

G. WRIGHT.
ELECTRIC SWITCH.

APPLICATION FILED AUG. 3, 1905.

Patented Apr. 27, 1909.

4 SHEETS—SHEET 1.

919,994.

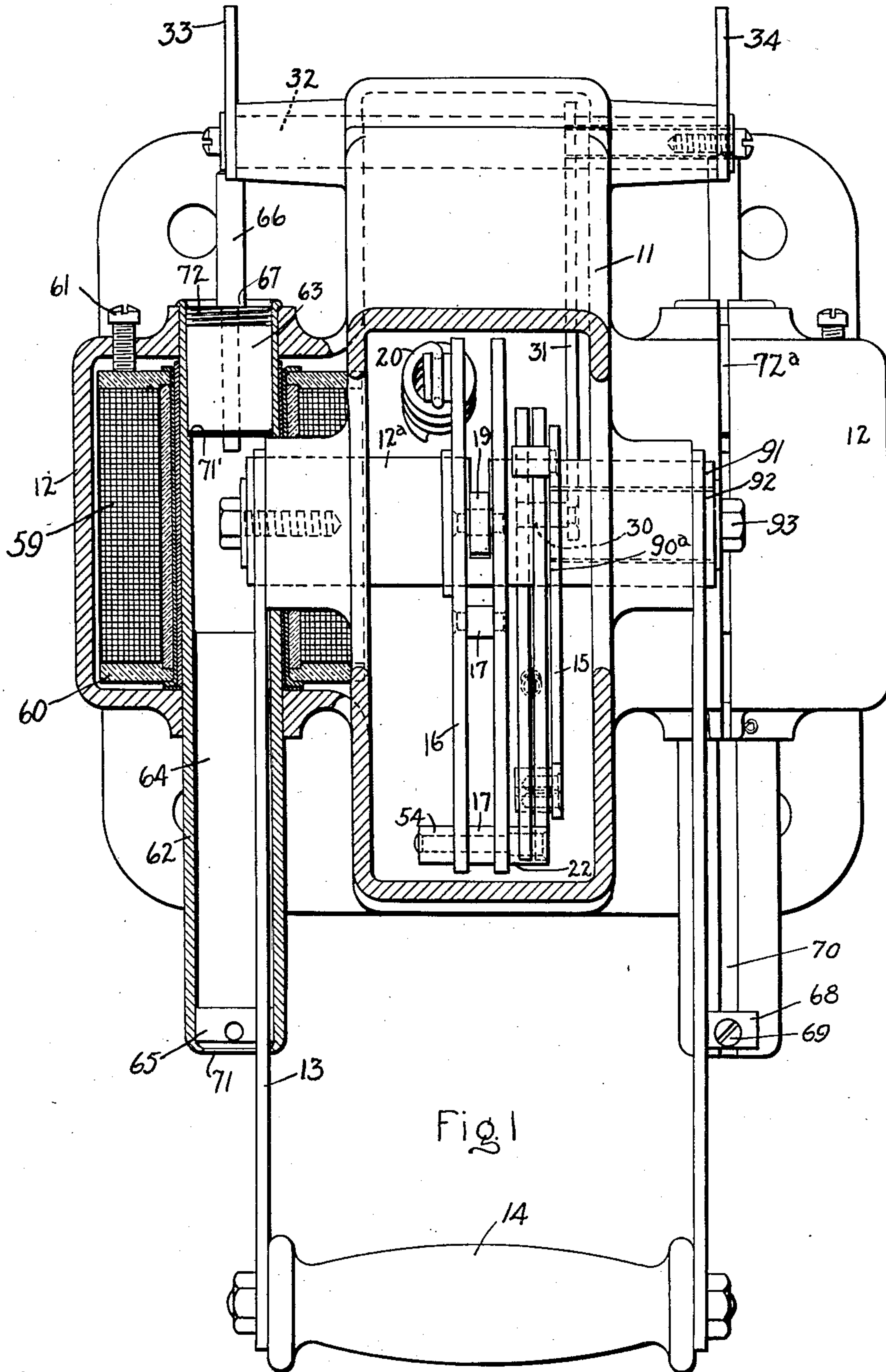


Fig 1

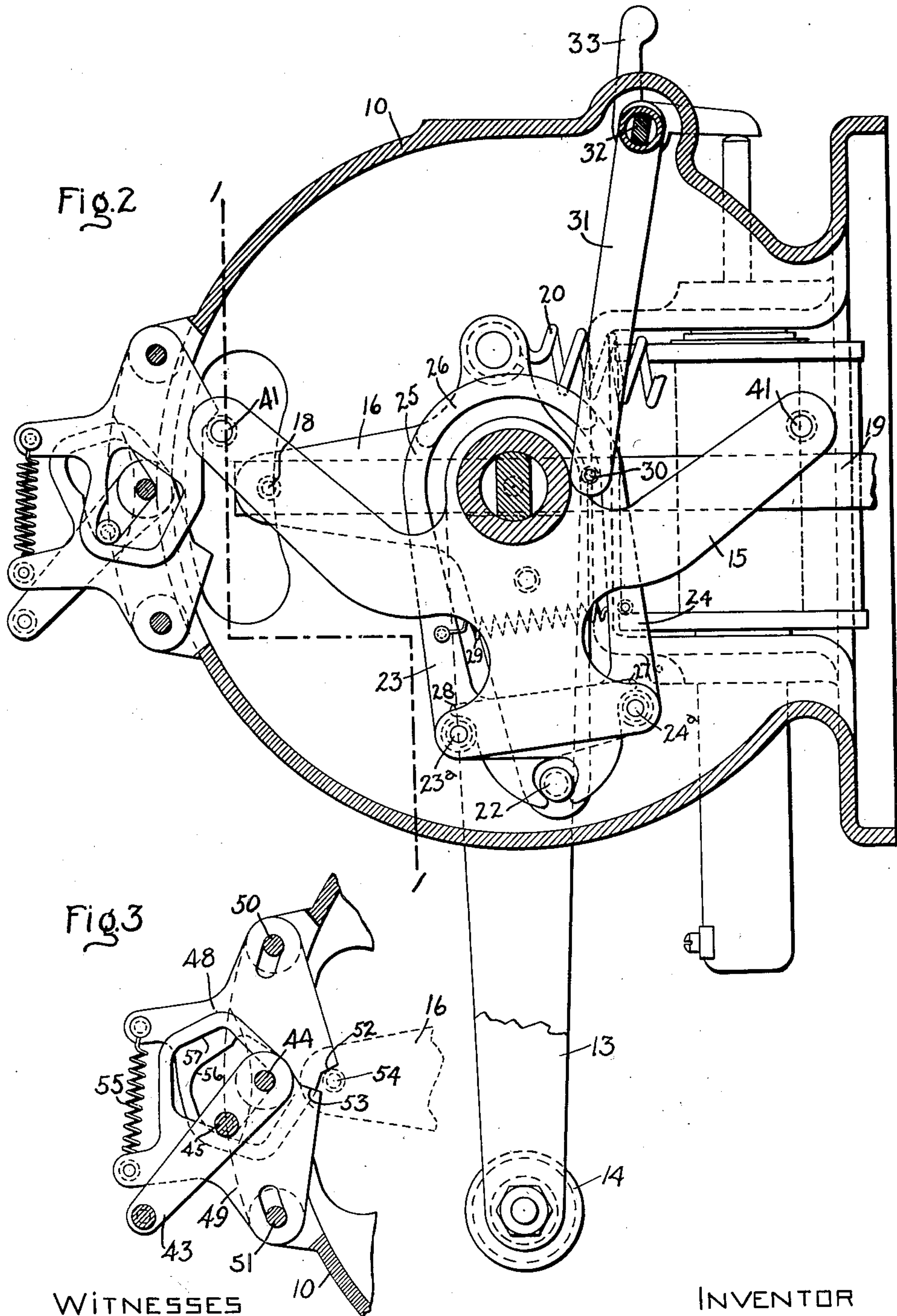
WITNESSES
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ATT'Y.

