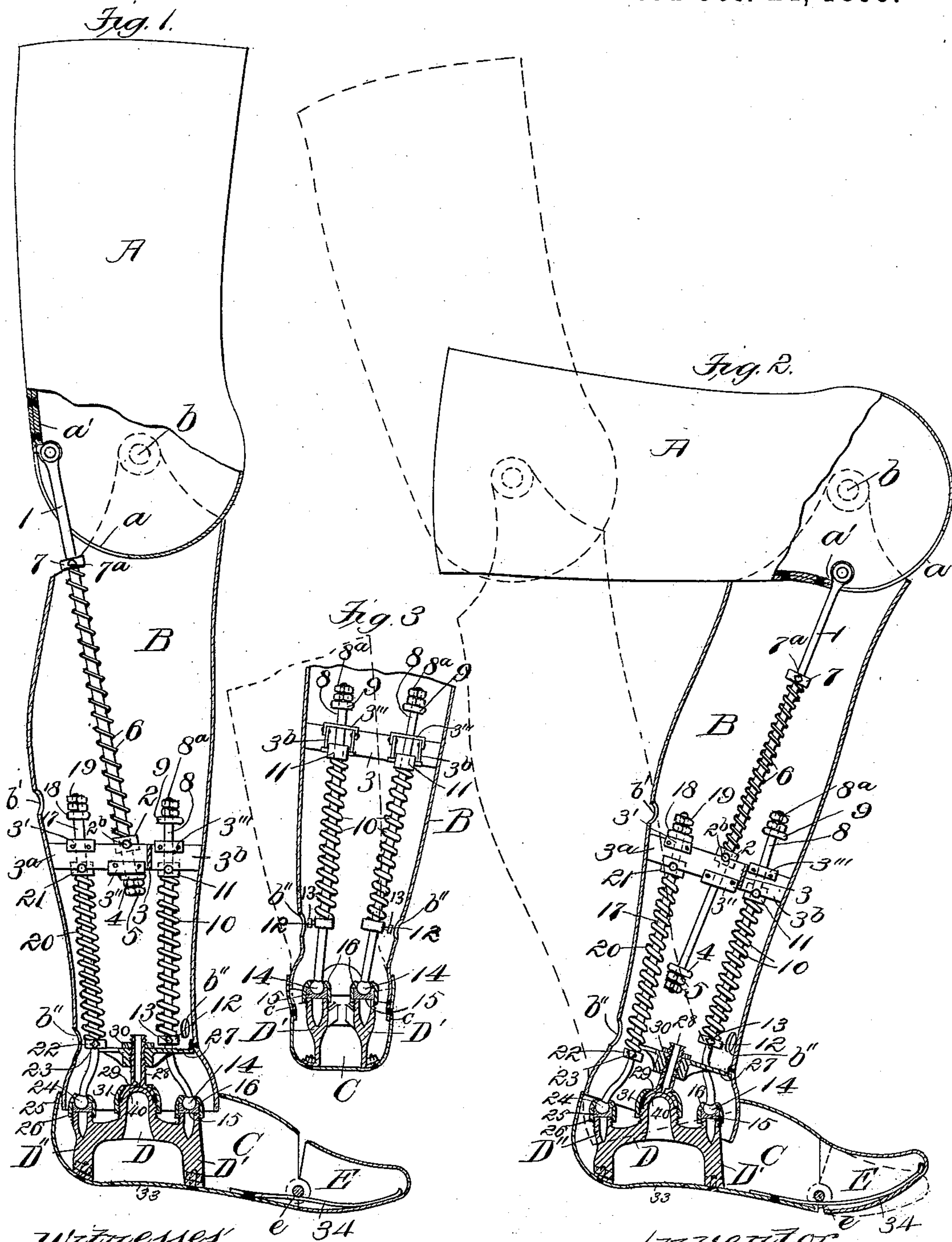
(No Model.)

2 Sheets—Sheet 1.

J. F. READ.  
ARTIFICIAL LIMB.

No. 507,453.

Patented Oct. 24, 1893.



Witnesses  
F. R. Cornwall  
W. M. Byrne.

