W. T. CARNES.

ARTIFICIAL HAND MECHANISM.

APPLICATION FILED JUNE 24, 1921.

1,402,476.

Patented Jan. 3, 1922.

2 SHEETS—SHEET 1.

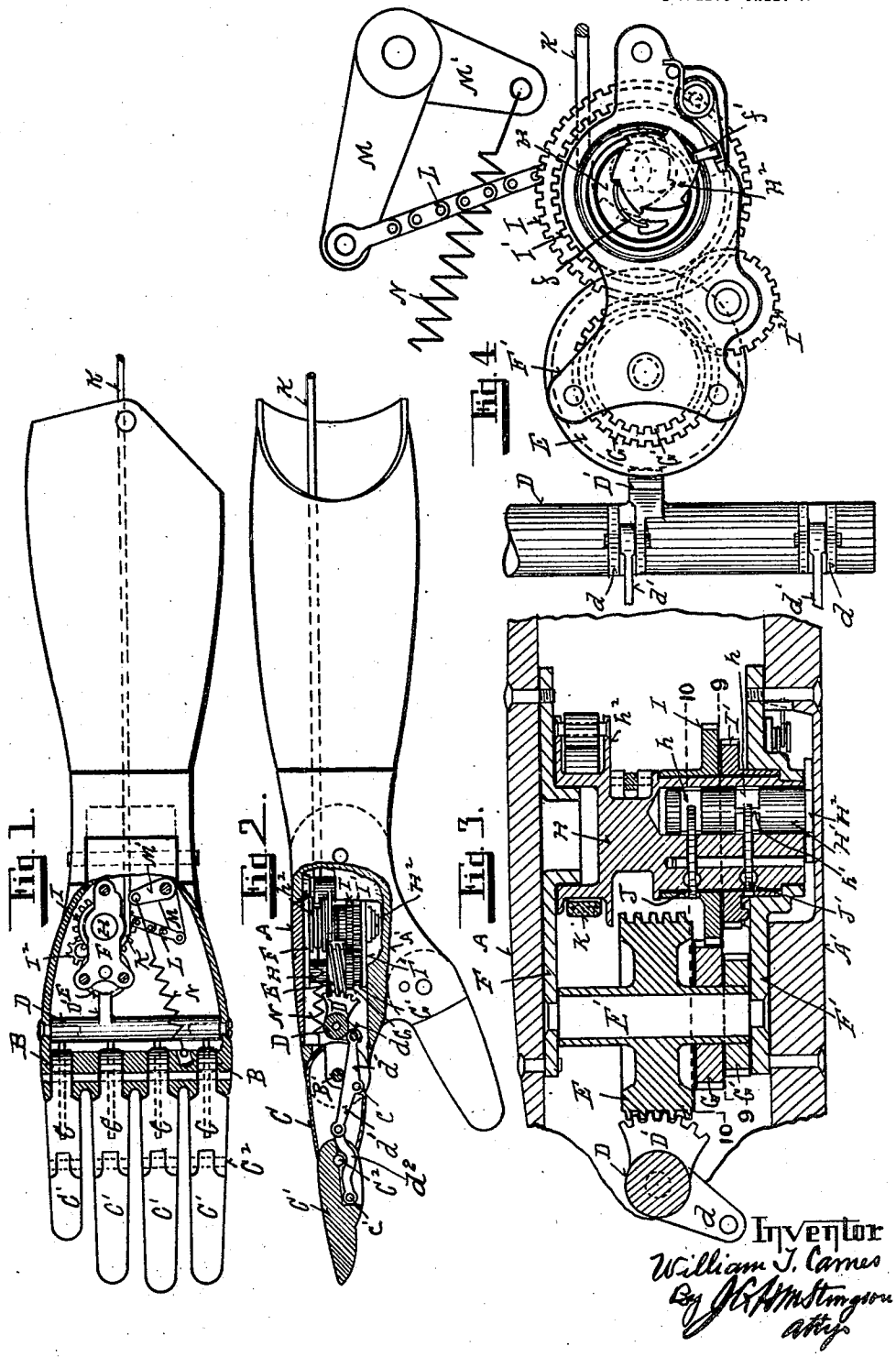


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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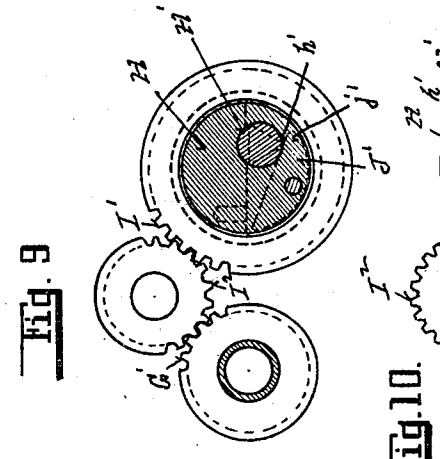


Fig. 9.

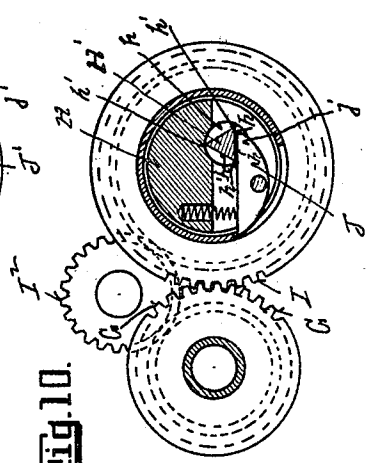


Fig. 10.

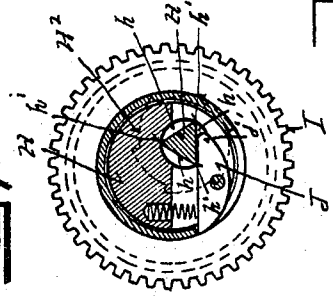


Fig. 7.

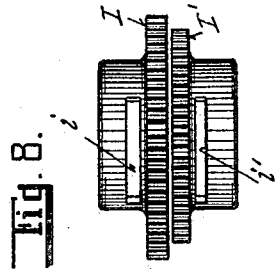


Fig. 8.

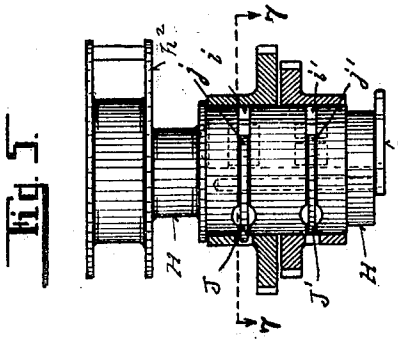


Fig. 5.

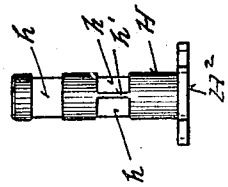


Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM T. CARNES, OF KANSAS CITY, MISSOURI, ASSIGNOR TO CARNES ARTIFICIAL LIMB COMPANY, OF KANSAS CITY, MISSOURI, A CORPORATION OF MISSOURI.

ARTIFICIAL-HAND MECHANISM.

1,402,476. Specification of Letters Patent. Patented Jan. 3, 1922.

Application filed June 24, 1921. Serial No. 480,097.

To all whom it may concern:

Be it known that I, WILLIAM T. CARNES, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Artificial-Hand Mechanism; and I 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention relates to improvements in artificial hand mechanism for operating the fingers thereof, and has for its object means contained in the hand which operate to positively move the fingers to open and close them, and hold the fingers stationary at any point in their movement; and also operating to reverse the movement of the fingers, as desired; or allowing the continued movement of the fingers in the same direction, the same being operated as desired by the wearer, by suitable means extending therefrom to the usual shoulder harness utilized for operating artificial arms and hands.

The features of my invention are hereinafter fully set forth and described and illustrated in the accompanying drawings, in which:—

Figure 1, is a top or plan view of a hand and fore-arm with parts of the hand broken away, showing a top or plan view of my improved mechanism.

