No. 762,031. PATENTED JUNE 7, 1904.

W. ENGELS.

ARTIFICIAL LEG.

APPLICATION FILED JUNE 25, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

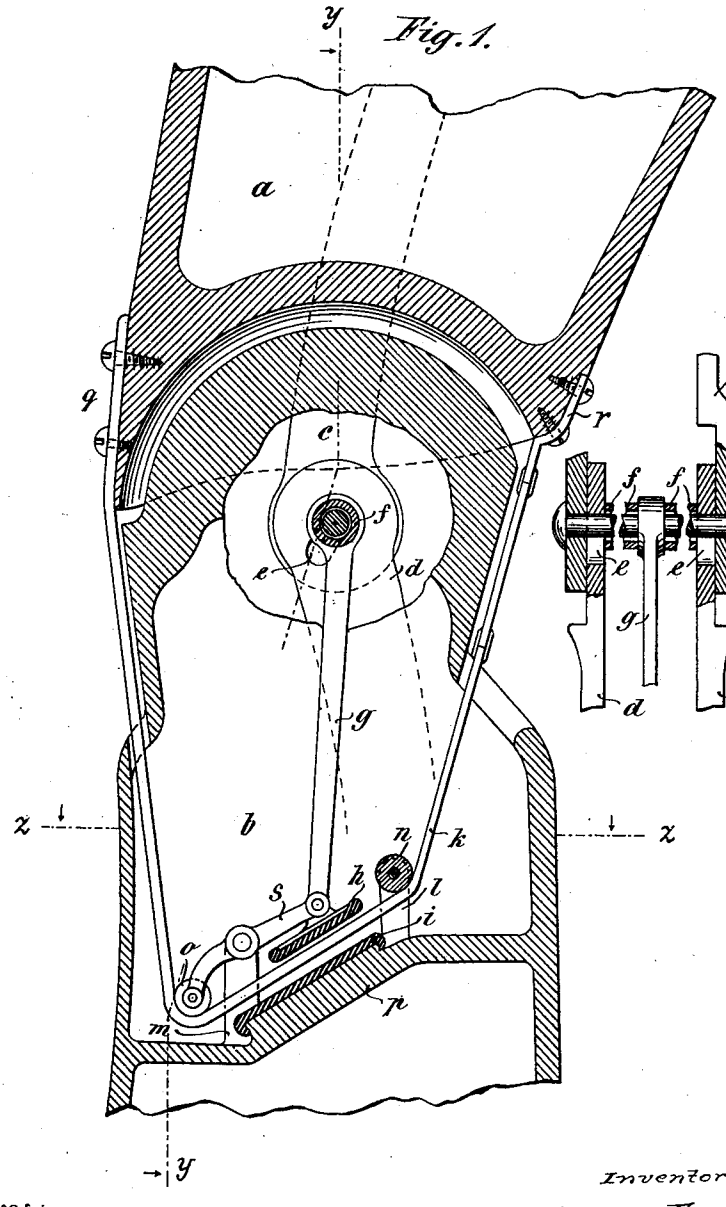


Fig. 2.

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NO MODEL. 2 SHEETS—SHEET 2.

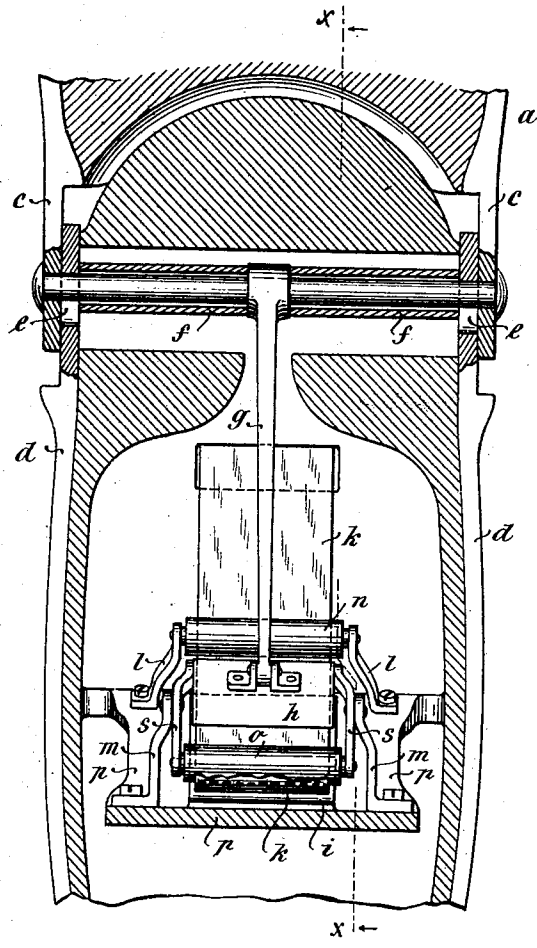
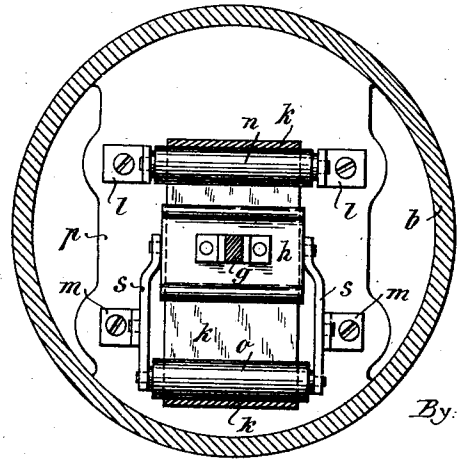


