W. T. CARNES.

ARTIFICIAL ARM.

APPLICATION FILED MAR. 18, 1912.

1,046,966.

Patented Dec. 10, 1912.

5 SHEETS—SHEET 1.

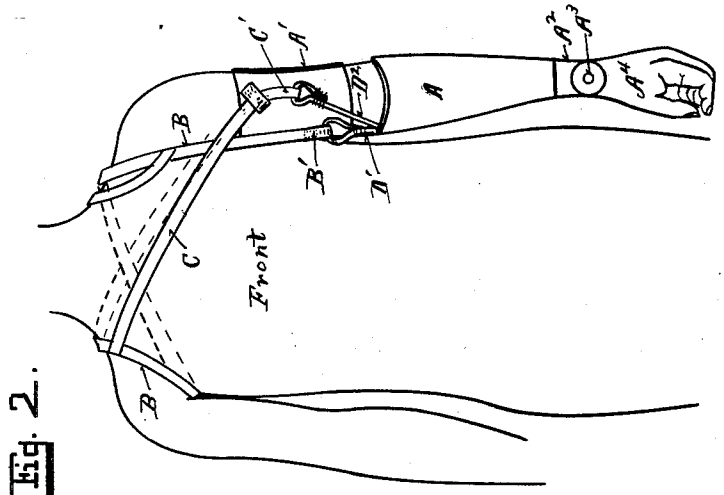

Fig. 2.

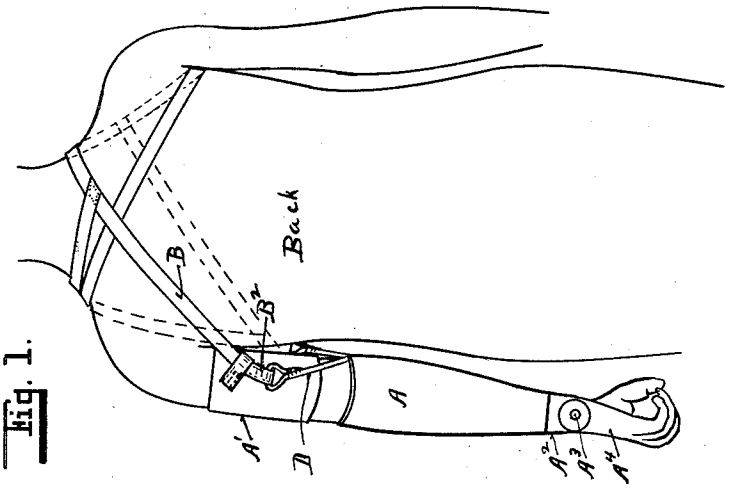

Fig. 1.

Witnesses.

Erma E. Myers

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Inventor.

William T. Carnes

By J. C. Stinson

attys

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5 SHEETS—SHEET 2.

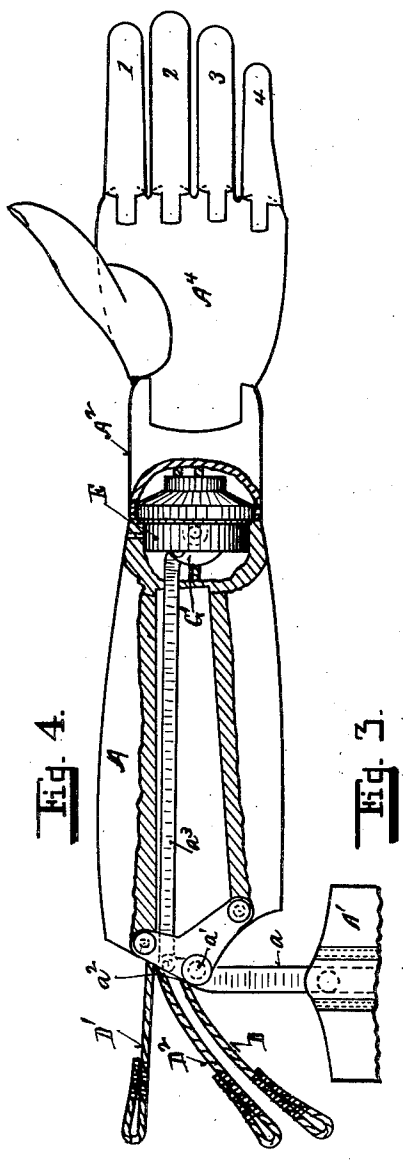

Fig. 4.

Fig. 3.

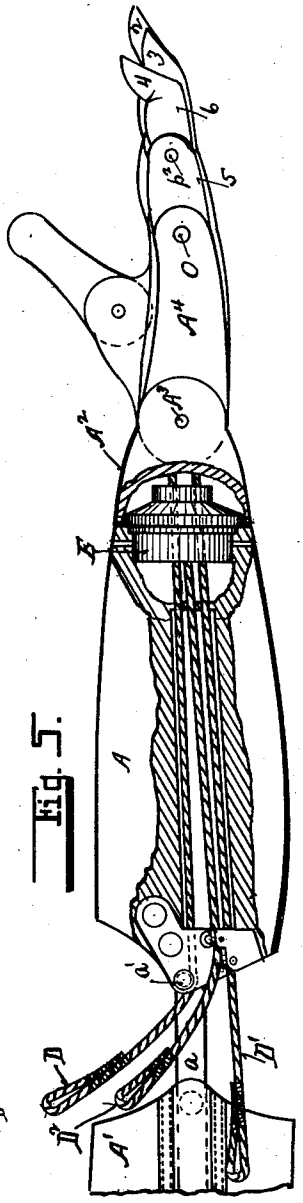

Fig. 5.

