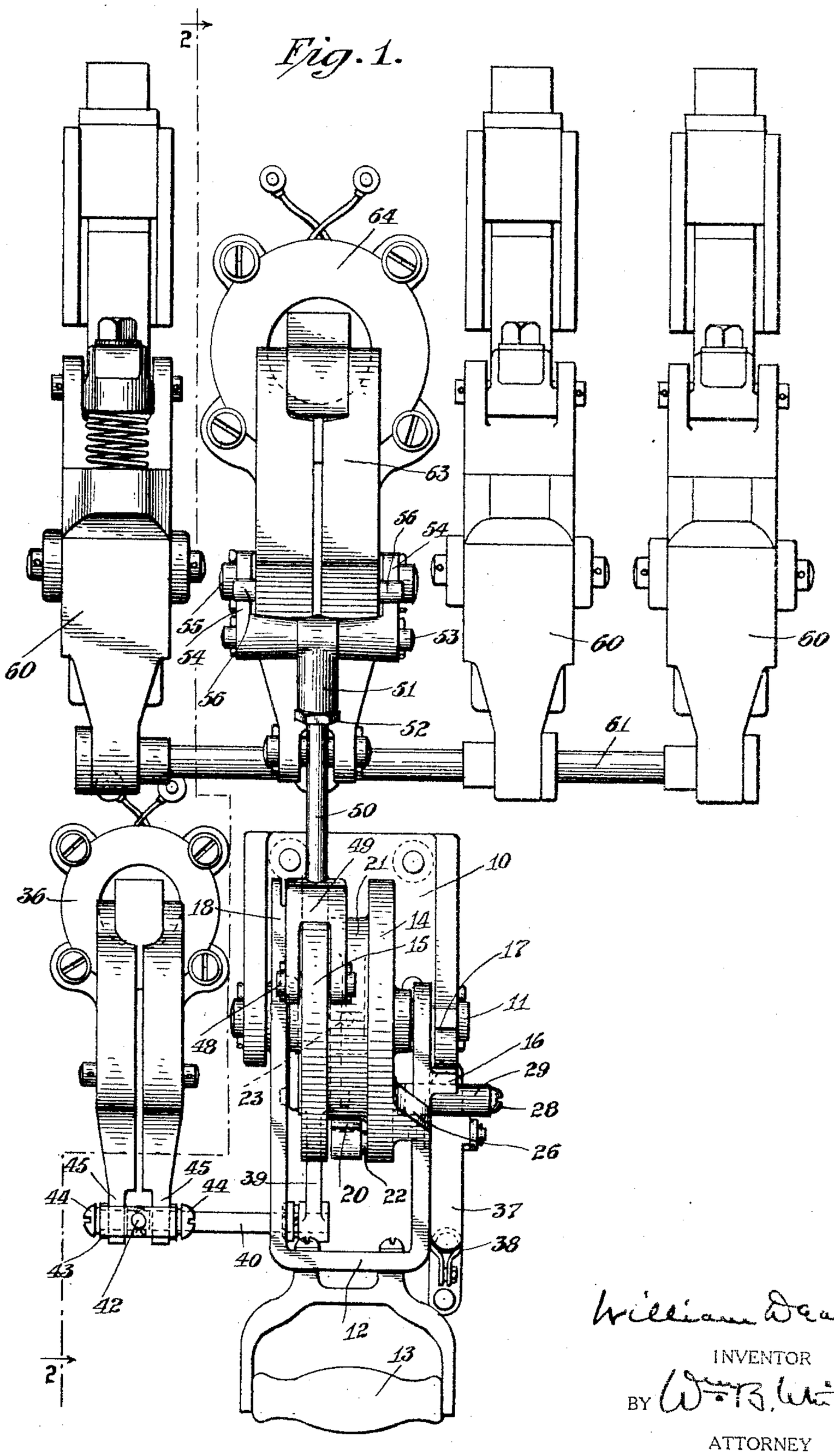
Feb. 14, 1933. W. DEANS 1,897,467

ELECTRIC SWITCH

Filed May 7, 1930 3 Sheets-Sheet 1

Fig. 1.



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Feb. 14, 1933. W. DEANS 1,897,467

ELECTRIC SWITCH

Filed May 7, 1930 3 Sheets-Sheet 2

Fig. 2.