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Fig. 4

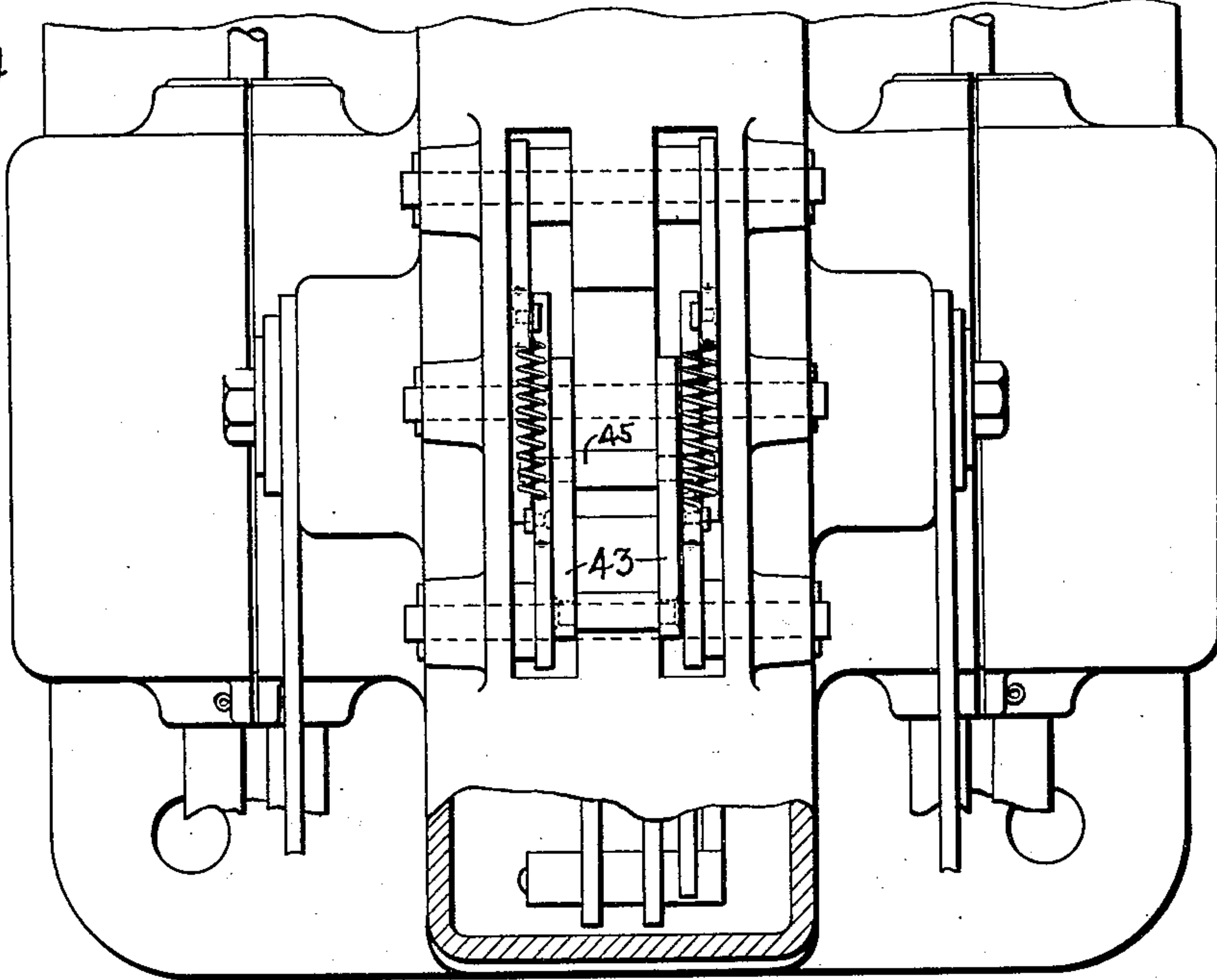