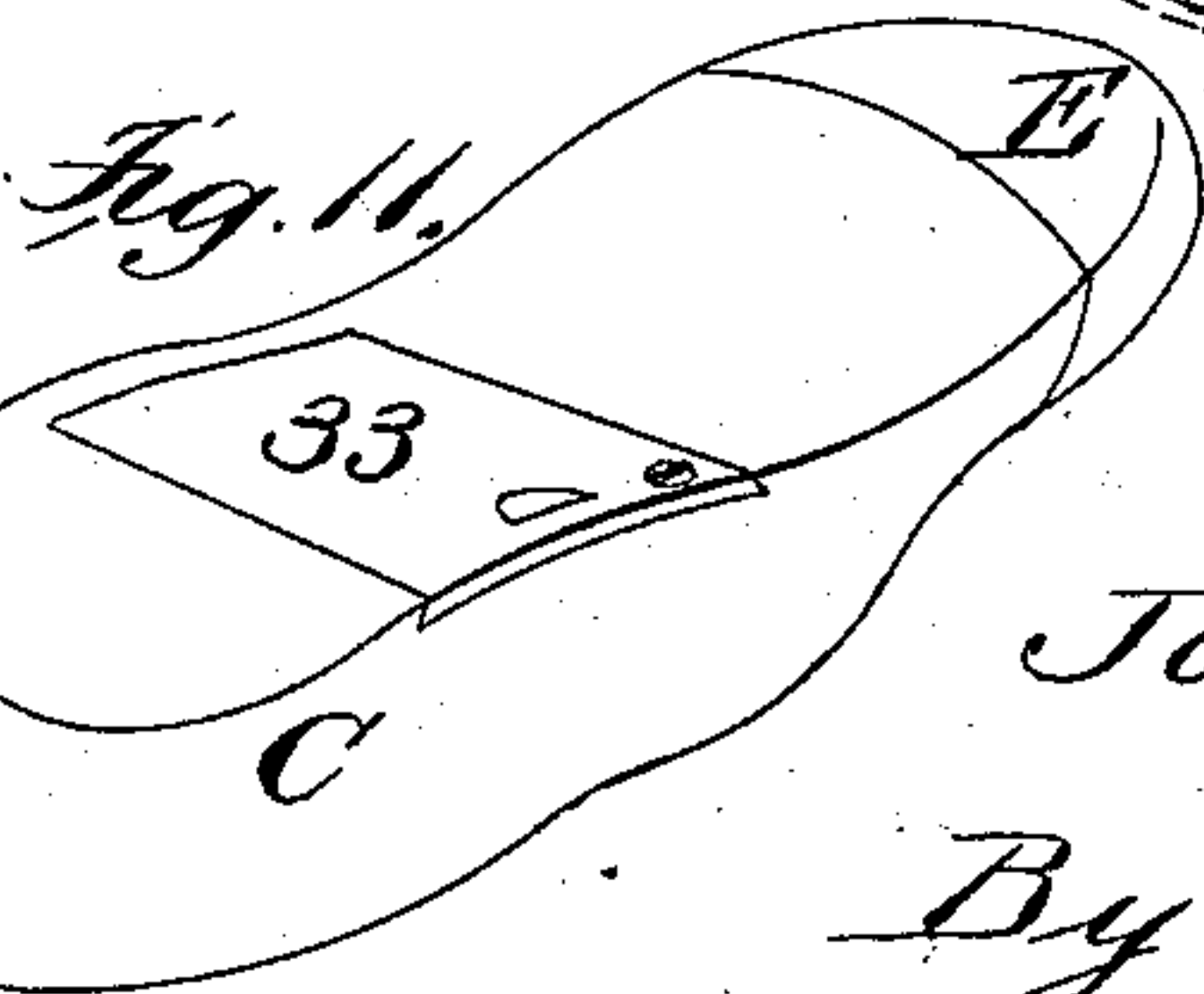
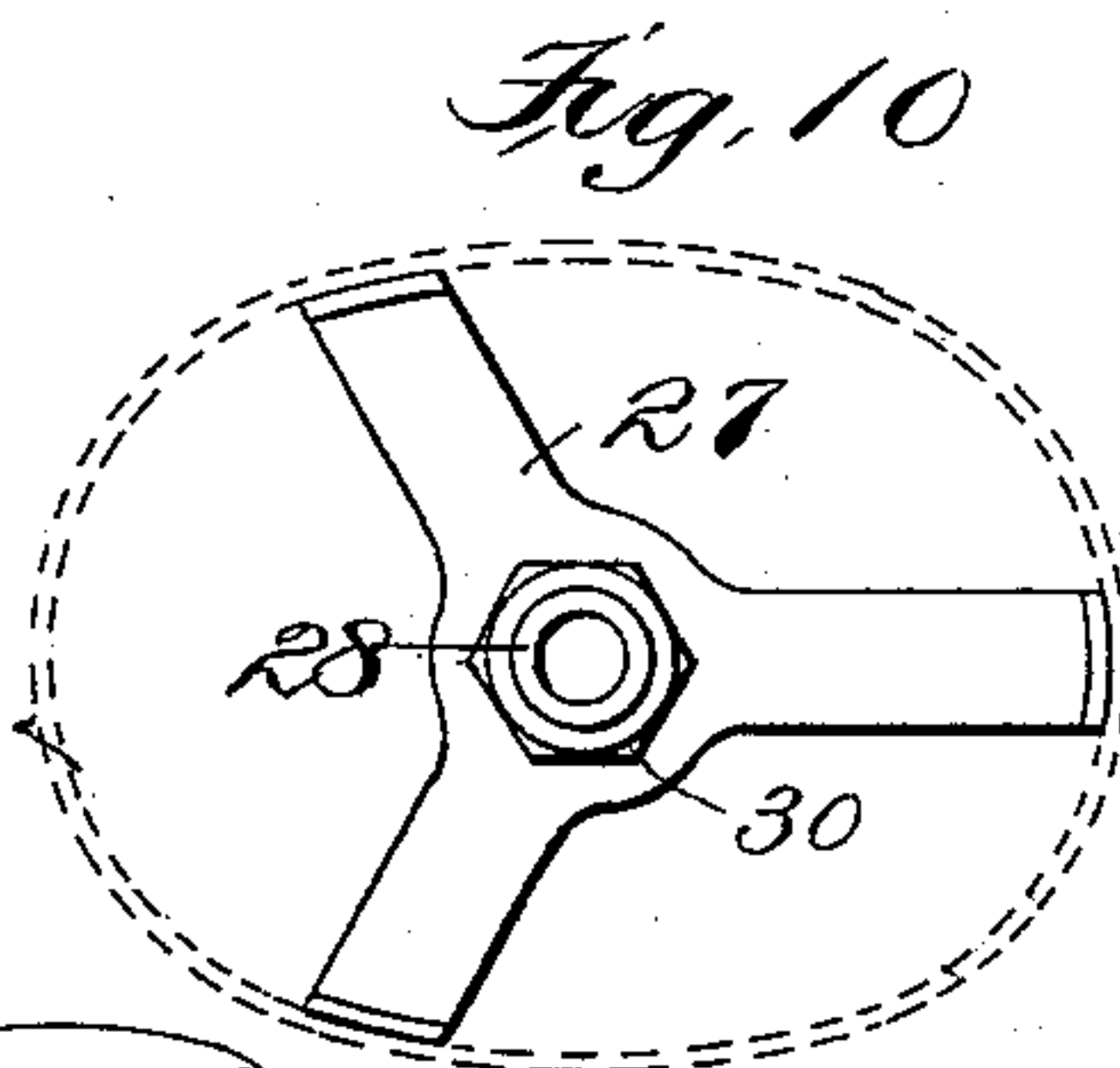