Witnesses.

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5 SHEETS—SHEET 3.

Fig. 8.

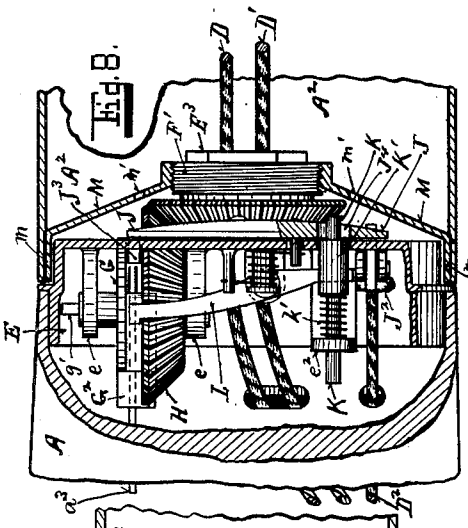


Fig. 9.

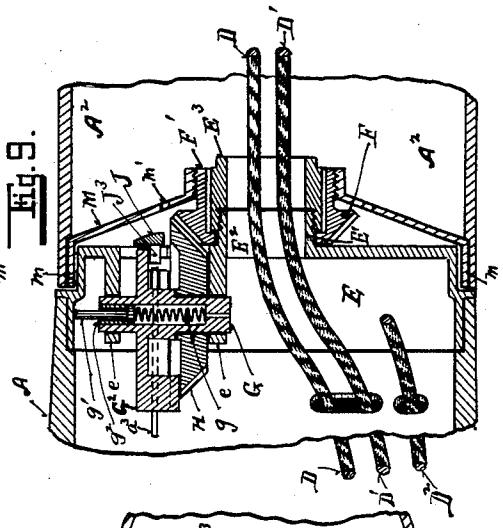


Fig. 6.

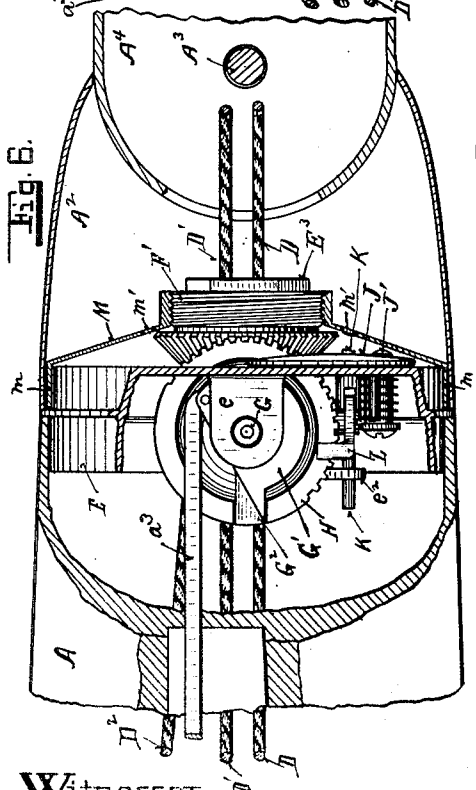
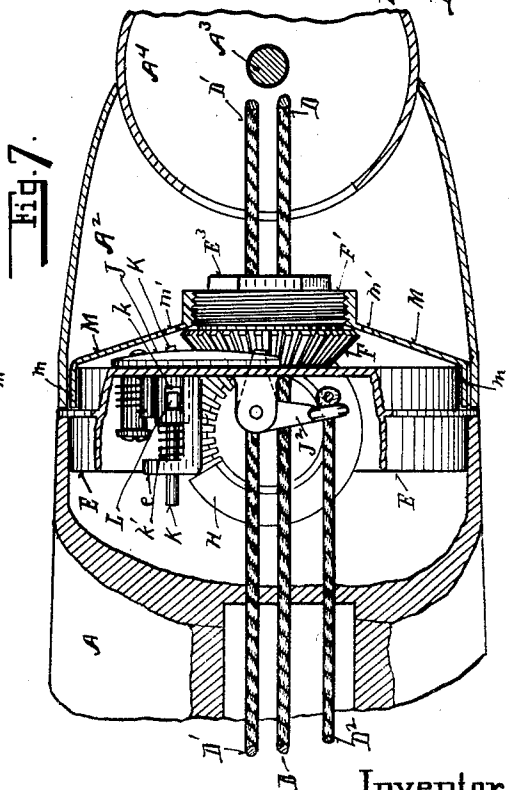


Fig. 7.



Witnesses.

Emma E. Phyfe

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W. T. CARNES.

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5 SHEETS—SHEET 4.

Fig. 14.