Fig. 5

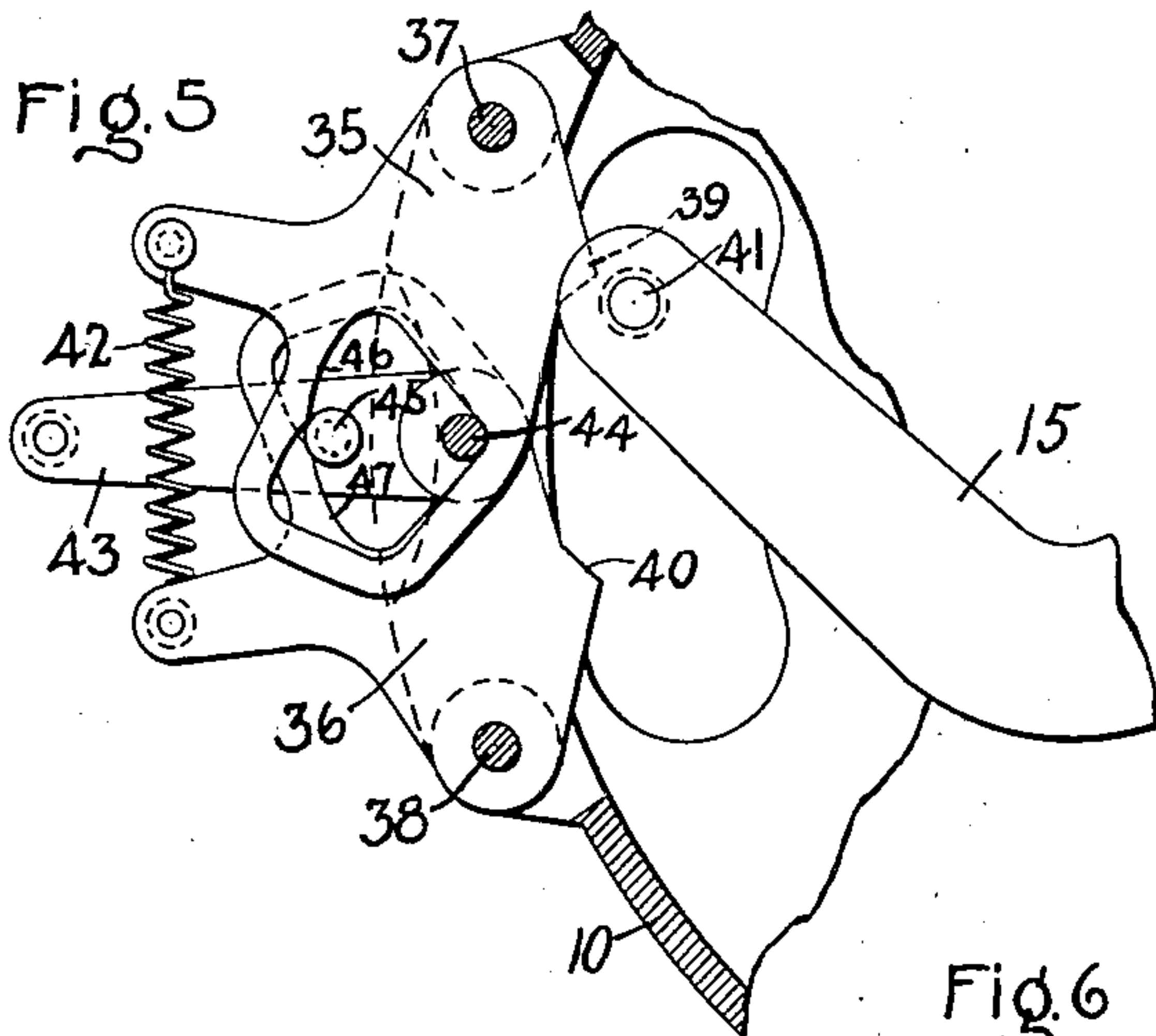
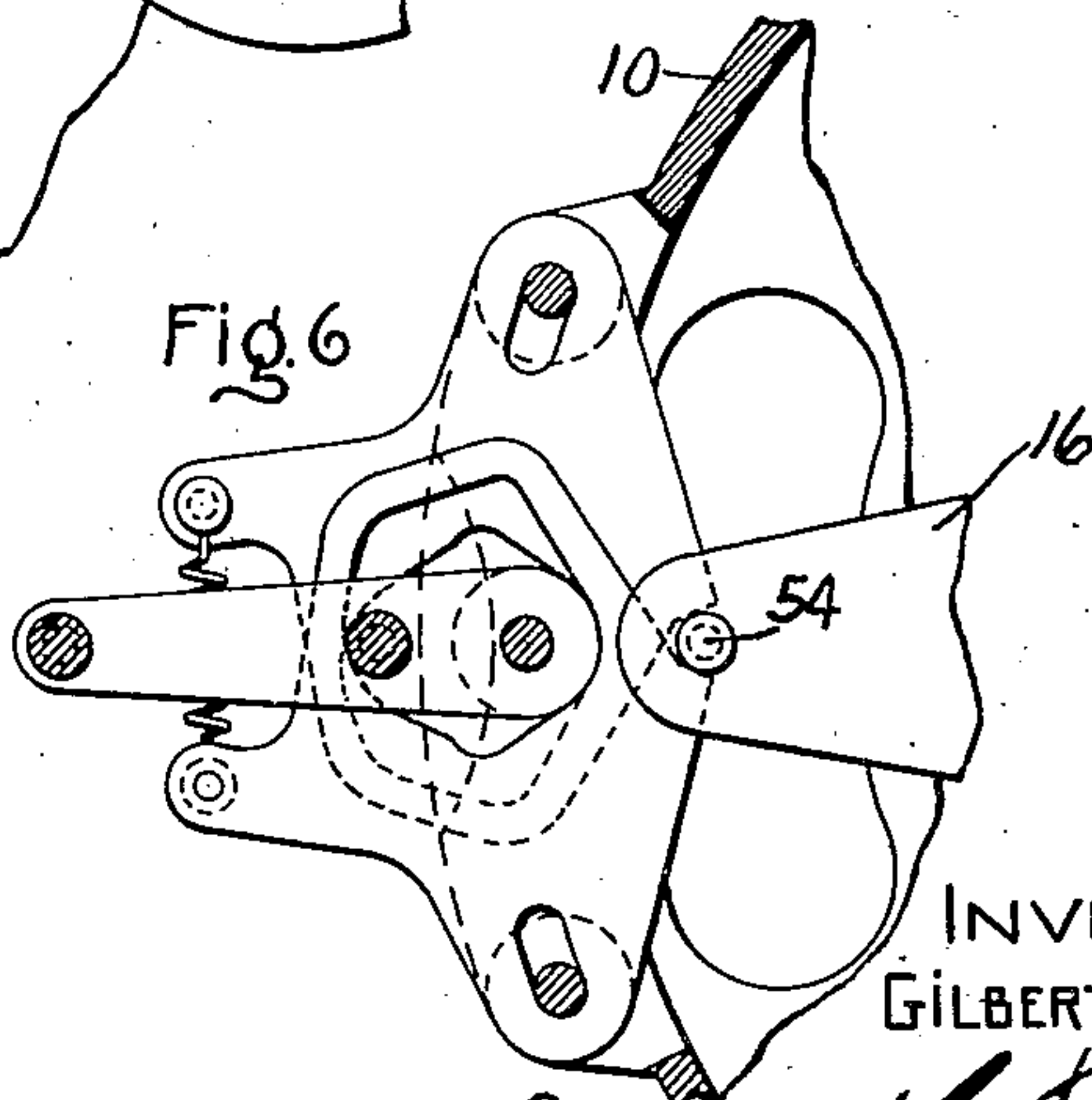


