No. 876,017. PATENTED JAN. 7, 1908.

G. X. ROBERTS.

ARTIFICIAL LIMB.

APPLICATION FILED OCT. 9, 1907.

2 SHEETS—SHEET 1.

Fig. 2.

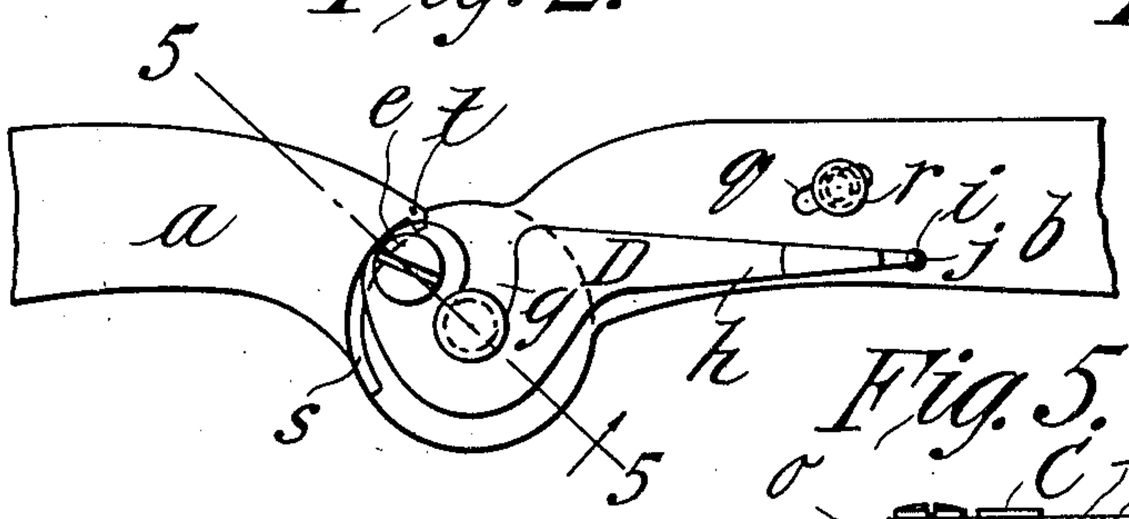


Fig. 1.

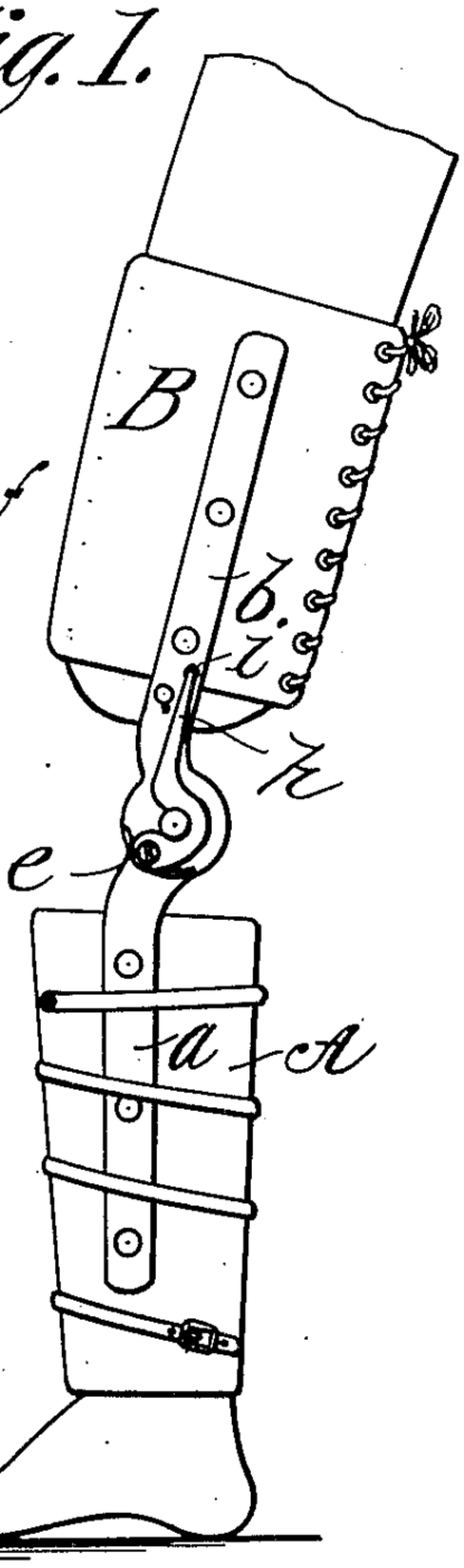


Fig. 5.

