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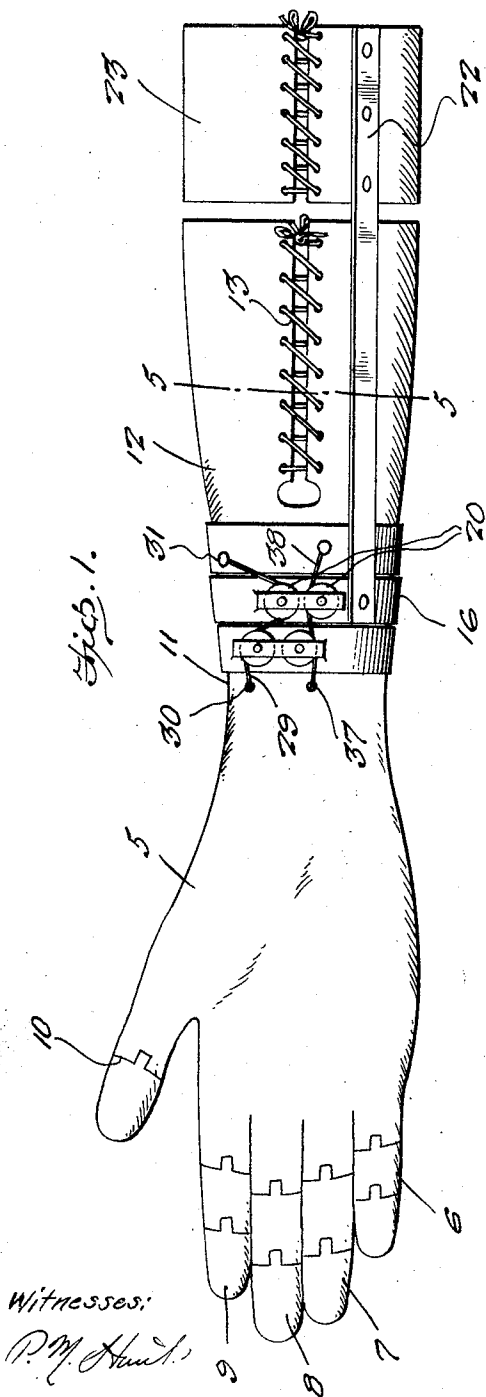
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E. LAHERTY

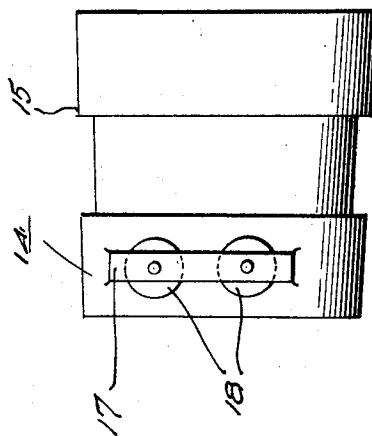
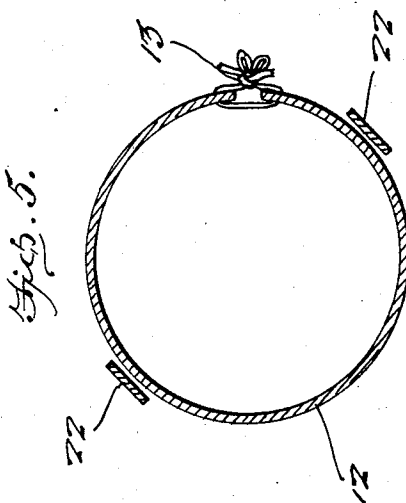
ARTIFICIAL HAND

Filed Dec. 3, 1923

3 Sheets-Sheet 1



Witnesses:
P. M. Hunt



Inventor
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Jan. 12, 1926.

