J. H. BRADLEY & E. & T. L. NICHOL.

ARTIFICIAL FOOT.

APPLICATION FILED NOV. 12, 1909.

961,582. Patented June 14, 1910.

3 SHEETS—SHEET 1.

FIG. 1.

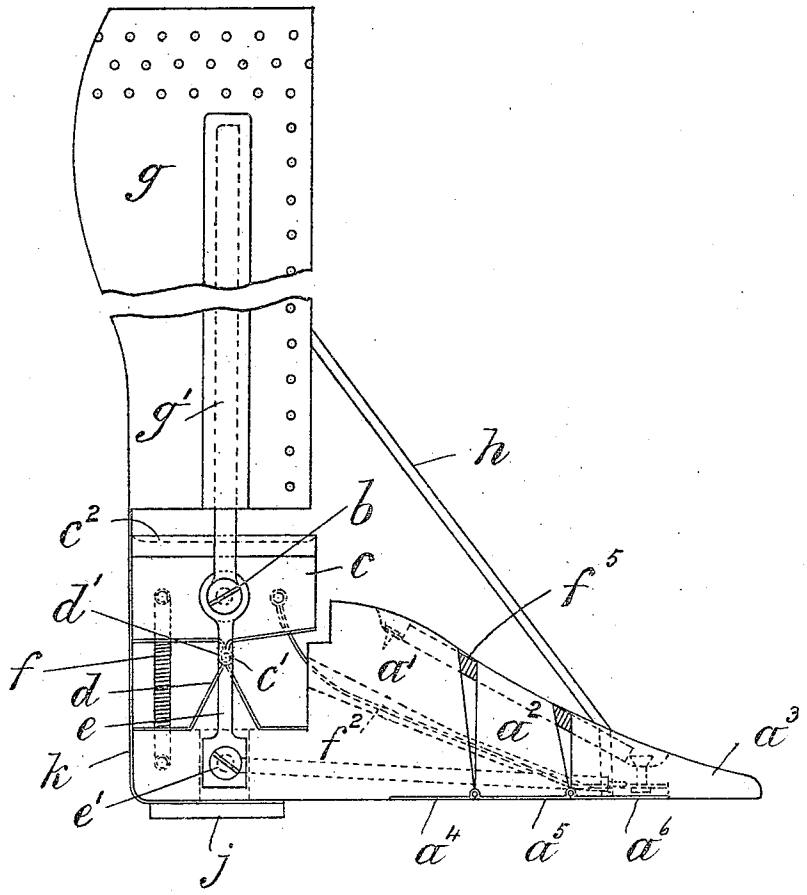
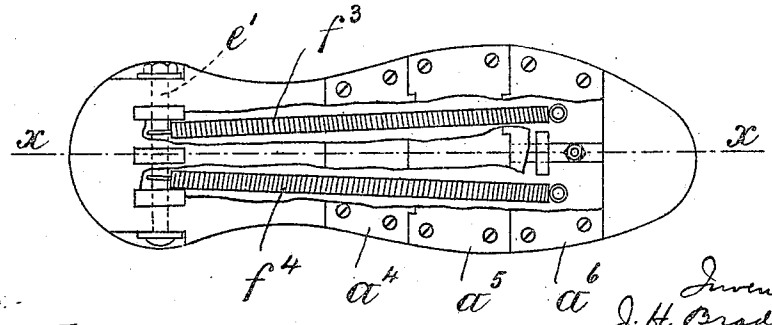


FIG. 2.



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3 SHEETS—SHEET 2.

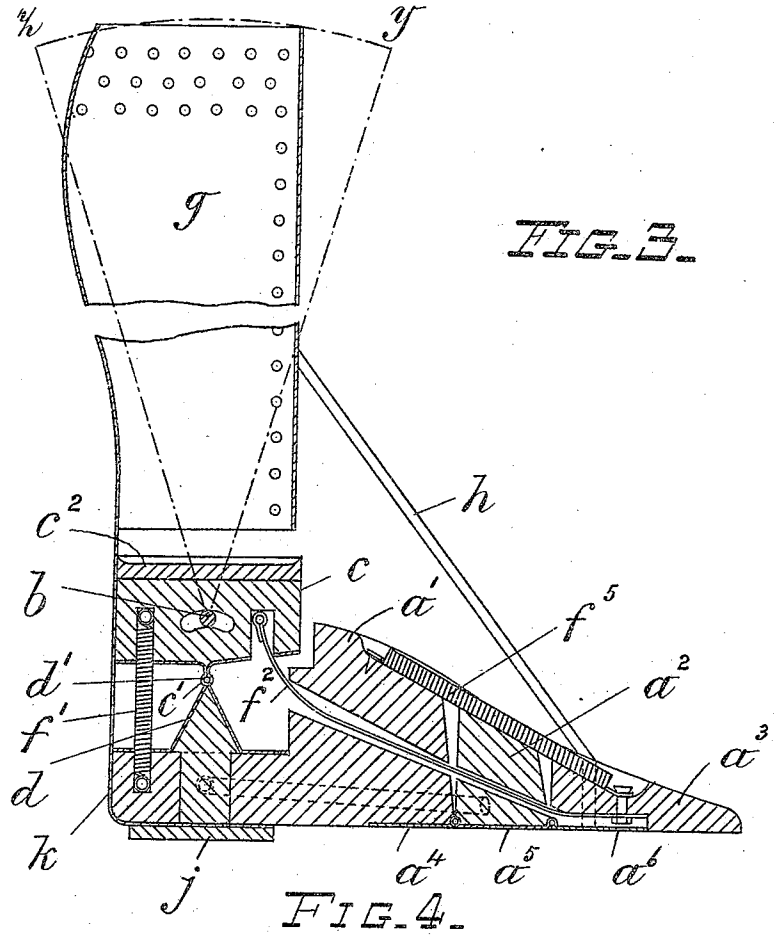
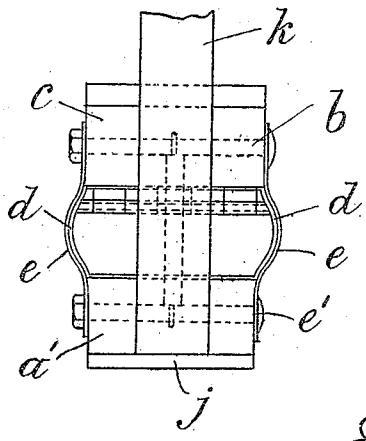


