

No. 671,278.

Patented Apr. 2, 1901.

E. M. HEWLETT.

ELECTRICALLY CONTROLLED SWITCH.

(Application filed Dec. 30, 1898.)

(No Model.)

3 Sheets—Sheet 1.

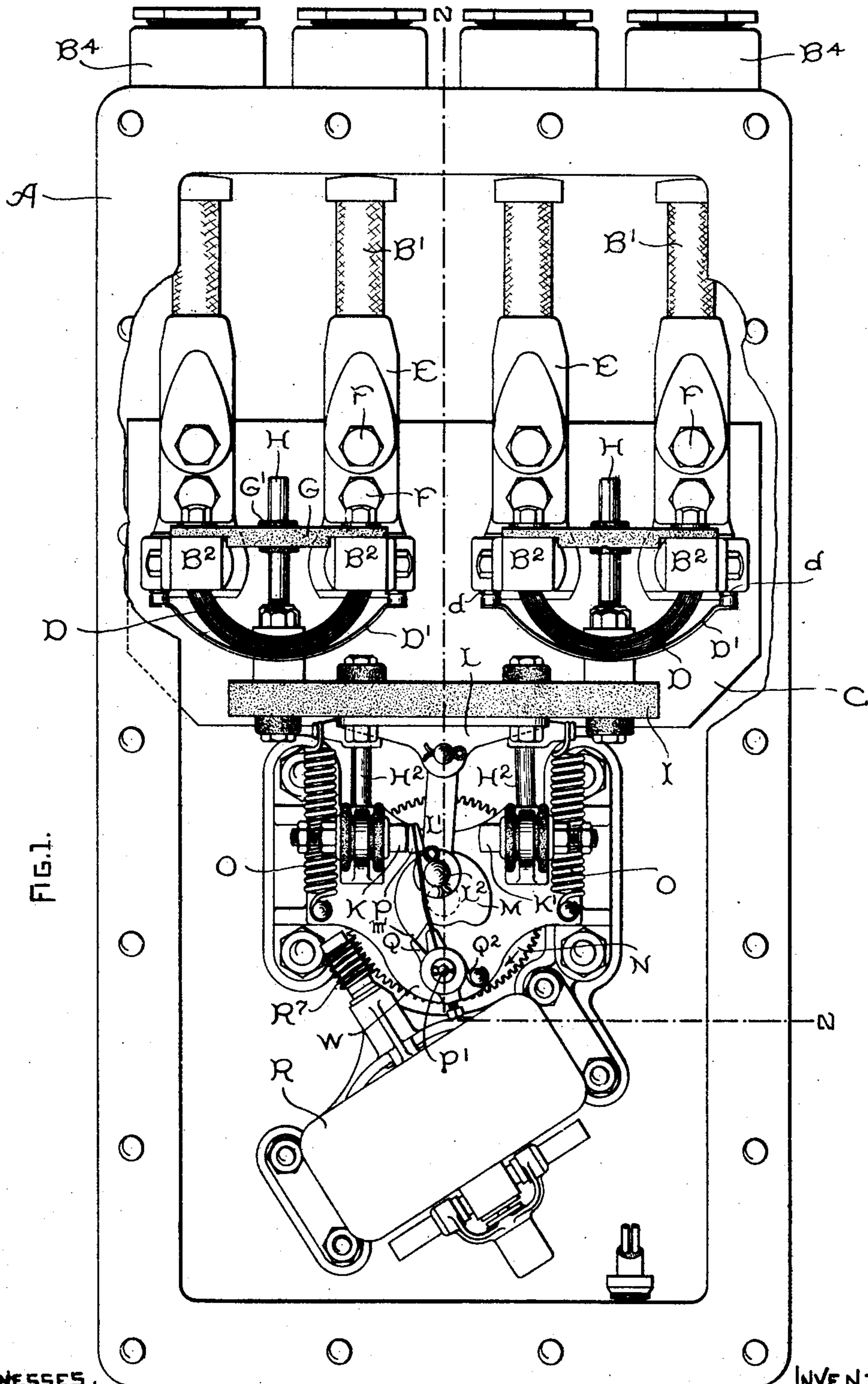


FIG. 1.

