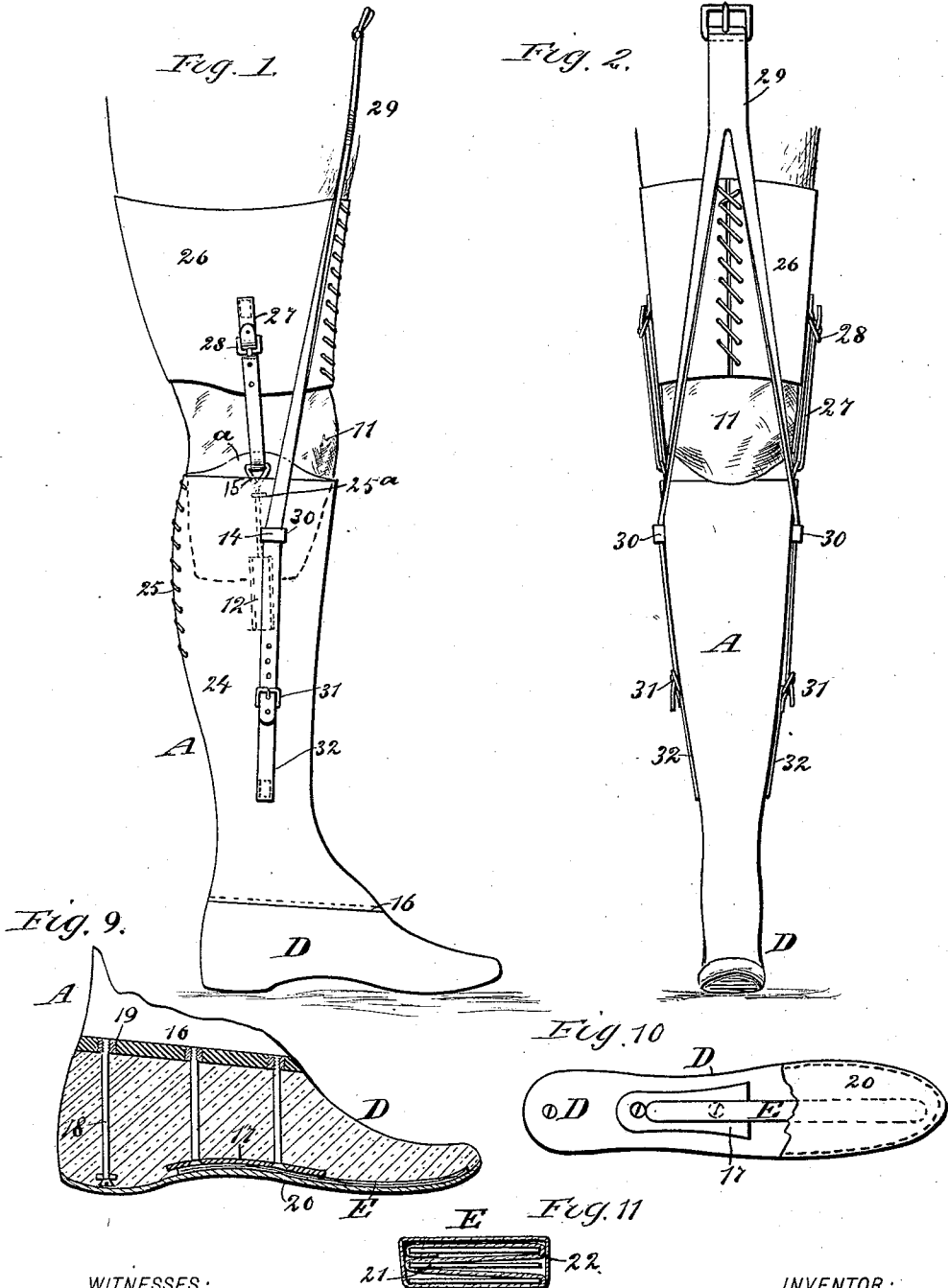


A. GAULT.
ARTIFICIAL LIMB.

No. 464,356.

Patented Dec. 1, 1891.



WITNESSES:
W. R. Davis.
C. Sedgwick

INVENTOR:
A. Gault
 BY
Murray
 ATTORNEYS

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Fig. 3.