FIG. 3.

FIG. 4.



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3 SHEETS—SHEET 3.

FIG. 5.

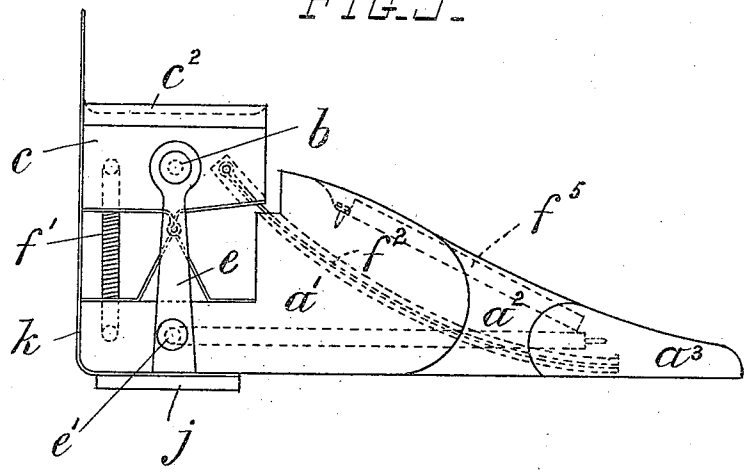
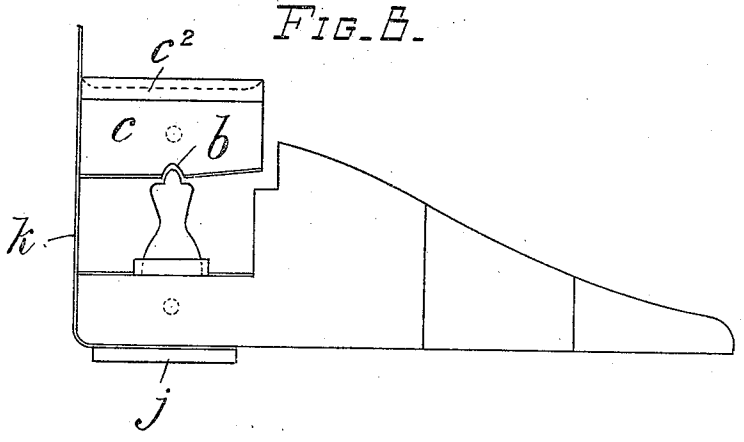


FIG. 6.



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UNITED STATES PATENT OFFICE.

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ARTIFICIAL FOOT.

961,582. Specification of Letters Patent. Patented June 14, 1910.

Application filed November 12, 1909. Serial No. 527,690.

To all whom it may concern:

Be it known that we, JOSEPH HANCOCK BRADLEY, EDWARD NICHOL, and THOMAS LOWERY NICHOL, subjects of the King of Great Britain and Ireland, residing at Hunwick, Croxdale, and Sunderland, all in the county of Durham, England, have invented certain new and useful Improvements in Artificial Feet; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to artificial feet which as at present constructed are too heavy and often too rigid, having no provision for approximating the lightness and agility of the natural foot, being often made with a rigid ankle and of heavy solid material.

The object of our invention is to produce an artificial foot resembling as nearly as possible in weight, form and action the natural foot by means of joints, springs, hinges and straps arranged and assembled together in the manner hereinafter described in this specification and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of an artificial foot embodying our invention, Fig. 2 an inverted plan corresponding to Fig. 1, but with certain sole plating removed to show the springs inside; Fig. 3 is a sectional view corresponding to Fig. 1 as taken on line x—x of Fig. 2, and Fig. 4 is an end elevation looking to the right of Fig. 1 and showing the formation above the heel from behind. Figs. 5 and 6 are side elevations showing modifications in certain details of construction.

