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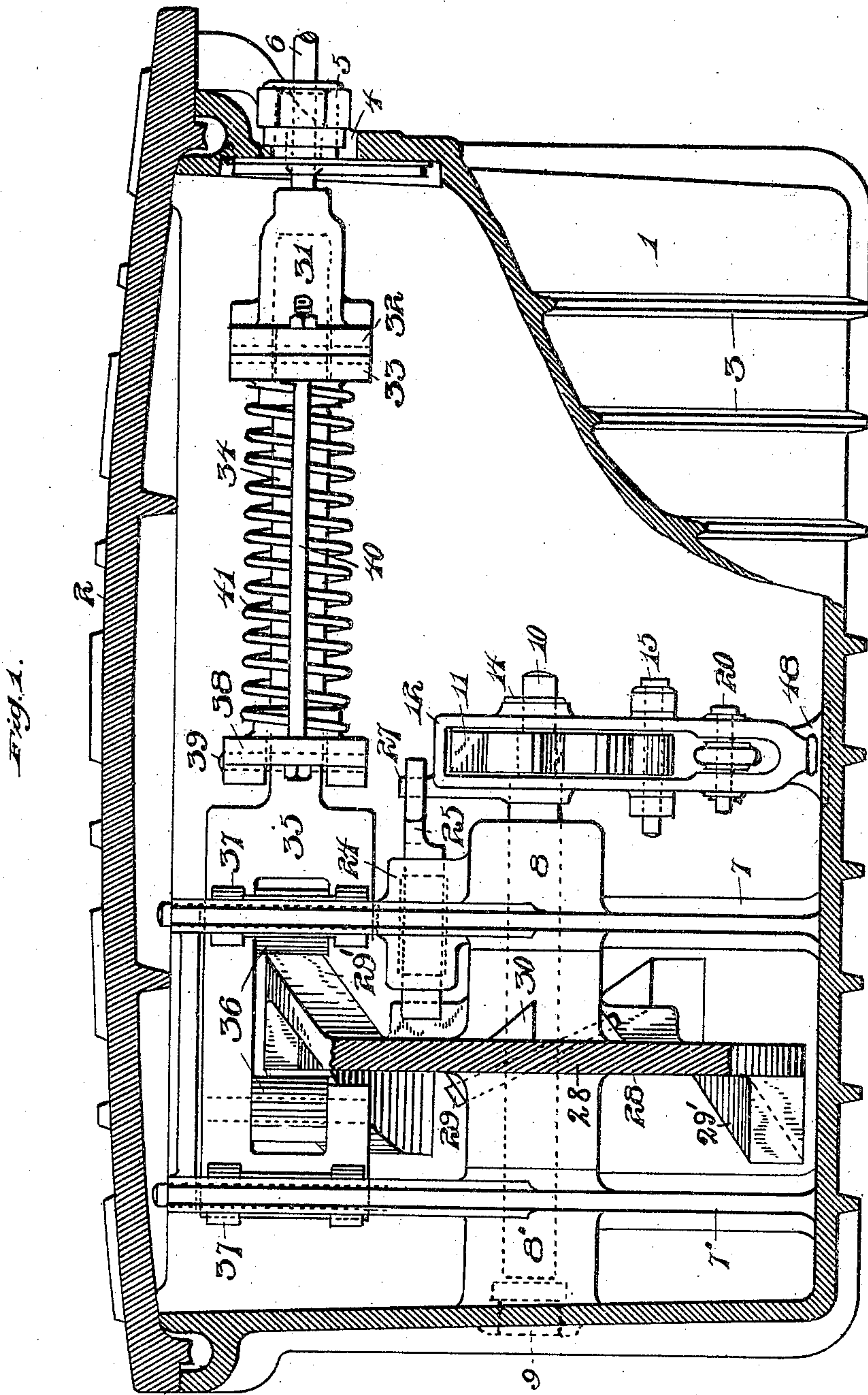
Patented Jan. 7, 1902.

J. H. SPANGLER & R. HERMAN.
OPERATING MECHANISM FOR ELECTRIC SWITCHES.

(Application filed Apr. 17, 1901.)