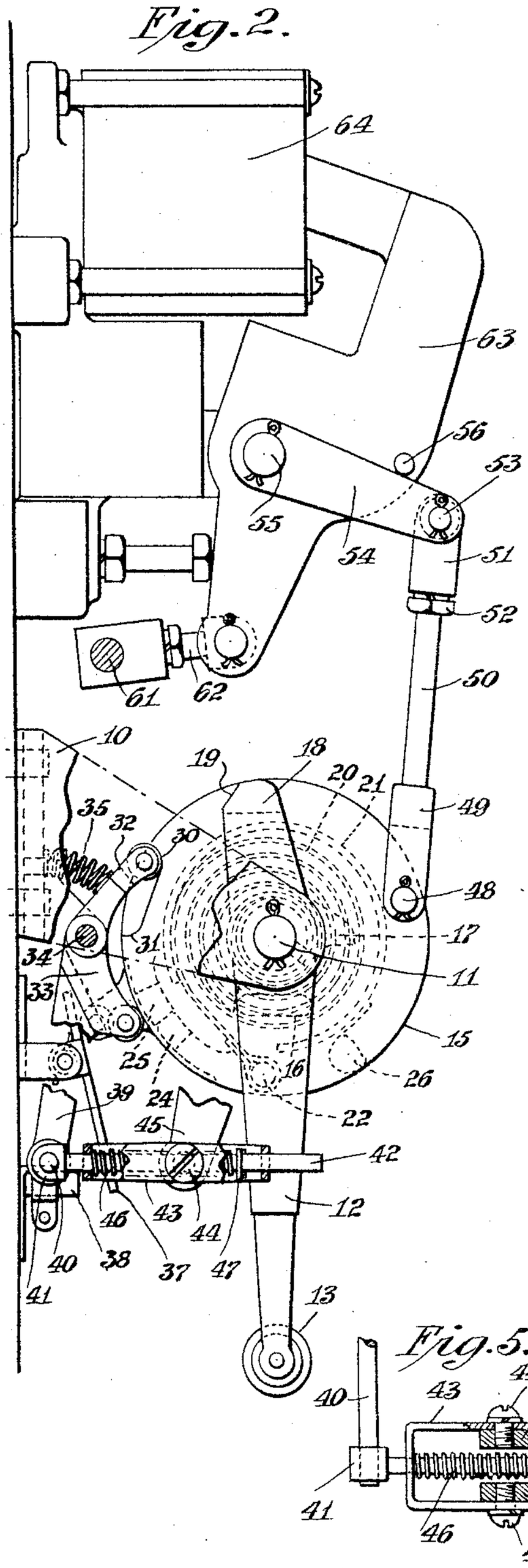

Fig. 3.

