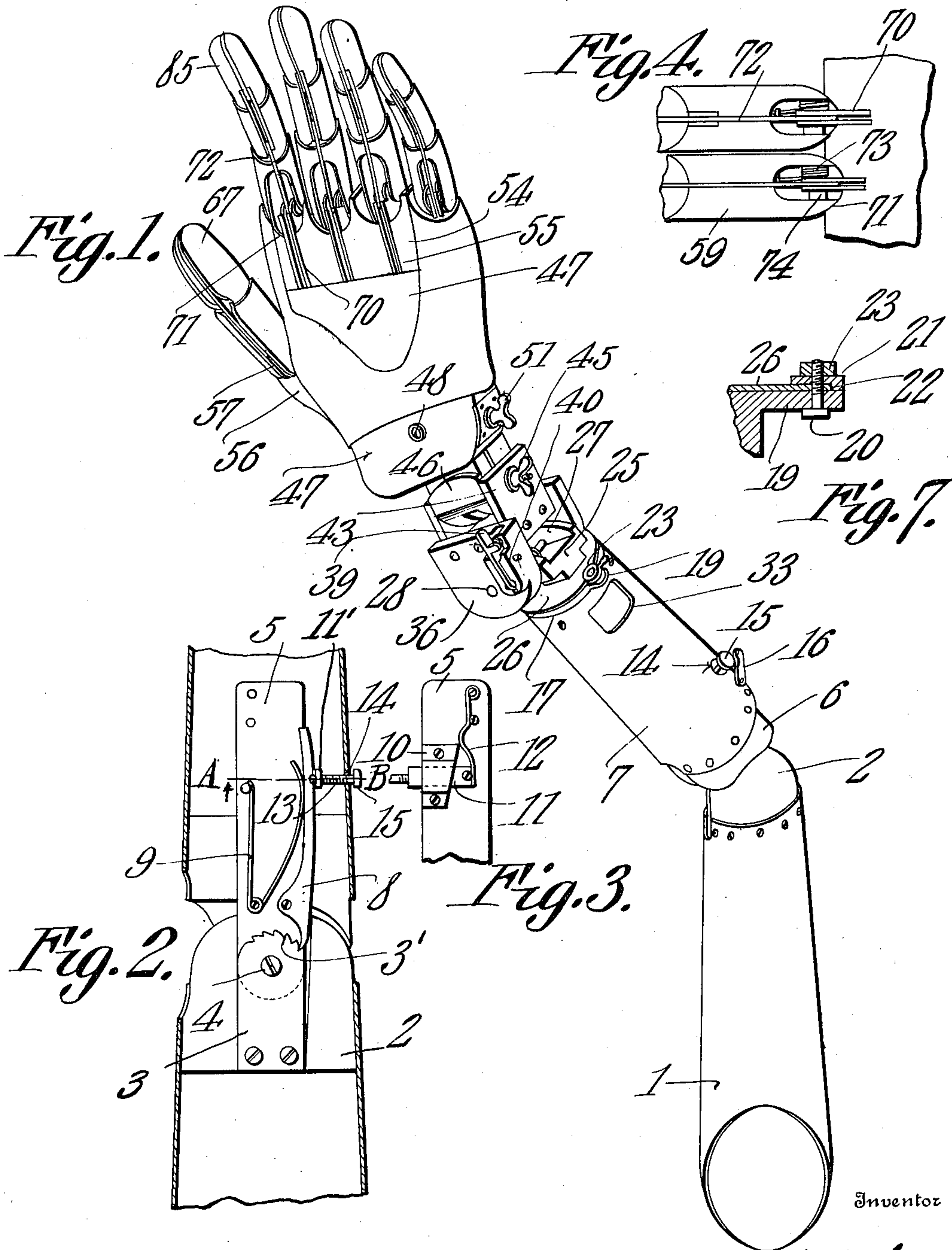


975,029.