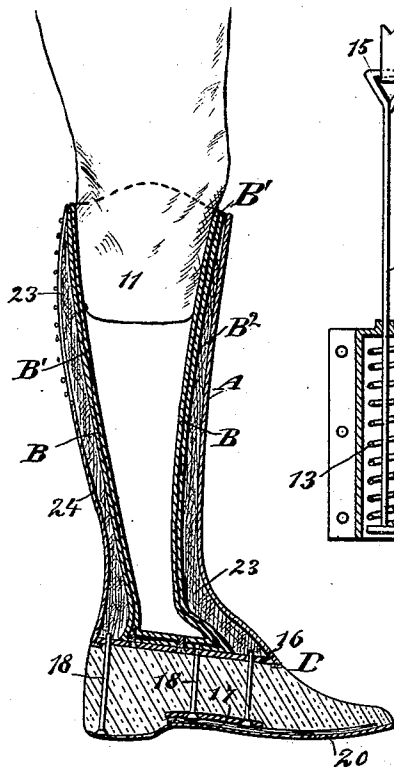


Fig. 6

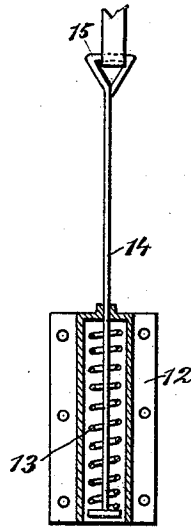


Fig. 4

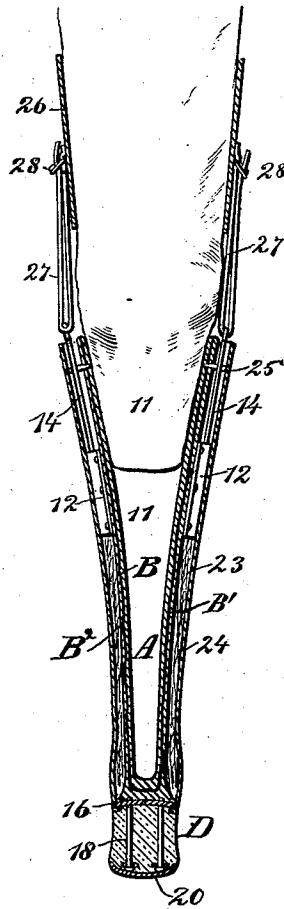


Fig. 5.

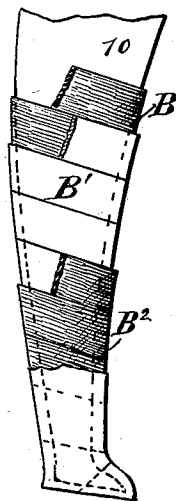


Fig. 7.

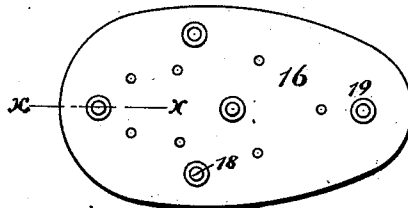
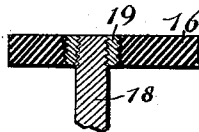


Fig. 8



WITNESSES:

M. R. Davis
C. Sedgwick

INVENTOR:

A. Gault

BY

Munn
ATTORNEYS

UNITED STATES PATENT OFFICE.

ALEXANDER GAULT, OF MEDFORD, MINNESOTA.

ARTIFICIAL LIMB.

SPECIFICATION forming part of Letters Patent No. 464,356, dated December 1, 1891.

Application filed April 1, 1891. Serial No. 387,278. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER GAULT, of Medford, in the county of Steele and State of Minnesota, have invented a new and useful Improvement in Artificial Limbs, of which the following is a full, clear, and exact description.

My invention relates to an improvement in artificial limbs, and has for its object to provide a limb that shall be exceedingly light and strong and capable of being economically constructed.

Another object of the invention is to provide a secure attachment to the limb of a felt foot, and also to provide a means whereby an artificial limb may be expeditiously and conveniently attached to a stump and be worn with the least amount of friction or inconvenience.