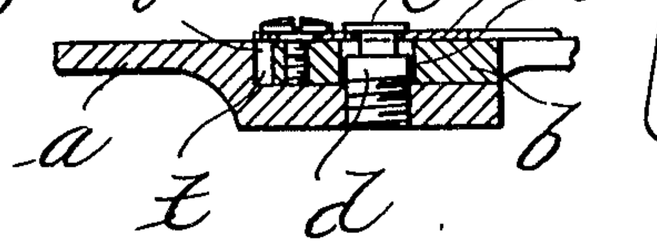


Fig. 3.

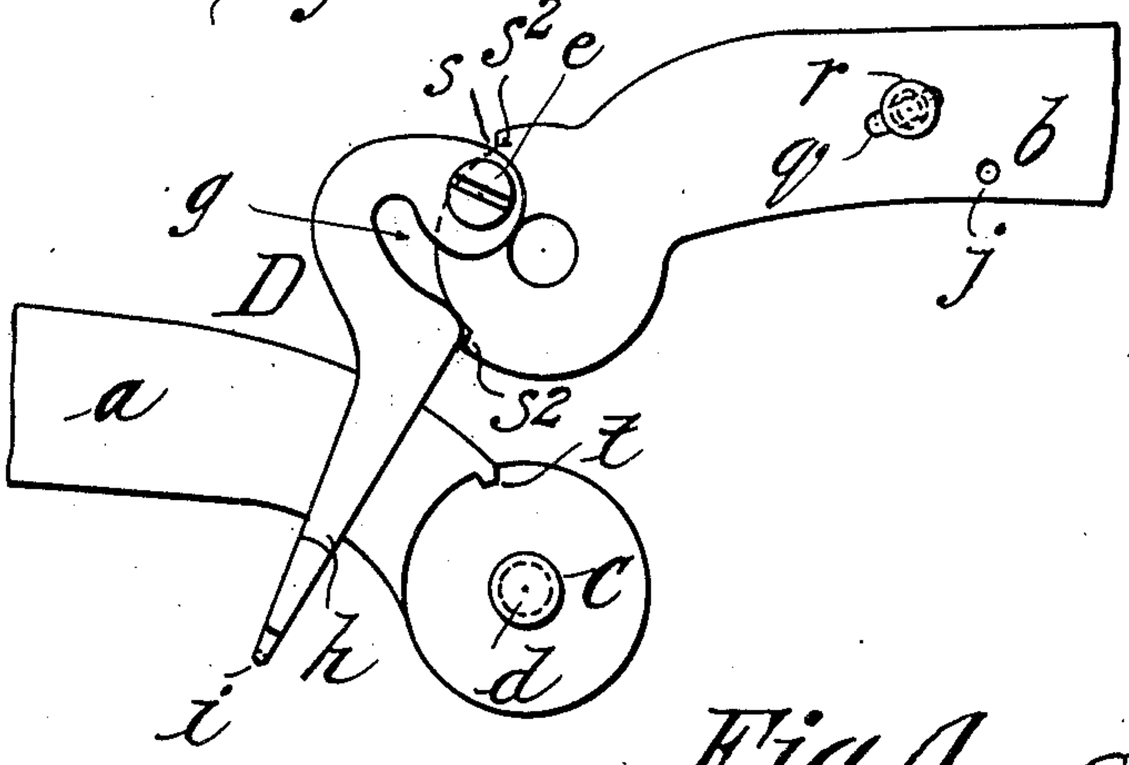


Fig. 4.

Fig. 7.

