

## **Specification of William Edward Newton : artificial legs.**

### **Contributors**

Newton, William Edward.

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A.D. 1857 . . . . . N<sup>o</sup> 750.

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S P E C I F I C A T I O N

OF

WILLIAM EDWARD NEWTON.

—  
ARTIFICIAL LEGS.  
—

LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,

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*Price 7d.*

1857.





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A.D. 1857 . . . . . N° 750.

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**Artificial Legs.**

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**LETTERS PATENT** to William Edward Newton, of the Office for Patents, 66, Chancery Lane, in the County of Middlesex, Civil Engineer, for the Invention of "**CERTAIN IMPROVEMENTS IN ARTIFICIAL LEGS.**"—A communication.

Sealed the 7th July 1857, and dated the 17th March 1857.

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**PROVISIONAL SPECIFICATION** left by the said William Edward Newton at the Office of the Commissioners of Patents, with his Petition, on the 17th March 1857.

I, **WILLIAM EDWARD NEWTON**, of the Office for Patents, 66, Chancery Lane, in the County of Middlesex, Civil Engineer, do hereby declare the nature of the said Invention for "**CERTAIN IMPROVEMENTS IN ARTIFICIAL LEGS,**" to be as follows:—

This Invention consists in the employment of elastic cords connecting the thigh with the foot, to imitate the action of the natural muscles, for the purpose of controlling the movements of the several parts of the limb. It further consists in the application to the socket of the thigh, in cases of amputation above the knee, of a sack, which is made of proper form to fit the stump of the natural limb, and suspended at its mouth from the edge of the socket of the artificial one, for the purpose of assisting to support the patient and relieving the stump from the unpleasant and often painful and injurious pressure that is produced upon the stump by the ordinary method of supporting it by forcing it into a tapered socket.

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*Newton's Improvements in Artificial Legs.*

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said William Edward Newton in the Great Seal Patent Office on the 17th September 1857.

**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, WILLIAM EDWARD NEWTON,** of the Office for Patents, 66, Chancery Lane, in the 5 County of Middlesex, Civil Engineer, send greeting.

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Seventeenth day of March, in the year of our Lord One thousand eight hundred and fifty-seven, in the twentieth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the 10 said William Edward Newton, Her special license that I, the said William Edward Newton, my executors, administrators, and assigns, or such others as I, the said William Edward Newton, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and 15 lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "**CERTAIN IMPROVEMENTS IN ARTIFICIAL LEGS,**" being a communication from abroad, upon the condition (amongst others) that I, the said William Edward Newton, by an instrument in writing under my hand and seal, 20 should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

**NOW KNOW YE,** that I, the said William Edward Newton, do hereby 25 declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, reference being had to the Drawing hereunto annexed, and to the letters and figures marked thereon (that is to say):—

This Invention of "certain improvements in artificial legs consists in the 30 employment of elastic cords connecting the thigh with the foot, to imitate the action of the natural muscles, for the purpose of controlling the movements of the several parts of the limb. It further consists in the application to the socket of the thigh, in cases of amputation above the knee, of a sack, which is made of proper form to fit the stump of the natural limb, and suspended at its 35 mouth from the edge of the socket of the artificial one, for the purpose of assisting to support the patient and relieving the stump from the unpleasant

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and often painful and injurious pressure that is produced upon it by the ordinary method of supporting it by forcing it into a tapered socket.

The Invention is illustrated in the accompanying Drawing, in which Figs. 1 and 2 are sections of an artificial limb, shewing the application of the  
5 Invention to cases of amputation above the knee. Fig. 3 is a similar section, illustrating its application to cases of amputation at or below the knee. Figures 4 and 4\* are two sections, at right angles to each other, of the leg, as constructed for cases of amputation at or below the knee. Fig. 5 is a side view of the foot. Fig. 6 is a detail view of a part of the means of connection  
10 between the elastic cords and the foot. Similar letters of reference indicate corresponding parts wherever they are to be found in the different Figures.

The application of the Invention to cases of amputation above the knee will be first described. The limb may be made hollow of willow or some other light wood, covered with leather, and varnished to imitate the natural limb, in  
15 the same manner as is generally adopted in the manufacture of artificial limbs. A (Figures 1 and 2) is the thigh piece; B is the leg, and C is the foot. The knee is made in the same piece as the leg B, and fits into the thigh piece, and the joint is made in the common way by a pin *a* passing through steel plates *b* (represented in dotted outline in Figures 1 and 2), that are riveted  
20 one to each side of the thigh between the wood and the leather covering, and through brass bushes in the leg. The wood is left as nearly as possible solid at the knee to give strength to the joint. G is a broad leather strap connecting the thigh piece A and leg B at the back of the knee joint, and serving as a stop when the limb is extended. The lower end of the leg B, like the knee  
25 portion, is made nearly solid, and is rounded to fit into the foot; and the ankle joint is made in substantially the same way as the knee joint by a pin *c* passing through steel plates *d* riveted to the foot, and through a brass bush in the solid wood of the leg. One of the plates *d* is shewn in Fig. 5, which represents the foot without the leather covering. The interior of the foot is left solid  
30 under the ankle, as shown at *e* and *f*, high enough to come in contact with the bottom of the leg, and stop it when the foot is bent upward or downward to the greatest extent desirable, and a spring *g* is applied between the stop *e* and the corresponding portion of the leg, in such a manner as to exert a tendency to throw down the toe or extremity of the foot for the purpose of giving  
35 elasticity to the foot in walking. E and F, Figures 1 and 2, are two elastic cords connecting the foot with the thigh piece, and passing through a slot *m, m*, in the middle of knee. These are secured near the back of the thigh piece, close above the knee by pegs of wood *i, i*, passing through loops at their upper ends to a brace *h*, of wood that extends across the