Patented Nov. 8, 1910.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

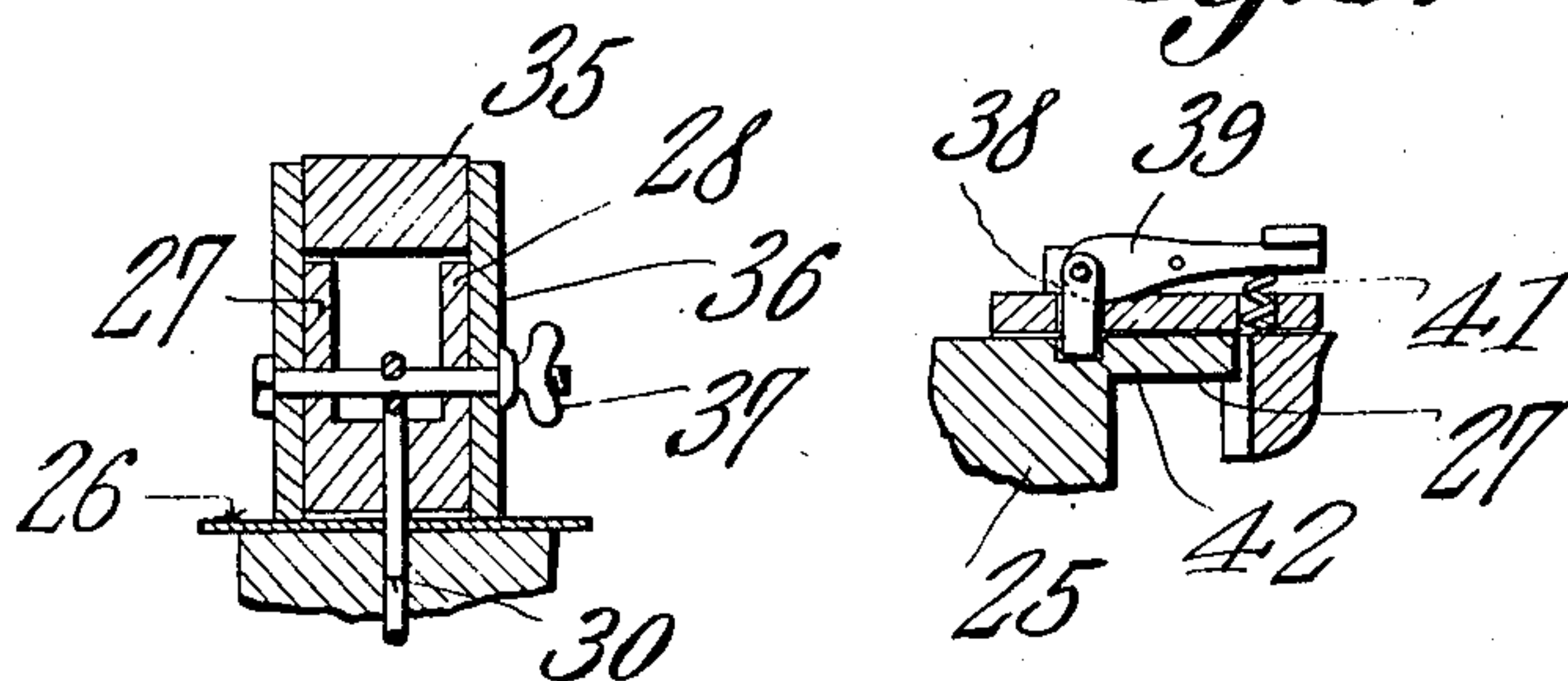
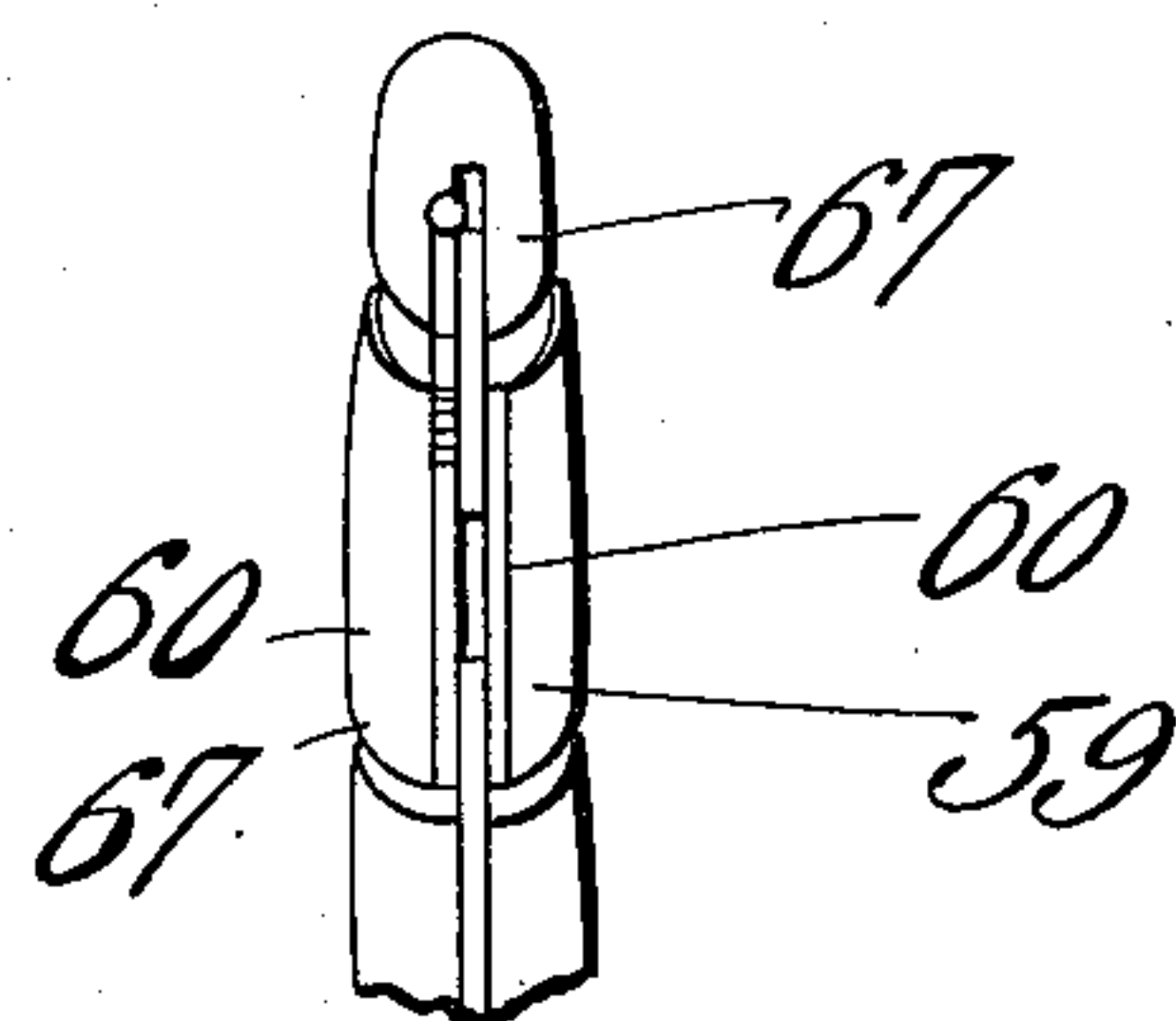