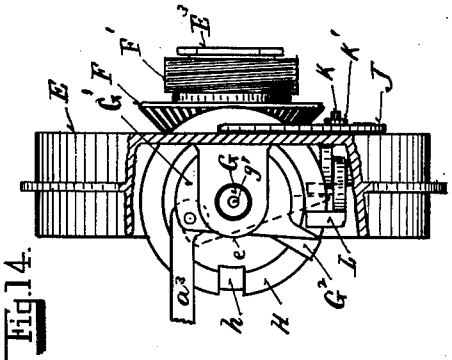


Fig. 12.

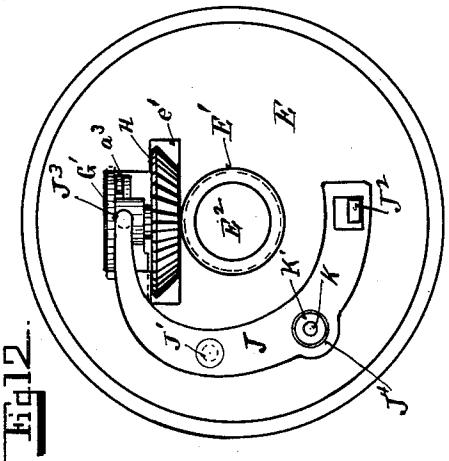


Fig. 13.

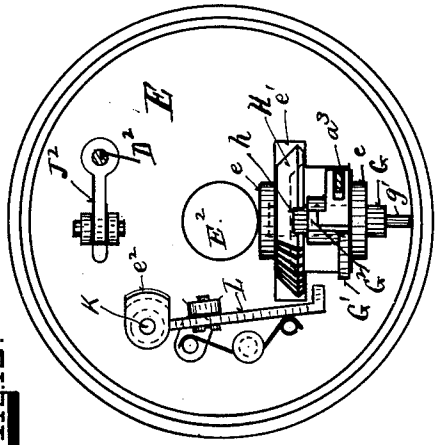


Fig. 10.

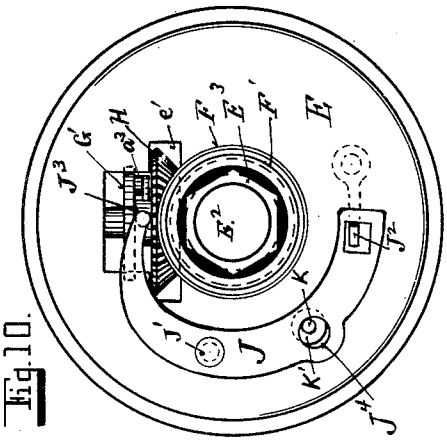
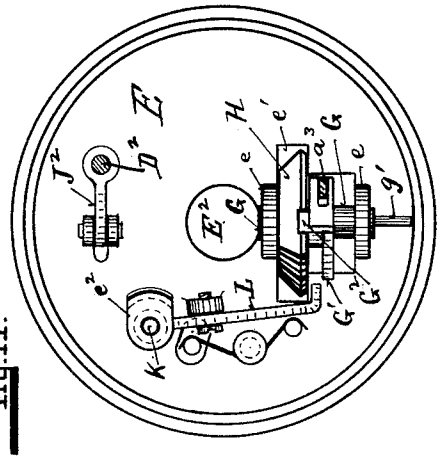


Fig. 11.



Witnesses.

Emma E. Myers

G. J. Mulvaney

Inventor.

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W. T. CARNES.

ARTIFICIAL ARM.

APPLICATION FILED MAR. 18, 1912.

1,046,966.

Patented Dec. 10, 1912.

5 SHEETS—SHEET 5.

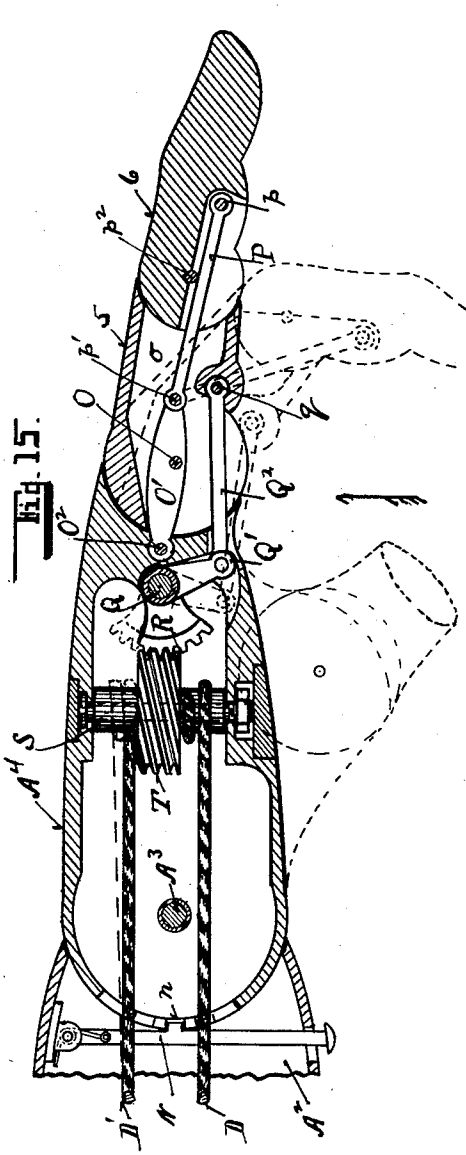

Fig. 15.