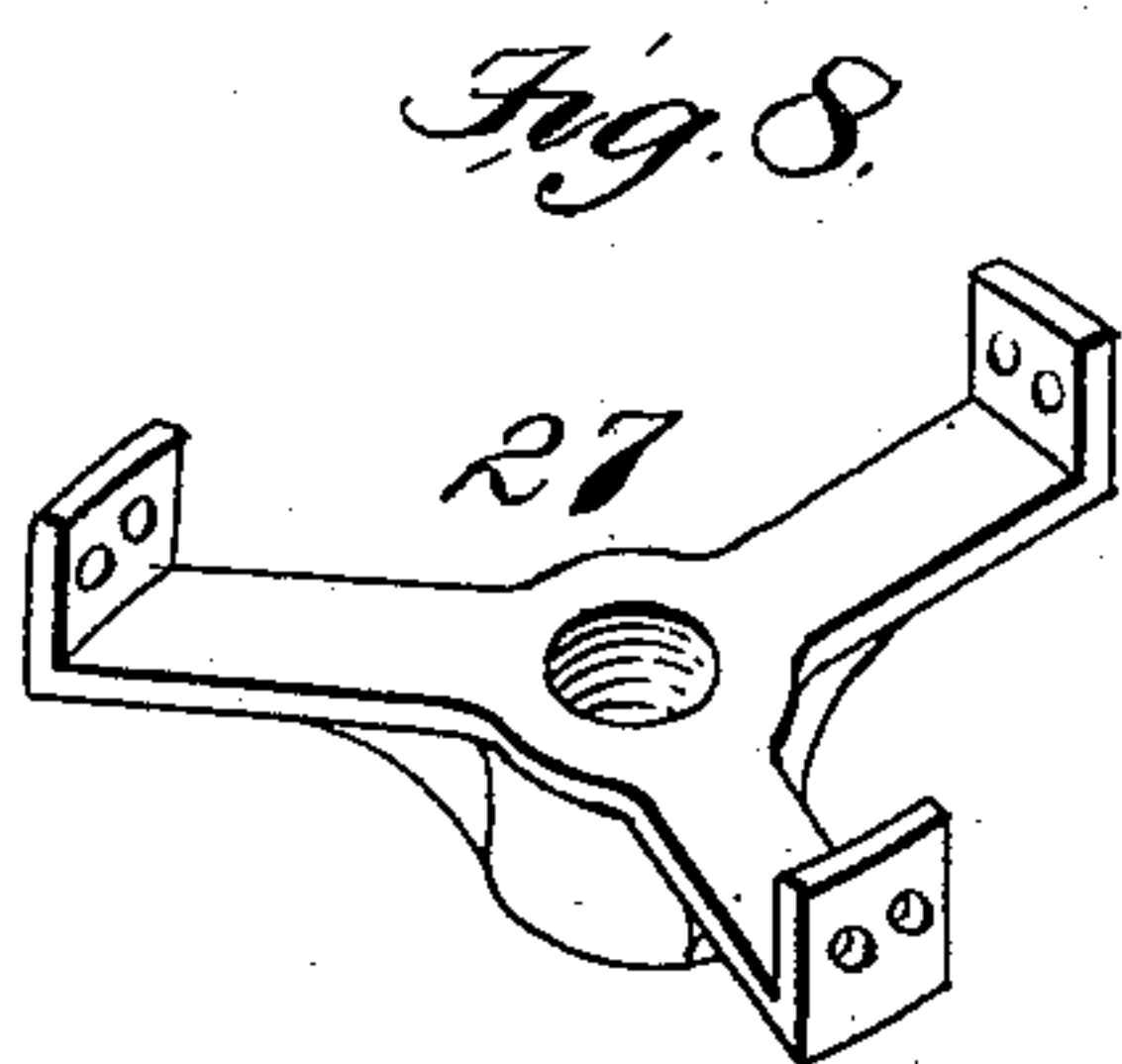
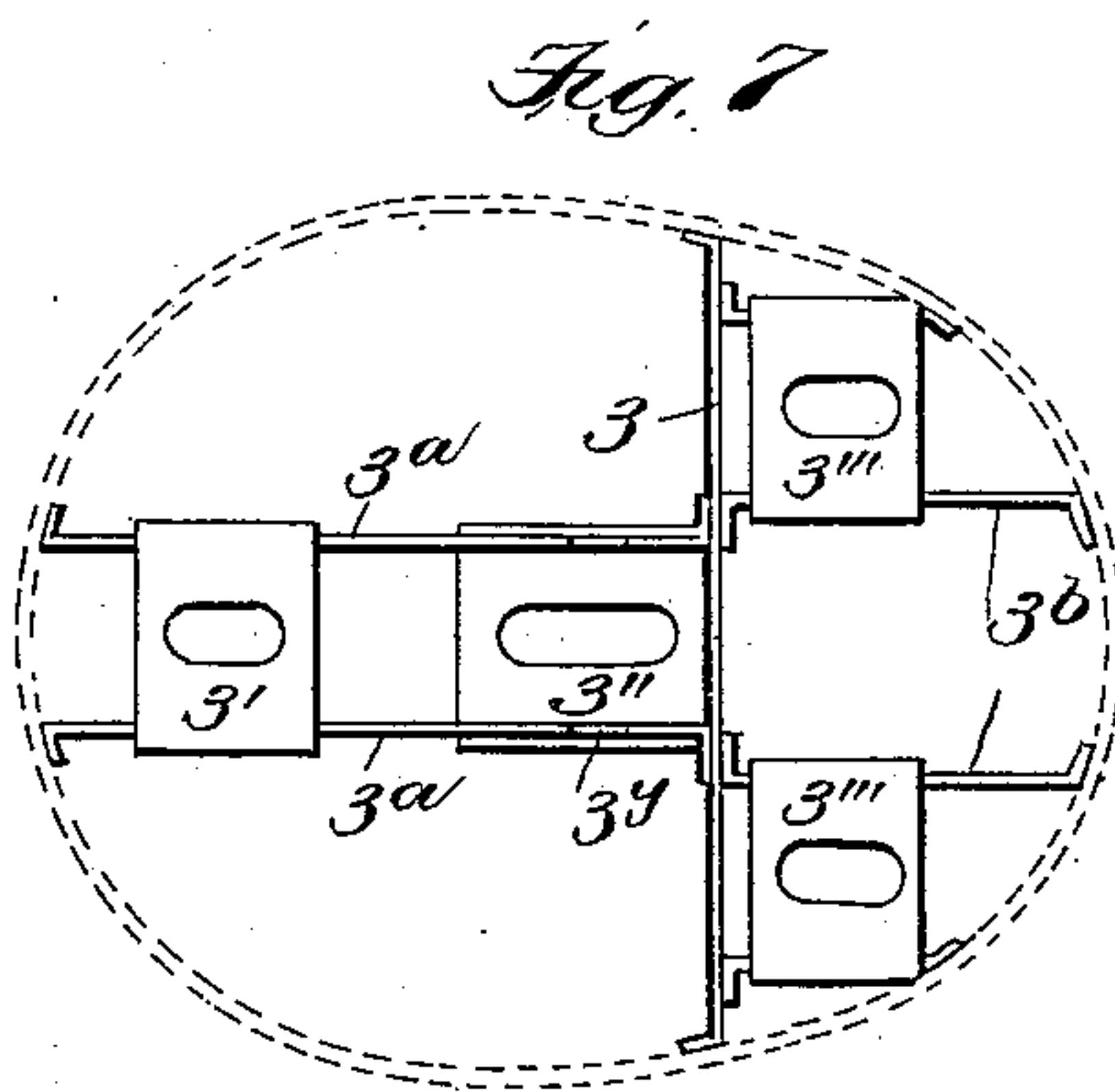
