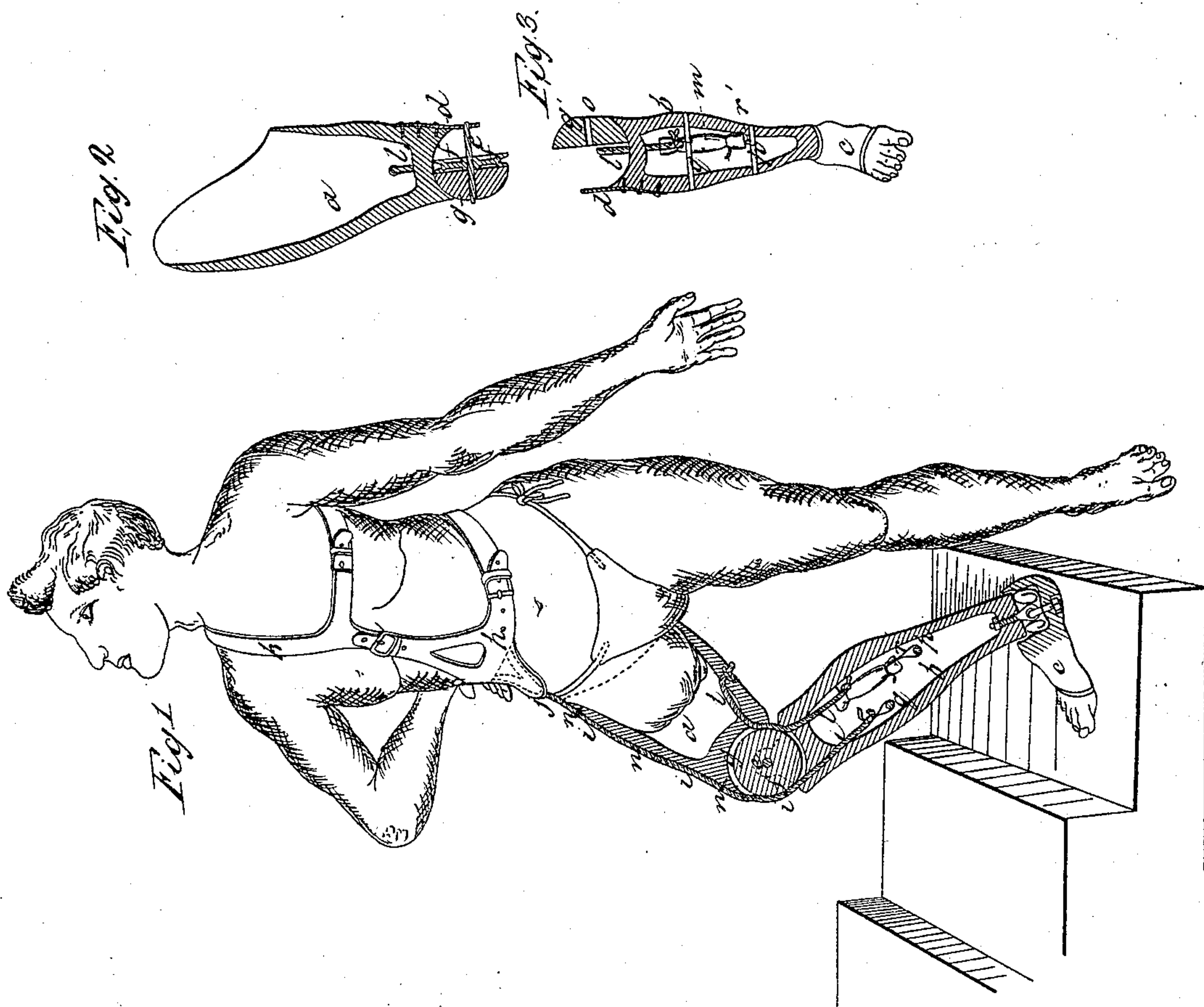


J. Reichenbach,
Artificial Leg.

N^o 41,238.

Patented Jan. 18, 1864.



Witnesses

Fr. M. Magee.

H. Bakewell

Inventor
John Reichenbach

UNITED STATES PATENT OFFICE.

JOHN REICHENBACH, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN ARTIFICIAL LEGS.

Specification forming part of Letters Patent No. 41,238, dated January 12, 1864.

To all whom it may concern:

Be it known that I, JOHN REICHENBACH, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Artificial Legs; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a man with an artificial leg attached to the stump of his thigh, the natural leg having been amputated near to the body, the false leg being shown in section to exhibit its construction and operation. The section is vertical and at right angles to the axis of the knee-joint. Fig. 2 is a sectional representation of my improved artificial leg, the section being vertical and in the plane of the axis of the knee-joint.

My invention consists in certain improvements in the construction of artificial legs, designed to be used when the wearer has lost his natural leg above the knee-joint, the improvement being chiefly in the construction of the knee-joint and in the devices for flexing and extending it at pleasure.