(No Model.)

3 Sheets—Sheet 1.



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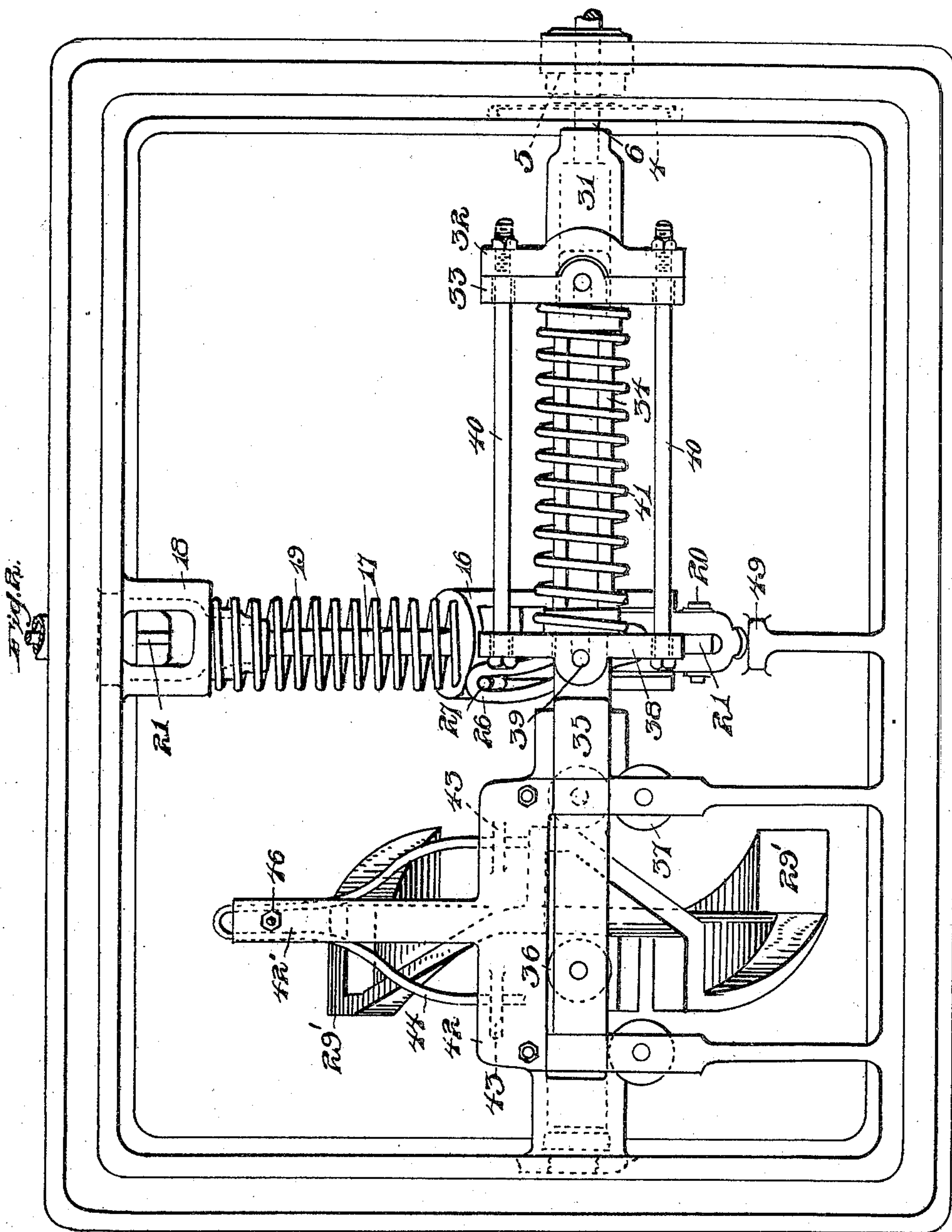
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3 Sheets—Sheet 2.