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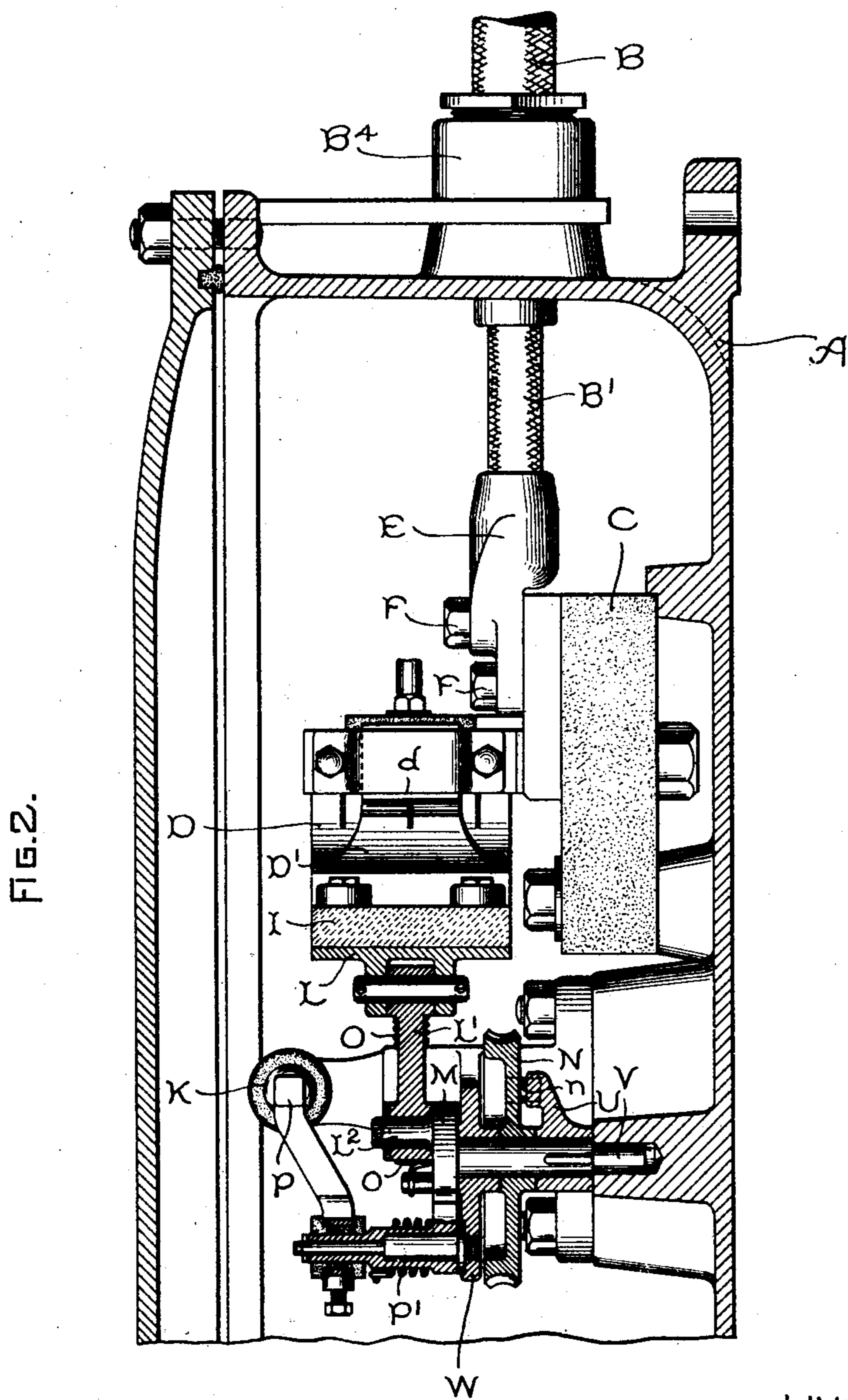
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3 Sheets—Sheet 3.