In the use of artificial legs embracing a knee-joint it has been heretofore found very difficult to control the motion of the lower leg or that part which is below the knee, because when the knee is flexed by raising the stump of the thigh to take a step forward with the artificial limb the wearer, before he can throw his weight on the false limb after bringing it down to the ground, must straighten the knee-joint, for if he bears his weight upon it when at all flexed it would bend still more, and he would be sure to fall. To overcome this difficulty with legs of ordinary construction it is necessary to use a stick to support the weight and aid in bringing the body into a vertical position over the straightened leg. This is especially the case in ascending stairs or rising ground, and is a serious defect in all attempts heretofore made to supply the loss of a leg above the knee. By my invention, however, I believe that I have been successful in providing a better substitute for the natural leg than any heretofore made. This I accomplish by furnishing to the wearer the means of straightening out the knee-joint when flexed with sufficient force to enable him to walk

without a stick or even to ascend steps without any extraneous assistance.

To enable others skilled in the art to construct and use my improvements, I will proceed to describe the construction and operation of my improved artificial leg so far as relates to the knee-joint, the contrivances for regulating its motion, and the mode of attaching the leg to the wearer's body.

In the drawings, *a* is the thigh of the artificial leg, *b* the lower leg, and *c* the foot. These parts are made of wood or other suitable material, the leg and thigh being hollow and as light as is consistent with sufficient firmness. The upper part or thigh is attached to the wearer by inserting the stump in the cavity of the case *a*, and fastening by bandages or straps in any convenient manner. The thigh-piece *a* is solid at its lower extremity, and has a cup-shaped cavity in the shape of a portion of a hemisphere; so, also, has the upper extremity of the leg-piece *b*, as shown in Figs. 1 and 2. On one side of each piece *a* and *b*, near to the knee-joint, and extending a sufficient distance above the knee on the thigh-piece *a* and below it on the leg-piece *b*, to give a firm bearing, is a metallic plate or hinge-piece, (see Fig. 2,) marked *d*, on one side of the thigh *a*, and *d'* on the opposite side of the leg-piece *b*. It is only necessary to have two hinge-pieces, one attached to the thigh and the other to the leg, as just stated, and they might be dispensed with altogether; but their use is preferred, as they add to the strength of the leg without materially increasing its weight. Each hinge-piece *d* extends a little beyond the axis of the knee-joint, and has a round hole in it, just at the axis or center of motion of the knee-joint, through which passes the joint-pin *e*, which need not be otherwise secured than by fitting accurately in the joint-pieces *g g'*, through the axis of which it is passed. On the joint-pin *e*, as its axis, is placed a circular metallic wheel or disk, *f*, which turns freely on and at right angles to the joint-pin *e*. Around the circumference of the disk *f* is a groove sufficiently deep to receive and retain the extensor-cord *i* of the leg, which passes over the cap of the knee, as seen in Fig. 1. The joint-pieces *g g'* are two half-balls or oblate hemispheres, made of hard wood or other material, and which may be partially hollow, if desired, so as to make

them lighter. One of these oblate hemispheres or joint-pieces, g , is firmly attached to the thigh-piece a of the leg, as shown in Fig. 2, being inserted into the cup-shaped cavity at the extremity of the thigh, on the opposite side of the knee to the hinge-piece d , and having a hole bored through its center at right angles to its plane side to receive the hinge-pin e . A similar oblate hemisphere, g' , is firmly attached to the upper extremity of the leg-piece b , as seen in Fig. 2, on the opposite side of the knee to that on which the other joint-piece, g , is attached to the thigh, so that when the two pieces of the leg are united at the knee the lower surface of the upper hemispherical joint-piece, g , fits into and works smoothly in the cup-shaped cavity of the leg-piece b , and the upper surface of the lower hemispherical joint-piece, g' , fits into and works smoothly in the cup-shaped cavity of the thigh-piece a , the pulley or disk f turning freely between them on the joint-pin e as its axis, which is passed through the hole o bored through both hemispherical joint-pieces to receive it; and thus the thigh-piece a and leg-piece b are securely united. The hemispherical joint-pieces are a little flattened on their outer curved sides, so as not to make too great a protuberance at the sides of the knee-joint. The diameter of the pulley or disk f is somewhat less than that of the joint-pieces g g' , so that there may be no friction of its circumference against the surface of the leg-piece or thigh-piece. The use of this ball-and-socket joint in the knee is a great addition to the strength and firmness of the leg, and prevents, in a great measure, the wear and tear of the hinge-pieces d , rendering them much less liable to break or wear loose. The extensor-cord i has its origin in a belt, h , strapped around the waist of the wearer and further secured from slipping down by shoulder-straps k . The point from which it arises is at or a little below the waist in front, and it thence extends downward in a groove in the front of the thigh-piece a , being kept in place by little wires or staples n at short intervals until it reaches the cap of the knee, where it enters and passes around the groove of the disk f , as shown in Fig. 1, and thence enters the leg-piece b in front, and has its insertion in the front part of the leg-piece b , being either fastened immediately thereto or to a pin, q , which is passed through the cavity of the leg-piece b , as seen in Fig. 2. The extremity of the extensor-cord i is attached to the pin q by a wire, r . The tone or tension of the extensor-cord may be regulated by lengthening or shortening it at its origin or points of attachment to the waistband h . The flexor-cord l has its origin in the lower extremity of the thigh-piece a , above the pit of the knee, where it is fastened, and thence passes in the groove of the disk f , on the rear side, and thence, entering the leg-piece at the pit of the knee, passes downward and is fastened to a strong strip of india-rubber, m , or

