

1,361,062.

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Fig. 1.

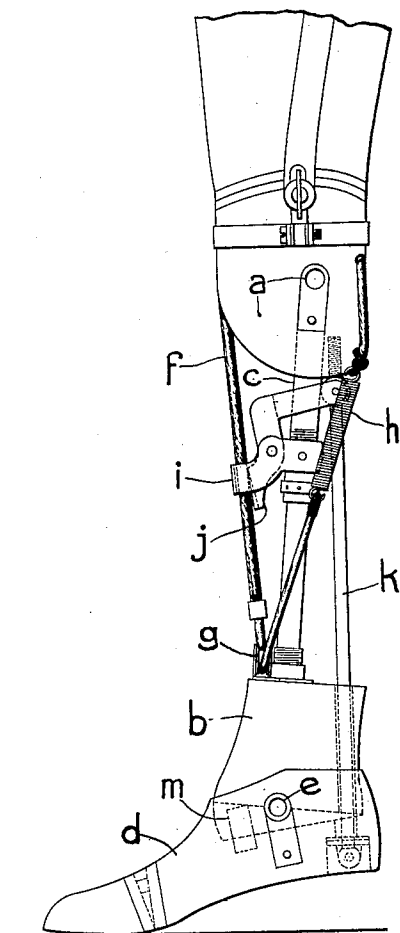
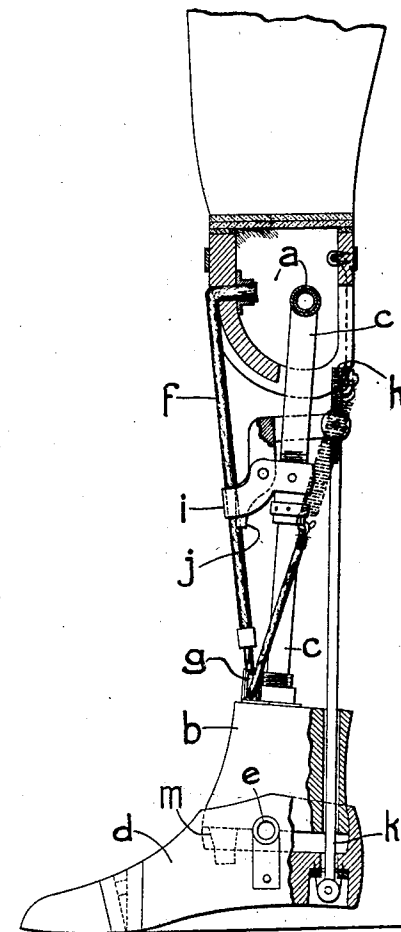


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ARTIFICIAL LEG.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, PAUL ADOLF INGOLD, a citizen of the Swiss Republic, and resident of Basel, Switzerland, have invented new and useful Improvements in Artificial Legs, of which the following is a full, clear, and exact specification.

In artificial legs with freely movable knee joints, the wearer feels on walking a certain instability inasmuch as, on treading upon the foot of the artificial leg, this not infrequently tends to bend in at the knee joint in the forward direction, which causes the wearer to have a sensation of falling. On this account, artificial legs are preferred which have the knee joint capable of being locked during walking, as compared with legs with a freely movable knee joint.

In order to give the wearer the necessary safety for walking with a leg having a freely movable knee joint, the leg must be able itself to fix the knee joint at the moment of use automatically in such a manner that it cannot bend under any circumstances. This condition is attained in an artificial leg in accordance with the present invention in a simple and safe manner, by the arrangement that the knee joint and the ankle piece of the leg, in addition to a connecting rod, are connected together in front by a movable flexible traction member permitting of the free backward motion of the leg, and there is combined therewith a locking device mounted upon the connecting rod actuated by the motion of the foot and so arranged that when the foot does not tread upon the ground it does not affect the movable flexible traction member so as to allow of a free relative motion between the same and the locking device and consequently a free backward movement of the leg, whereas on the pressing of the foot upon the ground it is closed upon the flexible traction member so that the aforementioned relative motion is interfered with and thereby the moving back of the leg is prevented.

The flexible traction member is preferably provided with a rear spring which keeps the flexible traction member constantly under tension but which is sufficiently elastic in order to admit of a free backward motion of the leg.

The accompanying drawing illustrates a constructional example of the invention as follows:

Figure 1 shows the artificial limb in side

elevation at the moment where the treading of the toes of the foot is beginning.

Fig. 2 shows the artificial limb in partial vertical section after the firm treading of the foot.

