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PATENTED NOV. 22, 1904.

L. A. WEISSER.
ARTIFICIAL LIMB.

APPLICATION FILED NOV. 14, 1903.

NO MODEL.

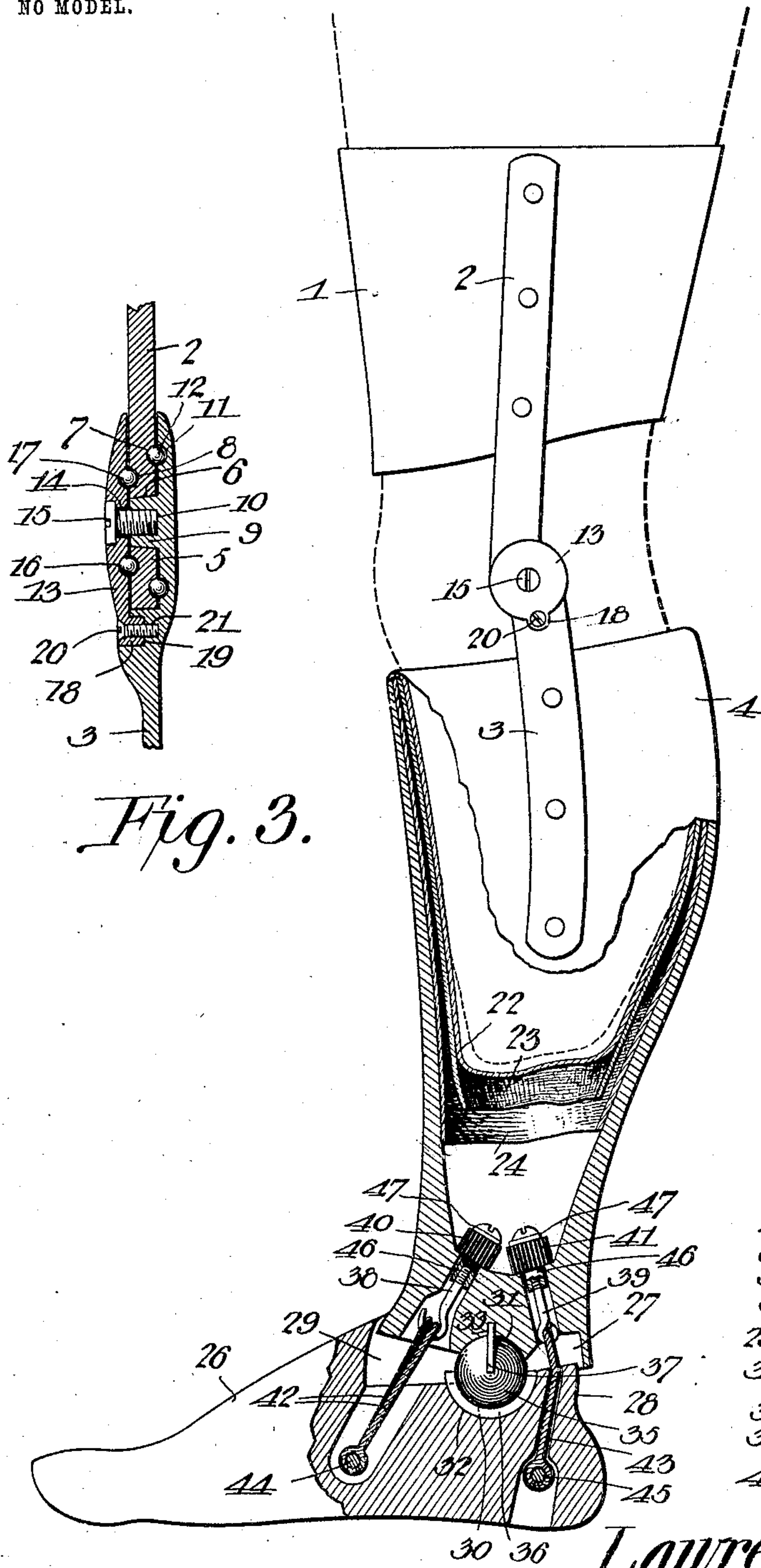


Fig. 1.