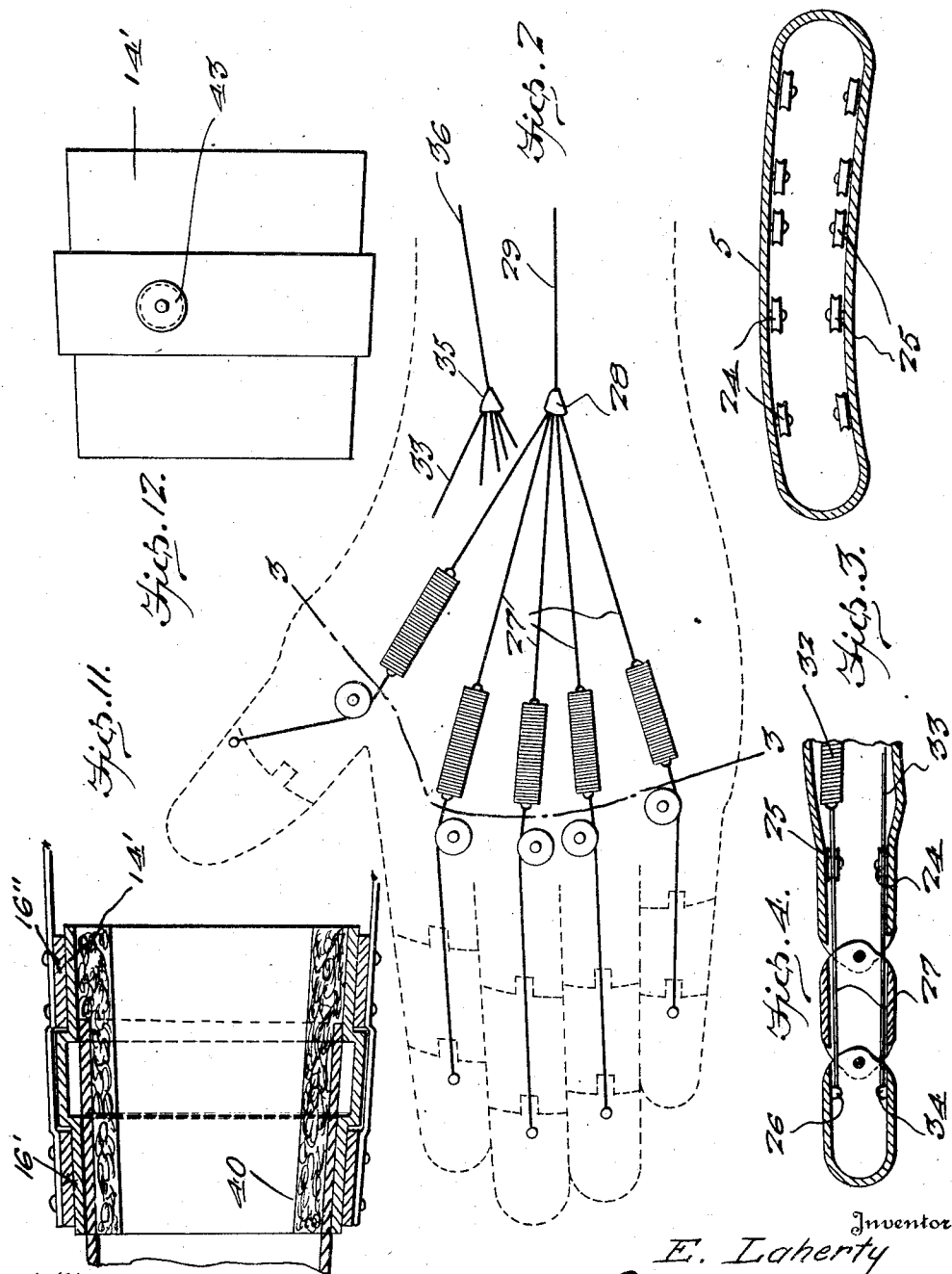
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ARTIFICIAL HAND

