

(No Model.)

J. H. KANE.  
ARTIFICIAL FOOT.

No. 469,348.

Patented Feb. 23, 1892.

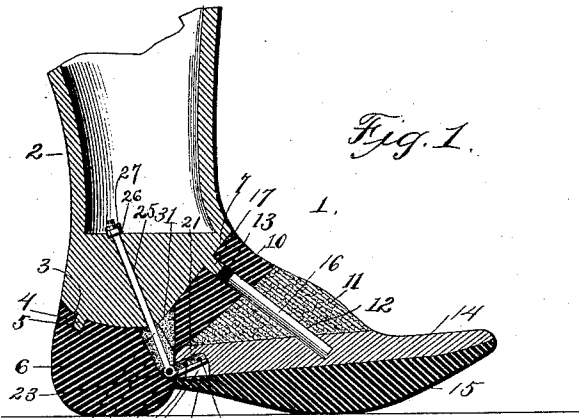


Fig. 1.

Fig. 2.

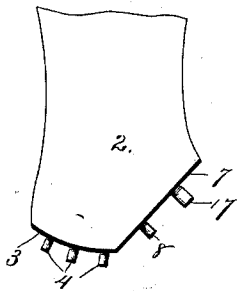


Fig. 5.

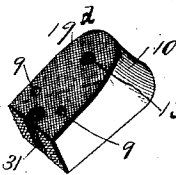


Fig. 10.

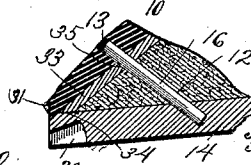


Fig. 7.

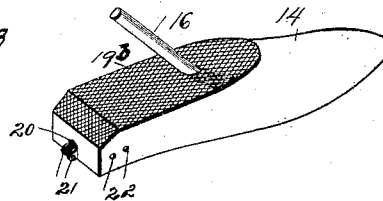


Fig. 4.

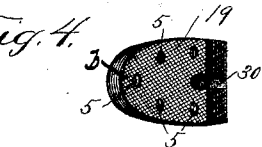


Fig. 6.

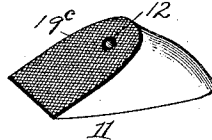


Fig. 8.

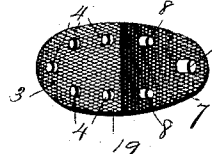
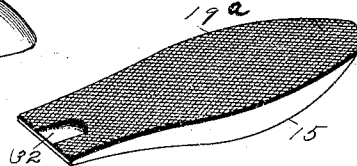


Fig. 3.

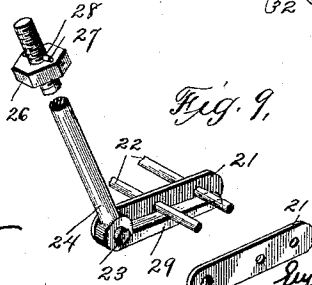


Fig. 9.

Witnesses:

*G. S. Hooper*  
*H. E. Price*

Inventor,  
*J. H. Kane.*

*Bigdon & Bigdon*  
Attorneys.

# UNITED STATES PATENT OFFICE.

JAMES H. KANE, OF KANSAS CITY, MISSOURI.

## ARTIFICIAL FOOT.

SPECIFICATION forming part of Letters Patent No. 469,348, dated February 23, 1892.

Application filed May 14, 1891. Renewed January 11, 1892. Serial No. 417,616. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES H. KANE, of Kansas City, Jackson county, Missouri, have invented certain new and useful Improvements in Artificial Feet, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to artificial feet; and the objects of my invention are to produce an artificial foot which shall possess the utmost strength, durability, and lightness, and which shall, when in use, exactly simulate the action of the natural human foot, so that the user's gait shall possess no constraint or awkwardness of movement whatever.