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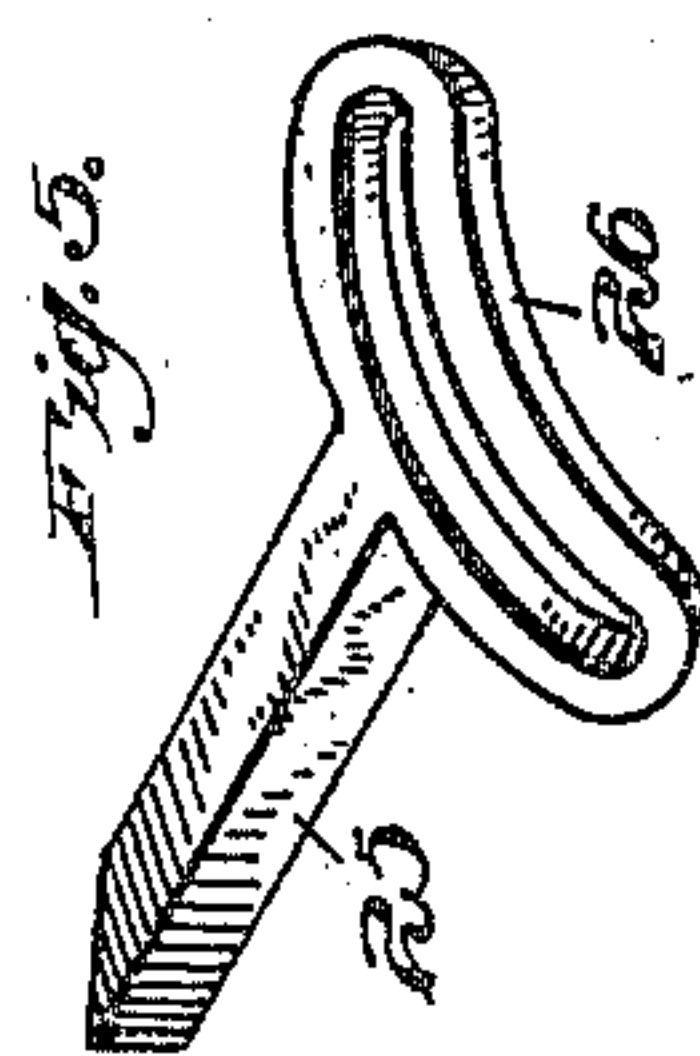
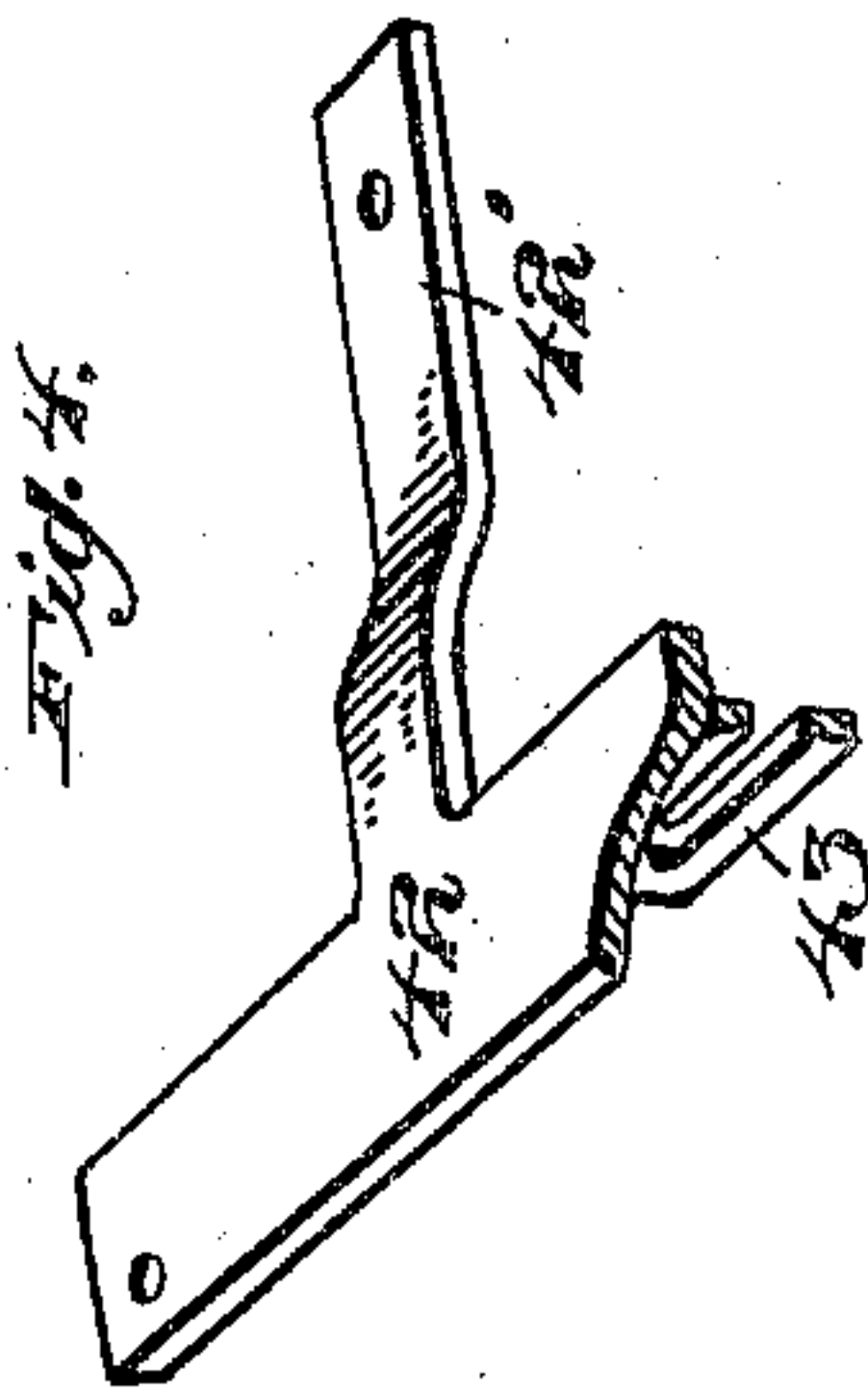