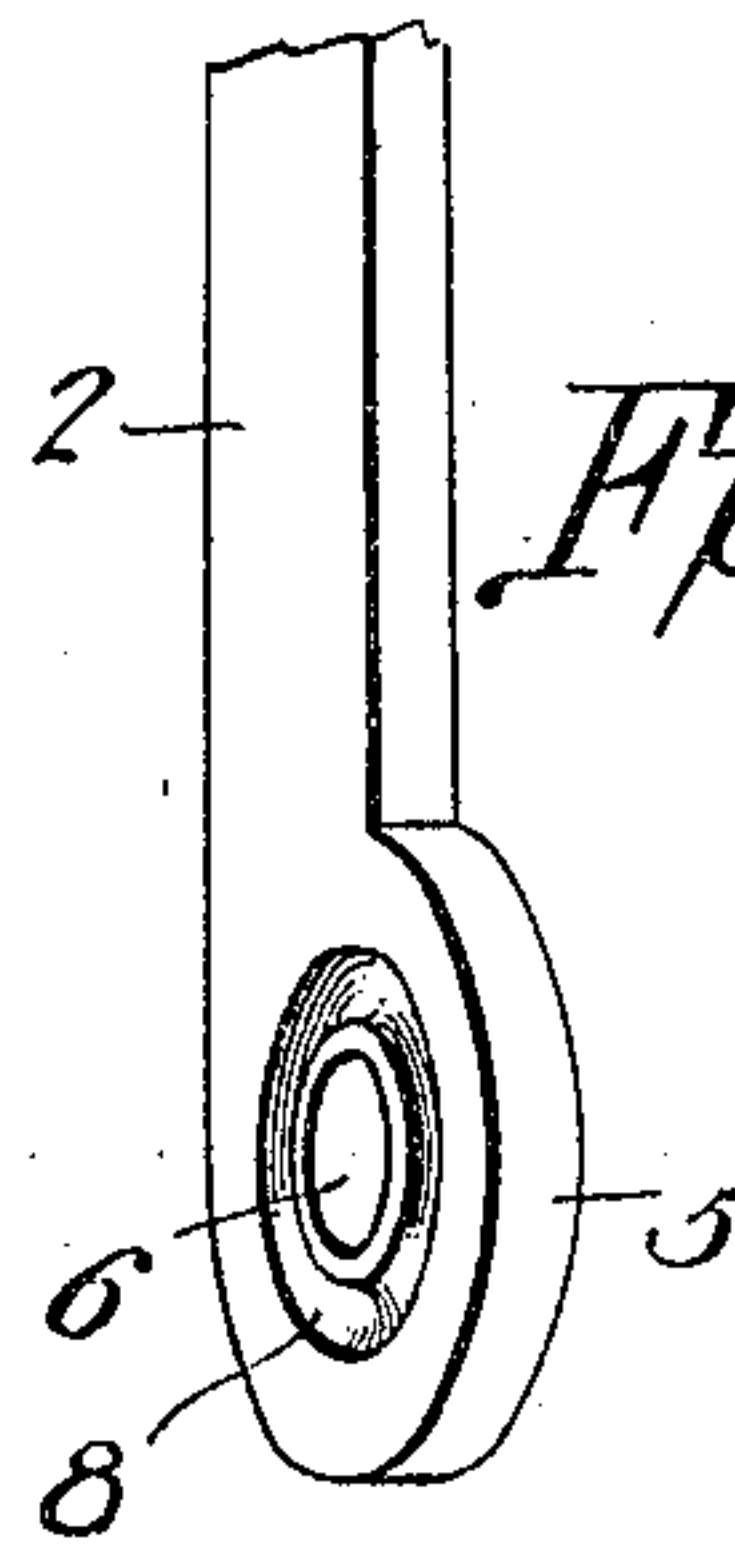