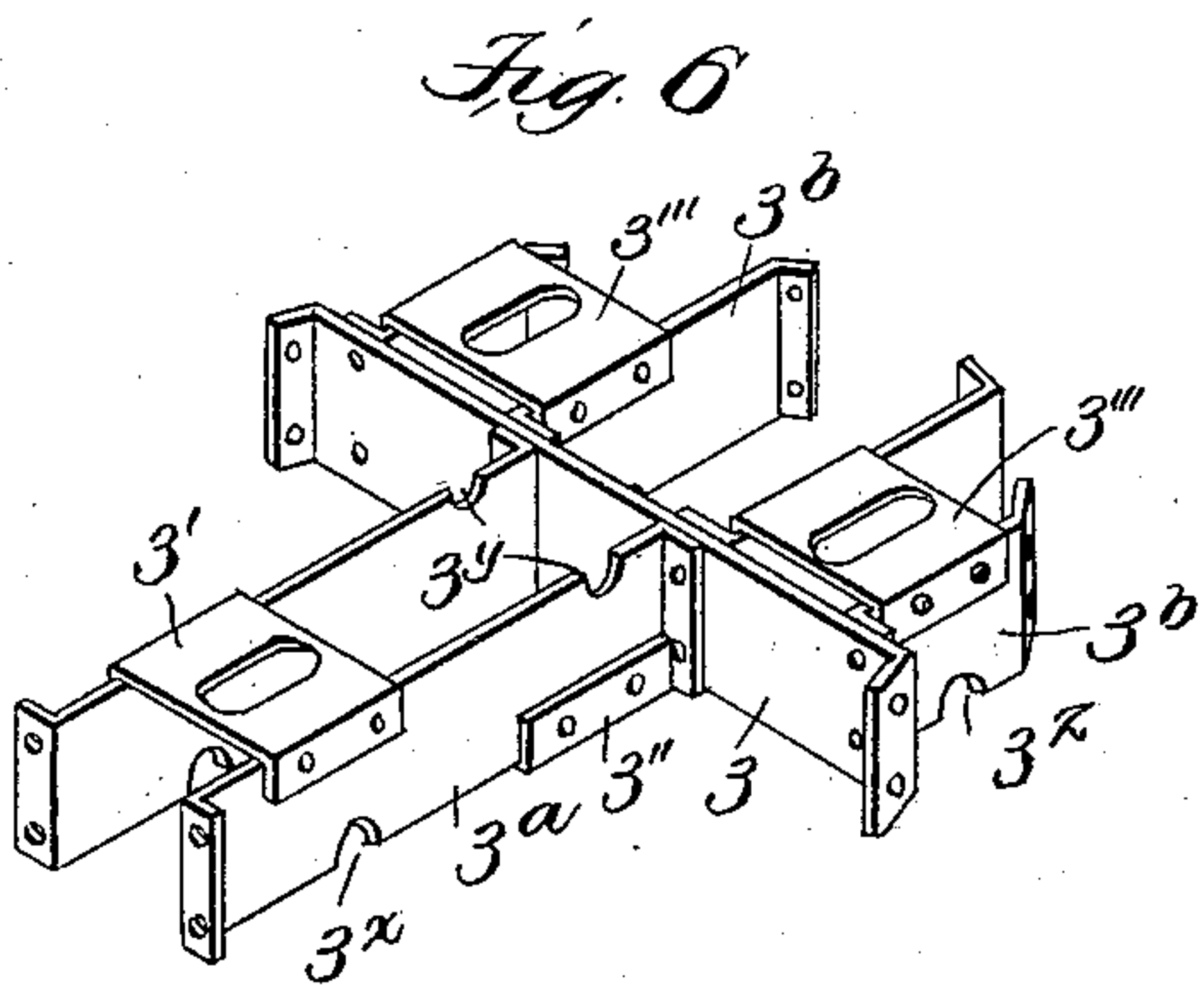
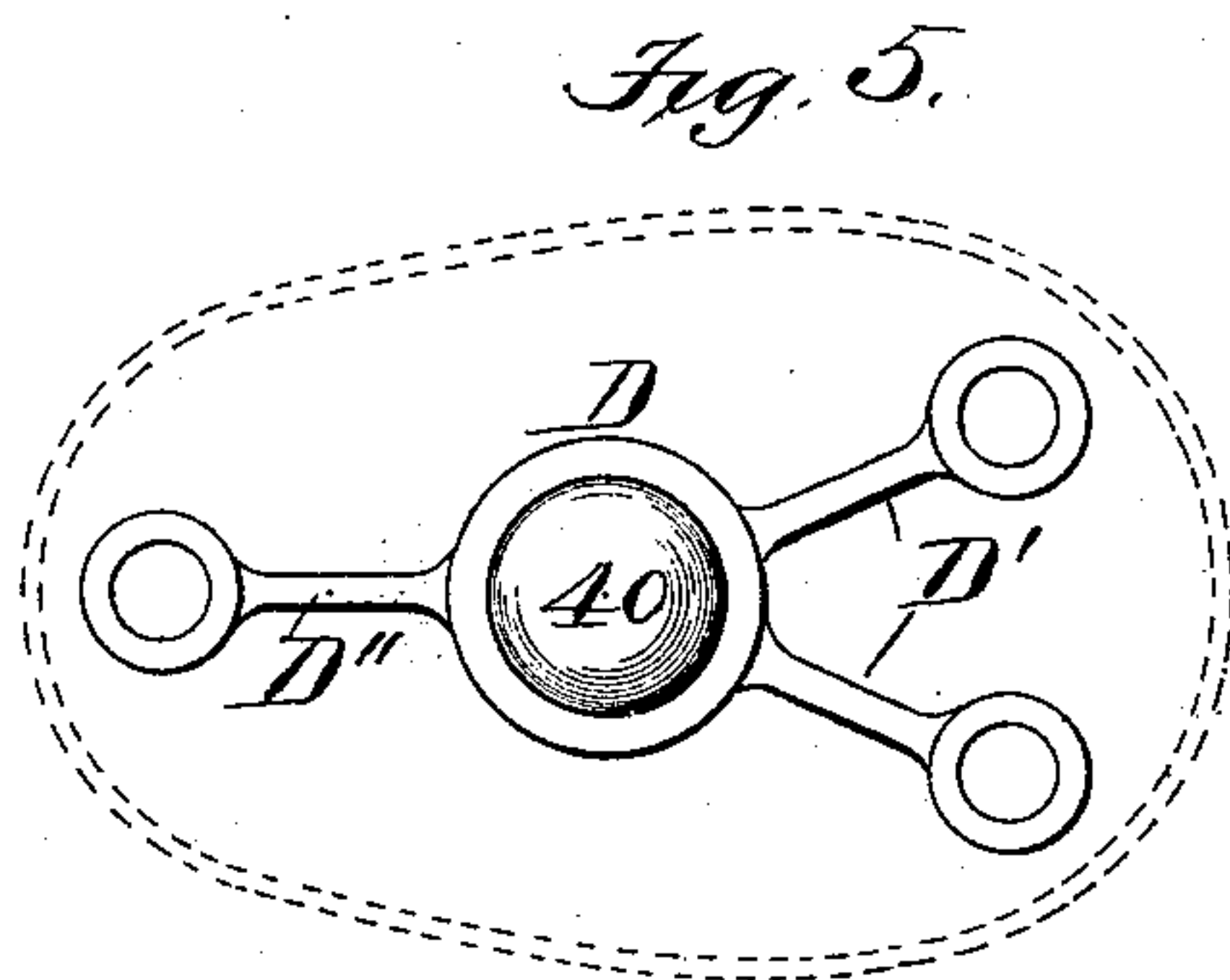