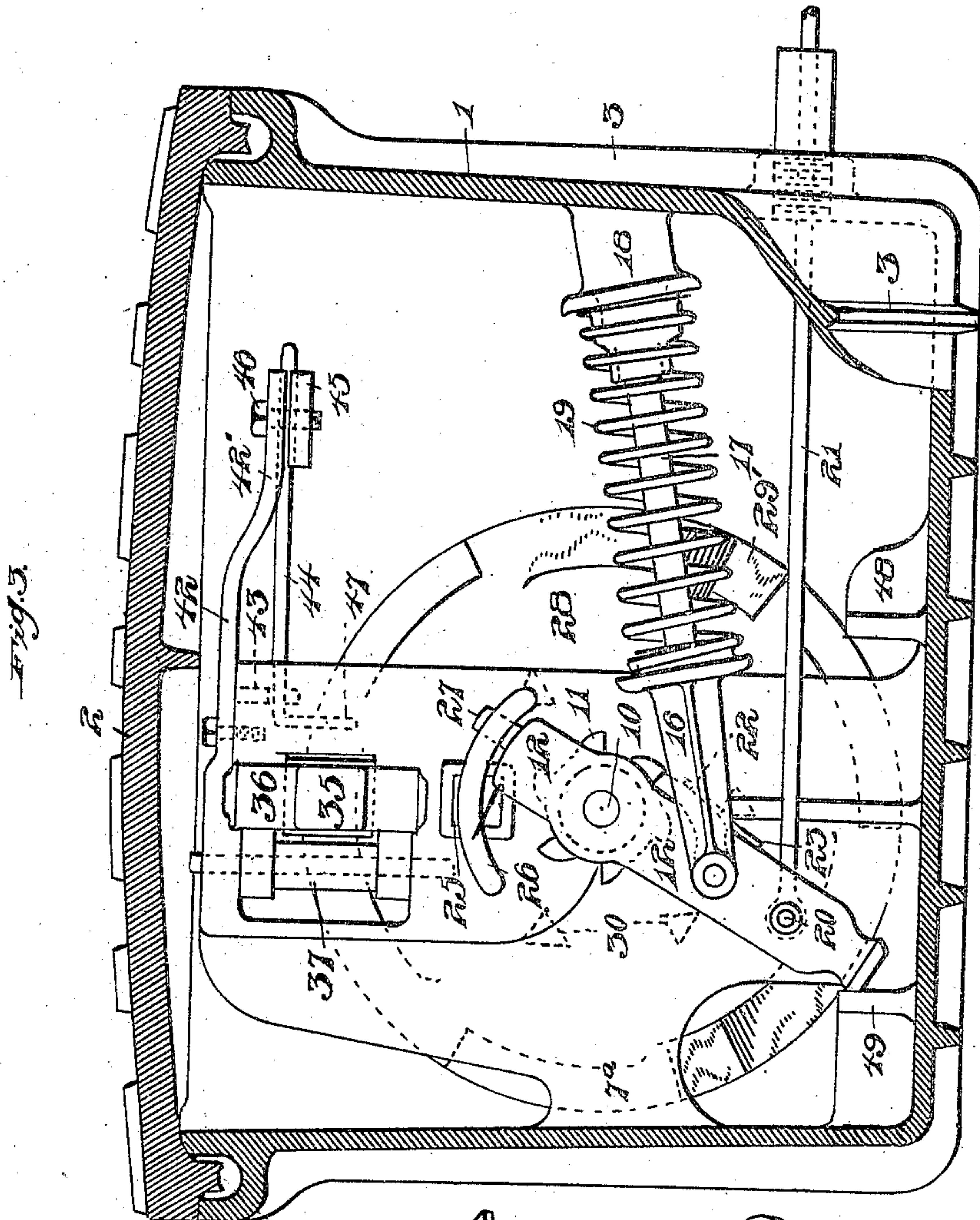
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UNITED STATES PATENT OFFICE.