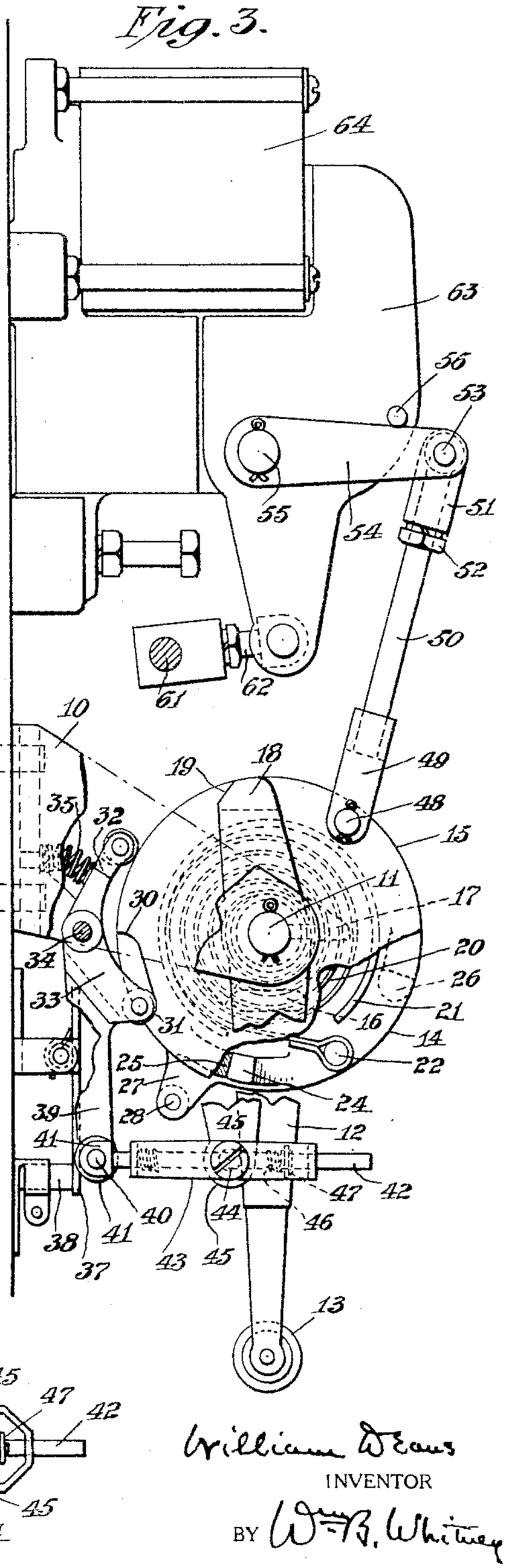

Fig. 5.

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Feb. 14, 1933. W. DEANS 1,897,467

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Filed May 7, 1930 3 Sheets-Sheet 3

Fig. 6.

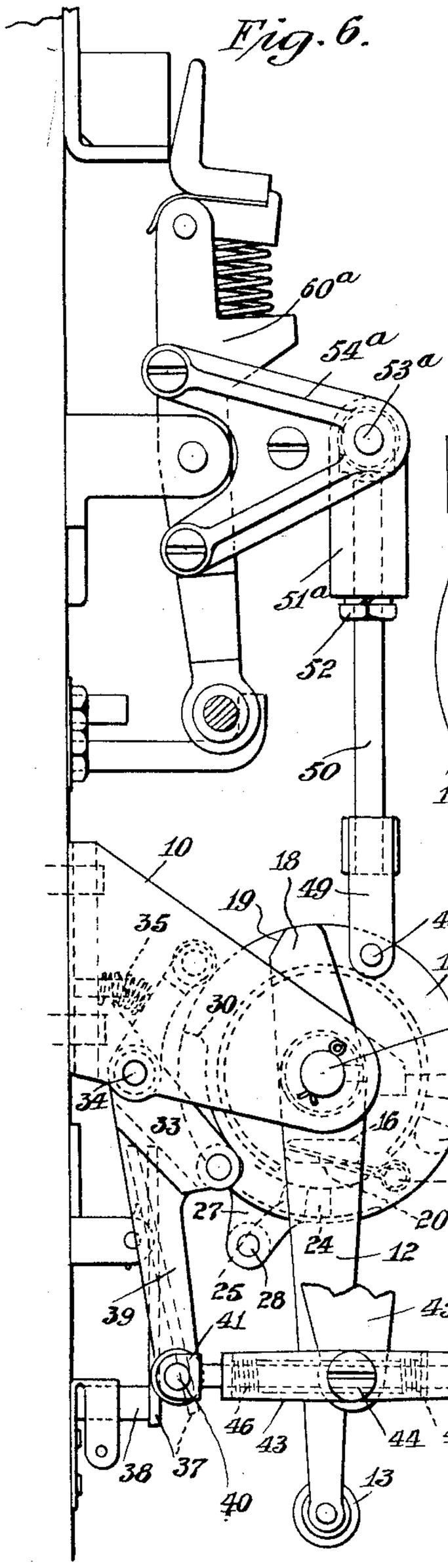
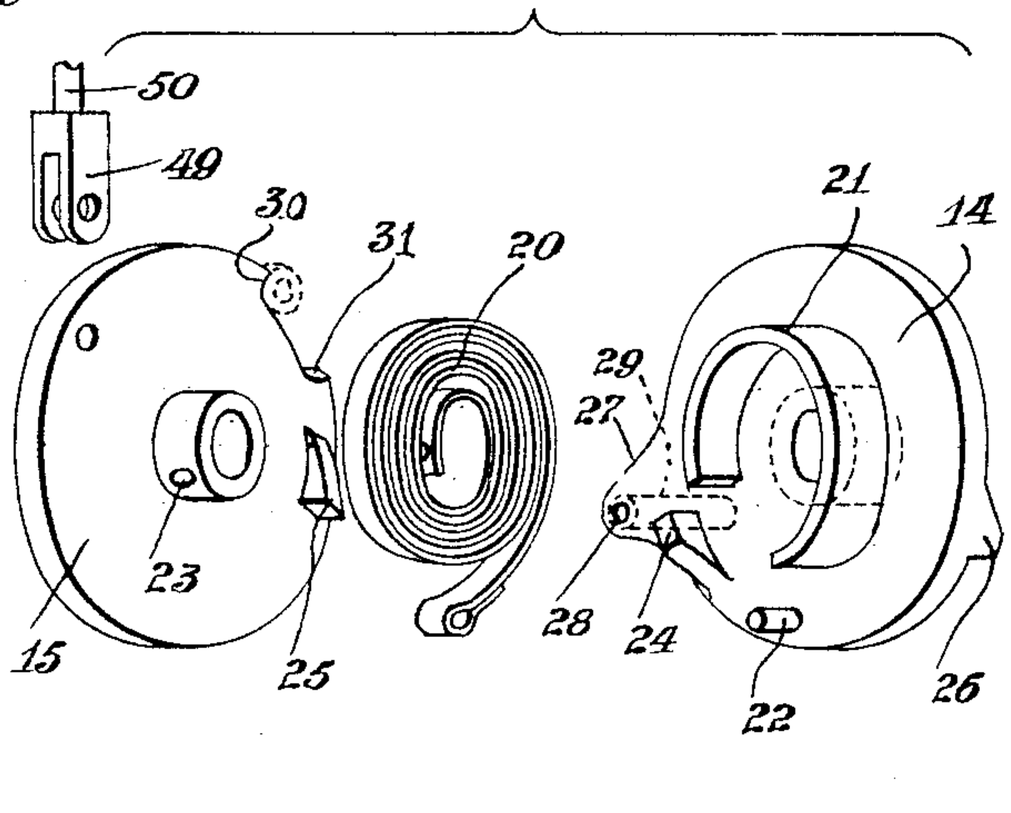