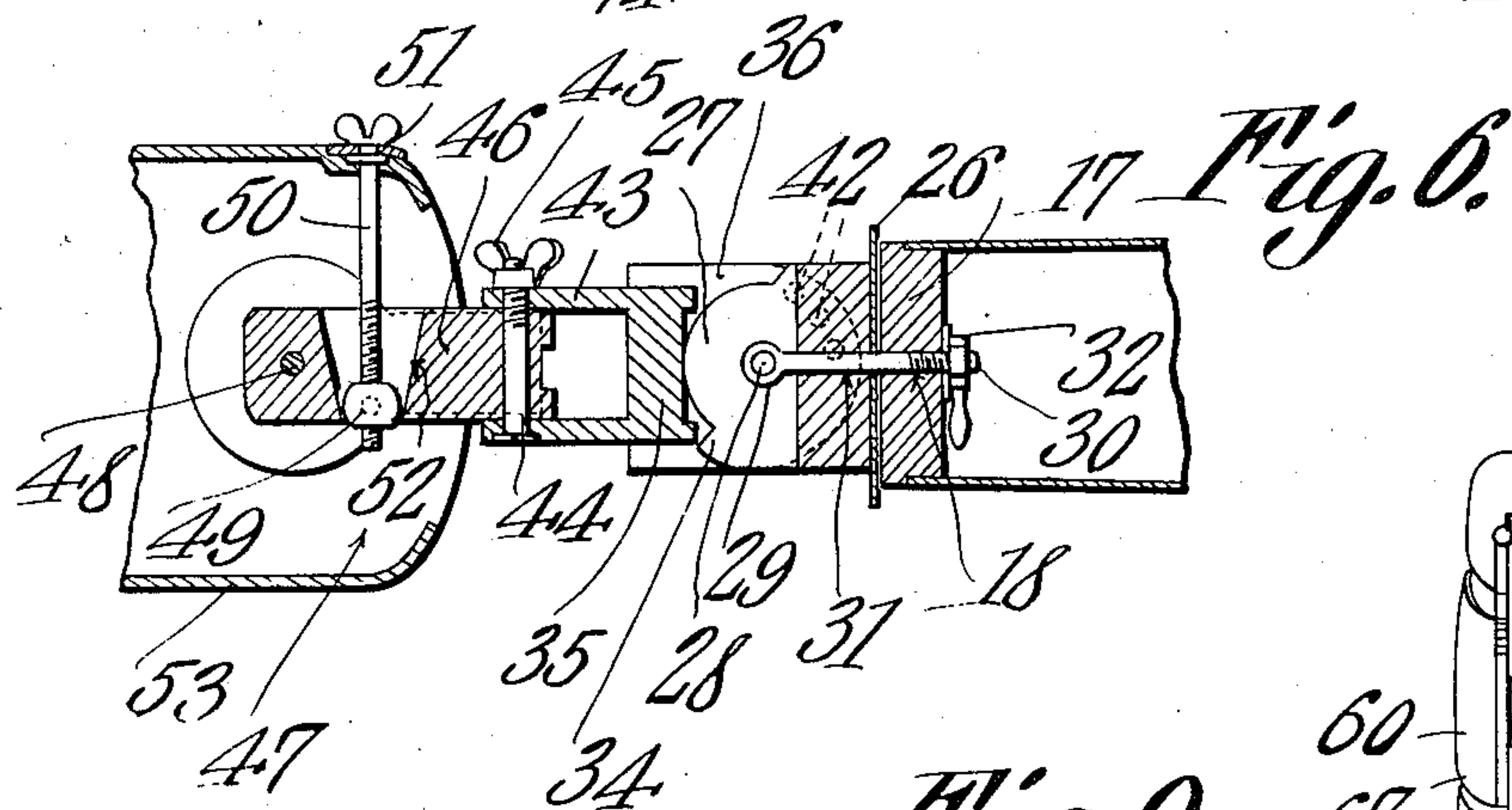
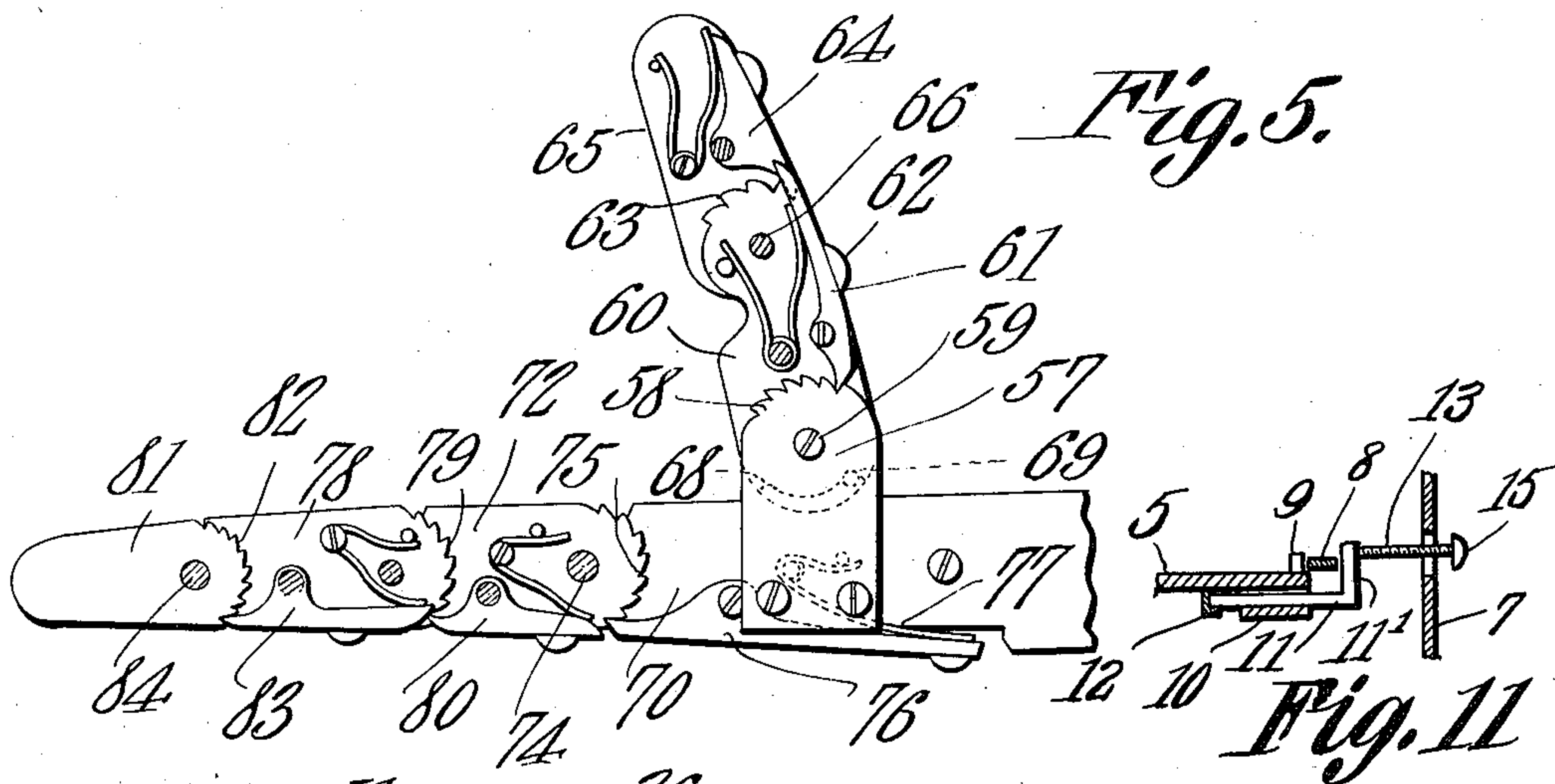