Another object of the invention is to provide springs for the foot adapted to maintain it in a natural position, which springs are so constructed that they impart to the foot a maximum of elasticity and are less liable to break than those at present employed.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of an artificial leg, illustrated in position upon the natural limb. Fig. 2 is a front elevation of the same. Fig. 3 is a central vertical section through an artificial leg, the said section being cut from front to rear. Fig. 4 is a similar section taken, however, at a right angle to the section shown in Fig. 3. Fig. 5 is a side elevation of the plaster cast employed, illustrating the manner in which the shell of the artificial limb is built thereon. Fig. 6 is a detail view illustrating the construction of the tension device adapted for use in connection with the limb. Fig. 7 is a plan view of a plate used as a medium for connecting the felt foot to the socket of the limb. Fig. 8 is a section through said plate, taken upon the line $x x$ of Fig. 7. Fig. 9 is a vertical section through

the foot of the limb. Fig. 10 is a bottom plan view of the foot, the sole being broken away; and Fig. 11 is a transverse section through the shaping-spring of the foot.

A plaster cast 10 of the stump 11 of a natural limb is made and the said cast is of a length to correspond to that of the socket of the artificial limb. The socket A of an artificial leg, for the construction of which the invention is particularly adapted, is of a length to extend from the stump to what would be the instep, including a portion of the latter, as illustrated in Fig. 1, and the plaster cast is made of a corresponding length. The plaster cast is wrapped with a strip or strips 11 of unvulcanized rubber, and over the layer B thus formed a layer B' of aluminum or of thin brass is placed, which metals may be in strips and wound upon the cast as a bandage is manipulated or in any other approved manner. The aluminum layer is then covered by a second layer B² of unvulcanized rubber, preferably made in the shape of strips, as described, in connection with the first layer of rubber. The cast thus wrapped is preferably coated with tin-foil or the equivalent thereof and is dipped into a receptacle containing plaster-of-paris of the proper consistency to set quickly. After the plaster has dried the cast and its wrappings are placed in a vulcanizer and the rubber is vulcanized. After the cast is removed the plaster-of-paris upon the outer face is dislodged and the cast itself is removed from the shell, which is adapted to constitute the socket-section of the limb. A shell thus made is exceedingly light, being made up of alternate layers of unvulcanized rubber and aluminum or other metal, the metal acting as a brace and support for the rubber. The upper portion of the socket will have been so shaped as to neatly fit the exterior contour of the natural stump, and the socket is preferably made slightly higher at the sides than at the front and rear, as illustrated at a in Fig. 1.

After the shell has been formed casings 12 are attached to opposite sides thereof, the upper ends of the casings being closed excepting at their centers, as illustrated in Fig. 6. In each casing a coil or spiral spring 13 is located, and a rod 14 is passed through the opening in the top of each casing downward

through the spring therein, while the lower ends of the rods are attached in any suitable or approved manner to the lower extremities of the springs, as is likewise best shown in Fig. 6. The rods extend some distance beyond the upper ends of the casings and their upper extremities are bent to form eyes 15. Upon the bottom of the socket a hard-rubber plate 16, of suitable shape, is rigidly fastened by means of screws, pins, or the equivalents thereof. The plate 16, while preferably made of hard rubber, as heretofore stated, may consist of rubber and aluminum or brass combined, and the size of the plate is such that it extends sufficiently far beyond the sides, front, and rear of the lower end of the socket to form a portion of the foot D, the said foot being adapted for attachment of the socket through the medium of the plate.

The foot D is preferably made of felt, and the instep thereof is supported by a metal plate 17, which plate, together with the foot, is attached to the socket-section of the limb by means of a series of bolts 18, preferably five in number. The bolts are passed through the foot and the plate 17 from the under side thereof up into the socket-plate 16. The bolts are secured in the socket-plates in a peculiar manner, which consists in producing in the socket-plate a series of threaded apertures and screwing into said apertures thimbles 19, exteriorly and interiorly threaded, as illustrated in Fig. 8, while the upper ends of the bolts 18 are threaded and screwed into the thimbles.