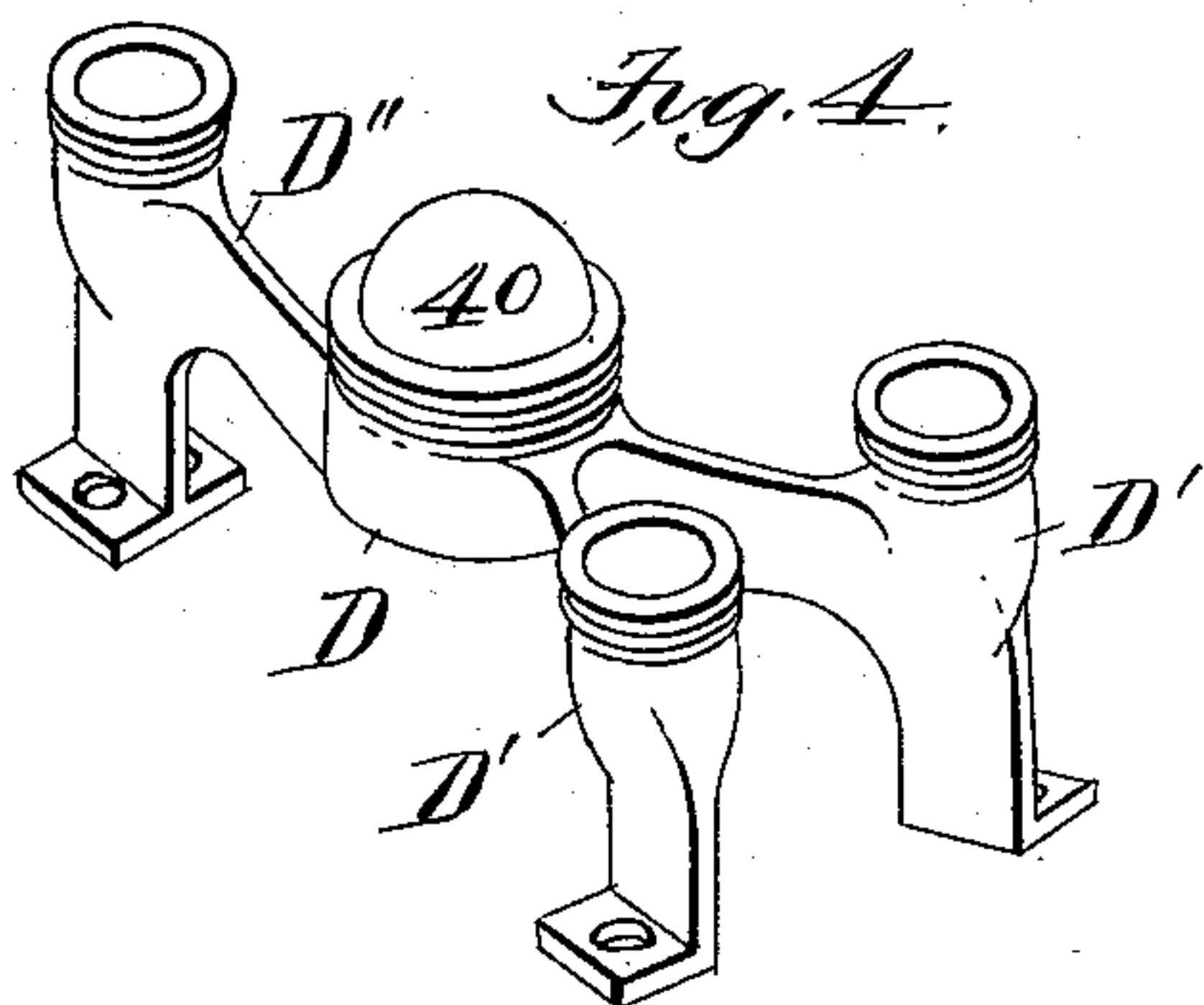
Inventor  
John F. Read