Fig. 4.



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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed May 7, 1930. Serial No. 450,399.

This invention relates to electric switches, and, specifically, to a device for manually effecting the closure of an electric switch, of either hand or automatic type.

In a switch operated simply and directly by an operator the contacts are subject to considerable burning. With slow actuation of the movable contact member there is a period during which the contact between the movable and the stationary contacts is necessarily imperfect, and arcing and the resultant burning of the contacts occur. And it is possible for the operator to "tease" the contacts, by alternately closing and opening them, and thereby cause damage to the switch and possibly injury to himself through the arcing so produced.

The object of my present invention is to provide a simple and efficient manually operated device which can be operatively connected with the movable member or members of a switch, either a switch of purely manual type or an automatic switch which will thereby be converted into a combined manual and automatic switch, and by means of which the actual closing, and opening, of its contacts will be effected positively and practically instantaneously without being subject to control by the operator.

To this end my new switch-actuating device comprises, broadly stated, a movably mounted spring-actuated member adapted to be connected up with and to control the movable contact or contacts of a switch, means for releasabily locking said member in what may be designated as its open position, to hold open the switch contacts, a hand lever adapted when swung in one direction to first tension the actuating spring of said member and then to release the locking means holding it in open position, to allow the member under the actuation of the spring to close the switch contacts, and when it is itself released by the operator to drop back to its initial idle position, and means for locking said member in what may be designated as its closed position, to hold the switch contacts firmly closed, and releasable manually or automatically to release said member and allow the switch contacts to spring open.

For a full understanding of the invention, reference is made to the accompanying drawings, in which—

Figure 1 is a front elevational view of one practical, and the preferred, embodiment of my new switch-actuating device and, by way of illustration, an automatic switch of the across-the-line starter type with which the device is operatively connected to thereby provide a combined automatic and hand starter, showing the switch open and the parts of the actuating device correspondingly positioned; Fig. 2 is a side view of the switch magnet and of the actuating device, with parts in section and other parts broken away, on the line 2, 2 of Fig. 1 and showing the parts in the same position in which they are there shown; Fig. 3 is a view corresponding to Fig. 2 but showing the parts in the position they occupy when the switch has been closed; Fig. 4 is an exploded view showing, in perspective, parts of the actuating device; Fig. 5 is a detail, partly in elevation and partly in section; and Fig. 6 is a view, similar to Fig. 3, showing the actuating device operatively connected with the movable member of a switch of purely manual type.

