No. 612,282. Patented Oct. 11, 1898.

R. F. SMITH.

ARTIFICIAL LIMB.

(Application filed Dec. 17, 1897.)

(No Model.)

Fig. 1.

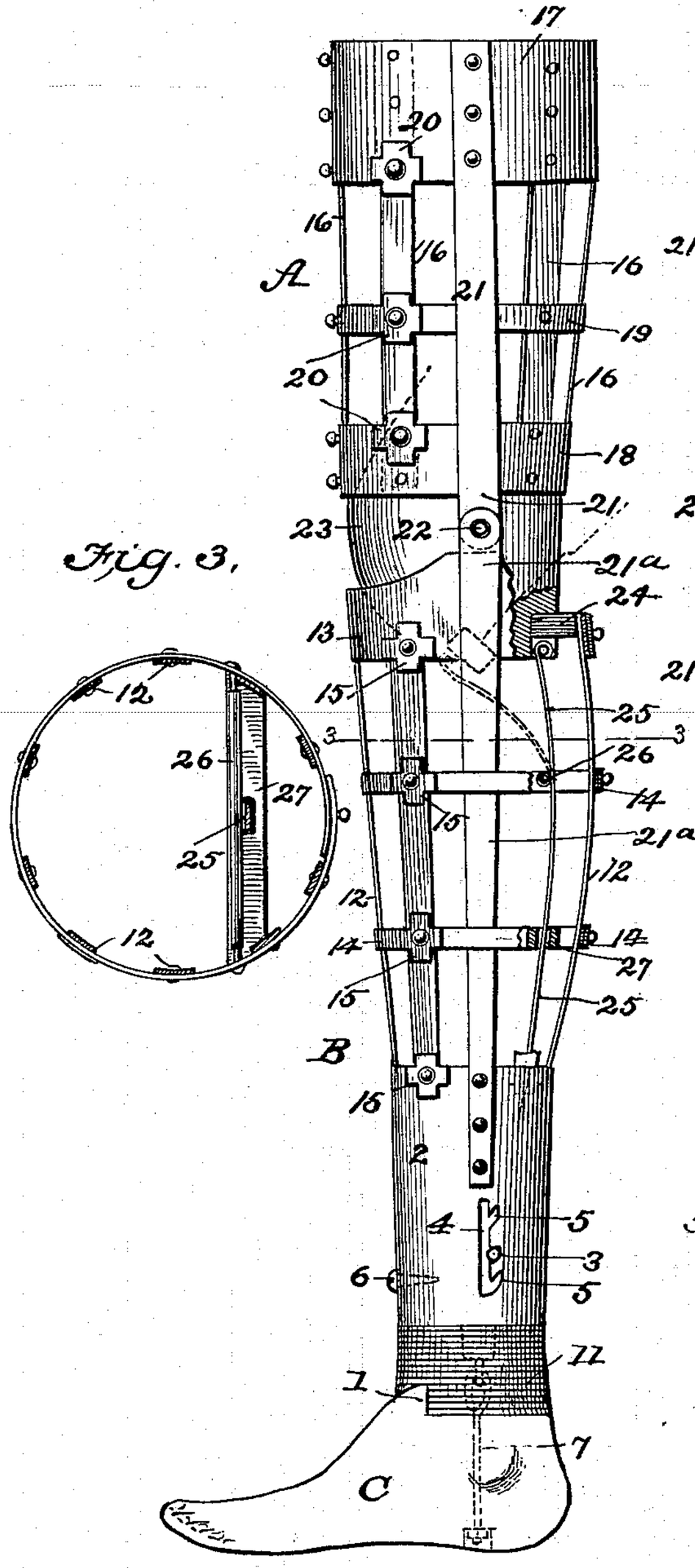

Fig. 2.

Fig. 3.

Fig. 4.

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ARTIFICIAL LIMB.

SPECIFICATION forming part of Letters Patent No. 612,282, dated October 11, 1898.