By Paul Bakerwell  
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# UNITED STATES PATENT OFFICE.

JOHN F. READ, OF WALSENBURG, COLORADO.

## ARTIFICIAL LIMB.

SPECIFICATION forming part of Letters Patent No. 507,453, dated October 24, 1893.

Application filed July 22, 1893. Serial No. 481,197. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN F. READ, a citizen of the United States, residing at Walsenburg, in the county of Huerfano, State of Colorado, have invented a new and useful Improvement in Artificial Limbs, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is an elevational view, with the shell or casing in section, of my improved limb, illustrating the normal position of the parts. Fig. 2 is a similar view, showing the position of the parts when the leg is in a rearward position, or the one assumed when the wearer is seated, illustrating, also, in dotted lines, the upright rearward position of the limb. Fig. 3 is a front elevational view, partly in section, illustrating the adaptation of the front springs to the side equalizing pressure springs. Fig. 4 is a perspective view of the bearing frame for the several rods. Fig. 5 is a plan view of the same. Fig. 6 is a perspective view of the skeleton bridge bearing. Fig. 7 is a plan view of the same. Fig. 8 is a perspective view of the spider-plate, which supports the inverted cup for the universal joint. Fig. 9 is a perspective view of one of the pivoted spring seats. Fig. 10 is a plan-view of the spider for the inverted cup bearing-piece. Fig. 11 is an inverted perspective view of the foot-section, showing the position of the slide in its bottom.

My invention relates to a new and useful improvement in artificial limbs, and consists, generally stated, in the peculiar form of construction of the universal connections at the ankle-joint, between the lower limb and foot section, and, in the construction and peculiar means of attachment of the different compression and equalizing springs, which are interposed between the moving parts, and in other minor details of invention, all as will hereinafter be described and afterward pointed out in the claims.