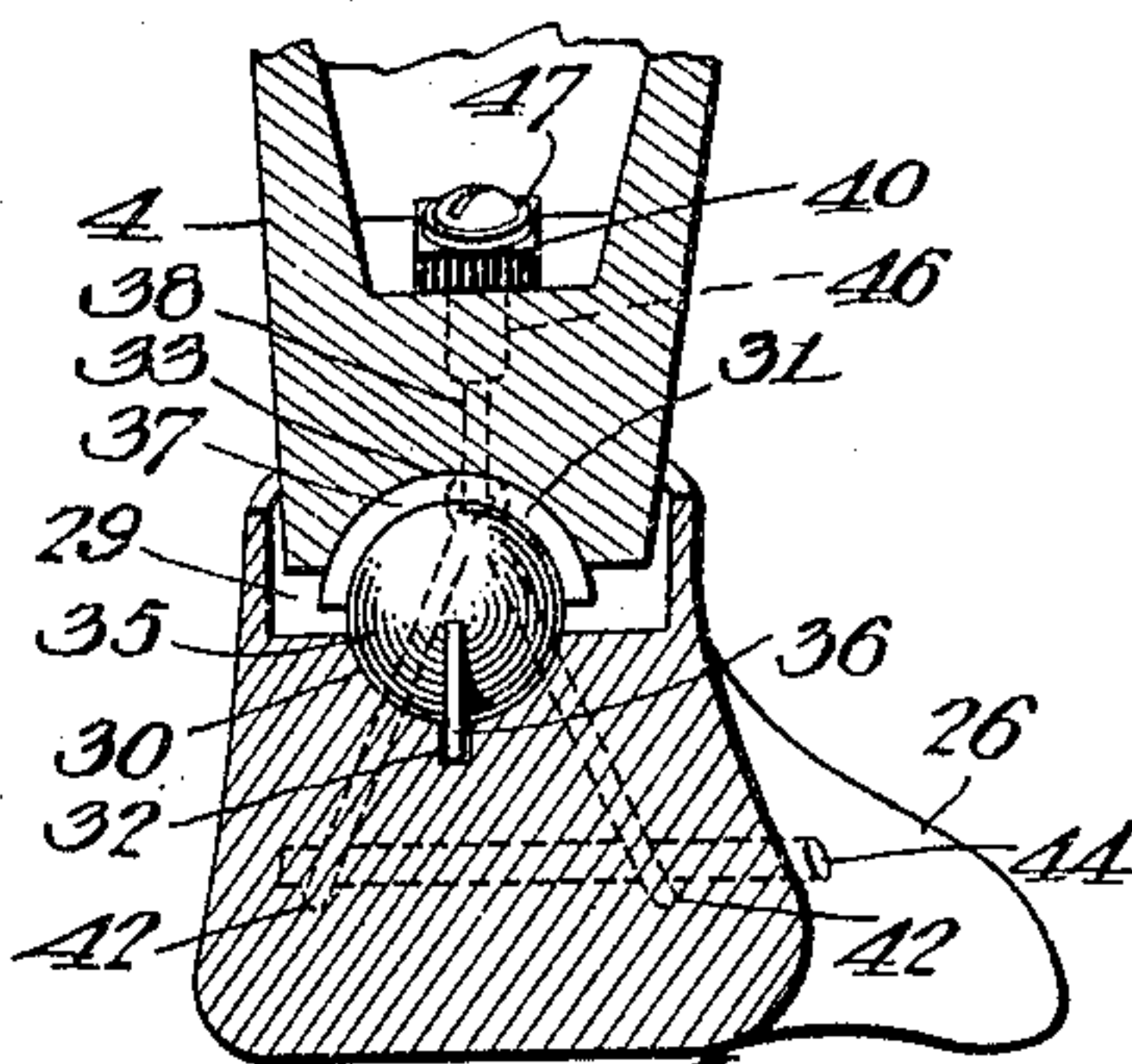