Fig. 8.

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UNITED STATES PATENT OFFICE.

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ARTIFICIAL LIMB.

975,029.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed January 13, 1910. Serial No. 537,900.

To all whom it may concern:

Be it known that I, JAMES A. GALVIN, a citizen of the United States, residing at Astoria, in the county of Queens and State of New York, have invented a new and useful Artificial Limb, of which the following is a specification.

This invention relates to artificial limbs and more particularly to an artificial arm and hand and one of the objects of the invention is to provide an arm having a hand portion connected thereto by a novel arrangement of joints whereby said hand portion can be caused to assume any position with relation to the arm that may be attained by the human hand.

Another object is to provide a hand portion having articulated fingers the various members of which can be readily locked at predetermined angles to each other, it being thus possible to arrange the joints of the fingers so as to firmly clasp any object placed in the hand.

Another object is to provide a hand the mechanism of which is compact and simple in construction and is so located as to produce no objectionable projections which might be noticeable when a glove is worn upon the hand.

Another object is to provide an artificial limb having a locking or holding device for each joint, all of said devices being so located and constructed as to be readily actuated.

With these and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings, Figure 1 is a perspective view of an artificial arm and hand embodying the present improvements. Fig. 2 is a longitudinal section through the elbow joint of the arm and showing the two pivotally connected plates of the arm members locked in alinement. Fig. 3 is a side elevation of a portion of one of said plates, the plate being viewed from the side opposite to that shown in Fig. 2 and showing the pawl actuating slide and its guide and spring. Fig. 4 is a plan view of portions of two adjoining fingers of the hand. Fig. 5 is a side elevation of the thumb and index finger of the hand, one of the face plates of each of

the said members being removed and the connecting rivets or fasteners being shown in section. Fig. 6 is a longitudinal section through the wrist portion of the artificial limb, said section being taken from one side to the other of the wrist. Fig. 7 is an enlarged section through the clamp of the wrist disk. Fig. 8 is a central longitudinal section through a portion of the wrist structure. Fig. 9 is an enlarged section showing the lock used in connection with the front and rear wrist blocks of the structure. Fig. 10 is an elevation of a portion of one of the fingers. Fig. 11 is an enlarged section on line A—B Fig. 2.