Fig. 6



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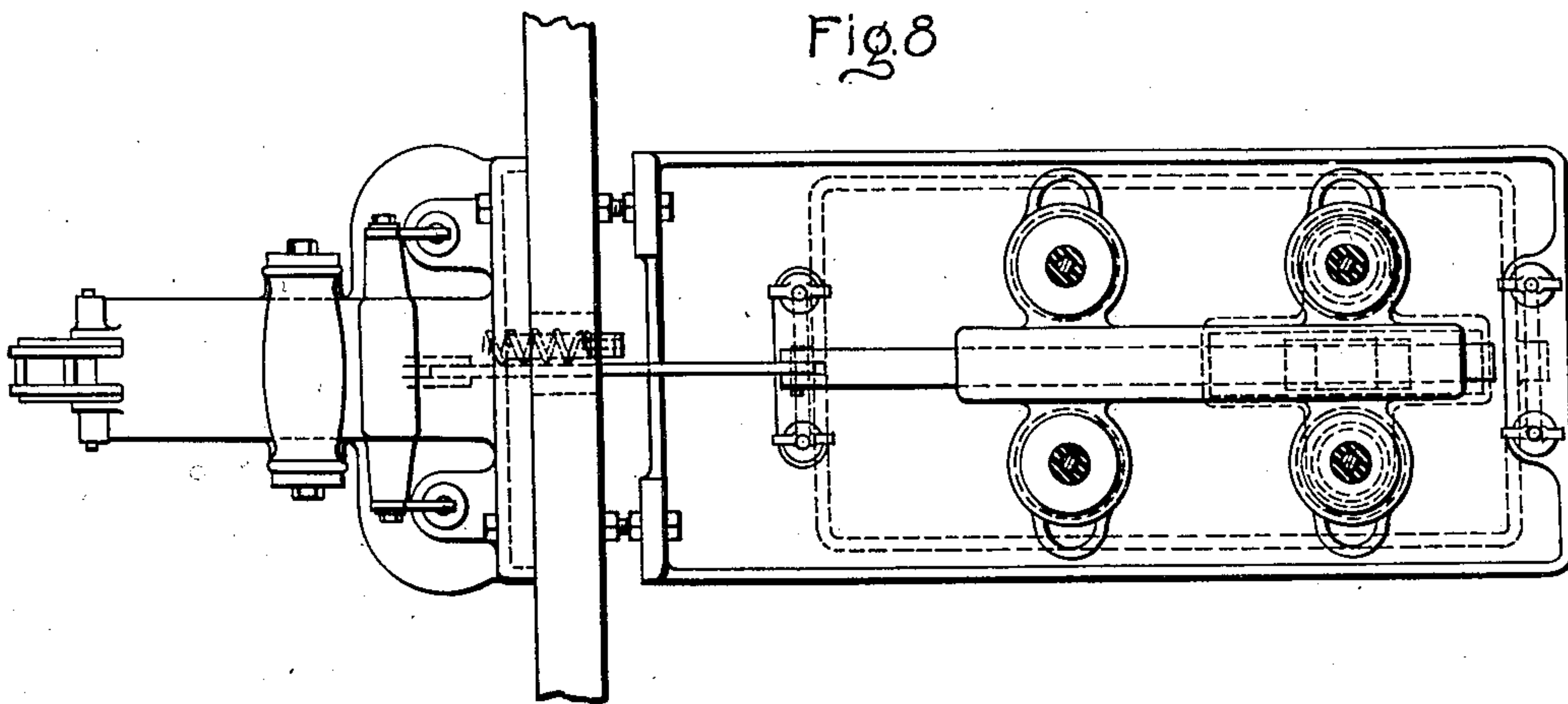
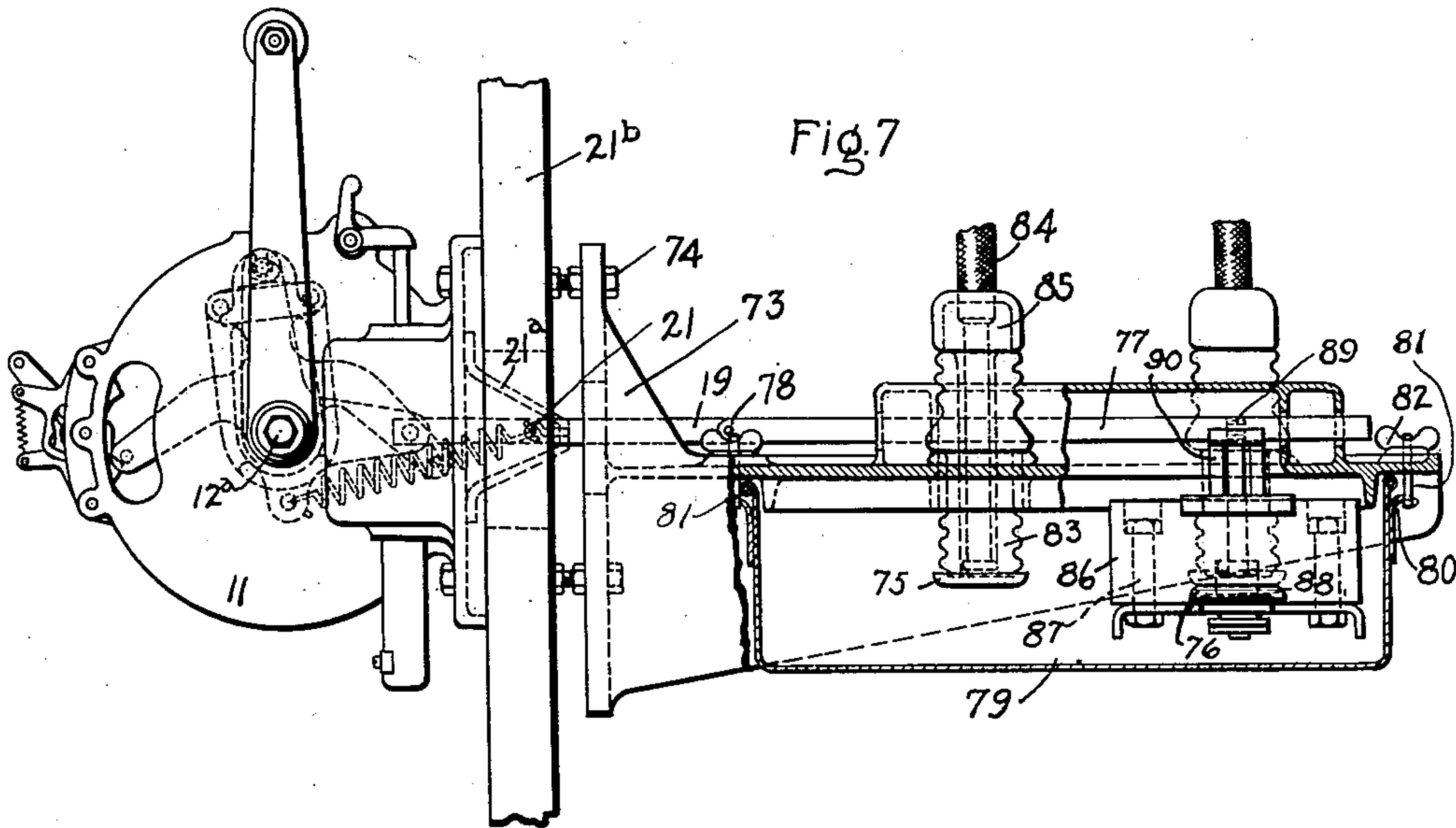
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UNITED STATES PATENT OFFICE.

GILBERT WRIGHT, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC SWITCH.

No. 919,994.

Specification of Letters Patent.

Patented April 27, 1909.

Application filed August 3, 1905. Serial No. 272,497.

To all whom it may concern:

Be it known that I, GILBERT WRIGHT, a citizen of the United States, residing at Pittsfield, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

The present invention relates to electric switches and more particularly to the operating mechanism thereof and it comprises a novel organization of parts together with certain novel features of construction which cooperate to render the proper operation of the switch more certain and thereby reduce the possibility of injury to apparatus to a minimum.

One of the features comprises a novel means for automatically indicating the different positions of the switch. This indicator is so constructed that when the switch is once opened, the indicator must be moved to a definite position before it is possible to again close the switch. In a double throw switch to which this feature is especially applicable, the indicator has a double throw movement which corresponds to the movement of the operating lever of the switch and when the indicator is moved so as to permit the switch to be closed it indicates the direction of movement of the operating lever necessary to produce such closure. By this organization, before it is possible to close the switch, it is therefore necessary