Application filed December 17, 1897. Serial No. 662,296. (No model.)

To all whom it may concern:

Be it known that I, REDMON FRANKLIN SMITH, of Gallatin, in the county of Daviess and State of Missouri, have invented a new and useful Improvement in Artificial Limbs, of which the following is a specification.

It is the object of my invention to provide an improved artificial leg for limbs amputated either above or below the knee.

The invention is embodied in the construction, arrangement, and combination of parts hereinafter first described in connection with certain old features and then more specifically indicated.

In the accompanying drawings, Figure 1 is mainly a side view, a small portion being in section, of my improved artificial leg. Fig. 2 is a rear view, the heel and ankle portion being shown in section. Fig. 3 is a horizontal section on line 3 3 of Fig. 1. Fig. 4 is a perspective view of a supplemental thigh attachment.

The three principal portions of the leg are the upper member or thigh-socket A, the lower member B, and foot C. The latter is preferably constructed of one piece of wood without joint at the ball of the foot. The leg members proper, A B, are constructed of bands and strips of thin sheet metal rigidly united, so as to form hollow skeleton frames having the shape of the natural leg.

The details of construction, connection, and operation are as follows:

The foot C has a projection 1, forming an offset or shoulder at the front side of the ankle, for a purpose hereinafter stated. The foot is flexibly connected with an attachment D of the leg proper, B, which consists of a cylindrical wooden shank-piece, Fig. 1, held detachably and also adjustably in the cylindrical sleeve or socket 2, forming the lower end of said member B. The parts D and 2 are connected by what is practically a bayonet-joint, the shank-piece D having lateral pins or lugs 3 at opposite points and the sleeve 2 having vertical slots 4 correspondingly arranged and provided on their front and rear sides, respectively, (see Figs. 1 and 2,) with upwardly-inclined notches 5, adapted to receive such pins 3. The shank-piece D is prevented from rotating in the sleeve 2 by means of a screw 6, inserted through the latter, as shown. It is apparent that by this construction the shank-piece D and the foot C, connected therewith, may be adjusted higher or lower on the leg member B by first removing the screw 6 and then pulling downward on the shank-piece and rotating the parts D and 2 on each other, so as to free the pins 3 from the notches 5. By such adjustment the leg may be adapted in length to accommodate the growth of young persons.

The attachment of the foot C to the shank-piece D is effected by two sets of stout wires or small bars 7 and 8, made of duly-flexible metal and having loops or elongated eyes 9 on their meeting ends, which interlock and thus form the main feature of the ankle-joint. The lower set 7 of said bars pass down through holes in the heel portion of the foot C and have nuts screwed on their threaded lower ends and arranged in countersinks, as shown. The upper set 8 of the bars are arranged in substantially the same manner in the shank-piece D. Between the latter and the foot C is a series of rubber disks 11, through slots in which the interlocked bars 7 and 8 pass, as shown, Fig. 2. The lower end of the shank-piece D has also a reduced extension *d*, around or on which certain of the disks 11 fit. It is obvious that this form of joint permits a natural lateral oscillation or adjustment of the foot C on the leg member B, as well as a vertical movement, due to compression of the rubber disks 11, when the wearer's weight is imposed on the leg. Further, the rubber disks 11 will slide more or less on each other, and thus relieve and prevent breaking of the joint when subjected to great and sudden strain, and yet the toe of the foot C is prevented from turning to the right or left except to a very slight degree.

The shoulder 1 of the foot C prevents the lower disks 11, which abut it, from sliding forward, so that they offer greater resistance to the flexure of the joint in that direction than would be practicable if the shoulder were dispensed with. This result is further promoted by the disks 11, that overlap the shoulder and press upon it.

With an ankle-joint thus constructed the necessity of a joint at the ball of the foot is avoided.

The body or main portion of the leg mem-

ber B is composed of longitudinal metal strips 12, a wide upper band 13, and narrower bands 14, which encircle the said strips. The latter are riveted or brazed to the sleeve 2 and upper band 13 at their respective ends, also to the smaller bands 14 at their intersection.