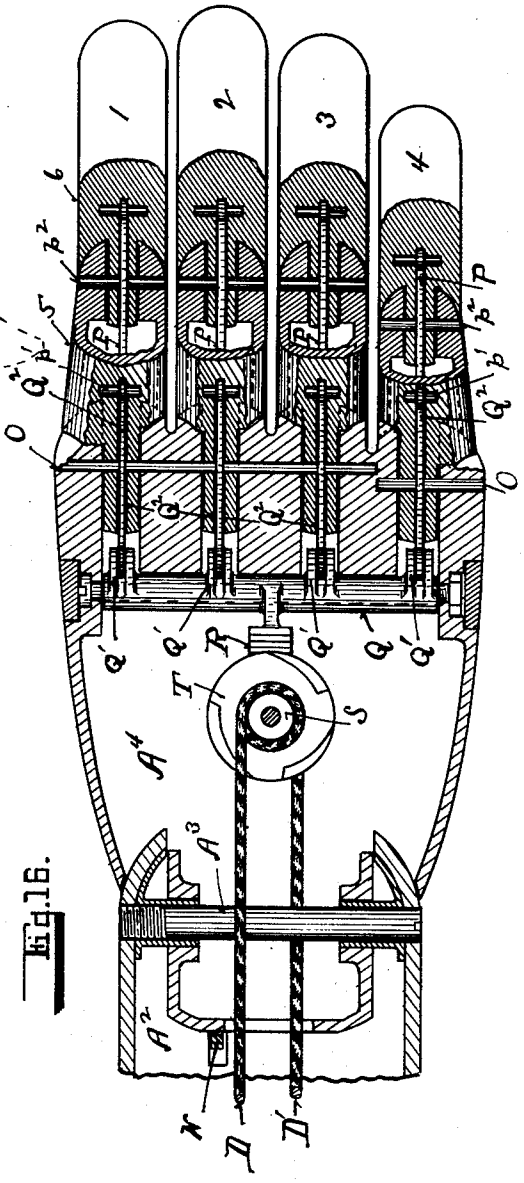

Fig. 16.

Witnesses.

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By J. C. Hume Sturgeon

attys

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 ARM.

1,046,966. Specification of Letters Patent. Patented Dec. 10, 1912.

Application filed March 18, 1912. Serial No. 684,467.

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 Arms; 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 artificial limbs and has for its object the construction of an artificial arm, in which there is installed mechanism by which the wrist may be rotated on the lower end of the fore-arm, a wrist joint may be operated and the fingers of the hand may be opened and closed.

My present invention relates to artificial limbs of the type embodied in U. S. Letters-Patent No. 760,102, granted May 17, 1904, and U. S. Letters-Patent No. 999,484, granted August 1, 1911, upon my applications.

The features of my invention are hereinafter particularly pointed out and the construction and operation thereof fully described, and illustrated in the accompanying drawings, in which:—

Figure 1, is a back view of my improved artificial arm in place upon a stump amputated below the elbow and showing a rear view of the supporting and operating harness therefor. Fig. 2, is a front view of the same. Fig. 3, is a side view in elevation of my improved artificial arm and hand, with a portion of the shell of the fore-arm and wrist broken away, so as to show the manner of operating the wrist swivel. Fig. 4, is a like view of the same showing the elbow joint bent to turn the hand and wrist from the position thereof shown in Fig. 3, to that shown in Fig. 4. Fig. 5, is a view in elevation of the opposite side of my improved arm and hand to that shown in Fig. 3. Fig. 6, is an enlarged view of the wrist swivel portion of my improved artificial arm partly in section and partly in elevation. Fig. 7, is a like view of the same taken from the opposite side of Fig. 6. Fig. 8, is a like view of the same from the upper side of Fig. 7. Fig. 9, is a central, vertical section of Fig. 8. Fig. 10, is an end view of the lower end of the fore-arm, with the wrist portion removed. Fig. 11, is a view of the opposite side of the mechanism shown in Fig. 10. Fig. 12, is a like view to Fig. 10, with the clutch mechanism disconnected. Fig. 13, is a like view to Fig. 11, with the clutch mechanism disconnected. Fig. 14, is an edge-wise view of the swivel mechanism removed from the lower end of the fore-arm, with a portion of the shell thereof broken away to disclose the operation of the clutch mechanism when the same is disconnected, as shown in Figs. 12 and 13. Fig. 15, is a vertical section of the hand portion of my improved artificial arm. Fig. 16, is a horizontal section of the same, looking in the direction of the arrow in Fig. 15.

In these drawings A indicates the fore-arm portion of my improved artificial arm, A′ indicates the sleeve portion thereof, adapted to embrace the arm of the wearer above the elbow joint, A^2 indicates the wrist portion of the artificial arm, A^3 indicates the wrist joint and A^4 the hand portion thereof.