to take two steps, first, to move the indicator to the proper position and second to follow this by a similar movement of the switch operating lever. In this way the operator is provided with an efficient check on his action and the likelihood of error in the manipulation of the switch is greatly reduced.

The invention comprises in addition to the above certain other features, which are capable of a varied and diversified application. The character and nature of the invention will be best understood upon reference to the following description taken in connection with the accompanying drawings and the essentials of the invention will be specifically pointed out in the appended claims.

Figure 1 is a front elevation of a switch embodying the features of the invention, parts being broken away and shown in section on a plane indicated by the line 1—1 of Fig. 2; Fig. 2 is a transverse section of the operating mechanism corresponding to one

of the closed positions of the switch; Fig. 3 is a similar view of the lock mechanism by which the switch is stopped and held in open position; Fig. 4 is a sectional elevation of a portion of the switch operating mechanism illustrating particularly the relative location of the switch lock-mechanism, shown in Fig. 3, and the similar lever lock-mechanism by which the operating lever is held in different operative positions; Fig. 5 is a view similar to Fig. 3 illustrating the operating lever lock-mechanism in non-engaging position; Fig. 6 is a view similar to Fig. 3 illustrating the lock shown therein in locking position; Fig. 7 is a side elevation of the switch, parts being illustrated in section; and Fig. 8 is a plan of the same.