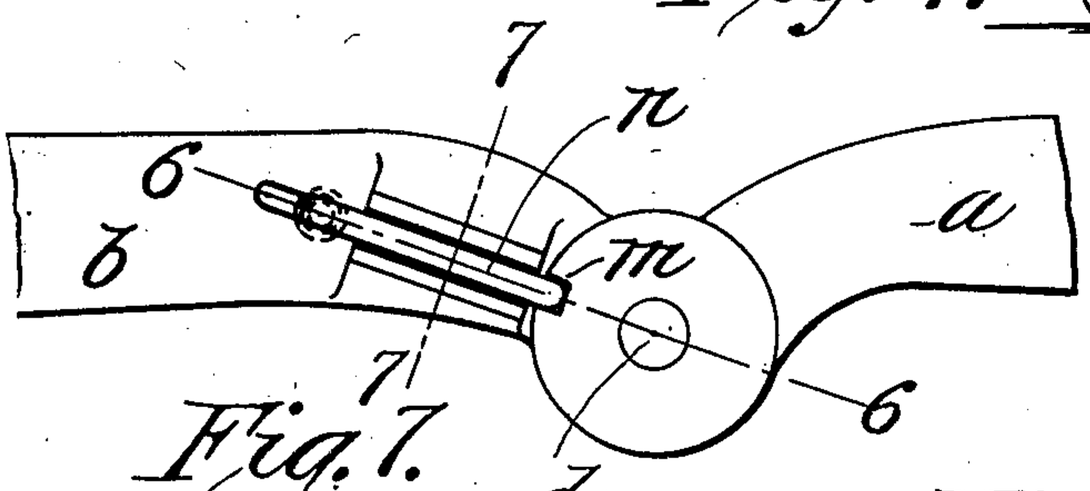
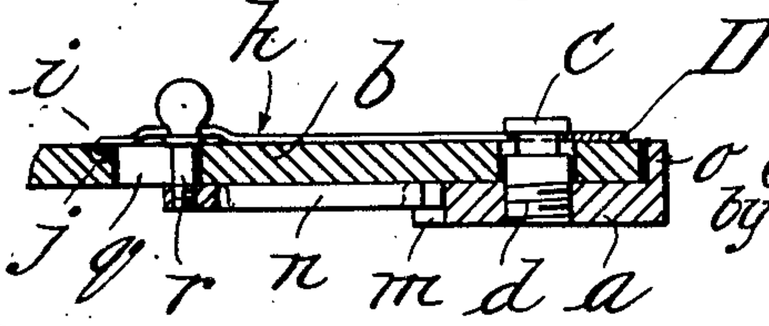


Fig. 6.



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2 SHEETS—SHEET 2.

Fig. 9.