Figure 2, is a side view of the same with parts of the side of the hand and front finger broken away, showing a side view in elevation of my improved mechanism.

Figure 3, is an enlarged, vertical, central section of my improved mechanism.

Figure 4, is an enlarged bottom plan view of my improved mechanism.

Figure 5, is a view in elevation of the reversing device of my improved mechanism.

Figure 6, is a view in elevation of a part of the same.

Figure 7, is a sectional view of a portion of the reversing mechanism on the line 7 in Fig. 5.

Figure 8, is a view in elevation of the gears of the reversing mechanism.

Figure 9, is a sectional view of parts thereof on the line 9 in Fig. 3.

Figure 10, is a sectional view of the same on the line 10 in Fig. 3.

From the above drawings it will be observed that my improved mechanism is mounted in a cavity formed in the body of the hand, between the back A and the inside A′ thereof, and is secured to the back A and the inside A′.

In slots B in the outer end of the hand body I pivot fingers C C′ in the usual manner; and in the hand body adjacent to the finger pivots B′, I mount a transverse rock-shaft D provided on its lower portion with arms d to which I pivot finger operating levers d' which are centrally pivoted on pivots c adjacent to the inside faces of the finger sections C. The outer ends of these levers d' are pivoted to the inner ends of levers d^2 adjacent to the rear of the joint C^2, uniting the outer section C′ of the finger to the inner section C thereof; and the outer end of the lever d^2 is pivoted at c' to the outer section C of the finger, so that when the rock-shaft D is rotated the levers d' d^2 operate the finger sections C C′ to open and close them in the usual manner.

For rotating the rock-shaft D, I provide a segmental gear-arm D′ extending horizontally rearward therefrom, which is engaged by a worm E; this worm E is mounted on a vertical shaft E′ secured between an upper frame F and a lower frame F′, respectively secured to the insides of the back A and inside A′ of the hand body; and on the shaft E′ below the worm E there are secured gear wheels G and G′.

Between frames F and F′ at the rear of the worm E there is rotatively mounted a vertical shaft H, on the periphery of which there is a loosely mounted gear wheel I intermeshing with the gear wheel G; and a like gear wheel I′ intermeshing with an idler gear I^2 (see Fig. 4) whereby the rotation of the shaft H, through the gears

I and G rotates the worm E in one direction, and when through the action of the reverser mechanism H′ (hereinafter described) the connection of the shaft H with the gear wheel I is released and returned to its normal position, and the connection of the gear wheel I′ established, when the shaft H is again rotated, the shaft H engages the gear wheel I′, and through the idler I^2 and gear G′ rotates the worm E in the reverse direction.

The reverser mechanism above referred to comprises substantially a reverser H′ (see Fig. 6) eccentrically mounted in the shaft H, so as to rotate therein (see Fig. 3). The stem of the reverser H′ is provided with slots *h h* having projections *h′* therein adapted to engage the ends *j* and *j′* of the spring actuated dogs J and J′ mounted in the shaft H and operating through slots *i* and *i′* in the hubs of the gear wheels I and I′ to engage and rotate said gear wheels in unison with the shaft H; and when the projections *h′* in the slots *h* and *h* engage and move the ends *j* and *j′* of said dogs J and J′ outward, the opposite ends of the dogs J and J′ are depressed and disengaged from the hubs of the gear wheels I and I′ (as clearly illustrated in Figs. 3, 5, 7, 9 and 10) which permits the shaft H to rotate freely within the hubs of said gear wheels.

To accomplish this the reverser H′ is provided on its lower end with a ratchet H^2, which, as the shaft H is rotated, is engaged at one point in its rotation by a spring stop *f* on the end of the shaft H, and the ratchet H^2 is also engaged at another point in its rotation by a stop *f′* on the frame F′, which operates to cause the partial rotation of the reverser H′ in the shaft H, and bring the projections *h′* in contact with the ends *j* or *j′* of the dogs J or J′, which are raised thereby so that the opposite ends thereof are out of contact with the ends of the slots in the hubs of the gear wheels I or I′, as the case may be. This operates in such manner that but one gear wheel I or I′ is rotated at a time by the rotation of the shaft H, and thereby rotates the worm E during one forward rotation of said shaft H, and in the opposite direction during the succeeding forward rotation thereof.