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3 Sheets-Sheet 2



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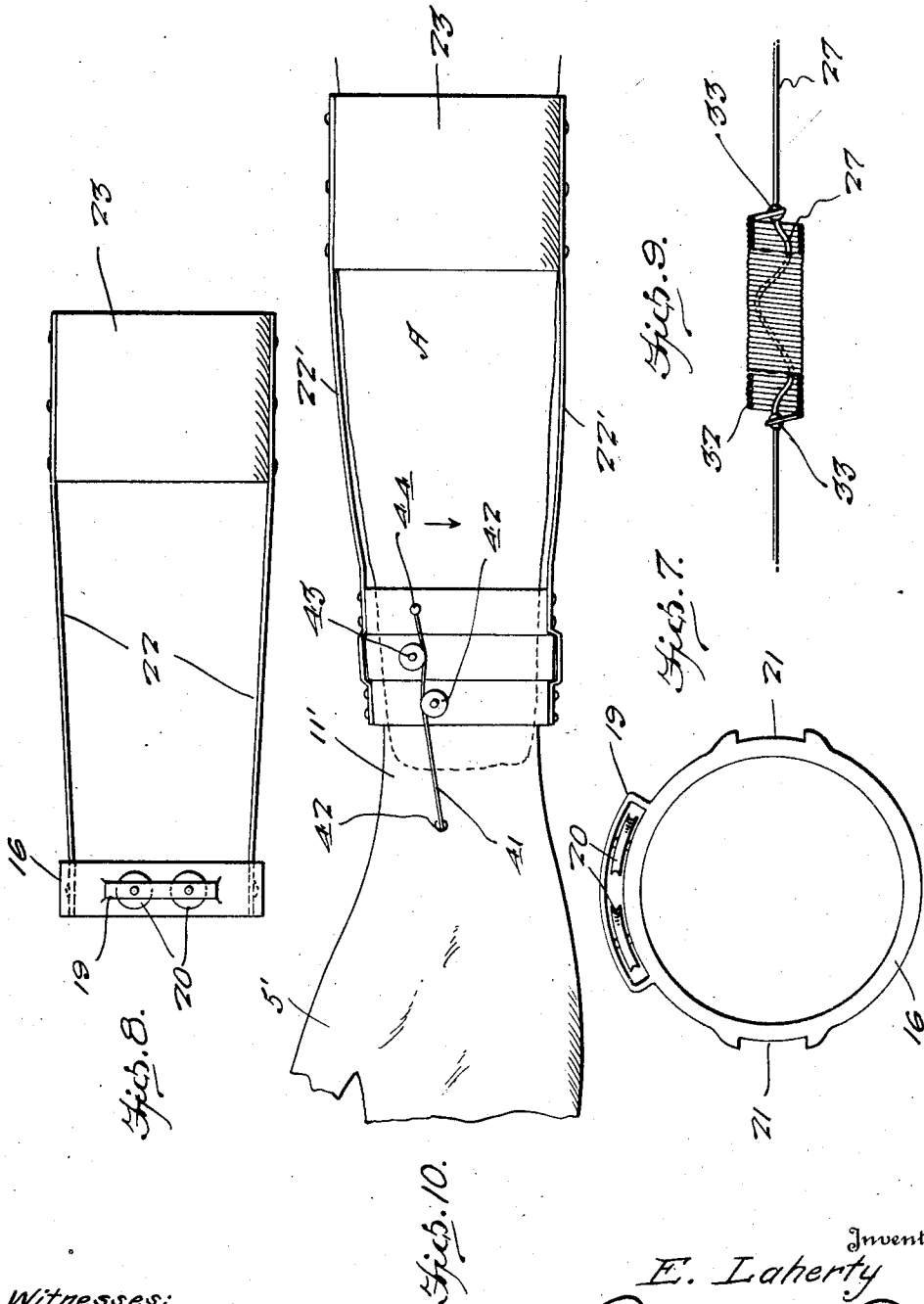
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ARTIFICIAL HAND

Filed Dec. 3, 1923

3 Sheets-Sheet 3



Witnesses:

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Fig. 10.

Fig. 9.
Inventor
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Fig. 8.
By *Charles A. O'Donnell*
Attorney

UNITED STATES PATENT OFFICE.

EDWARD LAHERTY, OF NENANA, TERRITORY OF ALASKA.

ARTIFICIAL HAND.

Application filed December 3, 1923. Serial No. 678,237.

To all whom it may concern:

Be it known that I, EDWARD LAHERTY, a citizen of the United States, residing at Nenana, Territory of Alaska, have invented certain new and useful Improvements in Artificial Hands, of which the following is a specification.

The present invention relates to an improved artificial hand in which the rotary movement of the forearm stump is used to actuate the thumb and the rest of the fingers, the primary object of the invention residing in the provision of such an artificial hand wherein said fingers and thumb may be moved to open and closed positions without the occasion of such movements being noticeable to others. The great disadvantage of the present types of artificial hands is that it is generally necessary to move the shoulder or entire arm that carries the artificial hand, and in some instances, the other arm, hand and fingers, for moving the fingers of the artificial hand to open and closed positions. This is the cause of great annoyance and embarrassment to the wearer.

A user of the present artificial hand may positively move the fingers and thumb thereof to closed and open position by a relatively slight turning movement of the human wrist, and this no matter what the position of the hand may be relative to the body.

It is an additional object to provide a device of this character wherein the foregoing objects may be attained without the provision of any complex and expensive construction, the present artificial hand being especially characterized by its extreme simplicity of construction, high efficiency of operation, and inexpensiveness of manufacture, and these so correlated as to reduce the possibility of disarrangement to a minimum.

A further object of the invention is to provide a device of this character wherein the necessity of using any shoulder, body or upper arm strap or harness is entirely dispensed with.