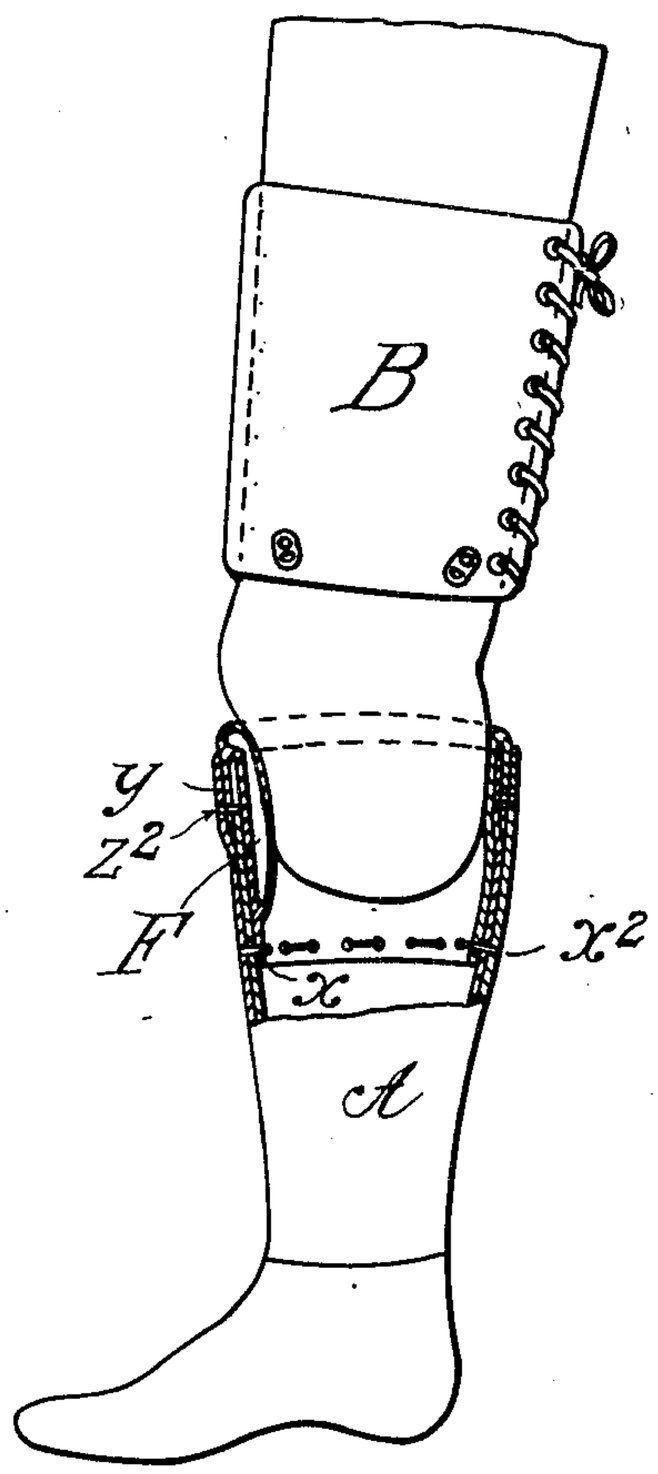


Fig. 8.

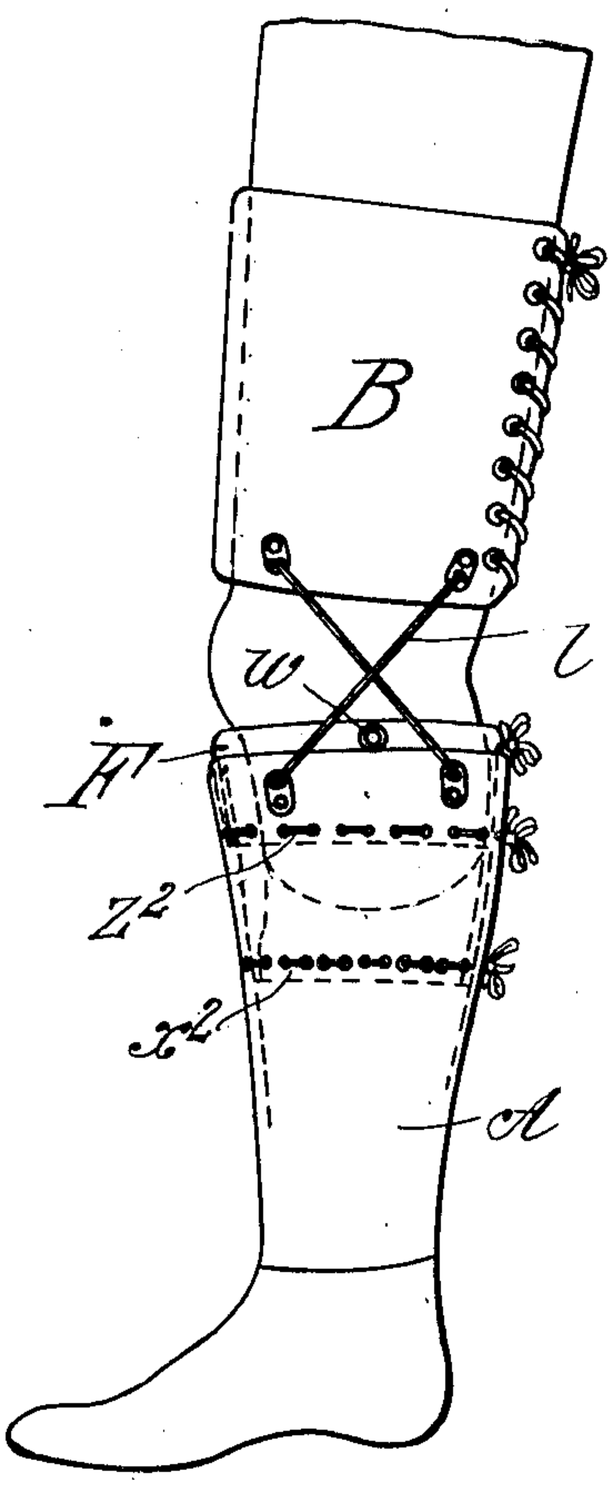


Fig. 11.