The shaft H is rotated in one direction by an operating cord K which extends from a spool h^2 on the upper end of the shaft H, which operating cord leads back to the ordinary shoulder harness (not shown) used for operating artificial arm and hand mechanism, and in the opposite direction by means of a flexible connection L leading around the shaft H in the opposite direction from the operating cord K, and leading therefrom to one arm M of the bell-crank lever M M′ pivoted in the back A of the hand, while a spring N extends from the other arm M′ to a point in the back A′ of the hand, whereby the shaft H is rotated in the direction opposite to that caused by the operating cord K.

In operation, the wearer, by putting tension on the operating cord K rotates the shaft H, carrying the reverser H′; this operates to move the fingers C C′ to close or open them as the case may be; and this movement can be continued by continuing the tension on the cord K, to any desired extent. If, however, it is desired at any point in the movement of the fingers, to move them either in the same direction or in the opposite direction, continued tension on the cord K will continue the movement; or the relaxing of such tension will allow the spring N to rotate the shaft H in the opposite direction; which, through the action of the reverser H′ hereinbefore described, will operate through the gears I or I′, as the case may be, to release and reverse the movement of the fingers C C′ as may be desired.

From the description of the mechanism and its operation hereinbefore described, it will be observed that the fingers can be positively opened or closed, and that this movement can be stopped at any point, and retained or reversed as may be desired.

Having thus described my invention so as to enable others to construct and utilize the same, what I claim as new and desire to secure by Letters-Patent is:—

1. In a device of the character described, a frame, a shaft mounted in said frame, gear wheels loosely mounted therein, dogs for connecting said gears with the shaft, and reversing mechanism mounted in said shaft adapted to operate said dogs to connect said gears with said shaft.

2. In a device of the character described, a frame, a shaft mounted therein, means for rotating said shaft in both directions, gear wheels loosely mounted on said shaft, dogs mounted in said shaft for engaging the gear wheels therewith, and a reverser mounted in said shaft for alternately engaging and operating said dogs, and means to rotate said reverser.

3. In a device of the character described, a frame, a shaft mounted therein, cord mechanism for operating said shaft in one direction, and spring mechanism for operating it in the other direction, gear wheels loosely mounted on said shaft, dogs mounted in said shaft for engaging said gear wheels therewith, a reverser eccentrically mounted in said shaft, alternately engaging and operating said dogs, and stop mechanism engaging said reverser and limiting the rotation thereof.

4. In a device of the character described, a hand, fingers hinged thereto, a frame secured in the body of the hand, rock-shaft

and worm mechanism for moving the fingers, gears on the worm, a shaft mounted in said frame, gears loosely mounted thereon engaging the gears on the worm, dogs in said shaft for engaging the gears thereon, a reverser mounted in said shaft operating said dogs to alternately engage the gears therewith, and stop mechanism to control the rotation of said reverser in the shaft.

5. In a device of the character described, a hand, fingers hinged thereon, rock-shaft and lever mechanism for moving the fingers, a segmental gear on said rock-shaft, a worm engaging said gear, gear wheels connected with said worm, a frame secured in the hand body at the rear of said worm, a shaft mounted in said frame, gear wheels loosely mounted thereon, one of which engages with one of the gears on said worm, and the other with an idler gear communicating with the other gear on said worm, means for rotating said shaft in both directions, dogs mounted in said shaft for engaging the gears mounted thereon therewith, a reverser eccentrically mounted in said shaft for alternately operating said dogs, and stop mechanism on the end of said shaft and on the frame, for controlling the rotation of said reverser in said shaft.

In testimony whereof I affix my signature.

WILLIAM T. CARNES.