Throughout these views like characters refer to like parts.

Referring in detail to these drawings, and, for the present more particularly to the operating mechanism, 10 designates the casing within which the greater portion of said mechanism is inclosed. This casing comprises a central cylindrical portion 11 and end portions 12 communicating therewith and within which are located the electro-magnetic devices employed to trip the switch. Within the end heads of the central portion 11 is journaled the shaft 12^a which is actuated by the operating lever 13 to throw the switch into its different operative positions. The operating lever 13 comprises two members which are rigidly connected at their inner ends to the ends of the shaft 12^a and at their outer ends to the handle 14. An irregularly shaped member 15 located within the casing 11 is also rigidly secured to the shaft 12^a. By reason of this construction all movements of the operating lever 13 are communicated to the member 15, the two moving as a unit. For the purpose of communicating the movement of the parts 13 and 15 to the switch contacts, the shaft 12^a is provided with a member 16 which is rotatably mounted on it and constructed and arranged so as to be latched or otherwise clutched to it. The member 16 comprises two identical plates held apart by suitable spacing blocks 17 and connected at the point 18 with the contact actuating bar 19. As shown in Fig. 2 the point 18 is some distance from the shaft 12^a so that, as the latter is rotated, the member 16 when clutched to it acts as a crank

give the actuating bar 19 a reciprocatory movement. To another projecting portion of the member 16 is connected one end of the coiled tension spring 20 which, as best shown in Fig. 7, extends through a suitable opening in the supporting panel 21^b and has its opposite end secured to some suitable fixed point, such as a hook 21^a which is carried by the casing. This spring gives a bias to the switch tending to maintain it in open position.

From the description thus far it will be seen that the member 16 and the movable switch element move as a unit freely with reference to the shaft 12^a and tend to occupy a definite position in response to the pull of the spring 20. On the other hand, the operating lever 13 and the member 15 are movable together, independently of the switch parts, to any desired position.

For the purpose of transmitting the motion of the latter to the former, latching mechanism is employed. For this purpose one of the projecting portions of the member 16 is provided with a projecting pin 22 which is adapted to cooperate with latches 23 24, pivoted at the points 23^a 24^a to the member 15.

As clearly illustrated in Fig. 2, the latches 23 and 24 are provided with tails 25 and 26 respectively, which embrace the shaft 12^a and considerably overlap each other. These latches are also provided with noses 27 and 28 which engage the pins 24^a and 23^a respectively to limit the movement of the latches under the action of the tension spring 29. The projecting noses 27 and 28 are so located that the tails 25 and 26 of the latches are maintained a definite distance away from the shaft 12^a so as to leave a concentric slot-like space between them and the shaft. This space constitutes a runway for a pin 30, shown in dotted lines in Fig. 1, which is secured to the lower end of the tripping lever 31, which is fixed at its upper end to an intermediate point in the horizontal shaft 32 journaled within bearings in the end walls of the central portion 11 of the casing 10 and terminates at its ends in projecting arms 33 and 34. Either of these arms may be actuated to rotate the shaft 32 and thus rock the tripping lever 31 to throw the particular latch which is in engagement with the pin 30 out of engagement with the pin 22 on the member 16 and thus break the transmitting connection between the operating lever 13 and the contact actuating link 19.

Fig 2 shows the operating parts in positions corresponding to one of the closed positions of the switch while Fig 7 illustrates the same in positions corresponding to the other closed position of the switch. With the parts in the latter position, the tripping lever 31 is in position to engage the latch 23 instead of the latch 24; but in each case the

proper latch will be tripped to free the member 16, which is connected with the switch contacts, from the operating lever 13, so as to allow the switch to fly to the open position under the tension of the spring 20.

One of the essential features of the invention consists in the novel means for locking the operating lever in what I may term its closed positions, that is, in its positions corresponding to the closed positions of the switch, and in the means for locking the member 16 in the position corresponding to the open position of the switch. For this purpose two locks located side by side at the front of the central portion 11 of the casing 10 are provided. Figs. 2 and 5 illustrate the lock for holding the operating lever; and Figs. 3 and 6 illustrate the lock for holding the contact actuating member 16. Referring to the former, 35 and 36 designate two irregularly shaped plates pivoted at 37 and 38, respectively, to the casing 10 and provided with engaging shoulders 39 and 40 which cooperate with pins 41 carried at the outer ends of arms on the member 15 which, it will be remembered, moves as a unit with the operating lever 13. A coiled tension spring 42 connects projecting portions on the plates 35 and 36 and tends to rock them about their pivots 37 and 38 into the path of movement of the pins 41. This movement is controlled by the manually operated control and indicating lever 43 pivoted at 44 to the casing 10 and provided at 45 with a bearing pin which engages cam faces 46 and 47 upon the latching plates 35 and 36 respectively. These faces are so shaped that when the lever 43 is in the position illustrated in Fig. 5, that is, in its mid position, the plates 35 and 36 are thrown out of engaging position, but if the lever 43 is thrown downward, the upper plate is allowed to move under the action of its spring into engaging position, while, on the other hand, if the lever 43 is thrown upward, the lower plate 36 moves into engaging position. From this it will be seen then that so far as this latching mechanism is concerned, the operating lever might be moved at will throughout its entire range of movement as long as the lever 43 occupies its mid position; but in order that said lever may be locked in its closed position, it is necessary to throw the control lever 43 in the direction in which it is desired to throw the operating lever. Thus the lever 43 serves as an indicator of the direction in which the operating lever should be moved in order to be locked.