FIG. 3.

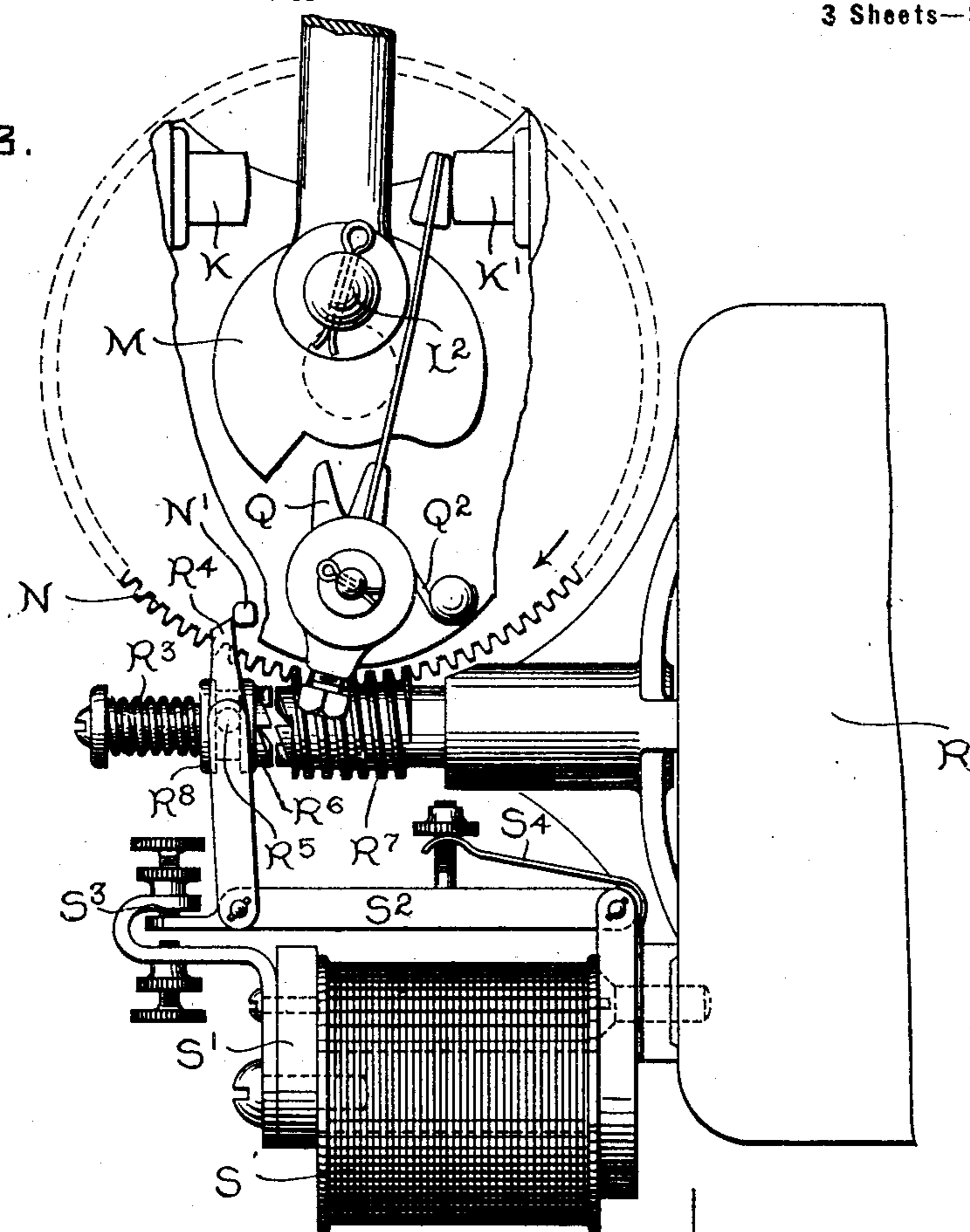
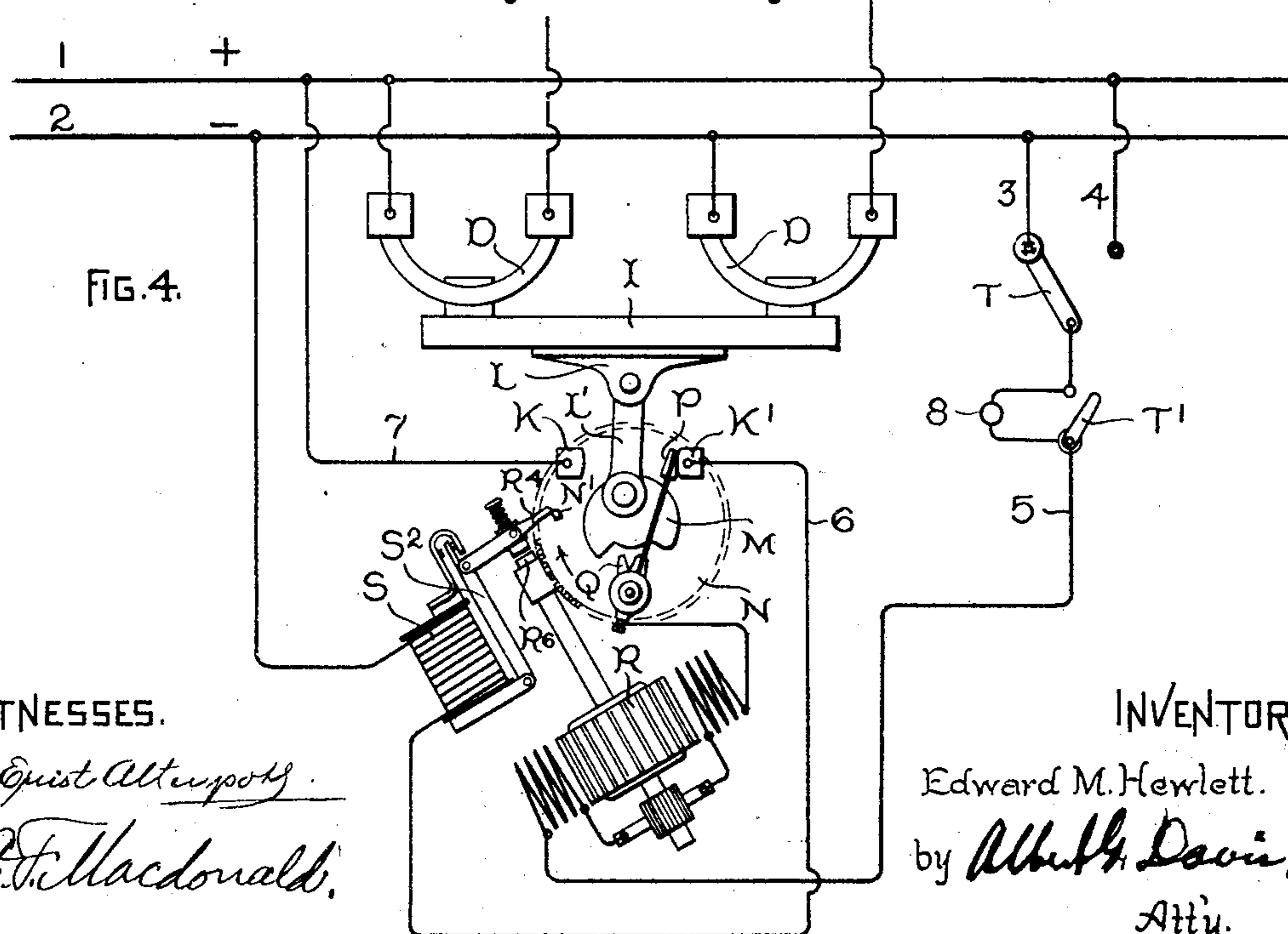


FIG. 4.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

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## ELECTRICALLY-CONTROLLED SWITCH.