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thigh piece, and they are attached to the foot below the ankle joint by being passed through holes and secured by wedges *k, k*, driven in from the underside of the foot before the cushion or padding *j* of the sole is put on. Both of the cords pass under an inverted arc-formed piece of metal *H*, that is screwed to the foot in such a manner as to stand concentric with the pin *c* of the ankle joint for the purpose of guiding the cords and transmitting their influence to the foot. The cord *F* passes directly up the back of the leg to the thigh, and the cord *E* passes up the front of the leg and over a pulley *I*, that is fitted within the slot or mortise *m, m*, to turn freely on the pin *a* of the knee joint. A top view of the arc-formed piece of metal *H* is given in Fig. 6, in which *p, p*, represent two lugs, through which screws are passed to secure it to the foot. The elasticity of the cord *E*, owing to the direction which the said cord is caused to take by passing over the pulley *I*, exerts a tendency to straighten the knee joint, and at the same time to depress the toe or point of the foot, and the elasticity of the cord *F* exerts a tendency to bend the knee joint and raise the toe. The cord *F* should be stronger than the cord *E*, in order to give the cords *E* and *F*, as nearly as possible, the character of the extensor and flexor muscles of the natural limb; they are made elastic for a portion only of their length, and inelastic at both ends, the elastic portion having the character of a muscle, and the inelastic portions that of tendons. A convenient manner of making the cords with the above characteristics is to plait or braid the whole length of strips of leather, and to enclose within the middle portion of the length of the plait or braid a cord or bunch of cords or strips of india-rubber. In Figures 1 and 2, the strips or cords of india-rubber are indicated by *l, l*, and the plaited or braided leather by *n, n*. In Fig. 2 the cords *E, F*, are shewn in section, but in Fig. 1 they are shewn entire. *J*, Figures 1 and 2, is the sack, which is suspended from the top of the hollow socket of the thigh *A* to receive the stump of the thigh of the natural limb. This sack is secured all round the top edge of the hollow socket of the thigh *A*, and is made of such depth as is necessary to produce an agreeable or painless pressure on all parts of the stump. It may be made of soft leather or woven fabric. The socket of the thigh is made large enough internally to fit easily around the stump; by raising or lowering the sack, the limb may be adjusted to the proper length.

The construction of the limb to suit cases of amputation at or below the knee will now be described:—If the leg is amputated at a sufficient distance below the knee to leave a stump to which to attach the artificial limb, a hollow socket *K* (Figures 3, 4, and 4\*) is made to fit the stump, and then the lower

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portion L of the leg is fitted to the socket, as shewn at *q, q*, in Fig. 4\*, and secured by gluing or otherwise. A socket M (see Fig. 3) made of two thicknesses of leather is fitted to lace on the patient's thigh, and the socket K is connected with the socket M by rule joints *r, s*, one on each side, the upper 5 portion *r* of each joint being fitted and riveted between the two thicknesses of leather of the socket M, and the lower portion *s* of each joint being riveted to the socket K. These joints correspond with the position of the natural knee joint. A stop piece G of leather is applied between the sockets M and K behind the knee joint to assist in stopping the limb when straightened at 10 the knee joint. The two elastic cords E\* and F\*, connecting the thigh with the foot, are attached to the thigh socket M, and pass downward through oblique slots *t, t*, made through the leg at or near the junction *q, q*, of the socket K, and lower part L of the leg. The connection of the elastic cords E\* and F\* with the foot is effected in the same manner as that of the cords 15 E and F, as herein-before described, a similar arc-formed piece H being attached to the foot. The upper parts of these cords are made of india-rubber webbing, and stitched at the top to the socket M, and the lower parts are made of raw hide, the two parts being united at *u, u*, just outside of the slots *t, t*, by metallic links or by sewing. If the limb is amputated so closely below 20 the knee that there is no stump on which to fit the leg with a socket, the leg may be made all in one piece, and the cords E, F, may pass over the top into the interior of the leg. The sack may, if desired, be employed to support the stump in cases of amputation below as well as above the knee. The operation of the elastic cords is substantially the same, whether applied 25 in the manner represented in Figures 1 and 2, or in that represented in Fig. 3. When the knee is bent in walking, the forward cord E or E\* is strained over the pulley I, or over the knee, and by that means when the foot is lifted from the ground, the leg and foot are caused to be thrown forward by the elasticity of the said spring as the forward movement of the natural thigh 30 takes place, and at the same time the point of the foot is caused to be raised relatively to the leg so as to prevent it from dragging on the ground. The bending of the knee, at the same time that it strains the cord E or E\*, slackens the cord F or F\*, but before the foot comes forward to the farthest position, the cord F or F\* is stretched, and as it is stronger than E or E\*, it gradually 35 checks and finally stops the motion of the leg without any sudden jerk, and at the same time it raises the heel so that the foot will come down flat on the ground when the surface thereof is of an ordinary level character. The spring *g* prevents too much motion of the foot under the influence of the elastic cords, and when the leg comes on it, as shewn in Fig. 2, in stepping