Fig. 3.

Fig. 4.



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No. 762,031. Patented June 7, 1904.

UNITED STATES PATENT OFFICE.

WALTER ENGELS, OF HAMBURG, GERMANY.

ARTIFICIAL LEG.

SPECIFICATION forming part of Letters Patent No. 762,031, dated June 7, 1904.

Application filed June 25, 1902. Serial No. 113,167. (No model.)

To all whom it may concern:

Be it known that I, WALTER ENGELS, a citizen of the Kingdom of Prussia, and a resident of Hamburg, in the German Empire, have invented a certain new and useful Improvement in Artificial Limbs, of which the following is a specification.

My invention relates to artificial limbs; and its object is to provide suitable means whereby the movably-connected or jointed members of such limbs, as artificial legs or arms, may be rendered capable, even when in a bent position, of supporting the weight of the body thrown thereon or part of such weight.

To this end my invention consists in the improved construction or combination of parts whereby upon one of two jointed artificial limbs or members becoming depressed by the weight thrown thereon the vertical movement of the upper limb or member upon the lower through a slot at or near the knee-joint acts to operate a brake or clamping device located within the other limb or member, thereby locking both limbs or members relatively to each other in whatever position they may at the time be occupying relatively to each other, the said limbs or members then remaining thus rigidly locked until relieved from the weight, whereupon they will then be free to move in their joint again. In the preferred form of my invention the means for thus operating the said brake or clamping device consists of a rod connected with its one end to the said brake or clamping device and with its other end to an axis vertically movable in a slot at the joint of both limbs or members, so that the said brake or clamping device may be operated from the said other limb or member through the latter becoming depressed by the weight of the body thrown thereon. Any tendency of the said members while locked in the bent position to bend still further under the action of the weight resting thereon will, according to a preferred form of my invention, cause a lever to press one of the brake parts so much more firmly against the other part or parts, thereby increasing the efficiency of the locking action.

According to one form of my invention the brake device located in the lower limb or member of an artificial leg, for instance, upon being operated as above referred to will act upon a strap or band which passes from the upper member into and through the lower member, and by clamping the said strap or band between a brake-block and an abutment surface will lock both limbs or members, thus rendering them rigid in their common joint.

In the drawings illustrating my invention as applied to an artificial leg, Figure 1 is a vertical section on the line $x\,x$, Fig. 3, of an artificial leg embodying my invention with parts broken away. Fig. 2 is an elevation, partly in vertical section, of a detail with parts broken away. Fig. 3 is a vertical section on the line $y\,y$, Fig. 1, with parts broken away. Fig. 4 is a horizontal section on the line $z\,z$, Fig. 1.

a is the upper member; b, the lower member. The brace-rod c of the upper member is provided at its lower or joint end with a transverse axis f, capable both of a rotary movement and of a sliding movement within the inclined slot e of the brace-rod d of the lower member b. Pivoted on the said axis, in the center thereof, is a depending arm g, having a plate h rigidly secured to its lower end. If weight is thrown upon the upper member a, the axis f will slide downward in the slot e, whereby also g and h will be pressed downward. As shown in the drawings, a bridge p, obliquely ascending from front to back, is provided within the lower member b below plate h, the said bridge widening out below plate h, so as to form an equally large bearing-surface i parallel to plate h. In brackets m, mounted on the bridge p, is fulcrumed the lever s, the said lever being movably connected at its one end to the arm g above the plate h, while its other free end is provided with a roller o. Other brackets l, provided at a point nearer the other end of the bridge p, have a roller n journaled therein.