Referring to the figures by characters of reference 1 designates the upper arm portion of the limb, being preferably formed of a tapered metal tube having spaced joint members 2 extending from the small end thereof, the projecting portions of these joint members or elements being rounded so as to cooperate to form the ball portion of a ball and socket joint. A plate 3 is secured between these joint members 2 and that end thereof nearest the outer ends of the members 2 is rounded and toothed to form a relatively fixed ratchet 3'. A pivot stud 4 or the like extends through the plate 3 at a point concentric with the toothed edge of said plate and mounted on this pivot device is a metal plate or strip 5 which projects between bearing members 6 extending from the elbow end of the forearm 7 of the limb. This forearm member is preferably formed of a tapered metal tube, the bearing members 6 being located in the large end thereof, and having their projecting ends concaved so as to receive the members 2 and form a bearing therefor. Strip 5 has a pawl 8 pivotally mounted on one side thereof and a spring 9, which is also secured to the strip 5, serves to hold the pawl 8 normally in engagement with the toothed portion 3'. A guide bracket 10 is fixedly secured to one side of strip 5 and a slide 11 is mounted in this bracket and has an arm 11' extending at right angles therefrom and projecting across the edge of strip 5 and the pawl 8. A spring 12, which is fastened to strip 5, yieldingly supports the slide. A screw 13 is adjustably connected to the free end portion of arm 11' and extends through an opening 14 in the forearm 7, there being a head 15 upon the outer end of the screw and constituting a button which, when pressed toward

the opening 14, causes the arm 11' to move against the pawl 8 and swing it out of engagement with the rack 3'. Should it be desired to lock the pawl out of engagement with the ratchet, a pivoted holding strip 16 which is mounted on the outer face of the forearm 7, can be swung over the depressed head 15 so as to hold the two springs 9 and 12 under stress and prevent the slide 11 and stem 13 from returning to their normal positions.

The front end of the forearm 7 is closed by a cylindrical plug 17 having a central bore 18 and a laterally extending ear 19. A screw threaded stud 20 extends outwardly from this ear 19 and has a clamping plate 21 loosely mounted upon it, there being a shoulder 22 upon this plate and which bears against a corresponding shoulder on the ear 19 so as to hold the plate against rotation upon the stud. A nut 23 engages the stud and by giving this nut a one-quarter or a one-half turn the plate 21 can be shifted into clamping position for the purpose herein-after set forth.

The wrist portion of the limb consists of a block 25 having parallel ears extending from one end thereof while a disk 26 is arranged upon the other end of the block and extends between the ear 19 and the clamping plate 21. The ears, which have been indicated at 27, constitute bearings for a pivot bolt 28 the middle portion of which is engaged by an eye 29 formed at one end of a bolt 30. This bolt extends through a bore 31 formed within the block 25 and also through the bore 18, the end of the bolt projecting into the tubular portion of the forearm 7 and being engaged by a nut 32 whereby the parts can be tightened so as to cause the disk 26 to bind firmly against the outer end of the plug 17. An opening 33 is formed in the tubular portion of the forearm so as to permit access to be readily had to the nut 32. The edges of the ears 27 are curved and concentric with the bolt 28, each of these edges being provided with a stop shoulder 34 constituting an abutment for a front wrist block 35. Ears 36 extend from this front block and bear upon the outer faces of the ears 27, the bolt 28 being extended through the ears 36 and having a nut 37 thereon whereby the ears 36 and 27 can be clamped together. The shoulders 34 of course constitute means for limiting the swinging movement of the front block 35 in one direction upon the pivot bolt 28. The movement of said block in the other direction upon said bolt can be limited by means of a locking pin 38 which is slidably mounted within and extends transversely through one of the ears 36 and is pivotally connected to an actuating lever 39 fulcrumed within an extension 40 formed upon said ear 36. A spring 41 is seated within the extension 40

and bears against the lever 39 so as to hold the pin 38 normally projected against the outer face of the adjoining ear 27, said ear being provided with a series of recesses 42 any one of which is designed to receive the pin 38. It will be apparent therefore that when the pin is seated in one of these recesses 42 the ears 36 will be locked to the ears 27 and the front and rear blocks 35 and 25 of the wrist portion will thus be held against relative movement.

Ears 43 extend forward from the front wrist block 35 and are connected at their outer ends by a pivot bolt 44 having a nut 45 on one end. This bolt constitutes the pivot of a connecting block 46 which projects between the top and bottom plates 47 of the hand structure. The said plates are pivotally connected to the front end of the block 46 by means of a pin or bolt 48 and a nut 49 is pivotally mounted within block 46 at a point between the bolts 44 and 48. This nut is engaged by a bolt 50 having a head swiveled in one side of the hand portion as indicated at 51, the said head being so shaped as to be readily grasped and turned for the purpose of actuating the bolt and thus pulling or pushing on the nut 49. Such movement of the nut will, obviously, cause the hand portion of the limb to swing about the pivot 48, it thus being possible to get a very minute adjustment of the hand with relation to the connecting block 46. It is of course necessary to provide a tapered opening 52 in which the nut 49 is mounted so as to permit this swinging movement of the bolt 50 relative to the block 46.