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forward while ascending a hill, or stepping up on to a higher surface or step, it causes the heel to rise with more elasticity, and helps the patient to ascend and to carry him forward.

Having now described the Invention of "Improvements in artificial legs," and having explained the means of carrying the same into effect, as communicated to me by my foreign correspondent, I would observe that I do not confine myself to the methods herein described of constructing the elastic cords, as they may be variously constructed without interfering with the peculiar character of their operation; but what I claim as new, and as the Invention secured to me by Letters Patent as aforesaid, is the use and application of the elastic cords, or artificial muscles and tendons running from the thigh to the foot, and operating to control the motions of the leg and foot, as described.

And, I further claim the sack applied to the socket of an artificial limb, as described, for the purpose of receiving the stump of the natural limb, and to assist in supporting the weight of the patient upon it, and to adjust it according to the length required.

In witness whereof, I, the said William Edward Newton, have hereunto set my hand and seal, the Eleventh day of September, in the year of our Lord One thousand eight hundred and fifty-seven.

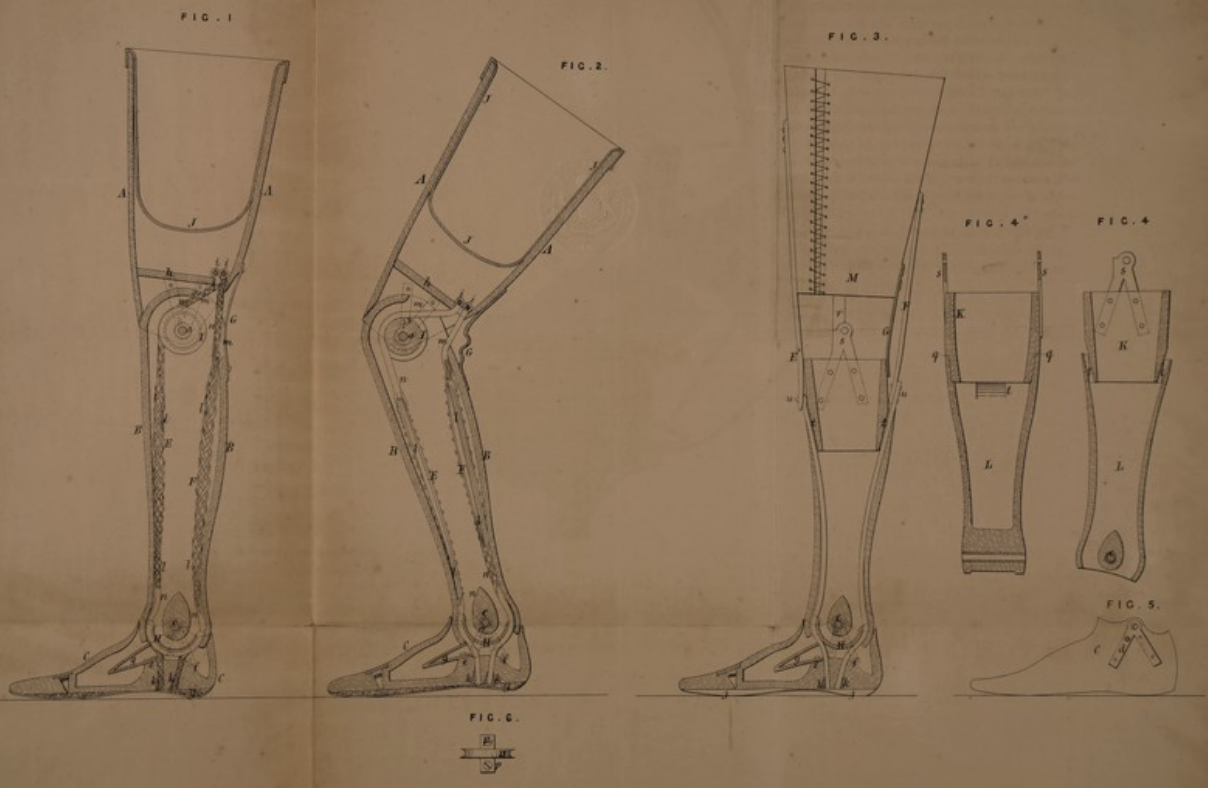
W. E. NEWTON. (L.S.) 20

Witness,

J. W. MOFFATT,  
66, Chancery Lane.

LONDON :

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Printers to the Queen's most Excellent Majesty. 1857.



The fluid drawing is partly colored