JOHN H. SPANGLER AND REINHOLD HERMAN, OF CRAFTON, PENNSYLVANIA.

OPERATING MECHANISM FOR ELECTRIC SWITCHES.

SPECIFICATION forming part of Letters Patent No. 690,883, dated January 7, 1902.

Application filed April 17, 1901. Serial No. 56,251. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. SPANGLER and REINHOLD HERMAN, citizens of the United States of America, residing at Crafton, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Operating Mechanism for Electric Switches, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in switch-operating mechanism, and relates particularly to improvements in the switch-operating mechanism shown and described in the patent issued to John H. Spangler on February 26, A. D. 1901, No. 668,662.

The invention especially relates to improvements in the construction and operation of the operating-lever which actuates the toothed wheel of the mechanism and to means for locking this wheel against backward movement, so as to insure the same remaining in the position to which it has been moved, in order that when the switch-operating mechanism is again actuated the wheel will be in position to assure the operating of the switch-tongue.

In the operation of electrical switches such as described and claimed in the patent above referred to it has been found that when the magnets are deenergized and the operating-lever returns to its normal position the operating-wheel is liable to turn or be carried backward by the return movement of the operating-lever, so that in the succeeding operation of the switch the teeth which are carried by said wheel will not be in proper position to be engaged by the mechanism to actuate the switch-tongue. This difficulty we have effectually overcome by improvements in the construction of the operating-lever and by the provision of a lock which engages the teeth of the operating-wheel to prevent any backward movement of the latter.

Our improvements will be hereinafter specifically described and then particularly pointed out in the claims, and in describing the invention in detail reference is had to the accompanying drawings, forming a part of this specification, wherein like numerals

of reference indicate corresponding parts throughout the several views, and in which—

Figure 1 is a vertical sectional view of the inclosing box or casing, partly in side elevation, showing the switch-tongue-operating mechanism in side elevation, with the toothed operating-wheel partly in section. Fig. 2 is a top plan view of the box or casing with the switch-tongue-operating mechanism arranged therein. Fig. 3 is a transverse vertical sectional view of the box or casing, showing the switch-tongue-operating mechanism in end elevation. Fig. 4 is a detail perspective view, partly broken away, of the supporting-bracket for the lock which prevents the backward movement of the toothed wheel. Fig. 5 is a detail perspective view of the locking-pin for the toothed operating-wheel.