In Figs. 1 and 2 is shown the harness which I place upon the shoulders of the wearer and by means of which the mechanism of my improved artificial arm is operated. This harness consists of the strap B which starts at the back of the arm adjacent to the sleeve A′ and extends upward therefrom and diagonally across the back, over the opposite shoulder and down in front thereof as shown in Fig. 2, back under the opposite arm, diagonally upward across the back, preferably passing under itself, and forward over the shoulder of the maimed arm and down to a point adjacent to the front of the sleeve A′ in Fig. 2, ending in the loop B′. The end of the strap B shown in Fig. 1, terminating in the loop B^2. To that intermediate portion of the strap B which passes up in front of the shoulder of the wearer which is opposite to the maimed arm, I secure another strap C, as shown in Fig. 2, which strap C crosses the chest of the wearer and terminates in the loop C′ in front of the sleeve A′.

To the loop B′ (see Fig. 2) a hand opening cord D′ is secured, which cord extends downward through the shell of the fore-arm A through the wrist portion A^2 into and is connected with the finger operating mechanism in the hand A^4 as hereinafter more fully described. From the loop B^2 at the back of the maimed arm, another cord D, for the purpose of closing the fingers of the hand A^4 extends downward through the shell of the fore-arm A, wrist portion A^2 into and is connected with the finger operating mechanism in the hand A^4. Connected to the loop C′ in front of the maimed arm (see Fig. 2) there is a cord D^2 extending therefrom downward through the shell of the fore-arm A for the purpose of operating, or controlling the operation of the wrist swivel locking mechanism hereinafter described.

The sleeve A′ (see Figs. 3, 4 and 5) is secured to the fore-arm portion A by means of side bars a, which are secured therein by rivets or otherwise and the lower ends of said side bars being pivoted to the upper end of the fore-arm member A by means of the pivots a'. One of said side bars a, is provided with an extension a^2 shown in full and broken lines in Figs. 3 and 4, and to this extension a^2 is pivoted one end of a wrist swivel operating link a^3, which extends from said extension a^2 to and is pivoted to the wrist swivel operating mechanism E, secured in the lower end of the fore-arm member and hereinafter fully described.

In the wall of the fore-arm member A opposite to the side thereof occupied by the link a^3 shown in Figs. 3 and 4, I make a longitudinal recess through which the operating cords D, D′ and D^2 pass, as shown in Fig. 5.

Secured in the lower end of the fore-arm member A there is a circular or cylindrical frame E, which closes the lower end of the fore-arm member A and has extending outward therefrom a cylindrical stud E′ having a central opening therethrough (E^2) for the purpose hereinafter set forth. Mounted upon this cylindrical stud on the frame E there is a miter-gear wheel F provided with a hub-portion F′, (see Fig. 9). The outer end of the hollow cylindrical stud E′ is provided with screw threads upon which is screwed a hollow nut E^3 for the purpose of retaining the miter-gear F upon the hollow stud E′. The hub F′ of the miter-gear F is also screw threaded on its periphery for the purpose hereinafter set forth.

Mounted in suitable bearings e e, on the under side of the circular frame E, the same being within the lower end of the fore-arm member A (see Figs. 8 and 9) there is a hollow shaft G, and loosely mounted upon this hollow shaft G there is a miter-gear H of sufficient diameter to extend outward through a slot e' (see Figs. 10 and 12) to intermesh with the miter-gear F, hereinbefore described.

The hollow shaft G is provided with a substantially semi-circular disk G′, (see Figs. 6, 8, 9 and 14), to one corner of which disk the wrist swivel operating link a^3 heretofore described is pivoted.

The miter-gear H is provided with a notch, or slotted recess h (see Figs. 13 and 14), and the disk G′ is provided with an arm G^2, which is adapted to fit and enter into the notch h in the gear H. Within the hollow shaft G, I place a spring g, and against the end of the spring g, I place a small headed rod or plunger g', which is retained within the hollow shaft G by means of a bushing g^2, said plunger g' extending outward from the end of the hollow shaft G and contacting with the inner circular wall of the frame E, so that normally, the spring g within the hollow shaft G forces the hollow shaft G longitudinally toward the center of the frame E with the arm G^2 in the notch h in the miter-gear H, so that when the semi-circular disk and hollow shaft G is rotated by the link a^3 due to the bending of the elbow joint as shown in Fig. 4, the miter-gears H and F will be rotated.

For the purpose of disconnecting the arm G^2 from the notch h in the miter-gear H, I provide on the outer face of the circular frame E a lever J, which is secured to said frame E by means of the pivot J′. This lever J is operated by means of a bell-crank lever J^2 secured, or pivoted in ears depending from the inner surface of the frame E as shown in Figs. 7, 8, 11 and 13, to one arm of which the operating cord D^2 hereinbefore described, is secured. The opposite end of this bell-crank lever J^2 engages one end of the lever J. The other end of the lever J extends from the pivot J′ around the edge of the miter-gear H, which projects outward through the slot e in the frame E and is provided with an inwardly extending stud J^3 which projects inwardly between the miter-gear H and the semi-circular disk G′, so that when the cord D^2 is pulled, the bell-crank lever J^2 operates the lever J so that the stud J^3 thereon will move the disk G′ sidewise and the hollow shaft G longitudinally, as illustrated by Fig. 12, thereby lifting the arm G^2 out of the notch h in the miter-gear H, thereby permitting the shaft G and semi-circular disk G′ to rotate without causing the miter-gears H and F, to rotate.