Referring now to the other locking mechanism by which the contact actuating member 16 is stopped and locked in open position, 48 and 49 designate latches which are pivoted respectively at 50 and 51 to the forward end of the casing 10. These plates are provided with shoulders 52 and 53 which co-

operate with the pin 54 on the member 16 in the operation of the mechanism. A coiled tension spring 55 connects outwardly extending arms upon the plates 48 and 49 and exerts a pull normally tending to force the plates into latching position. The plates 48 and 49 are punched out similarly to the plates 35 and 36 so as to provide cam faces 56 and 57. With these faces the pin 45 of the control lever 43 coöperates in the same manner as it coöperates with the cam faces 46 and 47 on the plates 35 and 36 of the other locking mechanism. And similarly, as in the other case, when the lever 43 is thrown downward, as in Fig. 3, the plate 48 is moved to engaging position, while when it is thrown upward the plate 49 is moved to engaging position. Each of the plates 48 and 49 is provided with a slot, at its point of engagement with its pivot pin, which extends in the direction of movement of the outer end of the member 16, that is, in a direction substantially concentric with the shaft 12^a. The purpose of this will be understood if it be assumed that the operating mechanism is in the position illustrated in Fig. 2 and the same be tripped so as to free the contact actuating member 16 from the member 15. In the position of the operating mechanism illustrated in Fig. 2, the lock for the member 16 will be in the position shown in Fig. 3. With the parts so disposed, as soon as the latch 24 is tripped, the member 16 will fly around under the pull of its spring 20 and the pin 54 thereon will be driven with considerable force against the shoulder 52 on the plate 48. This will be sufficient to move the plate 48 upward. The effect of this movement, due to the arrangement of the cam faces 56 and 57, is such as to cause the controlling lever 43 to rotate about its pivot 44 into the position illustrated in Fig. 6. As soon as this takes place, the plate 49 is free to move to its outward or engaging position and in doing so the shoulder 53 passes on the opposite side of the pin 54 thus securely locking the member 16 and the switch in open position. Thus when the switch has been automatically tripped the pin 54 will be locked by the plates 48 and 49, as illustrated in Fig. 6, and the operating lever will occupy either the positions shown in Fig. 2 or that shown in Fig. 7. If, then, it is desired to close the switch it is necessary to throw the lever 43 into its upper or lower position according to the position into which it is desired to throw the switch. For example, if it is desired to throw the switch into the position illustrated in Fig. 7 the lever 43 will be thrown upward and this movement will be followed by a corresponding movement of the operating lever 13 after the same has been moved to its mid position for the purpose of latching the members 15 and 16. In the movement of the operating lever from

the position of Fig. 2 to that of Fig. 7, as it passes through the mid position, connection will be established between the members 15 and 16 in the following manner. The outer end of the latch 24 will be engaged by the pin 22 on the member 16 and forced inward thereby against the pull of the spring 29. When the pin 22 comes up against the latch 23, the latch 24 will spring back into place thus completing the clutching operation. When this is accomplished the switch may be thrown to the desired position by the further movement of the operating lever.

Obviously, the actuation of the tripping bar 31 by which the movable element of the switch is unlatched from the operating lever may be accomplished in any desired manner. In the present instance this function is performed by either one or both of the two solenoid magnets contained within the portions 12 of the inclosing casing 10. These magnets are identical in construction so that it will be sufficient for the present purpose to describe one of them in detail.

Referring to Fig. 1, 59 designates the winding of one of these magnets upon a fiber spool 60 which is firmly held in the casing 12 by a screw 61 threaded through the upper portion of said casing. A calibrating tube 62 extends through the center of the spool 60 and contains a fixed core 63 and a movable core 64. The movable core normally rests at the lower end of the tube against an adjustable stop 65 and is adapted to be drawn upward by the magnetic pull of the winding 59 into engagement with the fixed core 63. Near the end of this movement the core 64 engages the lower end of a pin 66 which extends down through and slightly beyond core 63, the downward movement of the pin 66 being limited by a shoulder 67 thereon. The upper end of the pin 66 engages the outer end of one of the arms 33 or 34 on the shaft 32. The length of the pin 66 is such that when it is driven upward by a blow from the movable core 64, it rocks the arm 34 and thereby through the agency of the trip arm 31 unlatches the members 15 and 16. The position of the stop 65 may be varied at will by means of the clamping plate 68 and the screw 69. The screw passes through the plate 68 and into threaded engagement with the block 65 and may be turned up to clamp the adjacent walls of the tube between the plate and the stop and thereby hold the stop in place. The longitudinal slot 70 in the calibrating tube permits the passage of the screw 69, and the lower end of the tube is turned over slightly, as at 71, to keep the stop 65 from falling out of the tube when the screw 69 is loosened. The bore of the calibrating tube 62 is slightly enlarged at its upper end so as to provide a shoulder against which the lower end of the fixed core 63 may abut and the upper end of the bore is threaded for the

reception of a nut 72 by which the core 63 is held in place. Obviously the windings 59 may be energized directly from the circuits controlled by the switch or by any independently controlled circuits as may be desired. The current employed may also be either alternating or direct. When the former is employed each of the casings 12 is slotted longitudinally, as at 72^a, to break up its continuity as a circuit for currents which would be induced otherwise by the current in said winding 59.

For the purpose of completing the illustration and more fully disclosing the character of my invention I have shown the operating mechanism above described in connection with a switch of the type disclosed in Patent No. 761,745, granted to me June 7, 1904. It is, of course, to be understood that my switch operating mechanism is capable of use with other types of switches and that the present switch is merely illustrative, being selected largely on account of its simplicity. In Figs. 7 and 8 in which said switch is illustrated, 21^b designates the panel or other support upon which the switch and its operating mechanism are mounted. Briefly described, the switch comprises a frame 73 which is secured to the rear of the support 21^b in any suitable manner as by screws and nuts 74 and from which fixed contacts 75 depend. These contacts cooperate with a reciprocating bridging contact 76 which is hung from a reciprocating rod 77 suitably guided within the upper portion of the frame 73 and operatively connected at the point 78 to the actuating rod 19 of the operating mechanism. The under side of the frame 73 is provided with an oil can 79 which surrounds the fixed and movable contacts and is adapted to contain a bath of oil of sufficient depth to submerge said contacts. This oil can is held in place by any suitable means as the hooks 80 and cooperating stirrups 81 provided with the thumb nuts 82.