SPECIFICATION forming part of Letters Patent No. 671,278, dated April 2, 1901.

Application filed December 30, 1898. Serial No. 700,710. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD M. HEWLETT, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electrically-Controlled Switches, (Case No. 650,) of which the following is a specification.

My present invention relates to electrically-controlled switches such as are used, for example, for junction-boxes of underground systems, by which a branch circuit is connected to the main or feeder circuit by apparatus operated from a distance.

The particular type of switch which I have constructed consists in its essential features of a rotary motor, which by a system of gearing not only operates the circuit connections, but also throws a switch by which it is cut out of circuit after its office has been performed and a new circuit established by means of which the motor may be again operated for a certain definite time, again shifting its own circuit and operating the connections as before. The opening of the motor-circuit is effected by a double-acting snap-switch having a quick break in both directions. Inasmuch as the usual underground systems are adapted only for moderate or low potentials no arc-extinguishing means is provided for any of the different contacts to be made or broken; but nothing in my invention limits me in this regard, as any usual device for this office might be added without invention. Not only does the motor thus control its own circuit, so that its operation is suspended after a certain time, but it is mechanically connected to the gearing by means of a loose connection or clutch, so that after a certain length of time, even should the motor continue to run by momentum, its operative connection with the gearing will be broken until the circuit is again established through the motor. In the circuit of the motor is a device by means of which the operative connection between the motor and gearing will be again reestablished as soon as current-flow is established in the motor. In addition to the loose connection between the motor and the gears there is also a lost-motion connection between the gear and the cir-

cuit-breaker, operative in one direction only, the arrangement of this being such that if for any reason the usual springs should fail to open the circuit the continued motion of the motor would positively open the circuit-breakers to a sufficient distance to prevent arcing.

The circuit-mains are employed to convey current to the motor, and a single auxiliary line is run from the point at which the motor is to be controlled to the junction-box. In this line I prefer to arrange some sort of a testing device or indicator, by preference an incandescent lamp, which shall be of such high resistance that when it is in circuit sufficient current will not flow to start the motor. A switch is arranged by which the indicator may be cut out of circuit, and sufficient current then flows to rotate the motor until its cycle of operations is performed.

The accompanying drawings show a junction-box and its inclosed mechanism in which my invention has been embodied.

Figure 1 is a plan of a box. Fig. 2 is a section of a part of the box upon the line 2 2 of Fig. 1. Fig. 3 is an enlarged detail of the connection between the motor and the circuit-breakers, and Fig. 4 is a diagram of the circuits.

In Figs. 1 and 2, A is the frame of the box, which, as usual, is made of an integral casting.

B in Fig. 2 shows one of the main cables.

C is a slab, of slate or other substantial insulating material, to which the terminals B<sup>2</sup>, B<sup>3</sup>, &c., of the circuit-breakers are affixed. Cables B' B' enter the box through the glands B<sup>4</sup>. The cables end in metal terminals E, which are secured in place by the bolts F F. Each pair of terminals B<sup>2</sup> is connected by a bridge D, formed of a number of strips of good conducting metal, so as to have a limited flexibility, and an additional set of contacts d is closed by a strip D'. These latter contacts are preferably of carbon, for well-known reasons. The bridge is carried upon a pin H, moving in a guide G', supported by a bar G, the latter being of insulating material. There are two of the circuit-breakers, one for each side of the system. They are carried by a bar I, of slate or other insulating material having sufficient rigidity. Pins

H<sup>2</sup> H<sup>2</sup> keep the bar in position and act as guides. Springs O O open the circuit when the gear is rotated to the proper position, as presently to be described. The motor R (see  
 5 Figs. 1 and 3) is provided with a worm R<sup>7</sup>, meshing with the gear N. A cam M, operated by the gear, but having a separable connection therewith, acts through the medium of the pawl Q to throw the contact P from  
 10 one to the other of the contacts K K' as the gear rotates. The cam also carries a pin L<sup>2</sup>, connecting the arm to the plate L on the under side of the insulating-bar I, the rotation of the cam acting to open and close the circuit-breakers. A lost-motion device is also  
 15 provided, as presently to be described.