As a means of further strengthening the leg member B and increasing its durability without adding very materially to its weight or size I apply cruciform clips 15 at the intersection of the longitudinal strips 12 and encircling bands 14, as well as the sleeve 2 and broad band 13. The attachment is effected by the same rivets that pass through the strips 12 and bands 14, and the ends of the clips 15 are preferably brazed to the adjacent surfaces.

The upper or thigh member A is constructed, essentially, like the lower one, B, since it is composed of longitudinal metal strips 16, broad upper and lower bands 17 and 18, and intervening narrower bands 19, which are riveted or brazed together. Clips 20 are also applied in the same manner as to member B.

The two members A and B are connected by pivoting together the lapped ends of long strips or bars 21 and 21^a, which extend practically the whole length of the respective members A B on opposite sides thereof and project from the respective bands 13 and 18, as shown. The pivot-bolt 22 also passes through a wooden piece 23, which is secured in the lower band 18 of the upper member A and projects into the lower member B, the same being rounded or fashioned on its front side to represent a natural knee in bent position. The curve of the piece 23 is concentric with the pivot 22 and works in loose contact with the front side of the upper band 13 on member B. A rubber block 24, Fig. 1, is fixed in a recess on the rear side and at the lower edge of the knee-piece 23, and thus adapted to come in contact with the band 13 of member B when the upper member A is alined therewith. This combination of parts prevents severe jar and shock in walking.

A long plate or ribbon spring 25 is hinged to the knee-piece 22 at the point where the elastic buffer 24 is arranged and extends down into member B, behind a transverse rod 26, and at a lower point passes through a slot in a wooden cross-piece 27. When the leg is flexed—for example, as indicated by dotted lines in Fig. 1—this spring 25 is drawn upward and forward and thus curved over and pressed upon the rod 26 and caused to slide upward in and press backward on the wooden bar 27, so as to aid effectively in throwing the lower portion of the leg forward with a swinging movement, simulating the corresponding movement of the natural leg in walking. In order to relieve friction, the rod 26 and cross-piece 27 may be provided with rollers, with which the spring will work in contact.

In order to provide for expansion or contraction of the leg member A circumferentially to adapt it to growth of a stump or other change in the condition of the latter, I divide its bands 17 and 19, Fig. 1, transversely on the front side of the leg and lap their ends and provide them with holes to receive lacing-strings or equivalent means for securing them together in any required adjustment. The bands 13 and 14 of the lower member B are similarly divided on the rear side, and thus adapted for expansion or contraction like the member A; but this is obviously only necessary when the upper or thigh socket A is dispensed with. In such case I provide a thigh attachment (shown in Fig. 4) which is composed of a broad leather band 28 and metal strips or bars 29. The band has numerous perforations to permit circulation of air and is divided and laced, as usual, in this class of devices. When this attachment is used, the member A is detached. Said strips or bars 29 are then pivoted to the strips or bars 21 of leg member B.

An artificial leg thus constructed is light, yet strong, durable in use, easy to flex or manipulate, elastic and natural in movement, well ventilated, and thus cool and comfortable for the wearer.

What I claim is—

1. In an artificial leg, the combination with the lower member, of the foot, a sleeve forming the lower part of said member and having on opposite sides vertical slots provided with upwardly-inclined notches, the foot shank-piece adapted to fit in said sleeve and having lateral headed pins which are adapted to slide in said slots and engage the notches, substantially as shown and described.

2. In an artificial leg, the combination, with the leg members pivoted together as specified, of a metal spring permanently attached to the lower portion of the upper member at the rear side, cross-bars fixed transversely, and with which the lower portion of said spring has free sliding contact, the spring working on the upper bar as a point of leverage, as shown and described.

3. In an artificial leg, the combination with vertical strips and encircling bands of cruciform clips applied at the intersection of said strips and bands, as shown and described.

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