The fixed contacts 75 take the form of bolts having rounded heads with their shanks extending up through insulators 83 carried by the frame 73. The upper ends of the shanks are electrically connected to suitable circuit leads 84 and the point of connection is inclosed within the protective insulating cap 85. The movable bridging contact 76 of the switch extends laterally from a supporting insulating block 86 and connected thereto by bolts 87. The outer ends of the bridging contact 76 are provided with contacting plates 88 of the same structure as the round contacting heads of the fixed contacts 75. The center supporting block 86 is secured by a bolt 89 to the reciprocating rod 77 and the rigidity of the connection is maintained by a suitable spacer 90.

For the purpose of assembling the parts upon the shafts 12^a and 32 in the switch

operating mechanism, a special construction has been employed, which will now be described in connection with the shaft 12^a. In this instance the member 15 is rigidly secured to the shaft. This is accomplished by turning down the shaft and cutting off the sides of the turned-down portion so as to leave an angular section such as that shown in Fig. 2 and a square shoulder at 90^a against which the member 15 may abut. The latter member is provided with an opening of substantially the same shape as the section of the reduced portion of the shaft and is slipped over the same until it is brought up against the shoulder on the shaft. A tubular ring 91 is then slipped over the reduced portion of the shaft and pressed home against the opposite face of the member 15 by means of a washer 92 and a stud bolt 93 screwed into the end of this reduced portion of the shaft. In this way the member 15 is held against rotation and also against lateral displacement upon the shaft. The same means also rigidly connects the side members of the operating lever 13 to the shaft 12^a.

Obviously, certain alterations and modifications may be made in the matter herein disclosed without departing from the spirit and scope of my invention. I therefore do not wish to be limited to the specific matter presented, but aim to cover by the terms of the appended claims all such alterations and modifications.

What I claim as new, and desire to secure by Letters Patent of the United States, is,—

1. An electric switch comprising means for stopping the switch in its open position, and an indicator mechanically actuated by said means to show the changed position of the switch.

2. An electric switch comprising means for stopping and locking the switch in its open position, and an indicator actuated by said means to show the changed position of the switch.

3. A double throw electric switch comprising means for locking the switch in open position, and means for freeing the switch for movement to one closed position only.

4. A double throw electric switch comprising an operating lever, means for locking the switch in open position, and means for freeing the switch for movement to one closed position only and for indicating the direction of movement of the operating lever necessary to accomplish such closure.

5. A double throw electric switch comprising means for stopping and locking the switch in its open position, and means for freeing the switch for movement to one of its closed positions only.

6. A double throw electric switch comprising an operating lever, means for stopping and locking the switch in its open position, and means for freeing the switch

for movement to one of its closed positions only and for indicating the direction of movement of the operating lever necessary to accomplish such closure.

5 7. A double throw electric switch comprising an operating lever, means for locking the switch in its open position, and a double throw indicating device actuated by said locking means to indicate the open position
10 of the switch and manually movable to its other positions to free the switch for closure in the corresponding direction.

8. A double throw electric switch comprising a retaining latch for each closed position
15 of the switch, and means common to said latches for moving them into and out of engaging position.

9. An electric switch comprising an operating lever, means for opening the switch
20 independently of said lever, latching means for holding the lever in its closed position, and means operated by the opening of the switch to release said lever and lock the switch in its open position.

25 10. A double throw electric switch comprising an operating lever, means for opening the switch independently of said lever, latching means for holding the lever in its closed positions, and means operated by the opening
30 of the switch to release said lever.

11. A double throw electric switch comprising an operating lever, means for opening the switch independently of said lever, latching means for holding the lever in its
35 closed positions, and means operated by the opening of the switch to release said lever and lock the switch in its open position..

12. An electric switch comprising an operating lever, means for opening the switch
40 independently of said lever, latching means for holding the lever in its closed position, and means operated by the opening of the switch to release said lever and lock the switch in its open position and to indicate
45 the position of the switch.

13. A double throw electric switch comprising an operating lever, means for open-

ing the switch independently of the lever, latching means for holding the lever in its closed positions, and means operated by the
50 opening of the switch to release said lever and to indicate the position of the switch.

14. A double throw electric switch comprising an operating lever, means for opening the switch independently of the lever,
55 latching means for holding the lever in its closed positions, and means operated by the opening of the switch to release said lever and lock the switch in its open position and to indicate the position of the switch. 60

15. An electric switch comprising a plurality of latching means for holding the switch in its different operative positions, and means actuated by the engagement of
65 said switch with one latching means for controlling the action of the other.

16. An electric switch comprising a plurality of latching means for holding the switch in its different operative positions, and means actuated by the engagement of
70 said switch with one latching means for controlling the action of the other, and an indicator cooperating with said latching means to indicate the position of the switch.

17. An electric switch comprising a plurality of latching means for holding the switch in its different operative positions and means common to said latching means for
75 controlling their action.

18. An electric switch comprising an operating lever, an indicating device having
80 positions corresponding to the open and closed positions of the switch, and means whereby the movement of said lever to close the switch can be accomplished only after
85 the indicating device has been moved to the corresponding position.

In witness whereof, I have hereunto set my hand this first day of August, 1905.

GILBERT WRIGHT.

Witnesses:

FREDERICK MURRAY PLATT,
FORBES THOMPSON CULLENS.