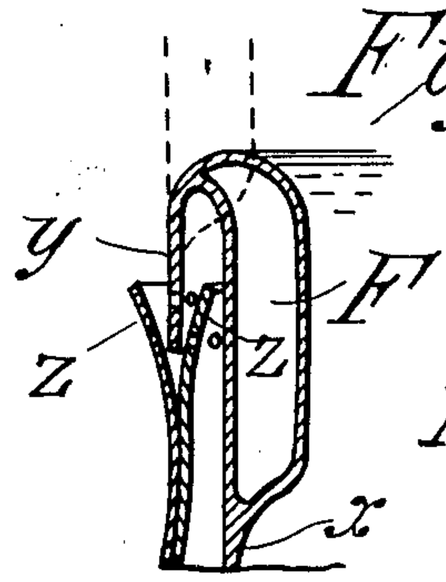


Fig. 10.

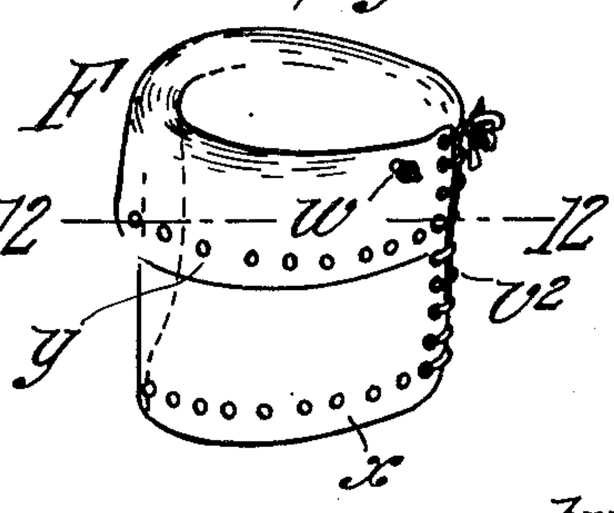
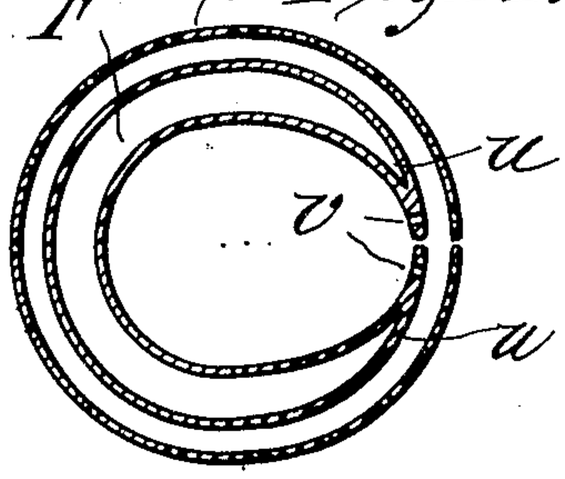


Fig. 12.



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UNITED STATES PATENT OFFICE.

GEORGE X. ROBERTS, OF BRATTLEBORO, VERMONT.

ARTIFICIAL LIMB.

No. 876,017. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed October 9, 1907. Serial No. 396,539.

To all whom it may concern:

Be it known that I, GEORGE X. ROBERTS, a citizen of the United States of America, and resident of Brattleboro, in the county of Windham and State of Vermont, have invented certain new and useful Improvements in Artificial Limbs, of which the following is a full, clear, and exact description.

This invention pertains to improvements in artificial limbs, more especially artificial legs, although certain portions or features thereof may be applicable in conjunction with arm members.

One object of the invention is to provide for upper and lower leg members, a construction of duplicated joint capable of permitting most readily and conveniently the attachment and detachment of the lower leg member with and from the upper or thigh member.

Another object is to provide means for detachably locking the lower member of the artificial leg which is pivotally connected to the upper member, so that at pleasure such lower member may be maintained as a rigid nether extension of the thigh member, to be of convenience to, and to conduce to the comfort of, the wearer who may have occasion to stand, for long periods, as for instance, up to a bench or machine.