In the specific embodiment here shown, the device has a bearing support 10, adapted to be secured by bolts in position on the usual panel, which carries, fixed in openings in the outer ends of its two forwardly projecting arms, a bearing pin 11 upon which are journaled the arms of a forked lever 12, carrying an operating handle 13, and, between the arms of this lever, two disks 14 and 15 which may be described as the actuating and the power disk, respectively.

One arm of the hand lever has an outwardly projecting stop lug 16 which in cooperation with a shoulder 17 on the end of the adjacent arm of the bearing support serves to limit the forward and upward swing of the lever. The other arm of the lever is extended, at 18, to the periphery of the disk 15 and terminates in an inclined cam end 19 which functions in a manner presently to be described.

The two disks are operatively connected by a coil spring 20 which, housed as shown

within an annular chamber formed by a flange 21 on the inner face of the actuating disk, is fixed at its looped outer end upon a pin 22 set into the inner face of the actuating disk 14 and at its inner end is secured by means of a pin 23 to the inwardly projecting hub of the power disk 15. The disks are also provided on their inner faces, respectively, with oppositely disposed co-operating stop lugs 24 and 25.

The actuating disk 14 has on its outer face a peripheral shoulder lug 26 against which the adjoining arm of the hand lever is adapted to bear, to operatively engage and rotate the disk, and also a radially projecting ear 27 in the outer end of which is set an outwardly projecting screw pin 28 carrying an elongated roller 29, of insulating material, the function of which will later appear.

The periphery of the power disk 15 is notched, adjacent the back of the stop lug 25, to provide two oppositely disposed shoulders 30 and 31, and operatively related to these shoulders, respectively, are two oppositely disposed lock levers 32 and 33 which carry friction rollers journaled in their outer ends and are themselves journaled, the lever 33 straddling the lever 32, upon a bearing pin 34 fixed in the arms of the bearing support 10. The friction roller of the lock lever 32, which may be designated as the open position lock, is yieldingly held against the periphery of the disk by a compression spring 35, by which it will be forced into the notch in the disk, in position to engage the shoulder 30, whenever the disk is so rotated as to bring the notch opposite it, and will be forced back out of the notch and out of engagement with the shoulder, to release the disk, by the inclined cam end 19 of the extended arm of the hand lever when such lever is swung forwardly and upwardly. The lock lever 33, which may be designated as the closed position lock, may in like manner be yieldingly held by a spring with its friction roller bearing against the periphery of the disk and ready to spring into the notch therein and engage the shoulder 31 when brought into position therefor, and may be forced back therefrom to unlock the disk in any suitable manner, as by means of a manual release lever. As here shown, however, this lock lever is controlled by a no-voltage release magnet 36 of the clapper type, the coil of which is in a circuit controlled by switch contacts 37 and 38 in turn controlled by the insulator roller 29 carried by the actuating disk 14, through the following connections: The lock lever has at its back a downwardly extending arm 39 in the lower end of which is fixed a laterally projecting rod 40. The outer end of the rod 40 extends through and is pivoted in an opening in a bearing head 41 carried by a push rod 42 which extends through and reciprocates in openings in the back and front ends of a supporting frame 43, which frame is operatively connected with the armature of the magnet 36 by pivot screws 44 44 set through openings in its sides into the sides 45 45 of the forked tail of the armature, the push-rod and frame being yieldingly held in normal position relative one to the other by a spring 46 bearing at one end against the rear end of the frame and at the other end against a collar 47 pinned in position from the rod. A normally closed push-button switch (not shown) will usually be connected in series with the coil of the magnet 36 by means of which its circuit can be opened and the magnet de-energized at any time. It will be observed that the parts are so related that when the magnet 36 is energized and draws in its armature the tail of the armature will be swung forwardly and carry with it the supporting frame 43 to thereby tension the spring 46 which, acting through push rod 42, rod 40 and arm 39, presses forwardly the friction roller of the lock lever, and, further, that when the armature is released on the de-energization of the magnet its tail will be rocked rearwardly and carry with it the frame 43 in manner to cause the rear end of the frame to strike a hammer blow against the bearing head 41, thereby insuring the withdrawal of the lock lever and the release of the disk.