With the above and other objects in view as the nature of the invention is better understood, the same comprises the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the drawings wherein there is disclosed the two most practical embodiments of the

present invention with which I am familiar at the present time, and wherein like reference characters indicate corresponding parts throughout Figures 1 to 8, inclusive, and Figures 9, 10, 11 and 12, respectively,

Figure 1 is a front-side elevational view of a prosthetic hand constructed in accordance with the present invention,

Figure 2 is an enlarged diagrammatic plan view disclosing the major portion of the finger operating mechanism of the hand, the hand being shown in dotted lines,

Figure 3 is a detail transverse cross section taken substantially upon the curved line 3—3 of Figure 2.

Figure 4 is a longitudinal sectional view taken through one of the fingers and a portion of the palm of the hand for more clearly disclosing the arrangement of the finger operating cords disposed therein,

Figure 5 is a detail transverse sectional view through the adjustable fore-arm strap element of the present invention,

Figure 6 is an enlarged elevational view of a slightly tapered metallic sleeve member that comprises an essential part of the present invention,

Figure 7 is an enlarged front elevational view of a metallic band or ring that is positioned upon the before mentioned metallic sleeve, the same being held stationary with respect to the sleeve for purposes presently to be set forth,

Figure 8 is an elevational view of a unit included in the present invention, the same having as one of its elements: the before mentioned metallic band or ring, said unit adapted to be rigidly secured to the forearm of the wearer and this at a point directly adjacent the elbow thereof,

Figure 9 is an enlarged side elevational view partly in cross section, of one of the spring members in the line of connection between the fingers of the hand and the means for actuating said connection for providing a slight tension upon the connection whereby the fingers of the hand are normally maintained in their natural positions,

Figure 10 is a fragmentary front side elevational view of a slightly modified form of the present invention,

Figure 11 is an enlarged fragmentary longitudinal sectional view for disclosing more clearly the wrist construction of the modified form of artificial hand, and

Figure 12 is an elevational view of the

tapered metallic sleeve member employed in conjunction with the modification, said sleeve member adapted for tight fit upon the end of the human stump whereby a rotation of the wrist portion of the stump will manifestly rotate said metallic sleeve element for purposes presently to be set forth.

First having reference to Figures 1 to 9, inclusive, wherein there is shown the most preferred embodiment of the present invention, the same consists of a metacarpus or body part 5 which is hollow and of conventional shape and with which metacarpus or body 5 is formed the fingers 6, 7, 8 and 9, and the thumb 10. The fingers and thumb are also hollow and comprise the usual jointed sections of conventional form.

The present artificial hand also comprises a wrist portion 11 and a fore-arm portion 12 which fore-arm portion is preferably of suitable leather and secured in any well known manner to said wrist portion 11. This leather fore-arm portion 12 is split longitudinally at one end whereby the same may be tightly engaged with the fore-arm through the medium of suitable lacing 13.

The interior of the wrist portion 11 of the metacarpus or body 5 is shaped to fit the curvature of the wrist of a particular wearer and positioned over the external surface of said wrist portion 11 is a slightly tapered metallic sleeve 14 that is formed intermediate its ends with a circumferential relatively wide groove or channel 15 and within which is freely rotatably disposed a metallic band or ring 16, Figure 7.

Adjacent the front end of the metallic sleeve 14 the same is formed with an open housing 17 within which is disposed upon vertically arranged pins a pair of spaced relatively small pulleys 18—18. The stationary metallic ring or band 16 is also formed at a point normally out of alinement with the open housing 17 with a similar open housing 19 that also carries a pair of horizontally disposed spaced pulleys 20—20. Secured within recesses 21—21 upon opposite sides of said metallic band or ring 16 are the front ends of rearwardly directed relatively narrow and thin strips of metal particularly aluminum 22—22, the arrangement of these strips of metal being such as not to contact or rub against the fore-arm portion 12 of the artificial hand.

The rear ends of said metallic strips 22—22 are rigidly connected in any manner desirable to a fore-arm strap 23 which fore-arm strap is to be tightly secured through the medium of lacing 13 or other means to the fore-arm of the wearer, and this at a point directly adjacent the elbow of the arm.

Arranged upon the top side of the interior of the metacarpus or body 5 of the hand is a plurality of horizontally disposed relatively small cord or cable pulleys 24 which

as clearly shown in Figure 3 are five in number, the same being so positioned within the metacarpus or body 5 of the hand as to register with the fingers and thumb thereof. Similarly arranged upon the bottom or palm of said metacarpus or body 5 is a plurality of other horizontally arranged relatively small cable or cord pulleys 25 which are also five in number and which also aline with the fingers and thumb 6 to 10, inclusive.