To the above purposes my invention consists in certain peculiar and novel features of construction and arrangement, as hereinafter described and claimed.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a central vertical section of an artificial foot embodying my invention. Fig. 2 is a detached view, in side elevation, of the lower portion of the leg. Fig. 3 is a lower end view of the same. Fig. 4 is an upper side plan view of the heel of my improved artificial foot. Fig. 5 is a detached perspective view of the elastic upper instep-piece. Fig. 6 is a similar view of the lower instep-piece. Fig. 7 is a similar view of the toe and body piece of the foot. Fig. 8 is a similar view of the sole-piece of the foot. Fig. 9 is a detached perspective view of the connecting-bar, its stop-bar, and the bearing-plates for the latter, one of said bearing-plates being separated from the other parts. Fig. 10 is a detached perspective view of the instep-section.

In the said drawings, 1 designates the leg portion of the device, said leg portion being of any suitable light and at the same time strong material, and, for the sake of additional lightness, being also hollow throughout the greater portion of its length. The lower end of this leg portion is, however, formed solid, and the under surface of said solid portion is

formed with a convex rear portion 3 and a straight front portion 7. The straight front portion 7 inclines downwardly from the front of the leg to a point about midway of the lower end of the leg, measuring from front to rear of the leg. The convex rear portion 3 begins at the lower terminus of the straight upwardly and forwardly inclined portion 7 and terminates at the rear surface of the leg at a point below the level of the front terminus of the straight portion 7 and slightly above the point of its own front beginning. The convex surface 3 of the leg is formed or provided with a suitable number of projections 4, which may either be formed integrally with the surface 3, or which may be pins driven into said surface a part of their length, so as to project therefrom. The straight inclined surface is also formed with two or more projections 8, which may also be either formed integrally with said surface, or which may be in the form of pins driven partially into said surface. This straight surface 7 is also formed or provided with a longer and preferably larger projection 17, which may be of either of the forms of construction just described relative to the projections 4 and 8.

6 designates the heel of the foot, the said heel being formed of rubber or of any other equivalent material or composition which combines strength with the required degree of elasticity. The lower or bearing surface of this heel is approximately semi-cylindrical in form, so as to closely resemble the form of the heel of a natural human foot. The upper surface 19 of this heel-piece is concave to correspond with the convex surface 3 of the leg portion 1, and this surface 19 is provided with a number of depressions or cavities 5, into which the projections 4 extend, said projections being preferably cemented firmly into said cavities. The front upper portion of this heel-piece is formed with a downwardly and forwardly extending recess 30 for a purpose to be hereinafter explained.

15 designates the sole-piece of the foot, said sole-piece being also formed of rubber or other equivalent material or composition possessing the required elasticity and strength. This

sole-piece extends from the front lower part of the heel-piece 6 continuously to the front end or toe portion of the foot, and the under surface of said sole-piece is convex, so as to constitute at its rear portion a close resemblance to the arch of a natural foot and at the same time permit a natural rocking movement to the front part or ball of the foot. The upper surface 19<sup>a</sup> of this sole-piece is almost straight and the rear end of said sole-piece is formed on its upper side with a cavity or depression, extending longitudinally forward of the foot-piece a short distance and serving a purpose to be hereinafter explained.

14 designates the body-piece of the foot, and this body-piece is of wood of any suitable or preferred kind possessing strength and a proper amount of lightness. This body-piece extends from the extreme front or toe end of the foot backward to the rear end of the sole-piece, the upper and lower surfaces of the sole and body pieces abutting against each other and being firmly cemented together. At its rear end this body-piece is formed with a cavity or depression 20, which is formed principally in the under surface of the body-piece and which opens out at the rear end thereof, the purpose of said recess or cavity being hereinafter explained. The upper surface 19<sup>b</sup> of this body-piece extends from the rear end of said body-piece forward toward the toe end of the same about the distance shown in the drawings.

11 designates the lower instep-piece of the foot, said instep-piece being formed of cork and being generally of triangular form and of such form and length on its under side as to correspond with the form and extent of the upper surface 19<sup>b</sup> of the body-piece 14. The outer front surface of this instep-piece is curved to correspond closely to the shape of the lower part of the instep of a natural human foot and through the body portion of said lower instep-piece is formed an opening 12, which extends obliquely downward and forward from the upper surface 19<sup>c</sup> of said instep-piece, for a purpose to be presently explained.