Referring now more particularly to Fig. 3, the end of the motor-shaft has a ratchet R<sup>6</sup> fast to the motor-shaft, registering with a  
 20 similar ratchet on the end of a loose sleeve which carries the worm R<sup>7</sup>. A collar R<sup>8</sup> is secured to the shaft, and a pin R<sup>5</sup> slides in the collar as the latter rotates, the pin being fast to the lever R<sup>4</sup>. A suitable spring R<sup>3</sup>  
 25 acts to force the ratchets into engagement. As the gear N rotates a lug N' upon it engages with the end of the lever R<sup>4</sup> and draws the ratchets out of engagement. The lever R<sup>4</sup> is in turn fast to the armature S<sup>2</sup> of an  
 30 electromagnet S, having the yoke S' and the spring S<sup>4</sup>, together with an adjustment S<sup>3</sup>, by which the position of the lever R<sup>4</sup> may be varied as required.

The device for giving the snap action to the  
 35 circuit-breakers will be best understood from Figs. 1 and 2. Referring more particularly to Fig. 2, V is a stud which carries the cam M and upon which rotates the gear-wheel N, the latter being loose on a sleeve turning on the  
 40 stud, but keyed to the arm U. W is a part of the frame forming a front bearing for the sleeve-carrying cam M. On the back of the gear is a lug n, registering with the arm U, keyed to the stud V, the arm thus being rigid  
 45 with the cam M. The lug n has only contact with the arm U, so that the arm is free to move in one direction, but not in the other. The pawl Q is pivoted on the stud P', which is fixed to a part of the frame W of the appa-  
 50 ratus. This pawl is provided with a toe, which is operated by the walls of the notch in the cam M. The spring Q<sup>2</sup> acts to throw the pawl in one direction—that is, to the right toward the contact K'—and the cam throws  
 55 the pawl in the opposite direction, maintaining it against the opposite contact K until the cam has made its complete revolution to nearly the illustrated position, in which the toe remains in engagement with the shoulder m'. An instant later it is released, the  
 60 spring Q<sup>2</sup> carrying the contact P back to the contact K'. The springs O O being much stronger than the spring Q<sup>2</sup>, when the loose connection between the cam M and the gears  
 65 is actuated the latter spring is immediately overpowered. The device is thus a double-acting snap-switch, breaking the circuit

quickly and positively in both directions of its movement. The operation of this part of the device is as follows: When the motor ro-  
 70 tates, the gear is turned in the direction of the arrow. (See Figs. 1 and 3.) The cam is thus rotated, and when the stud L<sup>2</sup> passes the center the springs O O force down the bar I, and with it the link L', the arm U snapping  
 75 away from the lug n on the back of the gear N.

Referring now to Fig. 4, the circuits of the apparatus may be readily traced. 1 2 are the  
 80 circuit-mains, and 3 4 are the leads from them to the terminals of the switch T. In the illustrated position the circuit of the motor is open, as will be seen by tracing from the lead 3  
 85 through the motor to the contact P, then by lead K', wire 6, and electromagnet S, the circuit as thus traced starting from the minus  
 90 main and returning to the same side, so that no current flows. The ratchet R<sup>6</sup> is also out of engagement, as illustrated.