Other objects are to construct the joint connections with a view to simplicity and cheapness of construction, and durability under long extended usage. And a still further object of the invention is to provide in an artificial limb, within the socket for receiving the stump of an amputated leg,—or arm,—an inflatable internally encircling band or cushioning sack, in conjunction with which are provided novel ways and means for the attachment of the cushioning band or sack, and for its most satisfactory and serviceable disposition in its relation to the socketed limb.

The invention consists in combinations or arrangements of parts and the constructions of certain of the parts all substantially as hereinafter fully described and set forth in the claims.

Exemplifications of the present improvements in artificial limbs are represented in the accompanying drawings, in which,—Figure 1 is a side elevation of an artificial leg having the detachable pivot joint or connection, and understood as having means, mostly located on the rear or inner side for locking the lower leg member to render it as a rigid extension of the upper or thigh member. Fig. 2 is a side view of the endwise overlapped and detachably pivotally connected bars of the upper and lower leg members in their connected relation. Fig. 3 is a side view similar to Fig. 2, but showing the parts in separated relations. Fig. 4 is a view of the parts shown in Fig. 2, but as seen at the opposite side thereof. Fig. 5 is a sectional view through the joint, as seen on line 5—5, Fig. 2, and drawn on a larger scale. Fig. 6 is a sectional view on line 6—6, Fig. 4. Fig. 7 is a cross sectional view on line 7—7, Fig. 4. Fig. 8 is a side elevation of an artificial leg having in the stump socket of the lower member thereof the inflatable cushioning appliance. Fig. 9 is a somewhat similar view but showing the stump socket portion and inflatable cushioning appliance in central vertical section. Fig. 10 is a perspective view of the inflatable stump socket cushioning appliance. Fig. 11 is a vertical sectional view of parts shown in Fig. 9, but drawn on a larger scale for increased clearness of illustration. Fig. 12 is a horizontal cross section taken on line 12—12, Fig. 10.

Similar characters of reference indicate corresponding parts in all of the views.

Referring to Sheet 1 of the drawings, in which an artificial leg is represented, A represents the lower leg member and B the upper member or appliance; and on the sides of said members A and B are rigidly affixed bars *a* and *b* which are endwise made of partially circular form, facewise overlapped and detachably pivotally joined by means as follows. One of the bars, for instance the one *a* has at its rounded extremity the concentric rigid stud *d* having at its outer end portion a peripheral groove whereby a shoulder *c* is produced, while the rounded extremity of the bar *b* has a hole *f* therethrough to freely fit over the shouldered stud *d*. The thickness of the end portion of the bar *d* is less than the length of extension of the stud beyond the face of the bar *a*, whereby the shoulder *c* stands slightly outwardly beyond or clear from the outer face of the bar *b* when the same is engaged over the stud; and compactly disposed in its facewise relation to the adjacent bar.

D represents a plate pivotally connected at *e* on the outer face of the bar *b* at its end portion, and to swing relatively thereto; and said plate is provided with an arc shaped recess *g* whereby it is adapted by such recessed portion to engage with and be disengaged from the shoulder of the pivot stud *d*, as represented in Figs. 1, 2, 5 and 6. The said plate for the interlocking engagement with the shoulder of the pivot stud is made with a spring deflective extremity *h* and with an angularly turned end *i* for a detachable spring, or snap catch, engagement in a small socket *j* in the bar *b*.

When the joint forming extremities of the two bars *a* and *b* are connected and the locking plate D swung to engagement at the margins of the recess *g* with the pivot stud shoulder *c*, and the retention of the plate in its so interlocked position by the engagement of the angularly turned end *i* in the hole *j* is assured, there can be no liability of the one leg member from becoming disconnected or detached from the other, and yet all freedom of pivotal action or swinging movement of the one member relatively to the other will be permitted unless purposely prevented by the joint locking means to be next described.

The rounded end of the bar *a* is offset or thickened and made with a depression or rabbet, as shown in Figs. 5 and 6, as somewhat common in "halved together" hinge joints, and the rounded end of the bar *b* is accommodated in this rabbet and partially edgewise inclosed by an arc shaped wall *o*.

In the edge of the offset or thickened rounded end portion of the bar *a* is a recess or bolt socket *m*; and a bolt *n* is slidable in a guideway constituted by parallel lips or ribs *p p* formed or provided on the inner side of the bar *b*,—that is the side opposite from that at which the pivoted locking plate D is carried.