Fig. 4.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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ARTIFICIAL LIMB.

SPECIFICATION forming part of Letters Patent No. 775,506, dated November 22, 1904.

Application filed November 14, 1903. Serial No. 181,240. (No model.)

To all whom it may concern:

Be it known that I, LAWRENCE A. WEISSER, a citizen of the United States, residing at National City, in the county of San Diego and State of California, have invented a new and useful Artificial Limb, of which the following is a specification.

This invention relates to artificial limbs; and it consists in certain improvements in hinges for forming joints at the knee, improvements in a socket to receive the stump of the natural limb to which the artificial limb is secured, and improvements in an ankle-joint adapted to permit the foot to yield laterally and to swing in a vertical plane extending from front to rear without becoming twisted in a horizontal plane.

The object of the invention is to simplify the construction of the ankle-joint in an artificial leg, so that the parts may be more easily assembled than is ordinarily the case and so that the continued use of the limb will have very little tendency to alter the original relation of the parts.

A further object of the invention is to provide an ankle-joint of the ball-and-socket type which will completely prevent any twisting of the foot in the horizontal plane, while permitting the foot to yield laterally to accommodate itself to inequalities in the surface upon which it is placed and also to yield in the plane extending from front to rear to conform to the movement of the wearer of the artificial limb in walking.

Other minor objects of the invention will appear as the invention is more fully disclosed.

In describing the invention reference will be had to the accompanying drawings, forming part of this specification, in which I have illustrated a preferred form of embodiment of the invention capable of carrying the same into practical operation, it being understood that changes in the form, proportions, and exact mode of assemblage of the elements may be made without departing from the spirit of the invention or sacrificing its advantages.

In the drawings, Figure 1 is a view, partly in side elevation and partly in section, of an artificial leg constructed in accord with the present invention, the position of the stump

in the socket being indicated in dotted lines. Fig. 2 is a transverse vertical section at the ankle-joint looking forward. Fig. 3 is a sectional view through a hinge at the knee. Fig. 4 is a detail view of the lower end of one of the upper hinge members.

Referring to the drawings, in which corresponding parts are designated by similar characters of reference, 1 designates the thigh portion of the artificial leg, which is hollow for the reception of the stump and has rigidly secured on the outer surface thereof by screws, rivets, or other suitable fastening devices the upper hinge members 2, which cooperate with lower hinge members 3, attached to the leg-section 4 of the artificial limb to form the knee-joint. Each of the hinges, consisting of a member 2 and a member 3, is of the type illustrated in Fig. 3. The member 2 is rounded at its lower end to form a disk-shaped portion 5, having a central opening 6, and upon the inner face of the disk-shaped portion 5 is provided a groove 7, which forms a circle around the central opening 6 and serves as a ball-race. On the outer face of the disk-shaped portion 5 is provided a similar circular groove 8 of somewhat smaller diameter than the groove 7, the difference in the diameters of the two circular grooves being made to prevent the formation of the two grooves at opposite points on the faces of the disk-shaped portion and consequent undue thinning of the hinge member between the two grooves. The lower hinge member 3 is cut away at the upper end to afford a seat for the disk-shaped portion 5, and a stud 9, having a central threaded opening 10, is situated in the center of the seat for engagement with the central opening 6 in the disk-shaped portion 5 of the hinge member 2. A groove 11 is formed in the face of the seat to correspond to the groove 7 formed in the disk-shaped portion 5, and balls 12 are disposed in the channel formed by the two cooperating grooves in order to eliminate the friction of movement of the member 2 on the member 3. The member 2 is secured upon the stud 9 by means of a plate 13, having a central opening 14 countersunk at its outer end for the reception of the head of a screw 15, which enters

the threaded opening 10 in the stud 9 in order to secure the plate 13 in position. The plate 13 is provided on its inner face with a circular groove 16, corresponding in diameter 5 to the groove 8 on the outer face of the disk-shaped portion 5 of the hinge member 2. Balls 17 are disposed in the channels formed by the cooperating grooves 8 and 16, and the balls 17 cooperate with the balls 12 in eliminating friction in the operation of the hinge-joint. In order to prevent the operation of the hinge from having any tendency whatever to loosen the screw 15, by means of which the plate 13 is secured in position, the 15 plate 13 is provided at one side with a lug 18, which is adapted to enter a recess 19, formed in the hinge member 3, as shown in Fig. 2, and a screw 20, mounted in the lug 18, engages with a threaded opening 21, formed in the hinge member 3 at the bottom of the recess 19.

By means of the devices described in the preceding paragraph any turning of the plate 13 in the action of the hinge is completely obviated, and hence there is no tendency to turn the screw 15 in the opening 10 and cause the plate 13 to become loose. Moreover, the screw 20 cooperates with the screw 15 in holding the plate in close contact with the 30 hinge members 2 and 3, and so relieves the screw 15 in a measure of the strain which is imposed thereon whenever the artificial limb is subjected to any lateral strain.

The stump-socket is formed in the leg-section 4 of the artificial limb and consists of a lining 22 of some tough soft but slightly yielding material, such as leather, which is strengthened by a reinforcing-sheath 23, of tough and unyielding material, such as canvas. Outside of the reinforcing-sheath and 40 between it and the shell of the leg-section 4 is arranged a cushion layer 24 of leather.