In the operation of the electrical switch described and claimed in the patent above referred to the switch-tongue-operating mechanism is arranged within a suitable casing 1, which is provided with a removable cover 2. This casing is preferably provided with ribs 3, which serve to materially strengthen the same. This casing 1 is provided in one of its ends with an opening 4, in which is secured a stuffing-box 5, through which the switch-tongue-operating rod extends, this rod 6 being connected at its outer end to the switch-tongue. (Not shown.)

Mounted upon the bottom of the box or casing 1 are a pair of supporting-standards 7 7', provided on their outer faces with bosses 8 8', respectively, the boss 8' abutting against the one end of the box or casing 1, so as to receive the tap-screw or like securing device 9. Journaled in these standards 7 7' and in their bosses 8 8' is a shaft 10, which extends outwardly beyond the boss 8 of the standard 7 and has mounted thereon a ratchet-wheel 11. This ratchet-wheel is mounted on the extended end of the shaft 10 within an operating-lever 12, which is of a yoke or open-link form and said operating-lever being free to swing upon the shaft 10 and held in position thereon by a pin 14. Connected to this operating-lever by a pin or bolt 15 is a yoke or clevis 16, carrying a shaft 17, which extends into a socket 18, formed integral with or secured to the inner face of one side of the box

or casing 1. Between this socket 18 and the head of the yoke or clevis 16 is arranged a stiff coil-spring 19 for the purpose of returning the operating-lever to its normal position after the same has been actuated and the magnets of the electric operating mechanism are deenergized. The operating-lever 12 is connected near its lower end by a pin 20 to an operating rod or cable 21, extending outwardly through the side of the box or casing and connected to the core of a solenoid. (Not shown.) When the operating-lever 12 is actuated, the ratchet-wheel 11 and shaft 10 are operated by the engagement with the ratchet-wheel 11 of a pawl 22, which is mounted on the pin 15 and held at all times in engagement with a spring 23, which is attached to the operating-lever. The supporting-standard 7 is provided upon its boss 8 with a boss 24, which is cored to receive the locking-pin 25, extending through said boss and through the standard, which pin carries on its outer end a link-shaped head 26. Engaging in the curved slot in this link-shaped head 26 is a pin 27, which is carried on the upper end of the operating-lever 12, the slot in said link being so placed that the actuating of the operating-lever forces the locking-pin inwardly toward the toothed operating-wheel. Mounted upon the shaft 10 between the standards 7 7' is a toothed operating-wheel 28, which may be rigidly secured to said shaft by a key 29, as shown, or in any other suitable manner in order to make the same rigid with the shaft. This operating-wheel 28 is provided with a series of throwing-lugs 29', which are arranged thereon alternately upon each side of the wheel. This wheel also is formed on its one face with a series of lugs 30, which are circumferentially arranged on the face of the wheel around the hub thereof and are adapted to engage with the locking-pin 25 when the operating-wheel has been actuated a sufficient distance to move the same forward one tooth and operate the switch-tongue. The inner end of the rod 6 is connected to a sleeve 31, this sleeve being provided at its opposite end with flanges 32, which abut against the cross-head 33, carried on the outer end of the slotted throwing-rod 34. This slotted throwing-rod 34 is connected at its inner end or terminates in a yoke 35, which operates within the standards at their upper ends and carries rollers 36, which are adapted to be engaged alternately by the inclined faces of the throwing-lugs 29' as the toothed wheel is operated. Rollers 37 are journaled in the standards for engagement with the side of the yoke to facilitate the movement of the same. A cross-head 38 is mounted on the slotted throwing-rod 34 adjacent to the outer end of the yoke 35 and carries a pin 39, which operates through a slot in said rod. This cross-head 38 is connected to the flanges 32 of the sleeve 31 by tie-rods 40, which operate through the cross-head 33 and flanges 32. A stiff coil-spring 41 is arranged above the slot-

ted operating-rod 34 between the cross-heads 33 39.

