

No. 644,802.

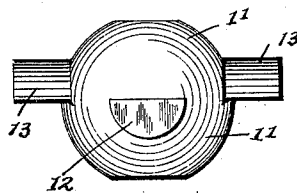
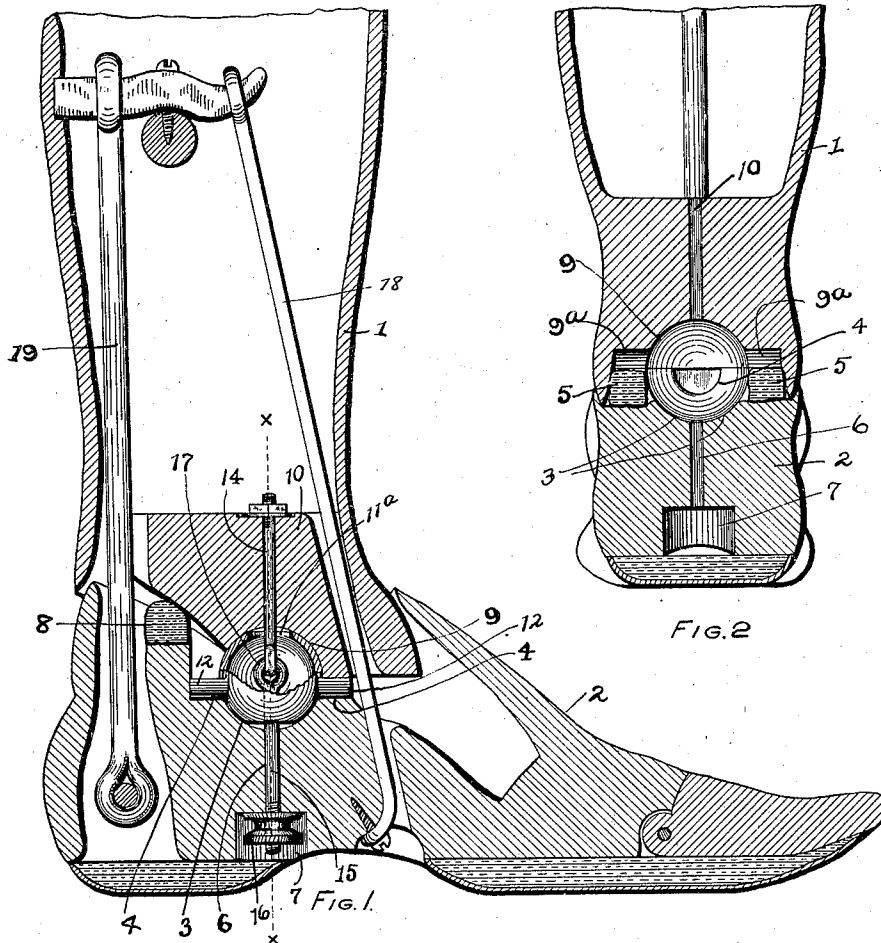
Patented Mar. 6, 1900.

L. E. HULLINGER & R. P. CURTS.

ARTIFICIAL LIMB.

(Application filed June 10, 1898.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## ARTIFICIAL LIMB.

SPECIFICATION forming part of Letters Patent No. 644,802, dated March 6, 1900.

Application filed June 10, 1898. Serial No. 683,146. (No model.)

*To all whom it may concern:*

Be it known that we, LYNUS E. HULLINGER and ROBERT P. CURTS, citizens 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.

Our invention relates to the improvement of artificial limbs, and has particular relation to the improvement of the parts forming the joint between the foot and leg.

The objects of our invention are to provide an improved foot and leg joint of superior construction and arrangement of parts, to so construct said joint as to admit of a desirable and natural lateral and backward-and-forward movement of the foot, and to produce other improvements in details of construction and arrangement of parts, which will be more fully pointed out hereinafter. These objects we accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a central vertical section of a foot and portion of a leg, showing our improved jointed connection of the same. Fig. 2 is a transverse section through a portion of the foot and leg, taken on line *xx* of Fig. 1; and Fig. 3 is a view in elevation of the ankle-joint ball, which we employ in the manner hereinafter described.

Similar numerals refer to similar parts throughout the several views.

1 represents the lower portion of an artificial leg, and 2 represents the foot. As is usual in artificial limbs, the lower and substantially-solid end portion of the leg is adapted to be received by a socket or recess in the upper side or ankle portion of the foot. With-  
in this ankle-recess we provide a ball-receiving socket or concavity 3, the latter having leading therefrom, in the direction of the length of the foot and on opposite sides of said ball-socket, socket-arms or bearing-grooves 4. The ball-socket 3 is, as indicated in the drawings, of such form as to be adapted to receive a half ball or sphere. 5 represents yielding bearing projections, of rubber or similar material, which are arranged on those sides of

the ball-socket 3 which are at right angles with the bearing-grooves 4.