For its operative connection with a switch the power disk 15 carries pivotally mounted at its periphery upon a pin 48 the forked head 49 of a connecting rod 50. And where the device is to be used with an automatic starter, as illustrated in Figs. 1—3, this connecting rod is connected with the armature of the switch magnet by a head 51 into which the outer end of the rod is threaded and adjustably locked by a nut 52, which head is pivoted upon a pin 53 between the inturned ends of two levers 54 54 pivotally mounted in turn upon the extended ends of the pivot pin 55 of the armature and acting on the armature in one direction through pins 56 56 set into the sides thereof. The starter here shown, which is a typical across-the-line automatic starter, comprises three sets of switch contacts the movable members 60 60 of which are operatively connected by bar 61 and link 62 with the tail of the armature 63 of magnet 64.

The operation of the device as used with the automatic starter is as follows:

Assuming that the contacts of the starter are open, the armature of its actuating magnet and the parts of the manual actuating device will be positioned as shown in Figs. 1 and 2. The hand lever 12 hangs idle. The power disk 15, which has been rotated in a clockwise direction (as seen in Fig. 2) by the downward thrust of the armature 63 acting through pins 56, levers 54 and connecting rod 50 far enough to allow the friction roller

of lock lever 42 to spring forward into engagement with the shoulder 30, is locked in open position. The insulation roller 29 carried by the actuating disk 14, which has also been rotated in a clockwise direction by the action of spring 20 until stopped by the engagement of stop lug 24 with a stop lug 25, bears on the tail of and holds open the movable contact 37 of the switch in the circuit of the no-voltage release magnet 36, so that the tail of the armature of this magnet, now de-energized, is at the rearward limit of movement, relieving the forward spring pressure on the lock lever 33. To effect the closure of the contacts of the starter, the hand lever 12 is swung forwardly and upwardly, and, by the engagement of an arm thereof with the shoulder lug 26 rotates the actuating disk 14 in a counter-clockwise direction to thereby wind up or tension the spring 20. The first movement of the actuating disk also swings the insulation roller 29 from the tail of switch contact 37, which thereupon closes with the result that the no-voltage release magnet 36, being now energized, draws in its armature, rocks the tail of the armature to its forward position, and thrusts the supporting frame 33 forward to thereby tension the spring 46 and press the friction roller of lock lever 33 against the periphery of the power disk 15 (see Fig. 3). Finally, as the hand lever 12 nears the limit of its upward movement, as determined by stop lug 16 and shoulder 17, the cam end 19 engages the outer fork end of lock lever 32 and forces that lever back and out from behind the shoulder 30; whereupon the power disk 15, thus released and under the actuation of the spring 20, is immediately and rapidly rocked counter-clockwise to thrust the connecting rod 50 upwards and through the levers 54 and pins 56 to rock the armature 63 and thereby close the contacts of the starter. This rotary movement of the disk 15 brings it to a position in which the friction roller of lock lever 33 will spring forward and bear against the shoulder 31 and so lock the power disk in its contact closing position; and it also shifts the shoulder lug 25 forwardly against shoulder lug 24, so that when the hand lever is released and drops back to idle position the actuating disk 14 is held in place and does not follow the movement of the lever. The parts are now all in the position shown in Fig. 3, and there they are held until the no-voltage release magnet 36 is de-energized and releases its armature, either on a failure of current in its circuit or by the opening of the circuit by means of the push-button switch hereinabove mentioned. And whenever the no-voltage release magnet is de-energized, its armature rocks forwardly by gravity, the supporting frame 43 is thrust rearwardly by its tail and delivers a hammer blow upon the bearing head 41 to thereby force the friction roller of rock lever 43 from behind the shoulder 31, the power disk 15 is unlocked from its closed position, the contacts of the starter snap open as usual when released, and the parts of the device are returned to their original starting positions.