Secured upon the top of the standards 7 7' is a bracket 42, substantially T-shaped in form, the head thereof carrying on its underneath face slotted lugs 43, which lie between the standards 7 7'. This bracket 42 carries locking means which prevents the backward turning of the wheel as the operating-lever returns to its normal position after the magnets have been deenergized. This locking or preventing device in the accompanying illustration, as shown, is formed of a substantially Y-shaped spring 44, the doubled end of which lies under the arm 42' of the bracket 42 and is secured by a clamp or nut 45 and a bolt or screw 46 passed through the arm 42' near its end and into the nut or clamp 45. The free ends 47 are bent downwardly in an angular direction, so as to be engaged alternately by the inclined faces of the lugs on the toothed wheel 28, and as the lug passes beyond the underneath ends of the spring this spring flies back into position behind the lugs, so as to prevent the backward movement of the wheel. The arms of the spring lie within the slotted lugs 43. It will thus be observed that when the toothed wheel 28 is actuated one of the inclined lugs on said wheel engages with its inclined face one of the angular ends 47 of the locking-spring, forcing the same outwardly until the lug of the wheel passes beyond the end of the spring, when the latter retracts or returns to its normal position, where it will be back of the lug that has just actuated the same, so as to hold the wheel against backward movement as the operating-shaft is being returned to its normal position.

The standards 7 7' are preferably cast with webs 7^a, which are fastened to the one face of the box, and located in the bottom of the box or casing 1 are stops 48 49, the former to limit the movement of the operating-lever 12 when being actuated and the latter to limit the return movement of the lever under the action of its spring 19 when the magnets are deenergized. When the magnets of the switch are energized and the rod, chain, or cable 21 thereby operated, together with the operating-lever 12, which in turn operates the toothed wheel to actuate the yoke 35 and through its action to operate the switch-tongue, (not shown,) it will be observed that the movement of the operating-lever causes the pin 27 to force the locking-pin 25 inwardly, where it will be engaged by one of the lugs 30 to prevent the movement of the operating-wheel or lock the same against further movement than the passage of one of the lugs between the yoke to operate the latter and actuate the switch-tongue. In the construction the standards 7 7', socket 18, and the stops 48 49 may be all cast integral with the box or casing, thereby materially simplifying and cheapening the construction of the same. The standards may, however, if de-

sired, be cast independent of the box or casing and suitably secured therein.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In operating mechanism for electric switches, an operating-wheel having lugs on each side thereof, combined with a spring-lock the arms of which spread under action of the lugs on the forward movement of the wheel and retract after the passage of each lug to lock the wheel against rearward movement, substantially as described.

2. In operating mechanism for electric switches, an operating-wheel having lugs on each side thereof, combined with a substantially Y-shaped locking-spring having angular ends which engage back of the lugs at each operation of the wheel and lock the latter against rearward movement, substantially as described.

3. In operating mechanism for switches, the combination with an operating-wheel having operating-lugs, of a Y-shaped locking-spring the arms of which are engaged and spread by the lugs in the forward movement of the wheel, and the ends of which arms engage back of the lugs to lock the wheel against rearward movement, substantially as described.

4. In operating mechanism for switches, an operating-wheel having inclined-faced lugs on both sides thereof, and a spring-lock having arms which are spread by the lugs on the forward movement of the wheel, said arms when in their normal position lying back of the lugs to lock the wheel against rearward movement, substantially as described.

5. In operating mechanism for electrical switches, an operating-wheel having lugs alternately arranged on opposite sides thereof, and means for actuating said wheel, of means for engagement back of the lugs on each operation of the wheel to prevent the rearward movement of said wheel, substantially as described.