In the circular frame E and in a suitable bearing e^2 depending from the inner surface thereof, I mount a slidable bolt K, having an enlarged intermediate, slotted portion K′, said enlarged slotted portion being slidably mounted in an opening in the circular frame E underneath the lever J, and the lever J is

provided with an opening J^4 adapted to receive the enlarged portion K′ of the sliding bolt K when the lever J is operated to disconnect the arm G^2 from the notch h in the miter-gear H as illustrated in Figs. 12 and 14, for the purpose of maintaining the lever J in the position shown in Fig. 12, and the arm G^2 disconnected from the gear H, and for the further purpose of locking the wrist portion A^2 against rotation as hereinafter described.

For the purpose of releasing the lever J so as to permit the arm G^2 to again enter and engage the notch h in the miter-gear H I pivot a suitable lever L in ears depending from the inner surface of the frame E so that one end of said lever L extends into the slot k in the enlarged portion K′ of the sliding bolt K and the other end of said lever L extends past and behind the miter-gear H so as to be engaged by the arm G^2 on the disk G′, so that by an extreme bending of the elbow joint, the arm G^2 will operate the lever L to draw the bolt K backward sufficiently to release the lever J when the spring g in the hollow shaft G will force the disk G′ toward the miter-gear H, which in turn will move the lever J back so that the opening J^4 no longer coincides, or is concentric with the enlarged portion of the sliding bolt K, but serves to retain said sliding bolt in its withdrawn position as shown in Figs. 8 and 10.

To force the sliding bolt K forward, when the same is released by the operation of the lever J, as hereinbefore described, I provide a spiral spring k' thereon, between the enlarged portion K′ of said bolt and the inner end of the ear e^2 as shown in Fig. 8.

Upon the hub F′ of the miter-gear F, is screwed a disk M, having a cylindrical flange m, at the outer periphery thereof, this disk M fitting the hub F′ so closely that it will rotate therewith when the wheel F is rotated as hereinbefore described. The disk M is provided with a series of holes m', any one of which is adapted to receive the locking bolt K, when the same is released by the operation of the lever J, as hereinbefore described, for the purpose of preventing the rotation of the disk M, and miter-gears F, and H, when the arm G^2, is disconnected from the notch h, in the miter H. The wrist portion A^2, of the artificial arm is secured upon the flange m, of the disk M, so that when said disk is rotated, said wrist portion A^2, will revolve therewith, and the locking of said disk M, by the bolt K, locks said wrist portion A^2, against rotation. Upon the lower end of said wrist portion A^2, I hinge the hand portion A^4, by means of the pivot joint A^3. This pivot joint A^3, is of the usual form and type as shown in my aforementioned Letters-Patent, and is provided with a spring actuated latch N, which engages notches n, in the upper semi-circular end of the hand member A^4, and serves to maintain the hand member A^4, at such angle to the wrist member A^2, as may be desired. (See Figs. 15 and 16). One end of the latch N, extends outward through the shell of the wrist member A^2, by means of which the latch N, may be operated when desired.

In the outer end of the hand member A^4, I mount finger members 1, 2, 3 and 4. The first joint 5, of each of said finger members being hinged to the hand member by means of the usual pivoted joints common in artificial hands and particularly described in my patents heretofore mentioned, and being secured in place by means of the pivot O. The portions 5, of the finger members are provided with longitudinal recesses o. (See Fig. 15). Upon the pivot-rod O, within the recesses o, in each of the portions 5, of the fingers, I place a lever O′, one end of which extends back into the hand body where it is secured by means of a cross-rod O^2, so that when the portions 5, of the fingers are swung on the pivot-rod O, the lever O′, does not swing therewith. Upon the outer ends of the portions 5, of the fingers, the second joints or portions 6, of the fingers are pivoted in the usual manner, said outer portions 6, of the fingers being provided with slotted recesses in their faces, as shown in Fig. 15, and in said slotted recesses are placed links P, one end of which is pivoted in the portions 6, of the fingers by means of the pivots p, and the other end thereof is pivoted to one end of the lever O′, by means of the pivot p', so that when the finger portions 5, are bent upon their pivot O, the links P, will cause the finger portions 6, to swing upon their pivots p^2, as indicated by broken lines in Fig. 15. For operating the fingers of my improved artificial hand, I mount a rock-shaft Q, in the hand portion A^4, said rock-shaft being provided with cranks Q′, shown in Figs. 15 and 16. Pivoted in the ends of the cranks Q′, are links Q^2, which extend therefrom outward to the intermediate portion of the faces of the finger portions 5, to which they are pivoted by means of the pivots q.

For rotating the rock-shaft Q, I provide a segment of worm-gear R. Mounted within the hand portion A^4, I provide a shaft S, upon which there is a screw-gear wheel T, which inter-meshes with the segment of gear R. Around the shaft S, on one side of the screw-gear T, the lower end of the operating cord D, is wrapped in one direction, and around the shaft S, on the opposite side of the screw-gear, is wrapped the operating cord D′, in the other direction, so that a pull on the cord D, will rotate the screw-gear T, in one direction, and a pull on the cord D′, will rotate the screw-gear T,

in the opposite direction. It is obvious from the fore-going description, that when the screw-gear T, is rotated, that the worm-gear R, will rotate the rock-shaft Q, which through the cranks Q′, and link Q^2, will cause the finger members 1, 2, 3 and 4 to close, as shown by broken lines in Fig. 15. It is also obvious that by means of the screw-gear T, the finger members of this artificial hand will be retained in any desired position intermediate between an entirely open position as indicated by full lines in Fig. 15, and an entirely closed position as indicated by broken lines in said figure, until a further movement of the screw-gear T, is effected by either of the cords D, or D′.