Anchored as at 26 within the outermost finger and thumb sections and this upon the palm side of the hand thereof are cables or cords 27 that extend rearwardly, that are guided over the pulleys 25 and that are secured jointly as at 28 to a single cable or cord 29 that passes outwardly through the wrist portion of the hand through an opening 30, and that is passed over one side of one of the pulleys 18—18, carried by the tapered metallic sleeve 14, said cord or cable being then extended slightly downwardly and engaged over the opposite side of the adjacent one of the pulleys 20—20 carried by the stationary metallic band or ring 16 that is disposed upon said sleeve 14. This cable is then extended upwardly in an opposite direction and is anchored as at 31 adjacent the rearmost end of the sleeve 14.

Surrounding a normally slack portion 27' of each of the cords or cables 27 is a retractile coiled spring 32 the opposite ends thereof being secured as at 33 to different points of the respective cable 27. These coiled springs 32 serve to normally apply a tension to each of the cables or cords 27 for maintaining the fingers and thumbs in positions of reality.

Anchored to the back sides of the fingers or thumbs and at a point within the fingers and thumb as at 34, Figure 4, is another series of cables or cords 35 that extend rearwardly and are guided over the pulleys 24 at the back side of the interior of the hand and are jointly connected as at 35 to a cable or cord 36 which extends outwardly through the wrist portion 11 of the hand through an opening 37. This cable or cord 37 is then passed alongside of the remaining one of the pair of pulleys 18—18 and then upon the inner side of the remaining one of the pair of pulleys 20—20 carried by the stationary band or ring 16. This cable is then anchored as at 38 to the rear end of said metallic sleeve 14.

When the hand is applied to the stump of the arm the position of the different parts are as shown in Figure 1, and it will be at once obvious that when the wrist of the arm stump is given a slight turn in opposite directions, said metallic sleeve 14 will be rotated for obviously pulling upon the cables 29 or 36 as the case may be for opening or closing the fingers with respect to the meta-

carpus or body 5 of the hand. It will also be appreciated that when a slight turning movement is given to the wrist of the stump, and this in either direction, a pull will be applied to one cable for opening or closing the fingers and thumb as the case may be while tension will be released upon the other cable for thereby allowing this action.

In the modified form of the invention shown in Figures 10 to 12, inclusive, the hand comprises a metacarpus or body 5' of a construction similar to the metacarpus or body 5 of the hand shown in the preferred embodiment of the invention. This metacarpus or body 5' is also formed with a relatively short wrist portion 11' and in this form of the invention the body 5' is provided with fingers and a thumb of a type shown in the patent to Charles Hofer, No. 1,305,721, or to Alexander Pringle, No. 1,324,564. The fingers disclosed in the before mentioned patents are of the coiled spring type, and extending through each of which is a cord or cable that is attached to a master cable whereby a pull upon the same will move the fingers and thumb to a closed position, the normal arrangement of the fingers and thumb being in a partially closed or natural state. However, the construction above set forth does not enter into the spirit and scope of the present invention as the same is conventional and will therefore not be claimed by me either separately or in combination with the other elements of the invention.

In this form of the invention, the wrist portion 11' of the metacarpus or body 5' is secured within a tapered metallic sleeve 14' that is reduced in circumferential area at its opposite ends and upon which reduced portions are disposed metallic bands or rings 16' and 16''. The interior of the metallic sleeve 14' is provided with a felt padding 40 shaped to the curvature of the wrist of the wearer, whereby slight relative turns of the wrist in opposite directions will manifestly occasion slight turning movement of the sleeve 14' as well as the metacarpus or body 5' and fingers and thumb of the hand.

Rigidly connected to the rings or bands 16' and 16'' are rearwardly extending strips of metal 22'—22'', similar to the metal strips 22—22 in the before described embodiment of the invention. Carried by the rear ends of these metal strips 22'—22'' is a leather strap 23' that may be secured to the forearm of the wearer in any manner desirable it being herein noted that this strap 23 is also secured to the forearm at a point directly forwardly of the elbow of the arm.