other spring. The india-rubber spring m is attached immediately to the inside of the leg, just below the calf, or is fastened by a wire, r' , which is passed around a pin, p , inserted through the cavity of the leg. The india-rubber spring m is securely attached to the extremity of the flexor-cord l by knotting the end of the cord and passing a piece of wire around the piece of india-rubber and the cord, and then twisting the wire. The wire r is attached to the lower end of the india-rubber in a similar manner.

The use of the flexor-cord may be entirely dispensed with, if preferred, as the leg will bend naturally by its own weight when the thigh is raised.

Having thus described the construction of my improved artificial leg, I will proceed to explain its use and operation.

When the artificial leg is lifted from the ground by raising the stump or moving it outward from the body, the extensor-cord i is loosened at the point j , because it becomes the cord of the angle formed between the body and the stump of the natural leg on bending the leg, and this loosening of the extensor-cord i , at j , allows the knee to be bent by the force of the flexor-spring m , the slack of the extensor-cord i formed at j being taken up by the bending of the knee between the points x x on the disk f , as seen in Fig. 2, the center of motion being at e .

When it is desired to straighten the leg, so as to take a step forward with the other or natural leg and throw the weight of the body on the artificial leg, it is effected simply by drawing down the stump to a vertical position, which stretches the extensor-cord at the point j , thus forcing the knee to unbend, as the extensor-cord i is not long enough to permit of the knee being flexed when the stump is not also set at an angle to the body. The angle of the stump to the body regulates the angle of flexure of the knee, and as the stump is drawn down more and more nearly to a vertical position the knee-joint is proportionally straightened.

By this arrangement I am satisfied that the wearer of my false leg may even walk up steps without the aid of a stick, because so long as the stump is held down in a vertical position the leg cannot bend at the knee-joint, being held rigidly by the tension of the extensor-cord. The use of the flexor-cord l and spring m is not absolutely essential, and may be dispensed with, because if the knee-joint turns freely the leg will assume an angle to the thigh when the stump is bent outward; but to insure the proper flexure of the knee-joint I prefer to use it.

The great and obvious advantages of my improvement in artificial legs are the great simplicity of construction, which will enable them to be made at comparatively slight cost, and which renders them less liable to derangement or injury than those of more complicated mechanism, and that any mechanic of the most

ordinary skill can repair them in case of any accident; but the chief peculiarity and advantage which my artificial legs possess is the arrangement for straightening the leg and holding it firmly in that position by the voluntary motion of the stump of the wearer's natural leg.

Having thus described my improvement in artificial legs, what I claim as my invention, and desire to secure by Letters Patent, is—

1. Constructing the knee-joint of two hemispherical pieces, one attached to the thigh-piece and the other to the leg-piece, each working in a socket in that portion of the leg to which it is not attached, and connected together by a center or joint pin, substantially as described.

2. The use of a grooved pulley or disk turning on the center or joint pin of the knee for guiding the extensor-cord in its passage over the cap of the knee, substantially as and for the purpose hereinbefore described.

3. The combination of the hemispherical joint-pieces *g g'*, one attached to the thigh and the other to the leg, each working in a cup-shaped socket in that portion of the leg to which it is not attached, with the hinge-pieces

and hinge-pin, and either with or without the disk or pulley for the extensor-cord, the whole being constructed and arranged substantially as hereinbefore described.

4. The use of an extensor-cord attached to the leg-piece below the knee and extending over the pulley *f* over the cap of the knee, and thence passing up through the thigh, and having its origin in or being attached to a strap passed around the waist of the wearer and otherwise firmly secured to his body, so that by flexing the stump of the thigh outward from the body the extensor-cord is sufficiently loosened to allow of the flexure of the knee-joint, and by straightening the stump of the thigh or bringing it into a line with the body the extensor-cord may be drawn tight, thereby straightening out the leg at the knee-joint, substantially as described.

In testimony whereof I, the said JOHN REICHENBACH, have hereunto set my hand in presence of two witnesses.

JOHN REICHENBACH.

Witnesses:

F. M. MAGEE,

A. S. NICHOLSON.