10 designates the upper instep-piece of the foot, this piece 10 being constructed of rubber or any equivalent material which possesses the combined qualities of elasticity and strength desirable in this class of devices. The front and sides of this upper instep-piece are curved to correspond approximately with the form of the upper part of the instep of a natural human foot, and the under surface of said instep-piece corresponds in form and area with the form and area of the upper surface 19<sup>c</sup> of the lower instep-piece 11, the said two surfaces being firmly secured together by cement. The upper surface 19<sup>d</sup> of this upper instep-piece 10 corresponds in form and area with the form and area of the straight portion 7 of the leg portion 2, and said surface 19<sup>d</sup> is formed with a number of cavities 9 to

receive the projections 8 of said leg portion, the projections being firmly cemented into said cavities. This upper instep-piece is furthermore formed with an opening 13, extending obliquely downward and forward from the upper surface of the instep-piece, for a purpose to be hereinafter explained.

In the front part of the body-piece 14 is inserted the lower end of a limiting rod or bar 16, which extends thence obliquely upward and rearward through the opening 12 of the lower instep-piece 11 and into but not through the lower part of the opening 13 of the upper instep-piece 10. The larger projection 17 enters the upper end of this opening 13, and normally the outer or lower end of this projection is separated by a considerable interval from the upper end of the limiting-bar 16.

24 designates a connecting rod or bar, which extends downward and forward through a correspondingly-extending opening 25, which is formed through the solid lower end of the leg portion 2. The upper end of this connecting-bar is externally screw-threaded to receive a nut 26, which, when the parts are properly fitted to the wearer, impinges upon the upper surface of the solid part of the leg portion and is retained in position by a cross-pin 28, passed through the upper end of the connecting-bar and impinging upon the upper side of the nut 26. This connecting-bar passes downward through the recesses 10 and 30 of the upper instep-piece and of the heel-piece, respectively, and its lower end is connected by a pin or bolt 23 to the rear end of a stop-bar 29, which lies within the recesses 20 and 32 of the body-piece and sole-piece, respectively. Within the recess 20 of the body-piece are located two bearing-plates 21, between which the stop-bar 29 works, and said bearing-plates are secured in position by cross-pins 22, passing transversely through the body-piece and secured at the outer sides of the same, the said stop-bar coming at times into contact with the under surfaces of said cross-pins, as presently explained.

The action of this foot is as follows: As the user advances that limb which wears the foot and brings the heel upon the ground and then brings the other limb forward and places his natural foot upon the ground, a natural fall of the toe of the artificial foot follows the planting of the heel upon the ground, and when the artificial foot is to be lifted to take another step the elastic heel first gives a natural relief and impetus to the limb while the elastic sole eases and relieves the impact of the user's weight and then quickly imparts a lift to the body as the foot is being raised from the ground. As the body of the user is thrown forward the cork instep-piece and the rubber instep-piece combine to aid the sole in effecting a natural yielding and springing action, the yielding action or strain being borne, however, practically entirely by the more compressible upper instep-piece, the lower instep-

piece acting only as a deadening-cushion and bearing practically none of the compression strain. As the foot is raised for a stride the stop-bar rises and comes into contact with the under side of the cross-pins 22, and thus carries the front of the foot forward in a perfectly-natural elevated manner, and as soon as the weight is applied with the foot flat upon the ground the stop-bar quickly returns and thus insures a perfectly-natural and unopposed springing and yielding action of the foot, as just described.

In order to avoid absolutely any bare possibility of a wearing expansion of the cork lower instep-piece, due to the compression of the elastic upper instep-piece, the modification shown in Fig. 10 may be adopted. In this instance a flat strip or plate 33 of wood is interposed between the upper surface of the lower cork instep-piece and the under surface of the upper elastic instep-piece, the said piece 33 being beveled off at its rear end, as shown at 34, to properly fit the rear upper surface of the body-piece, and being also suitably and firmly cemented to the adjacent portion of the limiting-bar 16. Thus the portion 33 receives all of the impact of the elastic upper instep-piece and the lower cork instep-piece is free to act as a cushion and also to perform its other important office of lightening the foot.