The knee joint *a* and the ankle piece *b* of the leg shown are connected together by means of a tubular rod *c* capable of being extended, the said rod being hinged in the head of the knee joint upon a horizontal axis, whereas in the ankle piece it is fixed immovably. At the ankle *b* the foot *d* is pivoted at *e*. At the head of the knee joint *a* there is provided in front a flexible traction member *f* preferably consisting of a cat-gut cord, which cord in front extends downward passing under a guide roller *g* placed at the front part of the ankle piece *b*, and is connected from this point in the direction upward with the insertion of a helical spring *h* to the rear part of the knee joint head.

By means of the spring *h* the connecting cord *f* is kept permanently stretched. Nevertheless, the spring *h* is sufficiently elastic to admit of a free backward movement of the leg, corresponding to the turning motion of the knee joint backward, during which the connecting cord *f* is required to lengthen. As the spring *h* is connected to the rear part of the cord *f*, beyond the guide-roller *g*, it is subjected to smaller lengthening strains when the knee bends in, owing to the fact that the rear attaching point of the cord then advances to some extent.

The connecting cord *f* is carried between the jaws *i*, *j* of a clamping device, the one jaw *i* of which is fixed to the tubular rod *c*, while the other jaw *j* is pivotally arranged upon the first and connected adjustably by its rear forked arm to a draw-bar *k*. The draw-bar *k* passes freely through the ankle piece *b* and is connected below with the heel part of the foot *d*. The connection of the bar *k* with the foot *d* and the clamping jaw *j* may be arranged as ball joints.

During the sitting and during the stepping out of the user, the leg, in consequence of its own weight, can move backward, against the tension of the spring *h*, because the connecting cord *f* has sufficient play in the clamping device (see Fig. 1), but when the foot treads firmly upon the ground so that it turns on its joint and thereby draws down the draw-bar *k*, the clamping device will be closed upon the connecting cord *f* (Fig. 2) so that this latter can no longer slide through

the jaws and thereby any back motion of the leg is prevented. The leg can, therefore, not bend in at the knee joint and the more the weight of the body is transferred to that leg, the more firmly the clamping device clasps the connecting cord. When the foot is raised from the ground, then the rubbed buffer *m* replaces the foot in the position indicated in Fig. 1, and the draw-bar *k* opens the clamps.

The clamping device is adjustably mounted upon the tubular rod so that it can be raised or lowered thereon. The clamp *j* is adjustably connected to the draw-bar *k* by means of a screw joint which allows of adjusting the moment of closure of the clamping device.

The connecting cord shown in the drawing is preferably a gut cord, but it might also consist of a chain, a strap or the like.

What I claim is:—

1. In an artificial leg, a knee joint, an ankle piece, a foot hinged thereon, a rod movably connecting the knee joint and the ankle piece, a flexible traction member attached to the knee joint and movably connected to the ankle piece so as to allow of free backward movement of the leg, a locking device on said connecting rod, arranged to be closed upon said traction member, controlling means connecting said locking device with the foot, substantially as and for the purpose described.

2. In an artificial leg, a knee joint, an ankle piece, a foot hinged thereon, a tubular rod movably connecting the knee joint and the ankle piece, a flexible traction member attached to the knee joint and movably connected to the ankle piece so as to allow of free backward movement of the leg, said traction member being provided with a spring for stretching purposes, a locking device on said tubular rod, arranged to be closed upon said traction member, and controlling means connecting said locking device with the foot, substantially as and for the purpose described.

3. In an artificial leg, a knee joint, an ankle piece, a foot hinged thereon, a tubular

rod movably connecting the knee joint and the ankle piece, a flexible traction member, attached to the knee joint and movably connected to the ankle piece, so as to allow of free backward movement of the leg, a pair of clamping jaws for said traction member, one of which is mounted on said rod, while the other is movable relatively to the first jaw, and controlling means connecting said movable jaw with the heel part of the foot, substantially as and for the purpose described.

4. In an artificial leg, a knee joint, an ankle piece, a foot hinged thereon, a tubular rod movably connecting the knee joint and the ankle piece, a flexible traction member attached to the knee joint and movably connected to the ankle piece, so as to allow of free backward movement of the leg, a pair of clamping jaws for said traction member, one of which is adjustably mounted on said rod, while the other is movable relatively to the first jaw, and controlling means connecting said movable jaw with the heel part of the foot, substantially as and for the purpose described.

5. In an artificial leg, a knee joint, an ankle piece, a foot hinged thereon, a rod movably connecting the knee joint and the ankle piece, a flexible traction member attached to the knee joint, guide means on the front part of the ankle piece for movably guiding said traction member, elastic means for connecting the latter beyond said guide means to the rear part of the knee joint, a locking device on said rod arranged to be closed upon said traction member and controlling means connecting said locking device with the foot, substantially as and for the purpose described.

In witness whereof I have hereunto signed my name this 27th day of January, 1920, in the presence of two subscribing witnesses.

PAUL ADOLF INGOLD.

Witnesses:

WILLIAM E. HOLLAND,
AMAND BRAUN.