The foot portion is made of any light, tough and durable material, such as poplar wood, in three sections a^1 a^2 a^3 and has an ankle joint b working in an ankle block c pivotally mounted at c' to the part of a' which is projected upwardly for the purpose at d and covered with brass platings forming the socket for the pin d'. The ankle joint b consists of a bolt secured to and supported by the bars e e, which are themselves secured to the heel part a' by the through bolt e'. The bars e e are rigid, being made of iron in order to be strong enough to bear all the weight the wearer of the foot can put on in course of ordinary use. The ankle block c is intended to work, that is, vibrate on the ankle joint b subject to the control of springs connecting it to the solid part of the foot. To render the requisite vibration or rocking movement free and easy, the ankle joint b is furnished with a slot curved on an arc with the pin d' as a center. The parts a^1 a^2 a^3 of the foot portion are connected together by hinged plates a^4 a^5 a^6 and the parts are so tapered that the foot can bend as they close together, the plates a^4 a^5 and a^6 being hinged in line with the joints between the sections a^1 a^2 and a^3. The ankle block c is secured to section a' of the foot solid by a back spring f' and to section a^3 by a front spring f^2 passing through blocks a^1 and a^2. The sections a^1 a^2 and a^3 are tied together by the foot sole springs f^3 f^4 let into and running along the sole of the foot and secured to the pin e' at one end and to section a^3 at the other end and also by the instep spring f^5 secured to sections a^1 and a^3.

g is the wearer's legging which is stiff and strong so that an elastic suspender h, which is brought into position by being clasped in the boot, may be secured to the legging as shown. The legging also takes the weight on the leg in conjunction with the ankle block c, the top of which is cushioned at c^2 with any suitable padding, while the legging is rendered stiff and suitable for supporting weight by the aid of a stiffener g' let into a pocket in each side and pivotally supported by the ankle joint at b, the legging g is also well ventilated in consequence of the close fit required with the leg.

The several parts being arranged and connected together as hereinbefore described, they are intended to operate in conjunction with each other to form a foot having the action and agility of a natural foot, even to the extent of running, cycling and dancing, the action being as follows:—If the leg is inclined forward as shown by line y in Fig. 3, the sections a^1 a^2 a^3 are free to close more or less together as a natural foot would do. When the leg returns to the upright position, the ankle block c is drawn back by the back spring f' and the foot extended again to the original position in each case. When the leg is inclined backward as shown by the line z, Fig. 3, tension is set up in front spring f^2 and suspender h, back spring f' being compressed so that when the leg again assumes the upright position, the ankle

block c again returns to its original position. The bending of the foot and its tendency to return to the natural position is provided for by the combined action of the sole springs f^3 f^4 and the instep spring f^5.

j is a cork heel pad, which is useful in preventing the foot from beating upon the back edge of the heel; it also tends to make the foot take a level impact on the ground in taking a step forward. As the legging g is preferably cut away in front above the top of the boot for ventilation, a leather wrapper to overlap the edges of the legging bottom and boot top and cover the space between, adds to the comfort of the wearer. A back elastic strap k attached to the legging behind is secured to the heel and to the ankle block.

In Fig. 5 the sections a^1 a^2 a^3 are fitted together by knuckle joints, which are held together by the same springs before described. In Fig. 6 the ankle block is shown loosely mounted on a ridge or pivot edge at b, a loose fit being relied on to provide for the rocking movement or vibration of the ankle block c. In other respects the description given as to Figs. 1, 2, 3 and 4 applies equally to Figs. 5 and 6.

From the foregoing description taken in conjunction with the accompanying drawings, it will be seen that our invention is not necessarily limited to the precise arrangement and combination in all the details, some of which only are indispensable for effecting the purpose of our invention, others being more or less accessory and open to modifications, or even entirely omitted, or equivalents substituted therefor.

Having thus described our said invention, what we desire to claim and secure by Letters Patent of the United States is:—

1. In a device of the character described, the combination of a foot portion composed of a plurality of parts pivotally jointed together, an ankle block pivotally mounted on one of said foot portions, springs operating said foot portions together, and springs connecting the ankle block with the foot portions, substantially as described.

2. In a device of the character described, the combination of a foot portion composed of three parts pivotally jointed together, an ankle block pivotally mounted on one of said foot portions, springs connecting said foot portions together, springs connecting the ankle block with the foot portions, a legging, and an elastic suspender, substantially as described.

3. In a device of the character described, the combination of a foot portion composed of three sections united together by knuckle joints, springs connecting said three portions together, an elastic pad on the rear portion, an ankle joint pivotally mounted on said rear portion, springs connecting said ankle joint with said foot portions, said ankle joint being padded, a legging, and an elastic strap connecting said foot portion with said legging, substantially as described.

In testimony whereof, we affix our signatures, in presence of two witnesses.

JOSEPH HANCOCK BRADLEY.
EDWARD NICHOL.
THOMAS LOWERY NICHOL.

Witnesses:
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JOHN GEORGE MADDISON.