The hand portion of the device has the top and bottom plates 47 suitably connected at the sides thereof as indicated at 53, said plates being preferably so shaped as to substantially conform to the contour of the back and palm of a hand although, if desired, a suitable covering of wood, fiber, leather or the like can be placed on each plate so as to give the outer surfaces of the hand portion the proper contours. The space between the front ends of the plates 47 is filled with a block 54 having slots 55 extending thereinto, one of these slots being provided for each of the four fingers of the hand. An extension 56 may, if desired be located at one side of the body of the hand, this extension being provided with an outstanding plate 57 having its free end rounded and provided with a series of ratchet teeth 58. A pivot device 59 extends from the plate 57, the series of teeth being concentric therewith, and this device is engaged by spaced plates 60 between which the toothed portion of the plate 57 extends. A spring pressed dog or pawl 61 is pivotally mounted between the plates 60 and normally engages one of the teeth 58, said pawl being provided with a knob 62 which projects beyond the adjoining

edges of the plates 60 where it can be readily depressed for the purpose of shifting the dog or pawl out of engagement with the teeth. One of the plates 60 has a series of
 5 ratchet teeth 63 at its free end and these teeth are designed to be engaged by a spring pressed pawl 64 mounted upon one face of the terminal member 65 of the thumb, the
 10 66 whereby it can be readily depressed or shifted to become disengaged from the series of teeth 63. The member 65 is pivotally connected to the plates 60 as indicated at 66. It is of course to be understood that
 15 the outer faces of the various plates making up the various members of the thumb are to be provided with finishing strips of wood, fiber, leather or the like whereby the thumb will have a rounded surface simulating that
 20 of a natural thumb. These finishing strips or blocks have been indicated at 67 in Fig. 1. The meeting ends of the said finishing pieces are shaped so as to work or slide one within the other, one of said ends being preferably
 25 concave while the other is convex. In this connection attention is directed especially to Fig. 10. As shown by dotted lines in Fig. 5 the inner end of each of the plates 60 can be provided with spaced shoulders 68, there
 30 being a lug or projection 69 extending from the plate 67 and into the path of these shoulders so as to limit the swinging movement of the plates 60 in either direction. This kind of stop mechanism or any other preferred
 35 form can also be used, if desired, at the joint between the plates 60 and 64.

The first or index finger of the hand is made up of spaced metal strips 70 which are secured within the proper slots 59 and project
 40 into a concavity 71 formed at the outer end of the slot. The projecting ends of these plates 70 form ears between which is pivotally mounted a plate 72 constituting the core of the phalanx of the index finger, there being a spring 73 mounted on the pivot
 45 bolt or pin 74 and having its ends connected to the plate 72 and to the block 54 respectively so as to hold the said phalanx normally extended outwardly from the block.
 50 The inner end of the plate 72 is rounded and is provided with ratchet teeth 75 one of which is normally engaged by a pawl 76 which is pivotally mounted between the plates 70 and has a spring 77 for holding it
 55 in normal position. One end of this pawl projects beyond the exposed edges of the plates or strips 70 so as to be in position to be readily depressed when it is desired to disengage the pawl from the teeth 75. The
 60 second phalanx of the finger has a plate 78 constituting the core thereof, the inner end of this plate being rounded and provided with ratchet teeth 79 any one of which is designed to be engaged by a spring pressed
 65 pawl 80 which is pivotally mounted upon

the plate 72. The third phalanx of the finger has a core 81 the inner end of which is rounded and provided with ratchet teeth 82. A spring pressed pawl 83 carried by
 70 plate 78, normally engages one of the teeth 82. This plate 81 is pivotally connected to the plate 78 by means of a pin or bolt 84. As shown in Fig. 1 it is preferred to utilize two plates 78 with the pawl 83 located between them. One of these plates has been
 75 removed in Fig. 5 as has also one of the plates 70. Finishing strips 85 are secured upon the side faces of the plates 72, 78 and 81, the meeting ends of the said strips being preferably formed in the same manner as
 80 the strips 59 upon the thumb and which have already been described. The other three fingers are articulated in the same manner as the index finger which has already been described, the only difference between these
 85 fingers being that of length the little finger being, of course, shorter than any other fingers which are also formed in the proper proportions.