The master cable from the fingers above set forth is designated by the reference character 41 and in this instance the same also extends outwardly of the metacarpus or body 5' of the hand through an opening 42

in the wrist portion thereof, said master cable being engaged over a horizontally arranged pulley 42 upon the foremost one of the bands or rings, which foremost one is designated by the reference character 16'. The master cable is then extended rearwardly and engages over the opposed side of a pulley 43 that is carried by the sleeve 14' and this at a point slightly out of alignment with said first mentioned pulley 42. The master cable 41 is finally anchored as at 44 to the rearmost ring or band 16''.

It will thus be obvious that in actual use the stump of the arm designated A will be associated with the present artificial hand in a manner somewhat diagrammatically shown in Figure 10. A slight turning movement of the wrist of the stump will manifestly slightly rotate the sleeve 14' together with the wrist, body portion and fingers and thumb of the hand, for thereby closing or allowing the fingers and thumb to open as the case may be. A turning movement of the wrist in a direction as indicated by the arrow in Figure 10 will obviously cause the pulley 43 to draw the master cable 41 outwardly through the interior of the hand, which will obviously pull upon the cables carried by the fingers and thumb of the hand which will manifestly move the fingers and thumb to a closed position.

From the foregoing it will be readily apparent to those skilled in the art to which the present invention pertains, that I have provided a highly novel, simplified and inexpensive form of artificial hand, and one that will effectively anticipate all of the objects above ascribed.

I do not wish to be limited to the specific construction and arrangement of the parts disclosed in the forms of the invention set forth, as in the future practice of the invention other changes and modifications may be had without departing from the spirit and scope of the appended claims.

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

1. In an artificial hand, comprising a body terminating in a wrist portion and having a thumb and fingers articulated thereon, means for securing the wrist portion to the end portion only of the forearm of the wearer, and means carried by the wrist portion of the hand body relatively rotatable thereon adapted to be connected to the forearm only of the wearer rearwardly of the connection of the hand body, a rotative movement of the wrist portion of the hand body effecting a movement relative to said means for operating connections with the thumb and fingers to positively open and close the same.

2. In an artificial hand, comprising a hand body terminating in a wrist portion

and having thumb and fingers articulated thereon, means for securing the wrist portion of the body to the end portion only of the forearm of the wearer, cable connections with the thumb and fingers of the hands directly connected to the wrist portion of the hand body, and means carried by and relatively rotatable on the wrist portion of the hand body secured to the forearm of the wearer, rearwardly of the connection of the hand and body thereto, for operating said cable connection in a relative rotatable movement of the forearm for positively operating the fingers and thumb to open or close the same.

3. In an artificial hand, comprising a hand body terminating in a wrist portion and having a thumb and fingers articulated thereon, means for securing the wrist portion to the end of the forearm of a wearer, cable connections with the thumb and fingers of the hand directly connected to the wrist portion of the hand body, a member mounted on the wrist portion of said hand body and rotatable relative thereto having means for connecting said member with the forearm only of the wearer rearwardly of the end portion, said member engaging said cable connections and operable upon a relative turning movement of the end of the forearm of the wearer in opposite directions for effecting a positive operation of the fingers and thumb on the hand body, for opening or closing the same.

4. An artificial hand comprising a hollow hand body, hollow fingers, and a hollow thumb, mounted on said body for articulation relative thereto, and operating means for said fingers and thumb including cable connections with the back portions of the fingers and thumb, and movable through the back portion of the hand body, cable

connections with the palm portions of the fingers and thumbs and movable through the palm portion of the hand body, each of said cable connections being anchored to the wrist portion of said hand body adapted to be secured to the wrist of the forearm of a wearer, and operating means carried by the wrist portion and engaging said cable connections operable upon a relative rotative movement of the wrist of the hand portion and the forearm of the wearer for effecting a relative movement of said cables to produce a positive movement of the fingers and thumb in opening or closing the same.

5. An artificial hand comprising a hand body, thumb and fingers articulated thereon, means for securing the hand body to the stump of the forearm only of the wearer, means mounted only on the forearm having a portion relatively movable on the hand body, and means carried by the hand body operable upon a relative movement of the hand body and the portion of the last mentioned means thereon for positively operating the fingers and thumb to open and closed position.

6. An artificial hand, comprising a hand body, thumb and fingers articulated thereon, means for securing the hand body to the stump of the forearm only of the wearer, means mounted only on the forearm of the first mentioned means having a projecting portion relatively movable on the hand body, and cables connected to the thumb and fingers of the hand body operable by the projecting portion of the last mentioned means for producing a positive operation of the thumb and fingers to open and closed position.

In testimony whereof I affix my signature.

EDWARD LAHERTY.