The line of movement of the bolt *n* is radial to the pivot stud *d*. An operating stud *r* for the bolt *n* projects through a slot *q* in the bar *b* and has a knob or enlargement on the front or outer side of the bar to facilitate the sliding of the bolt into engagement with the recess or socket *m* to lock the bar *b* rigidly to the bar *a*, or the reversed sliding of the bolt for leaving the jointed parts free for their swinging or hinge like action within proper limits.

The limitation of the swinging movement of the bar *a* and lower leg member relatively to the upper leg member or appliance and its bar *b* is insured by the provision of an arc shaped rabbet *s* at the margin of the rounded extremity of the bar *b* and by the provision of a lug or projection *t* at the arc shaped wall or hinge boundary *o* to extend into the rabbet or depression *s* and to engage the shoulders s^2 at the ends thereof.

The position and arrangement of the parts of the hinge stop last referred to are such as to avoid all liability of the trousers or underwear being caught in the knee joint of the artificial leg when the latter has the members thereof in doubled up relations. In the artificial leg shown in Sheet # 2 of the drawings, in which it is understood that the lower leg member A is to be sustained or suspended from the upper leg member or appliance by any suitable connection or joint, the leg member A is provided with an upwardly open socket for receiving the stump of an amputated leg, in which is provided an inflatable lining or band F to constitute a cushioned and comfortable seat or rest for the stump. While in the disposition of the inflatable seat within the stump socket, such seat is practically annular and extends substantially entirely around and within the wall of the socket, I prefer in practice to produce the inflatable seat in the form of a band comprising a sack for the greater portion of its length, having the end portions thereof converged and closed as represented at *u u*, Fig. 12, with extremities made with lacing holes *v v*. The hollow band or sack is provided with an inflating valved tube *w* for receiving connection therewith of an ordinary air pump.

The inflatable band or sack is provided at the lower inner and upper outer edges thereof with flaps or lips *x* and *y*, preferably longitudinally continuous; and the upper or outer one of these flaps is return bent or folded, as represented in Figs. 9 and 11 and disposed within the separable layers or walls *z z* at the mouth of the stump socket and united therein by a lacing cord or other fastening interengaged with the several flaps or layers, for instance as represented at z^2 in Figs. 8 and 9. The inner and lower flap of the inflatable sack is disposed against the inner surface of the stump socket wall suitably below the top thereof and there held by a lacing cord x^2 or other selected form of fastening.

v^2 in Fig. 10 represents the vertical lacing for uniting the approached or adjoined ends of the inflatable band. The inflatable band or sack may be constituted by thin elastic sheet rubber, or suitable compounds of rubber or other material, and the flaps or lips *x* and *y* may be composed of rubber integrally made with the sack or of textile material cemented or otherwise secured thereto.

In Fig. 8 the upper leg member or thigh encircling appliance B and the lower leg member A are connected by crossed cords or lacings *l* understood as provided at the outer and inner sides of the leg. The inflatable cushioned stump socket seat, as apparent will be self conforming to the contour of the stump of an amputated limb and will conduce to greater comfort and convenience to the user than would be the case were a padded or "fashioned" seat or lining pro-

vided. The inflatable seat may be blown up only moderately, or extremely hard, as may be preferred; and it may be, after protracted usage and deterioration replaced.

I claim:—

1. In an artificial leg, in combination, upper and lower leg members and overlapped and pivotally jointed bars provided at the side of said members, one bar having a laterally extended, shouldered pivot stud, and the other a hole whereby it may be engaged over, and beyond the shoulder of, said stud, and said latter bar having a plate shiftable thereon, and provided with a recess, opening to the edge thereof, and adapted by such recessed portion to engage with, and be disengaged from, the shouldered pivot.

2. In an artificial leg, in combination,— upper and lower leg members and endwise overlapped, and pivotally jointed, bars provided at the side of said members, one bar having a laterally extended shouldered pivot stud, and the other a hole whereby it may be engaged over said stud, and said latter bar having a plate pivotally connected and to swing thereon, provided with a recess, opening to the edge thereof, adapted by such recessed portion to engage with, and be disengaged from the shouldered pivot, and also provided with a spring-deflective extremity having an angularly turned end for detachable engagement in a socket which is provided therefor in the bar on which said plate is pivotally connected.