In operation, when it is desired to close the fingers of the hand, the wearer of my artificial arm, by raising and throwing backward the opposite shoulder, puts a strain upon the strap B, which passes across his back, which strain is communicated to the cord D, which causes the cord D, to turn the screw-gear T, so as to move the segment of worm-gear R, to the position thereof as shown by broken lines in Fig. 15, which also causes the cord D′, to wind up on the shaft S, on the opposite side of the screw-gear T. When it is desired to change the angle of the hand member A^4, upon the wrist member A^2, this same movement of the opposite shoulder will, when the latch N, in the wrist member A^2, is disengaged from the notch n (see Fig. 15) through the cord D, cause said member A^4, to swing on the pivot hinge A^3, as may be desired, and when it is desired to turn the hand member A^4, backward on the pivot hinge A^3, the wearer, by thrusting the shoulder opposite to the artificial arm, downward and raising the shoulder of the artificial arm upward, will thereby place a strain upon the strap B, in front of the maimed arm, which strain is communicated to the cord D′, which will cause a backward movement of the hand member A^4, upon the pivot A^3, and further strain thereon will cause the cord D, to unwind from the shaft S, thereby rotating the screw-gear T, so as to move the segment of worm-gear back into the position thereof shown by full lines in Fig. 15, thereby causing the finger members 1, 2, 3 and 4, to move back to their open position.

It is likewise obvious from the description of the wrist swivel mechanism of my improved artificial arm hereinbefore described, that when the elbow joint thereof is bent from the position thereof shown in Fig. 3, to the position thereof shown in Fig. 4, that the hand and wrist members A^4, and A^2, will be rotated upon the hollow post E′, from the position thereof shown in Fig. 3, to the position thereof shown in Fig. 4, a movement very similar to the movement of the natural hand when raised upward toward the face. The post E′, and nut E^3, (see Fig. 9) are made hollow to permit of the passage therethrough of the cords D, and D′, so that the rotation of the wrist member A^2, upon the fore-arm member A, will cause little if any additional or unequal strain upon said cords.

When it is desired to lock the wrist swivel mechanism against rotation, a throwing backward of the maimed shoulder will put a stress upon the strap C, (see Fig. 2) which passes across the breast of the wearer, which stress is communicated to the cord D^2, passing downward through the shell of the artificial arm and connected to the bell-crank lever J^2, which will move the lever J, (see Fig. 10) from the position thereof shown in said figure, to the position thereof shown in Fig. 12, thereby releasing the arm G^2, from the notch h, in the miter-gear H, and permitting the bolt K, to pass outward through the opening J^4, so as to engage one of the holes m', in the disk M, and when it is desired to unlock the wrist swivel mechanism an extreme bending of the elbow joint will cause the arm G^2, to engage the lever L, which will in turn withdraw the bolt K, out of engagement with the hole m', in the disk M, and permit the lever J, to move backward again into the position thereof shown in Fig. 10, so as to permit the arm G^2, to again enter the notch in the miter-gear H.

The peculiar structure and arrangement of the shoulder harness is not herein claimed, as it forms the subject matter of another application.

Having thus fully described the construction and operation of 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. The combination in an artificial arm of a fore-arm member, a spring-pressed longitudinally movable shaft mounted in the lower end of said fore-arm member, a gear-wheel having a notch therein loosely mounted upon said shaft, an arm on said shaft adapted to engage the notch in said gear-wheel, a gear-wheel mounted on the lower end of said fore-arm member so as to intermesh with the first mentioned gear-wheel, a wrist member non-rotatably secured on the hub of said last mentioned gear wheel so as to rotate therewith, a side-bar pivoted to the upper end of said fore-arm member, an extension on the lower end of said side-bar, a bar pivoted to said extension and extending therefrom to and adapted to rotate said shaft in the lower end of said fore-arm member, a train of bell-crank lever mechanisms mounted in and on the lower end of said fore-arm member adapted to move said spring-pressed shaft longitudinally to disengage the arm thereon from the notch in the first mentioned gear-wheel, and a cord

extending therefrom upward through said fore-arm member, substantially as set forth.

2. The combination in an artificial arm of a fore-arm member, a spring-pressed longitudinally movable shaft mounted in the lower end of said fore-arm member, a gear-wheel having a notch therein loosely mounted on said shaft, an arm on said shaft adapted to engage the notch in said gear-wheel, a gear-wheel mounted on the lower end of said fore-arm member so as to inter-mesh with the first mentioned gear-wheel, a wrist member non-rotatably secured on the hub of said last mentioned gear-wheel so as to rotate therewith, a side-bar pivoted to the upper end of said fore-arm member, an extension on the lower end of said side-bar, a bar pivoted to said extension and extending therefrom to and adapted to rotate said longitudinally movable shaft in the lower end of said fore-arm member, a train of bell-crank lever mechanisms mounted in and on the lower end of said fore-arm member adapted to move said spring-pressed shaft longitudinally to disengage the arm thereon from the notch in the first mentioned gear-wheel, a cord extending therefrom upward through said fore-arm member, a spring-pressed bolt adapted to be released by said bell-crank lever mechanisms so as to lock the wrist member against rotation on the end of the fore-arm member and a lever mechanism adapted to be actuated by the arm on the spring-pressed shaft to withdraw said spring-pressed bolt from engagement with said wrist mechanism, substantially as set forth.