If now it be desired to open the circuit-breakers, the switch T would be thrown to  
 95 connect with the plus side of the circuit, when current would pass through the motor from the positive to the negative side over the circuit thus traced, the armature S<sup>2</sup> of the elec-  
 100 tromagnet S would be attracted, releasing the bar R<sup>4</sup>, the ratchet would come into engagement, and the motor would rotate by current until the cam M engaged with the pawl Q,  
 105 throwing the contact P to the other side of the circuit, where it would engage with the contact K and the lead 7. The circuit would thus be broken, but the motor would continue to run by momentum for a short time. As  
 110 soon as the circuit was broken the bar R<sup>4</sup> would be brought into the path of the lug N' (see Fig. 3) and the ratchet would be disengaged, so that after the circuit was established on the other side in readiness for a new im-  
 115 pulse of current the motor would cease to turn the worm R<sup>7</sup> and the device would quickly stop.

In the lead 5 from the switch T is a lamp 8, controlled by the switch T'. As already pointed out, it is designed to have the lamp  
 120 of such high resistance that not enough current could flow to start the motor. When the switch is thrown from one side to the other, it serves to show whether the connections are in proper shape for the operation of the motor, which may be then thrown into  
 125 action by the switch T', shunting the lamp and of ample current-carrying capacity.

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

1. A motor-operated switch, comprising a  
 130 driving electric motor operative always in the same direction, a gear, a clutch connecting the two, means for disconnecting the same after a definite range of movement, a two-way circuit-controller in the motor-circuit, a  
 135 lost-motion connection between the same and the gear, and a control-circuit having connections with the two contacts of the two-way switch.

2. The combination with a circuit-controlling device of a motor rotating always in one direction, a gear, a lost-motion connection between the gear and the circuit-controller, a clutch with the motor disconnected after a  
5 determined range of movement, and a switch operated by the connection for opening the motor-circuit and reestablishing it to the opposite main.

10 3. In a junction-box, means for opening and closing the connection between branch and main lines, a motor rotating in one direction only, a gear, a lost-motion connection between the gear and the circuit-breakers, a  
15 clutch with the motor disconnected after a determined range of movement, and a double-acting snap-switch operated by the connection for opening the motor-circuit and reestablishing it to the opposite main.

20 4. The combination of a motor rotating in one direction only, a switch opened and closed thereby, a gear operated by the motor, a two-way switch for the motor operated by the gear, a clutch between the gear and the motor, means for throwing the clutch out of ac-  
25 tion by the rotation of the gear to a definite position, and a control-circuit having connections with the points of the two-way switch.

30 5. The combination of a motor, a gear, circuit-breakers operated by the gear, a snap-switch for opening the motor-circuit, a clutch between the gear and the motor, a stud on the gear for disengaging the clutch at a certain definite position, a switch at a desired  
35 point for reestablishing the motor-circuit, and means for reengaging the clutch when the motor-circuit is established.

40 6. The combination of a motor, a gear, a clutch between the motor and the gear, a lever connected to the clutch, a stud on the

gear for operating the clutch at a definite position and disengaging the gear from the motor, circuit-breaking devices operated by the gear, a switch also operated by the gear for opening the motor-circuit at a definite  
45 position, another switch at a desired point for reestablishing the motor-circuit, and a magnet in the circuit of the second switch for disengaging the clutch-lever from the stud on the gear so that the clutch is again thrown  
50 into action.

7. The combination of a motor, a circuit-breaking device, a clutch between the circuit-breaker and the motor, means for disengaging the clutch after a determined range  
55 of movement, means for opening the motor-circuit, and a magnet in the motor-circuit for reengaging the clutch whenever the motor-circuit is established.

8. The combination of a motor, a double-  
60 acting snap-switch connected to the motor so that at certain definite times the motor opens its own circuit, a clutch releasing the switch after a definite range of movement, and a control-switch at a desired point for reestablish-  
65 ing the motor-circuit.

9. In a switch, the combination of fixed contacts, vertically-movable contacts carried by a spring-actuated frame, a crank and motor driving the same to close the contacts,  
70 thereby straining the spring, and means for releasing the frame after a determinate range of motor movement and permitting it to freely obey the spring.

In witness whereof I have hereunto set my  
hand this 28th day of December, 1898.

EDWARD M. HEWLETT.

Witnesses:

T. J. JOHNSTON,

B. B. HULL.