3. In an artificial leg, in combination, upper and lower leg members, bars affixed on the side of said members and endwise overlapped, means for detachably pivotally connecting the one bar to the other, and means for detachably locking one of said bars as a rigid continuation of the other.

4. An artificial leg comprising upper and lower members having bars rigidly affixed on the side thereof and endwise overlapped, with means for detachably pivotally connecting the one bar to the other and means for limiting the extent of swinging movement which one of the said bars may have relatively to the other.

5. An artificial leg comprising upper and lower members having bars rigidly affixed on the side thereof, endwise overlapped, and pivotally connected, one of said bars having a recess in its end portion, and a locking bolt slidably carried on the other of said bars and adapted to be engaged in and disengaged from said recess.

6. An artificial leg comprising upper and lower members having bars rigidly affixed on the side thereof, endwise overlapped and pivotally jointed, one of said bars having an edgewise recess in the end portion thereof adjacent the pivot and the other one of said bars having a guideway on the side thereof, and a slot therethrough, a bolt slidable in said guideway and adapted by the end thereof to engage into said recess and having a stud projected through said slot and protruding at the opposite side of the bar.

7. In an artificial leg, in combination,— upper and lower leg members and endwise overlapped, and pivotally jointed, bars provided at the side of said members, one bar having a laterally extended shouldered pivot stud, and an edgewise opening recess in its end portion adjacent the pivot bar having a hole whereby it may be engaged over said stud, having also a plate pivotally connected and to swing thereon, provided with an edgewise opening recess, to engage with, and to be disengaged from the shouldered pivot, and provided with a spring-deflective extremity having an angularly turned end for detachable engagement in a socket which is provided therefor in the said plate-carrying bar, and said bar having on its side opposite said pivoted plate a guide way, and a slot therethrough, a bolt slidable in said guideway, to engage and disengage the edgewise recessed first named bar, provided with a stud projected through said slot and protruding beyond the side of the bar.

8. A member of an artificial limb having a stump socket at an end thereof which is provided with an inflatable sack extending internally therearound.

9. A member of an artificial limb having a stump socket at an end thereof, a band made in the form of a sack and inflatable for the greater portion of its length, having the end portions thereof provided with uniting fastenings and arranged within, and constituting a cushioning lining for, the stump socket.

10. A member of an artificial limb having a stump socket at an end thereof which is provided with an inflatable sack extending internally therearound, said sack having at an edge thereof a lip or flap and means for connecting said flap with the wall of the stump socket.

11. An artificial limb or member having a stump socket at an end thereof, an inflatable sack extending around within said socket, the same being provided at its inner and outer edges thereof with flaps or lips and means for attaching said flaps at the mouth portion and also inwardly beyond, the mouth portion of the socket.

12. An artificial limb or member having a stump socket at an end thereof, an inflatable sack extending around within said socket, the same being provided at the outer edge thereof with a longitudinally extending flap or lip, the same being overlapped relatively to the sack portion thereof and connected with the mouth portion of the stump socket wall.

13. An artificial limb having a stump socket at an end thereof made with double separable walls or thicknesses, an inflatable

sack extending around within said socket and having at the outer edge thereof a longitudinally extending flap overlapped and disposed within the said separable socket walls and connected thereto.

14. An artificial limb having a stump socket at an end thereof made with double separable walls or thicknesses, an inflatable sack extending around within said socket and having at the outer and inner edges thereof longitudinally extending flaps, the outer flaps being overlapped and disposed within the said separable socket walls and connected thereto, and means for connecting the inner edge flap within the stump socket.

15. A cushioning band for a stump socket of an artificial limb comprising an inflatable sack adapted to extend around within the mouth portion of the socket and having at an edge thereof a flap or lip by means of which to secure the sack within, and to the stump socket wall.

16. A cushioning band for an artificial limb stump socket comprising an inflatable sack adapted to extend around within the mouth portion of the socket and having at opposite edges longitudinal flaps each provided with a row of eyes, for lacings or like securing means.

Signed by me at Brattleboro, Vt., in presence of two subscribing witnesses.

GEORGE X. ROBERTS. [L. S.]

Witnesses:
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CHARLES A. BOYDEN.