The ankle-joint, by means of which the foot 26 is articulated to the leg-section 4, is of the ball-and-socket type; but means is provided thereon for preventing the twisting of the foot 26 out of its normal position relative to the leg-section. The leg-section 4 is hollow at the top, as seen in Fig. 1, but at the lower end is 50 solid, and at the back of the ankle portion thereof a cavity 27 in the lower end of the leg-section is formed to give play to the upwardly-projecting heel portion 28 of the foot. In front of the ankle a cavity 29 is formed in the upper surface of the foot to afford play 55 for the lower end of the leg-section. In order to support the leg-section, a special form of ball-and-socket joint is used. A hemispherical socket 30 is formed in the foot and a corresponding socket 31 formed in the lower 60 end of the leg-section immediately above the socket 30 in the foot. The socket 30 is formed with a kerf 32 extending longitudinally of the foot, and the socket 31 is pro-

vided with a kerf 33, extending approximately transversely of the leg-section. The two kerfs are so placed that when the foot and the leg-section are assembled the kerfs will lie at right angles to each other and the artificial foot will be disposed at the same 70 angle to the line of movement of the wearer of the limb in walking as the natural foot which the artificial foot replaces. A hollow ball 35, with ribs 36 37, provided thereon and disposed at right angles to each other, as 75 shown in Fig. 3, is fitted in the cavity formed by the two hemispherical sockets, and elastic tension devices are employed to secure the foot and leg section in proper adjustment. The preferred devices for securing the foot 80 and leg section together are those shown in the drawings and comprise hooks 38 and 39, disposed in the front and rear portions of the ankle, respectively, and provided with cushions 40 and 41, of rubber or other suitable 85 material, and cords or wires 42 and 43 looped over the hooks in the ankle and fastened at their lower ends to transverse wires or rods 44 and 45 in the foot. The hooks 38 and 39 have threaded shanks which extend through 90 the cushions 40 and 41 and nipples 46, bearing washers 47, are threaded on the shanks of the hooks to adjust the tension of the cords or wires 42 and 43.

From the foregoing description it will be 95 readily seen that when the foot is placed upon a surface having a lateral inclination the ball 35 will be held stationary in the hemispherical socket 30 and the leg-section 4 will slide laterally upon the upper surface of the ball, 100 this movement being guided by the rib 37, which engages with the kerf 33. Similarly when pressure is placed on the forward portion of the foot in walking the ball will be held in rigid association with the leg-section 105 4 by the engagement of the rib 37 with the kerf 33, and the ball will turn in the socket 30 with the foot, this movement being guided by the rib 36 in the kerf 32; but when any strain is applied to the foot which tends to 110 twist it in a horizontal plane the engagement of the ribs 36 and 37 with the kerfs 32 and 33 will prevent such twisting and hold the foot in proper relative position to the leg.

By means of the nipples threaded on the 115 shanks of the hooks 38 and 39 the cushions 40 and 41 may be placed at any desired degree of compression to adjust the leg for the use of persons of different weights, and in case of the breakage of one or more of the 120 cords by means of which the foot is connected with the hooks the hooks and nipples may be easily disengaged and the hooks connected with new cords placed in position in lieu of the broken ones. The assemblage of 125 the leg and foot is thus made very easy to accomplish.

Having thus described the construction and

operation of my invention, what I claim as new, and desire to secure by Letters Patent, is—

- 5 1. In an artificial limb, the combination of a leg-section, and a foot having corresponding sockets, said sockets being each provided with a kerf, of a ball loose in said sockets and provided with ribs for engagement with said kerfs.
- 10 2. In an artificial limb, the combination of a leg-section, and a foot provided with corresponding sockets, of a ball fitted in said sockets and provided with means engaging each socket to limit its turning movement therein
- 15 to a single plane.
3. In an artificial limb, the combination with

a foot and leg section having a ball-and-socket joint between them, of hooks mounted in said leg-section, cushions upon which said hooks are mounted, a cord disposed in the heel of 20 said foot-section and engaging one of said hooks, and a pair of cords disposed in front of said joint and engaging the other hook, said cords extending downward into said foot-section and diverging toward their lower ends. 25

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

LAWRENCE A. WEISSER.

Witnesses:

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