6. In operating mechanism for electrical switches, an operating-wheel having lugs alternately arranged on opposite sides thereof, and means for actuating said wheel, of means for engagement back of the lugs on each operation of the wheel to prevent rearward movement of said wheel, and means operated by the operating mechanism of the wheel for limiting the forward movement of said wheel at each operation.

7. In switch-operating mechanism including an operating-wheel having lugs alternately arranged on opposite sides thereof, and lugs arranged circumferentially on one face of said wheel around its hub, of a locking-pin operated simultaneously with the wheel and adapted to be engaged by said lugs for limiting the movement of said wheel at each operation thereof, substantially as described.

8. In switch-operating mechanism including an operating-wheel having lugs alternately arranged on opposite faces thereof, and

lugs arranged circumferentially on one face of said wheel around its hub, of a locking-pin operated simultaneously with the wheel and adapted to be engaged by said lugs, for limiting the movement of said wheel at each operation, and means within the path of travel of said wheel to engage with the alternately-arranged lugs and prevent backward movement of the wheel, substantially as described.

9. In switch-operating mechanism, an operating-wheel having lugs alternately arranged on opposite sides of said wheel, means for actuating said wheel, and means projecting into the path of travel of the wheel to engage with said lugs and prevent backward movement of the wheel, substantially as described.

10. In switch-operating mechanism, an operating-wheel, a shaft upon which said wheel is mounted, a ratchet-wheel mounted on said shaft, an operating-lever straddling said ratchet-wheel, a spring-pressed pawl engaging said ratchet-wheel, a pin carried by the operating-lever, and means connected to the operating-lever for actuating the same, combined with a locking-pin having a slotted head to receive the pin carried by the operating-lever whereby the locking-pin is operated simultaneously with the operation of the operating-lever and operating-wheel, and lugs on the face of said operating-wheel to engage with the locking-pin to limit the forward movement of the operating-wheel, substantially as described.

11. In operating mechanism for switches, an operating-wheel having inclined-faced lugs on both sides thereof, a spring-lock having arms which are spread by the lugs on the forward movement of the wheels, said arms when in their normal position lying back of the lugs to lock the wheel against rearward movement, a series of lugs circumferentially arranged around the hub of the operating-wheel, and a locking-pin operated simultaneously with the wheel to engage with the circumferentially-arranged lugs to limit the forward movement of the said wheel, substantially as described.

12. In switch-operating mechanism, an operating-wheel, a shaft upon which said wheel is mounted, a ratchet-wheel mounted on said shaft, an operating-lever straddling said ratchet-wheel, a spring-pressed pawl carried by the operating-lever and engaging said ratchet-wheel, means connected to the operating-lever for actuating the same, a pin carried by the operating-lever, a locking-pin provided with a slotted head to receive the pin carried by the operating-lever, and lugs carried by the side of the operating-wheel to engage with the locking-pin and limit the movement of the operating-wheel at each operation, substantially as described.

13. In switch-operating mechanism, an operating-wheel, a shaft upon which said wheel is mounted, a ratchet-wheel mounted on the shaft, an operating-lever straddling said

ratchet-wheel and connected to the shaft, a spring-pressed pawl carried by the operating-lever and engaging said ratchet-wheel, means connected to the operating-lever for actuating the same, a pin carried by the operating-lever, a locking-pin having a slotted head to receive said pin whereby the locking-pin is operated simultaneously with the operating-wheel, lugs carried by said wheel for engagement with said locking-pin to limit the movement of the operating-wheel at each operation, and means within the path of travel of the wheel to prevent backward movement of said wheel, substantially as described.

15 14. In switch-operating mechanism, the combination with an operating-wheel inclined-

20 faced lugs on said wheel, and means for actuating the wheel, of a locking-spring the ends of which straddle the wheel and engage the back of the lugs to hold the wheel against rearward movement, and a locking-pin operated simultaneously with the wheel to engage with the latter and limit the forward movement thereof at each operation, substantially as described.

25 In testimony whereof we affix our signatures in the presence of two witnesses.

JOHN H. SPANGLER.
REINHOLD HERMAN.

Witnesses:

JOHN NOLAND,
A. M. WILSON.