3. The combination in an artificial arm of a fore-arm member, a shaft mounted on the lower end of said fore-arm member, a gear-wheel on said shaft, a gear-wheel mounted on a hollow post on the lower end of said fore-arm member, so as to inter-mesh with the first mentioned gear-wheel, a wrist member non-rotatably secured on the hub of said last mentioned gear-wheel so as to rotate therewith, a side-bar pivoted to the upper end of said fore-arm member, an extension on the lower end of said side-bar, a bar pivoted to said extension and extending therefrom to and adapted to rotate the shaft in the lower end of said fore-arm member, a hand member hinged on the lower end of said wrist member, jointed finger members hinged on said hand member, lever and link mechanism adapted to control the action of the joints of said finger members, a rock-shaft in said hand member, cranks on said rock-shaft, links pivoted to and extending between said cranks and said finger members, a segment of worm-gear on said rock-shaft, a screw-gear mounted in said hand member and inter-meshing with said segment of worm-gear for controlling the action of said finger closing mechanism, and operating cords secured to and adapted to rotate said screw-gear and extending therefrom upward through the hand member, wrist member, and fore-arm member, substantially as set forth.

4. The combination in an artificial arm of a fore-arm member, a sleeve member hinged to the upper end of said fore-arm member adapted to embrace the arm of the wearer above the elbow joint, a wrist member on the lower end of the fore-arm member, a hand body member hinged on said wrist member, fingers hinged on said hand body member, a rock-shaft mounted in said hand body member, cranks on said rock-shaft, links pivoted to said cranks and to said finger members, a worm-gear segment on said rock-shaft, a shaft mounted in said hand-body member, a screw-gear on said shaft inter-meshing with said worm-gear segment, and operating cords secured on said shaft, extending upward therefrom through said hand body member, wrist member, and forearm member, substantially as and for the purpose set forth.

5. The combination in an artificial arm of a fore-arm member having a slot in the lower end thereof, a spring-pressed longitudinally movable shaft mounted in the lower end of said fore-arm member, a gear-wheel having a notch therein loosely mounted on said shaft the periphery thereof extending outward through the slot in the end of the fore-arm member, a disk secured on said longitudinally movable shaft, an arm extending radially outward from the periphery of said disk adapted to engage the notch in said gear-wheel, a gear-wheel mounted on the lower end of said fore-arm member so as to inter-mesh with that part of the first mentioned gear-wheel extending through the slot in the end of the fore-arm member, a wrist member non-rotatably secured on the hub of the last mentioned gear-wheel so as to rotate therewith, a side-bar pivoted to the upper end of said fore-arm member, an extension on the lower end of said bar, a bar pivoted to said extension and extending therefrom to and pivoted to said disk opposite to the radial arm thereon, a bell-crank lever pivoted to the outer end of said fore-arm member, one arm thereof engaging said disk and adapted to force the same away from the gear-wheel projecting through the slot in the end of said fore-arm member, another bell-crank lever pivoted within said fore-arm member adapted to engage and operate the first mentioned bell-crank lever, a spring pressed locking bolt mounted in the lower end of said fore-arm member adapted to be released by the operation of said bell-crank levers, a lever pivoted within the lower end of said fore-arm member one end thereof engaging said locking bolt and the other end thereof adapted to be engaged and op-

erated by the radial arm on said disk, and an operating cord secured to said last mentioned bell-crank lever and extending therefrom upwardly through said fore-arm member, substantially as set forth.

6. The combination in an artificial arm of a fore-arm member, a hollow shaft mounted in the lower end thereof, a spring within said hollow shaft, a plunger inserted into the cavity in said shaft and contacting against the inner wall of the lower end of said fore-arm member so as to press against said spring, a gear-wheel having a notch therein loosely mounted on said shaft the periphery thereof extending outward through a slot in the lower end of said fore-arm member, a gear-wheel mounted on the lower end of said fore-arm member so as to inter-mesh with the first mentioned gear-wheel, a wrist member nonrotatably secured on the last mentioned gear-wheel so as to rotate therewith, a side-bar pivoted to the upper end of said fore-arm member, an extension on the lower side of said side-bar, a bar pivoted to said extension and extending therefrom to and adapted to rotate the hollow shaft mounted in the lower end of said fore-arm member, a train of bell-crank lever mechanisms mounted in and on the lower end of said fore-arm member adapted to move said shaft longitudinally backward against the spring therein to disengage the arm thereon from the notch in the first mentioned gear-wheel, and a cord extending therefrom upward through said fore-arm member, substantially as set forth.

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

WILLIAM T. CARNES.

Witnesses:

LANDRY B. HARWOOD,

FANNIE O. RUPERT.