The bottom of the foot-section D of the limb has sewed or otherwise attached thereto a sole 20, preferably made of leather, and the foot is held in a natural position under predetermined pressure through the medium of a shaping-spring E. The spring is of peculiar construction, and consists of a number of layers 21 of thin spring-metal strips, as shown in Fig. 11, which strips are separated by interposed layers 22 of canvas or other fabric, or of leather, fabric, however, being preferred. The wrapping of the springs consists, preferably, of a single strip, which is first wrapped around the lower spring, then around the next upper one, and so on until the uppermost spring-leaf has been covered, whereupon the edges of the fabric are secured in any suitable or approved manner to form for the leaf-springs a perfect envelope, or practically so. These springs thus bound together are placed between the sole 20 and the bottom of the felt foot-section of the limb, and the said springs are preferably of sufficient length to extend from beneath the instep of the foot nearly to the outer end of the toe, as is illustrated in Fig. 9. When the springs are cased in the manner described, a number of springs may be employed, and the springs will not break as quickly as would a thicker single spring. The action of the sectional spring is far better than that of a solid spring, as the leaves

of the former will slide one upon the other, and thus render the foot more elastic.

After the socket-plate 16 has been attached the leg is properly shaped by inclosing the shell, heretofore described, in a suitably-mod-
eled felt jacket 23, which jacket extends
nearly to the edges of the plate 16. The en-
tire socket is inclosed, with the exception of
the top, by a leather wrapping or outer jacket
24, thus rendering the socket pleasant to the
touch. This leather jacket closely fits the
socket, and the parts thereof are sewed to-
gether or seamed, with the exception of the
back seam near the top, which is united at
that point by a lacing 25, and said lacing is
provided in order that access may be had to
the casings 12 and their springs.

The casings 12 may be made of rubber, which may be vulcanized when the shell is so treated, or they may be made of metal and attached by screws or equivalent fastening devices to the shell. The rods 14 of the springs contained in the casings are guided in their movements by eyes 25^a, through which they pass, the said eyes being attached to the shell near the upper end thereof, as illustrated in Fig. 4, and a suitable opening is made in the leather casing or jacket 24 to admit of the outward passage of the upper ends of the spring-controlled rods 14.

A leather lacer 26 is laced upon or otherwise attached to the natural limb above the stump which is to be provided with an artificial extension, and a strap 27 is attached to each side of the stocking and provided with a buckle 28 near its upper end. The straps are adapted to be passed through the eyes of the spring-controlled rods 14 and upward through the buckles 28, as illustrated in Figs. 1 and 2, whereby the artificial limb is elastically held in convenient engagement with the stump. The only other support which the limb requires is that of a bifurcated strap 29, connected with the natural limb at the front in any approved manner, and the members of the strap 29 are carried downward through guides 30, located at opposite sides of the artificial limb and to an engagement with buckles 31, secured to straps 32, which straps are attached to the sides of the artificial limb, preferably at a point above the ankle, as shown in Figs. 1 and 2.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with an artificial leg provided with a felt foot, of a shaping-spring located between the sole and the body of the foot, the said spring comprising a series of leaves separated and enveloped by flexible strips, as and for the purpose specified.

2. In an artificial limb, the combination, with a socket and a plate attached to the lower end of the socket and provided with a series of apertures containing threaded thimbles, of a foot-section and bolts passed upward

through the foot-section and into the threaded thimbles, as and for the purpose specified.

3. The combination, with the socket of an artificial limb, and a plate secured to the socket at its lower end, provided with threaded apertures, and interiorly and exteriorly threaded thimbles secured in said apertures, of a foot of felt or of a like yielding material, and bolts passed through the foot from the sole thereof upward into the threaded thimbles of the plates, as and for the purpose specified.

4. In an artificial limb, the combination, with the socket-section thereof adapted at its upper end to receive the stump of the leg below the knee, and a leather lacer adapted for attachment to the natural limb above the knee-joint, of spring-depressed rods located at the sides of the socket-section, and straps attached to the leather lacer and passed through eyes in the rods, as and for the purpose specified.

5. As an improved article of manufacture,

an artificial limb the shell of which is composed of alternate layers of hard rubber and aluminum or thin brass, as and for the purpose specified.

6. As an improved article of manufacture, an artificial limb consisting of alternate layers of vulcanized rubber and aluminum or thin brass, an envelope of felt, and an outer casing of leather, substantially as described.

7. The herein-described process of constructing the socket-sections of artificial limbs, which consists in wrapping around a cast alternate layers of unvulcanized rubber and aluminum or thin brass, then vulcanizing the rubber upon the cast, and finally incasing the shell thus obtained in a yielding envelope, as and for the purpose set forth.

ALEXANDER GAULT.

Witnesses:

JOHN BAILEY,
ORRIN LEE.