A strap k, secured near the knee q of the upper member a, passes thence down through a slot in front of the lower member b and below the rollers o and n between h and p, finally emerging at the rear of the lower member b and terminating at the back of the upper member a, where it is fastened at r. When no weight rests on the limb, the said strap k

runs freely through the lower member *b* without impeding its movements. As soon, however, as the axis *f*, together with the arm *g* and plate *h*, becomes depressed under the action of a weight brought to bear upon them the strap *k* becomes firmly clamped between *h* and *i*. If, owing to an increase of the weight, the knee-joint bends, the strap *k*, hitherto lightly clamped between *h* and *i*, becomes stretched in front, thus tending to diminish the acuteness of the angle at *o*, and thereby raising the left arm of the lever shown in the drawings. The plate *h* thus being more firmly depressed by the right arm of the lever *s* shown in the drawings the strap *k* becomes all the more firmly clamped the greater the strain in bending. Thus the arm *g*, forming a continuation of the brace-rod *c* of the upper member *a*, has become the point of support for the said upper member, whereas the fulcrum-point of the knee-joint now lies approximately at *q*. Thus an imaginary one-armed lever has formed, as it were, having its point of support near *q* and its bearing-point vertically beneath the center of gravity of the weighted body—that is to say, behind the leg. The axis *f* near the fulcrum-point of this lever is very forcibly depressed. Therefore as soon as the strap begins to be clamped under the action of the weight every attempt at continuing to bend the leg can only result in the latter becoming more firmly locked. On the weight being removed the lower member *b*, by reason of its own gravity, depresses the brace-rod *d*, together with the slot *e*. In other words, *f*, *g*, and *h* are raised, the strap *k* is released, and the joint will then again be free to move.

Although I have hereinbefore and in the drawings described and shown my invention as applied to an artificial leg and knee-joint, it is by no means restricted to this mode of application, but may be similarly employed in other limbs and joints. Neither do I limit myself to the exact details of construction shown.

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

1. In an artificial limb the combination, with an upper member and a connected lower member both capable of angular and limited vertical movement relatively to each other, of flexible supporting and guiding means, such as a strap, extending from the upper member through the lower member below the center of angular movement of the latter, a clamping device arranged within the lower member in the line of movement of the said supporting and guiding means and operatively connected with the upper member, and a movable connection in a slot at the knee-joint pivot, for moving the said clamping device into engagement with the said supporting and guiding means by a vertical movement of one member upon the other, substantially as and for the purpose described.

2. In an artifical limb embodying two movably-connected members and a strap extending from the one member through the other member along a bearing-surface within the latter, the combination, with the said strap and bearing-surface, of a lever fulcrumed within the last-named member, a clamping-plate connected with the one arm of the said lever and means for operating the said lever and clamping-plate from without to clamp the said strap against the said bearing-surface, substantially as described.

3. In an artificial limb the combination, with an upper member and a connected lower member, both capable of angular and limited vertical movement relatively to each other, of a flexible supporting and guiding means, such as a strap, extending from the upper member through the lower member, the latter being suspended from, and capable of a sliding movement along the said supporting and guiding means, a bearing-surface immediately below the latter, a clamping-plate immediately above the same, connections between the said clamping-plate and the upper member, a lever fulcrumed within the lower member, with its one arm movably connected above the clamping-plate and its other arm bearing on the said supporting and guiding means with a roller provided thereon, substantially as and for the purpose described.

4. In an artificial limb having an upper member and a connected lower member capable of angular and limited vertical movement relatively to each other, a strap secured with its one end to the front side of the upper member, passing thence downward into and through the lower member, emerging from the latter in the rear and having its other end secured to the rear side of the upper member, a clamping mechanism operated by a vertical movement of the upper member to clamp the said strap against a bearing-surface within the lower member, a lever having one arm operatively connected with the said clamping mechanism and the other arm exposed to the strain of an angular portion of the said strap between the point of engagement of the said clamping device and the front end of the said strap, substantially as and for the purpose described.

5. In an artificial limb the combination, with the upper and lower members, of the strap *k*, the bridge *p*, bearing-surface *i*, brackets *l* with roller *n*, brackets *m* with lever *s* having roller *o*, clamping-plate *h*, arm *g*, axis *f*, brace-rods *d* with slot *e*, brace-rod *c*.

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