Leading downward through the body of the foot from the bottom of the socket 3 is an opening or passage 6, the lower end of which communicates with a recess or socket 7 on the under side of the foot. In rear of the foot ball-socket 3 we provide the body of the foot with a transverse yielding bearing-block, of rubber or similar material, as indicated at 8, this bearing-block being adapted to be retained in contact with the inclined under side and rear portion of the solid lower end of the leg.

In the lower end of the leg 1 we form a ball-socket 9, which, in conjunction with the socket 3, is adapted to form a complete sphere-receiving socket.

10 represents a bolt hole or passage which extends from the upper and central portion of the foot-socket 9 through the solid lower end portion of the leg, as indicated. As indicated at 9<sup>a</sup>, the leg-socket 9 has extending laterally therefrom trunnion-receiving grooves which, although inverted, correspond in form with the grooves 4 of the foot.

11 represents our improved ankle-joint ball, which, as shown partially in section and partially in elevation in Fig. 1 and as shown in elevation in Fig. 3, is in the form of a hollow ball, which is preferably constructed of metal, although other suitable material may be employed. In producing the ball we form the same with oppositely-located upper and under side openings 11<sup>a</sup>. The joint-ball thus employed is provided at opposite sides on its periphery with outwardly-projecting half-round trunnions or bearing-arms 12. As indicated in the drawings, the curved or rounded surfaces of these trunnions 12 are on their lower sides. As indicated at 13, we also employ trunnions or bearing-arms, which project from said ball-periphery at oppositely-located points and in directions at right angles with the trunnions 12, these trunnions 13 having their upper sides rounded.

As indicated more clearly in Fig. 1 of the drawings, the lower portion of the ball-body 11 is designed to rest or bear within the foot-

socket 3, while the rounded under sides of the trunnions 12 bear within the oppositely-located grooves or recesses 4. When the leg is in its place on the foot, the upper socket 9 receives the upper portion of the ball 11, while the rounded upper sides of the trunnions 13 are received by the grooves 9<sup>a</sup>. The parts are retained in the above-described position through the medium of bolts or rods 14 and 15, which extend, respectively, through the bolt-holes 10 and 6, the upper rod 14 having its upper end provided with a nut and the lower end of the lower rod 15 having a thumb-nut 16 thereon. The inner ends of the rods 14 and 15 are, as indicated at 17, hooked together or otherwise jointedly connected within the central portion of the ball 11.

In addition to the above-described connection of the foot and leg we employ the usual ankle and heel cords 18 and 19, which have their upper ends secured within the leg-body 1 and which have their lower ends suitably secured in the lower portion of the foot-body.

From the construction and arrangement of parts above described it is obvious that in the usual forward-and-backward joint movement of the leg the laterally-projecting trunnions 13 will serve as a bearing for the leg, while a lateral movement of the ankle portion of the foot will be facilitated through the bearing of the trunnions 12 within the foot-grooves 4. In the forward-and-backward and lateral movements it is obvious that the upper and lower sides of the ball-body will form, respectively, bearings for the leg and foot which will admit of said movements with a desirable degree of freedom. It will also be observed that the flattened under sides of the trunnions 12 bear upon the yielding cushions 5, which will serve to regulate or limit said rocking or lateral movement and prevent the jar

which otherwise might be occasioned by the sudden stoppage of the movement of the foot or leg.

From the construction and operation described it will be seen that a simple, reliable, and effective ankle-joint is formed in which a comparatively easy and natural backward-and-forward and lateral movement of the foot and leg is attained and which will greatly add to the comfort and convenience of the wearer.

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

1. In an artificial-limb joint the combination with the foot and leg body, of a ball bearing partly within said foot-body and partly within said leg-body, bolts 14 and 15 extending respectively from said foot and leg body, said bolts having a loop connection with each other within the center of said ball, substantially as and for the purpose specified.

2. In an artificial-limb joint, the combination with the foot and leg body, said foot-body having a partial ball-socket and trunnion-sockets therein and said leg-body having a partial ball-socket and trunnion-sockets extending at right angles with the trunnion-sockets of the foot-body, of a hollow ball adapted to bear partially within said foot-socket and partially within said leg-socket and having oppositely-located trunnions adapted to bear in said foot trunnion-sockets and oppositely-located trunnions adapted to bear in said leg trunnion-sockets and foot and leg rods jointedly connected within said ball, substantially as and for the purpose specified.

LYNUS E. HULLINGER.

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In presence of—

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W. L. MORROW.