It is of course to be understood that the
 90 upper arm portion 1 may be attached to the shoulder and stump by means of straps and bands such as ordinarily employed. Should it be desired to have the lower arm or forearm hang free at the elbow, the stem 13 can
 95 be pressed inwardly and the head 15 held by means of the strip 16. The pawl 8 will thus be shifted and held out of engagement with the ratchet 3 and the forearm is free to swing back and forth, as when the person to
 100 whom the arm is applied, is walking. Pronation and supination is attained by loosening the bolt 30 and by shifting the nut 23 out of frictional engagement with the clamping plate 21. Disk 26 and the parts con-
 105 nected thereto can then be rotated about the bolt 30 as an axis and after the hand has been brought to proper position the said parts can be locked by tightening the nuts 23 and 32. Flexing of the wrist portion is
 110 attained either by depressing the lever 39 so as to disengage the locking pin 38 from block 25 and thus swinging the block 35 about the pivot bolt 28 or by loosening nut 45 so as to permit the connecting block 46
 115 to swing upon the bolt 44. Should the adjustment obtained by means of the locking pin 38 be insufficient, a finer adjustment of the hand in the same direction can be effected by turning the screw 50 so as to shift
 120 the nut 49 toward or away from the head 51. This will result in the hand being swung about the pivot 48. By folding the phalanges of the fingers and thumb toward each other they can be caused to firmly grip upon
 125 an object placed in the hand and the various phalanges will be held against return movement by the pawls and ratchets used in the finger construction. Whenever it is desired to disengage the fingers from the object or
 130

objects held by them it is desirable to first press the projecting ends of the pawls 78. The springs 73 connected to the various fingers will thus promptly swing all of said fingers outwardly automatically after which the second and third phalanges of each finger can be also extended outwardly by disengaging the pawls 80 and 83 from the ratchets 79 and 82 respectively. The thumb can of course be disengaged in practically the same manner.

It will be noted that by providing the joints which have been described the hand can be brought into any position capable of being assumed by the human hand and, if said hand is provided with a soft covering such as a glove or the like it can be caused to firmly engage any object without danger of injuring it.

20 What is claimed is:

1. An artificial hand including pivoted fingers, elastic means for holding said fingers normally extended, and separate means for locking each finger out of normal position, said means being separately movable to release the respective fingers.

2. An artificial limb including a forearm portion, a hand portion, an articulated wrist portion constituting the connection between the forearm and hand portion and consisting of separately adjustable members, and separate means for holding the members of each joint of the wrist portion against relative movement.

3. An artificial limb including a forearm portion, a hand portion, an articulated wrist portion constituting the connection between the forearm and hand portions and consisting of separately adjustable members, said wrist portion being mounted for axial movement upon the forearm portion and means carried by said forearm portion for holding the wrist portion against axial movement.

4. An artificial limb including a forearm portion, a hand portion, and an articulated wrist portion constituting the connection between the forearm and hand portions, the wrist portion including a disk mounted for axial movement upon the forearm portion, means for clamping said disk to hold it

against movement, a block upon the disk, a block pivotally connected to the hand portion, and a front wrist block interposed between said first mentioned blocks and pivotally connected to them, the respective pivots being disposed at right angles to each other.

5. An artificial limb including a forearm, a hand, an articulated wrist portion, said wrist portion including a disk mounted for axial movement upon the end of the forearm, a clamping device for frictionally engaging the disk to hold the same against movement, a block movable with said disk, a front wrist block pivotally connected to the first mentioned block, and a connecting block pivotally attached to the hand and to the front wrist block, and means for locking said blocks against movement relative to the adjoining blocks.

6. An artificial limb including a forearm, a hand, an articulated wrist portion connected to the forearm and hand, an interiorly screw threaded member pivotally mounted within the hand at a point removed from the pivot thereof, and revoluble means within and extending beyond the hand and engaging said interiorly screw threaded device for shifting the hand about its pivot.

7. An artificial limb including a forearm portion, a hand portion, and an articulated wrist portion constituting the connection between the forearm and hand portions, said wrist portion including a back block pivotally connected to the forearm portion, a connecting block pivotally attached to the hand portion, and a front wrist block interposed between said blocks and pivotally connected to them, the respective pivots being disposed at right angles to each other, and separate means for securing the blocks against movement upon their pivots.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JAMES A. GALVIN.

Witnesses:

GERTRUDE M. GALVIN,
ED. B. GALVIN.