For use in the operation of a hand switch, as illustrated in Fig. 6, the connecting rod is connected directly to the movable contact member 60^a of the switch, which may be either the only movable contact member of a single pole switch or one of several similar and operatively connected members of a multiple pole switch, by an adjustable head 51^a, similar to the head 51 hereinabove described, which is pivoted upon a pin 53^a between the outer ends of two rock levers 54^a (one only here shown) rigidly attached, as by screws to the opposite sides of the member 60^a, to straddle its fulcrum point.

The actuating device is the same, and its operation is substantially the same, as hereinbefore described.

It will be seen that the closure of the switch contacts is effected solely by the action of the spring 20, after the power disk has been unlocked from its open position, and so is entirely independent of any movement of the hand lever either before or after the unlocking of the disk.

It is also to be observed that, by reason of its unidirectional connection with the magnet armature of an automatic switch, so long as the device is idle and the power disk locked in open position the levers 54 are withdrawn from the pins 56 so that the switch can be operated automatically by its magnet in the usual manner and without interference.

While I have illustrated and described my new switch actuating device in what I now consider the best form for the practical embodiment thereof, it is to be understood that the device can be variously modified in its several details, within the scope of the appended claims, without departing from the spirit or sacrificing the substantial advantages thereof.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a device of the character described, the combination of a movably mounted member adapted to be operatively connected with the movable contact or contacts of an electric switch, means for releasably locking said member in positions corresponding when so operatively connected with the switch both to the open and to the closed positions by its contacts, a spring adapted to move said member from contact-open to contact-closed position, a hand-lever adapted when moved in one direction to tension said spring while said member is locked in contact-open position and then to release the member from the locking means and thereafter to drop

back to its initial starting position, and means independent of the hand-lever for releasing the member from the means locking it in contact-closed position.

2. In a device of the character described, the combination of a member mounted to reciprocate forwardly and backwardly to a limited extent and operatively connected with the movable contacts of an electric switch, locking means adapted to lock said member against forward movement on reaching the limit of its backward movement, locking means adapted to lock said member against backward movement on reaching the limit of its forward movement, a power spring associated with and adapted to effect the forward movement of said member, a second member mounted to reciprocate forwardly and backwardly to a limited extent and adapted by its forward movement to tension said spring while said first member is locked against forward movement, manually-actuated means operative to effect the forward movement of said second member through a one-way connection therewith and at the limit of such movement to effect the release of said first member from the means locking it against forward movement, and means independent of said manually-actuated means for releasing said first member from the means locking it against backward movement.

3. In a device of the character described, the combination of a member mounted to reciprocate forwardly and backwardly to a limited extent, locking means adapted to lock said member against forward movement on reaching the limit of its backward movement, a power spring associated with and adapted to effect the forward movement of said member, manually operated means for tensioning said spring while said member is locked at the limit of its backward movement adapted when the spring has been suitably tensioned to effect the release of said member from said locking means, means for releasably locking said member at the limit of its forward movement when moved thereto by the action of said spring, and means for effecting an operative connection of said member with the movable contacts of a power-actuated switch through a one-way connection with the reciprocatory power element, whereby the switch can be actuated manually without interfering with its power actuation.

4. In a device of the character described, the combination of a member mounted to reciprocate forwardly and backwardly to a limited extent, means for locking said member against forward movement when at the limit of its backward movement, a power spring operatively associated with and adapted to effect the forward movement of said member, manually operated means for tensioning said spring while the member is locked at the limit of its rearward movement adapted when the spring has been suitably tensioned to release said member from said locking means, means controllable by a no-voltage release magnet for releasably locking said member at the limit of its forward movement, and means for operatively connecting said member with the movable contact or contacts of an electric switch.

5. In a device of the character described, the combination of a member mounted to reciprocate forwardly and backwardly to a limited extent, means for locking said member against forward movement when at the limit of its backward movement, a power spring operatively associated with and adapted to effect the forward movement of said member, manually operated means for tensioning said spring while the member is locked at the limit of its rearward movement adapted when the spring has been suitably tensioned to release said member from said locking means, means controlled by a no-voltage release magnet in a circuit controlled by said manually operated means for locking said member at the limit of its forward movement adapted to effect the release of said locking means by a hammer blow, and means for operatively connecting said member with the movable contact or contacts of an electric switch.