In the drawings, A indicates the leg section, above the knee-joint, which is adapted to be secured upon the stump of the limb of the wearer in any suitable manner. B indicates the lower limb section, to which the leg section A is connected through the medium

of the hinge joint *b*. C indicates the foot section, which has universal or ball-and-socket connections with the lower limb section, through the medium of a frame D contained therein, and E represents the toe section, pivotally attached to the foot section by a rod *e*, extending there-across, which acts in the capacity as a pivot. These different sections are composed of sheet metal, preferably of aluminium, and form a casing for the interior mechanism, which is inclosed therein, which mechanism finds suitable bearings in the ear brackets or bridge pieces, which are brazed, riveted, or otherwise secured on the inside of this sectional shell, and which will now be described.

The lower end of the leg section A is slotted as at *a* and has arranged on each side of the slot lugs or ears *a'* in which is mounted a rod 1 which I shall term the "knee" rod, passing through the slot. The position of these lugs is such that when the leg, as an entirety, is subjected to ordinary use, the knee-rod will have its bearing to the rear of the hinge-joint *b*, and in that position be at right angles to the pivotal point or fulcrum between the two sections A and B, thus giving the rod a greater longitudinal movement, in walking, which tends to make its spring more sensitive and quick-acting, but which, when the sections are in position shown in Fig. 2, places the pivotal point of connection of the knee-rod slightly beyond the line of the hinge-joint *b*, which latter receives the thrust of the spring, when the rod is so past dead center, thus relieving the wearer from any concern to retain the lower limb section in a vertical position when he is seated. The lower end of this rod passes down through a rocking block 2 which is pivotally mounted at about the center of a skeleton bridge bearing, comprising, as shown, a cross-piece 3, which is secured to the side walls of the lower limb section, two parallel pieces 3<sup>a</sup> which are secured to the piece 3 and to the rear wall of the shell, and four parallel pieces 3<sup>b</sup> which are secured to the piece 3 and the front wall of the shell. These parallel pieces 3<sup>a</sup> support cross-pieces 3' and 3'' at their upper rear and lower front edges, respectively, which, as shown in Figs. 4 and 5, are slotted longitudinally for the passage of the "heel" rod in the former in-



stance, and the "knee" rod in the latter. The parallel pieces  $3^b$  also support cross-pieces  $3'''$  which are in like manner slotted longitudinally, and through the slots in these cross-pieces pass the "toe" and side equalizing pressure rods, which will presently be described. The parallel pieces of this skeleton bridge bearing are recessed at  $3^x$ ,  $3^y$ , and  $3^z$ , on the edges opposite the cross-pieces  $3'$ ,  $3''$ , and  $3'''$ , respectively, in which recesses are received the side lugs or ears of pivoted spring seats, whose functions will presently appear. The rod 1 passes through the slot in the cross-piece  $3''$  and is threaded on its end, and has strung thereon a yielding washer 4, whose position, relative to limiting the movement of the rod longitudinally is determined by the adjusting nuts 5. The rocking block, or pivoted spring seat, as it may be termed, is of a construction such as shown in Fig. 9, wherein 2 represents the block formed with an opening  $2^a$  for the passage of the rod therethrough, which block is formed with lugs or ears  $2^b$  at its sides, which are received in the recesses  $3^y$  in the parallel pieces  $3^a$  of the skeleton bridge bearing, and form the bearing for the block, permitting it to assume a right-angular position to the rod in all its positions, to offer a square seat for this spring. Surrounding the rod above the block 2, is a spiral compression spring 6, just referred to, whose resistance is regulated and adjusted through the medium of the collar 7 and the set screw  $7^a$ . Passing through the cross-pieces  $3'''$  at the upper forward edges of the parallel pieces  $3^b$ , are rods 8, whose upper ends above the cross-pieces are threaded to receive the adjusting nuts  $8^a$  which regulate the positions of the yielding washers 9. These rods, of which there are two, and which I shall term the toe rods, in distinguishment from the heel rod hereinafter referred to, are provided with springs 10, which are compressed between two pivoted spring seats 11 bearing in the recesses  $3^z$ , in the parallel pieces  $3^b$ , and two collars 12, which latter are adjustable through the medium of the set screws 13. The lower extremities of these rods are provided with balls 14, which are received in sockets 15, mounted on the two forwardly-extending and diverging arms  $D'$  of the frame D. These arms are provided with threaded bosses on their upper outer faces, upon which rest the sockets 15, which latter are preferably circular in form, to permit confining caps 16 to fit over the same and hold the parts together, making ball-and-socket connections. The function of these rods is twofold, one being that when weight is put upon the ball of the foot, the springs 10, will yield and permit the rod to slide up into the section B, and when the ball of the foot is relieved of its weight, the springs will exert themselves to cause the foot section C to again assume a position of equilibrium; and the other is to take up lateral vibration by reason of the springs being located

on each side of the foot section, which will tend at all times to keep the foot straight, meanwhile permitting it to yield, should the wearer step upon an uneven surface. The lateral movement of the foot is limited by two stops c, located on the inside of the shell, as shown in Fig. 3.

Passing through the cross-piece  $3'$ , on the upper rear edge of the parallel pieces  $3^a$  is a heel rod 17, which is provided with a yielding washer 18, adjusting nuts 19 on the upper threaded end of the rod therefor; a spring 20, and its seat 21, which is pivotally mounted in the recess  $3^x$  in the lower edge of the parallel pieces  $3^a$ , and an adjustable collar 22 for the springs, which collar is pivoted to a set screw 23. This rod 17 has a ball 24 on its lower end, which is received into a socket 25, similar to the socket 15, which socket rests upon the face of a threaded boss formed on the rearwardly-extending arm  $D''$  of the frame D. The ball and socket are confined by a cap 26, whose function and operation is similar to the cap 16.