It is to be observed that with a lighter or a heavier wearer or during a slower or a faster pace of the same wearer the adjacent ends of the limiting-bar and the projection 17 will approach less or more toward each other, but will rarely, if ever, come into actual contact, the purpose of these parts being to strengthen the foot as a whole without detracting from its suppleness of action. The several contacting surfaces above described are preferably roughened somewhat, so as to insure more perfect connection of the parts. The connecting-bar 24 and its stop-bar are preferably of aluminium, in order to attain combined strength and lightness, but it is evident that such parts may be made of steel, iron, or any other suitable metal.

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

1. An improved artificial foot comprising a leg portion having at its lower end an upward and forwardly inclined front surface and a convex rear surface, an elastic heel-piece having a convex upper surface in contact with the convex surface of the leg, an upper elastic instep-piece having its upper surface in contact with the inclined front surface of the leg, a lower instep-piece of cork placed beneath the upper instep-piece, a body-piece of wood having its upper surface in contact with the under surface of the lower instep-piece and extending from the front or toe end of the foot to the heel-piece thereof, and an elastic sole-piece having its upper surface in contact with the lower surface of the body-piece

and extending also from the front or toe end of the foot to the heel-piece thereof, the under surface of the sole-piece being of convex form, substantially as set forth.

2. An improved artificial foot comprising a leg portion having at its lower end an upwardly and forwardly inclined front surface and a convex rear surface, an elastic heel-piece having a concave upper surface in contact with the convex surface of the leg, an upper elastic instep-piece having its upper surface in contact with the inclined front surface of the leg, an elastic sole-piece having a convex under surface and extending from the toe or front end of the foot to the heel-piece thereof, a body-piece of wood resting upon the sole-piece and extending through the length thereof, a lower instep-piece of cork resting upon the body-piece, and a wooden portion interposed between the lower and upper instep-pieces, substantially as set forth.

3. An improved artificial foot comprising a leg-piece having a solid lower end, an elastic heel-piece located beneath the rear part of the leg-piece, an elastic sole-piece extending from the heel-piece to the toe end of the foot, a wooden body-piece resting upon the sole-piece and extending from the heel-piece to the toe of the foot, a cork lower instep-piece, and an elastic upper instep-piece interposed between the body-piece and the front part of the leg, a connecting-bar extending obliquely through the end of the leg and having a retaining-nut at its upper end, and a stop-bar connected to the lower end of the connecting-bar and working within a recess at the rear of the body-piece, substantially as set forth.

4. An improved artificial foot comprising a leg-piece having a solid lower end, an elastic heel-piece located beneath the rear part of the leg-piece, an elastic sole-piece extending from the heel-piece to the toe end of the foot, a wooden body-piece resting upon the sole-piece and extending also from the heel-piece to the toe of the foot, a cork lower instep-piece, and an elastic upper instep-piece interposed between the body-piece and the front of the leg, a pair of bearing-plates located in a recess in the rear of the sole-piece, transverse pins securing the bearing-piece in position, a connecting-bar extending obliquely downward through the end of the leg and having a retaining-nut at its upper end, and a stop-bar connected to the lower end of the connecting-bar and working movably within the recess of the sole-piece and between the bearing-plates, substantially as set forth.

5. An improved artificial foot comprising a leg-piece having an upwardly-inclined front surface and a convex rear surface at its lower end, an elastic heel-piece located beneath the convex rear surface, an elastic sole-piece extending from the heel-piece to the toe of the foot, a wooden body-piece also extending from the heel-piece to the toe of the foot, a cork lower instep-piece resting upon the

body-piece, an elastic upper instep-piece interposed between the lower instep-piece and the front of the leg, a limiting-bar secured at its lower end to the body-piece and extending upward and rearward through the lower  
5 instep-piece and partially into the upper instep-piece, and a projection upon the front surface of the leg, extending obliquely par-

tially into the upper part of the upper instep-piece, substantially as set forth. 10

In testimony whereof I affix my signature in presence of two witnesses.

JAMES H. KANE.

Witnesses:

JNO. L. CONDRON,  
H. E. PRICE.