6. In a device of the character described, the combination of an actuating and a power disk mounted side by side to rock upon a common axis, means comprising a rod pivotally attached to the periphery of the power disk for operatively connecting said disk with the movable contact or contacts of an electric switch, means for locking the power disk against forward rotation at a position corresponding to the open position of the switch contacts when the disk is operatively connected therewith, a coil power spring attached at one end to the actuating disk and at the other end to the power disk in manner when tensioned by the forward rotation of the actuating disk to rock the power disk forwardly to effect the closure of the switch contacts when said power disk is operatively connected therewith, a hand lever pivotally mounted on the axis of the actuating disk and adapted through a one-way connection therewith to rock the said disk forwardly to tension the power spring while the power disk is locked in its open position and when the spring has been suitably tensioned to release the power disk from its said locking means, and means for releasably locking the power disk at its forward position, to hold the switch contacts closed when said disk is operatively connected therewith, when moved to such position by said spring.

7. In combination, an electromagnetically controlled electric switch, a power disk rotatably mounted and connected with the armature of the switch magnet by a one-way

connection operative to move said armature to closed position to thereby close the switch when the power disk is rocked in a forward direction and to return the power disk to its starting position when released to allow the armature and switch to open, means for locking the power disk at its starting position against forward rotation, an actuating disk mounted at one side of the power disk to rotate coaxially thereof, a power spring operatively connected with the two disks in manner to be tensioned by the forward rotation of the actuating disk when the power disk is locked in starting position and when unlocked therefrom to rock the power disk forwardly to move said armature to closed position, manually operated means for rocking the actuating disk forwardly through a one-way connection therewith to tension the power spring and adapted when said spring has been suitably tensioned to release the power disk from the locking means holding it at its starting position, and means for releasably locking the power disk in its forward armature-closed position when rocked thereto by the power spring to hold said armature closed.

8. In combination, an electromagnetically controlled electric switch, a power disk rotatably mounted and connected with the armature of the switch magnet by a one-way connection operative to move said armature to closed position to thereby close the switch when the power disk is rocked in a forward direction and to return the power disk to its starting position when released to allow the armature and switch to open, means for locking the power disk at its starting position against forward rotation, an actuating disk mounted at one side of the power disk to rotate coaxially thereof, a power spring operatively connected with the two disks in manner to be tensioned by the forward rotation of the actuating disk when the power disk is locked in starting position and when unlocked therefrom to rock the power disk forwardly to move said armature to closed position, manually operated means for rocking the actuating disk forwardly through a one-way connection therewith to tension the power spring and adapted when said spring has been suitably tensioned to release the power disk from the locking means holding it at its starting position, means for locking the power disk in its forward armature-closed position when rocked thereto by the power spring to hold said armature closed, and means including a no-voltage release magnet controlled by the rocking of the actuating disk for controlling said forward position locking means.

9. In combination, an electromagnetically controlled electric switch, a power disk rotatably mounted and connected with the armature of the switch magnet by a one-way connection operative to move said armature to closed position to thereby close the switch when the power disk is rocked in a forward direction and to return the power disk to its starting position when released to allow the armature and switch to open, means for locking the power disk at its starting position against forward rotation, an actuating disk mounted at one side of the power disk to rotate coaxially thereof, a power spring operatively connected with the two disks in manner to be tensioned by the forward rotation of the actuating disk when the power disk is locked in starting position and when unlocked therefrom to rock the power disk forwardly to move said armature to closed position, manually operated means for rocking the actuating disk forwardly through a one-way connection therewith to tension the power spring and adapted when said spring has been suitably tensioned to release the power disk from the locking means holding it at its starting position, means for locking the power disk in its forward armature-closed position when rocked thereto by the power spring to hold said armature closed, and means including a no-voltage release magnet in a circuit controlled by the rocking of the actuating disk for controlling said forward-position locking means in manner to effect the withdrawal thereof by a hammer below.

10. In a device of the character described, the combination of an electromagnetically controlled electric switch and manual means for effecting a quick closure of the switch including a one-way operative connection with the armature of the switch magnet, whereby the switch can be operated automatically by its magnet without interference from the said manual means when not in use, and means for effecting through such connections a quick closure of the switch contacts.

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