Near the lower end of the section B, is a spider 27, which is formed with an interiorly threaded boss into which a hollow stem 28 of an inverted cup 29 is received, which stem receives a jam nut 30 on its upper end. By forming the stem hollow and making a small opening in the top of the cavity of the cup which leads into the hollow of the stem, an oil receptacle is formed whose utility need not be gone into in detail.

The middle portion of the frame D at the junction of the arms  $D'$  and  $D''$  is formed with a crown 40 in the form of a semi-sphere, which fits up into the inverted cup 29 around the base of which crown are formed threads for receiving a confining cap 31, which holds the parts together and forms a universal connection between the section B and C.

The section or shell B is formed with, openings  $b''$  and  $b'''$  whose functions are to permit the insertion of a key or wrench to adjust the set screws of the collars on the toe and heel rods, respectively.

The bottom of the section B is formed flaring and concentric to the center of the universal joint, in order that no opening will be made when the parts move, which would tend to wear the stocking.

The bottom of the foot section is preferably provided with a slide 33 which may be removed to permit access to be gained to the interior for the purpose of removing lint, &c., which might accumulate therein, and repairing, &c. Over the slide on the bottom of the foot, I prefer to place a covering of felt or other soft and yielding material which will not wear the stocking when the shoe yields to the action of the moving parts.

The operation is as follows,—(assuming that the wearer be standing, at which time the leg would be in the position shown in Fig. 1): When the first step is taken, assuming that



it be with the natural limb, the first change in the relative position of the parts will be at the ankle joint, which is the result of the foot section remaining comparatively fixed and the lower limb section moving forward. This will compress the springs 10, on the toe rods 8, and by a combined movement, the washer on the heel rod 17 will strike against its seat 21 where it will be comparatively fixed in its relation, and at which time the limb will be in such a position, to the rear, that it will be ready to receive the weight on the ball of the foot and respond by impelling the body forward. When the limb is lifted to be carried forward, the compression of the springs 10 exert themselves over that of the spring 20, and the parts will assume a position as shown in Fig. 1, until the foot is placed upon the ground, when the heel will strike first, thereby compressing the spring 20 on the heel rod which will yield to the pressure, and by so doing take up the shock or jar which would otherwise be communicated to the wearer. Should the foot be placed upon an uneven surface, it will yield by the compression of the springs 10 either to one side or the other, as shown in Fig. 3, and take up such lateral twist which would otherwise be communicated to the wearer. The knee-rod in all these positions, will yield to accommodate the difference in the normal positions of the sections A and B, and will tend at all times to keep them straight. Should the wearer desire to seat himself, the two sections A and B will turn upon their pivot *b* compressing the spring on the knee-rod, and forcing said knee-rod beneath the pivot, which gradually reduces its tendency to straighten the parts, until it has passed dead center, when the two shells, coming in contact with each other, act as a stop and prevent further movement.

Having thus described my invention, what I desire to claim is—

1. In an artificial limb, the combination with the leg and lower limb sections pivoted together at the knee joint, of a knee-rod pivotally attached to the leg section to the rear of the knee joint, and slidingly connected to the lower limb section, said rod being surrounded by a compression spring, and check nuts, substantially as described.

2. In an artificial limb, the combination with the leg and lower limb sections pivoted together at the knee-joint, of a knee-rod attached to the leg section to the rear of the knee-joint, a cross-piece in the lower limb section through which said rod passes, a yielding washer on the rod beyond the seat, check nuts for adjusting the washer on the rod, a spring, a pivoted seat therefor through which the rod passes, and an adjustable collar on the rod for regulating the compression of the

spring, substantially as and for the purposes described.

3. In an artificial limb, the combination with the sections A and B pivoted together, of a knee-rod attached to the upper section and having a check connection in a bridge bearing piece in the lower section, a spring surrounding said rod, a foot section, a universal connection between the foot section and the lower limb section, and heel and toe rods attached to the foot section and having a check connection with the lower limb section, substantially as described.

4. In an artificial limb, the combination with the lower limb section and foot section, of a universal joint between the two sections, and toe and heel rods having ball and socket connections in the foot section, and sliding check connections in the leg section, substantially as described.

5. In an artificial limb, the combination with the lower limb section having a spider formed with an interiorly threaded boss at its lower end, an inverted cup mounted in the spider, a foot section, a frame in the foot section formed with a crown or semi-spherically-shaped projection which fits into the inverted cup, said projection being threaded around its base, and a confining cap which is received on the threads and retains the inverted cup in position, substantially as described.

6. In an artificial limb, the combination with the sections B and C, of a universal connection therebetween comprising a spider mounted in the lower end of the section B and formed with an interiorly threaded boss, an inverted cup formed with a hollow stem which is screwed into the boss, a jam nut on the end of the hollow stem, a semi-spherical bearing surface which is mounted in the section C and which projects up into the cup, and a confining cap which is screwed on the projection for holding the parts together, substantially as described.

7. In an artificial limb, the combination with the two sections A and B pivoted together, of a foot section having a universal connection with the lower section B, a bridge bearing piece in the last-named section, a knee-rod attached to the section A and having a check connection in the bridge, toe and heel rods universally connected in the foot section at its front and back, respectively, and having check connections with the bridge piece, substantially as described.

In testimony whereof I hereunto affix my signature, in presence of two witnesses, this 18th day of July, 1893.

JOHN F. READ.

Witnesses:

F. R. CORNWALL,  
HUGH K. WAGNER.