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G. A. TATE.

MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS.

APPLICATION FILED NOV. 29, 1901.

NO MODEL.

Fig. 1.

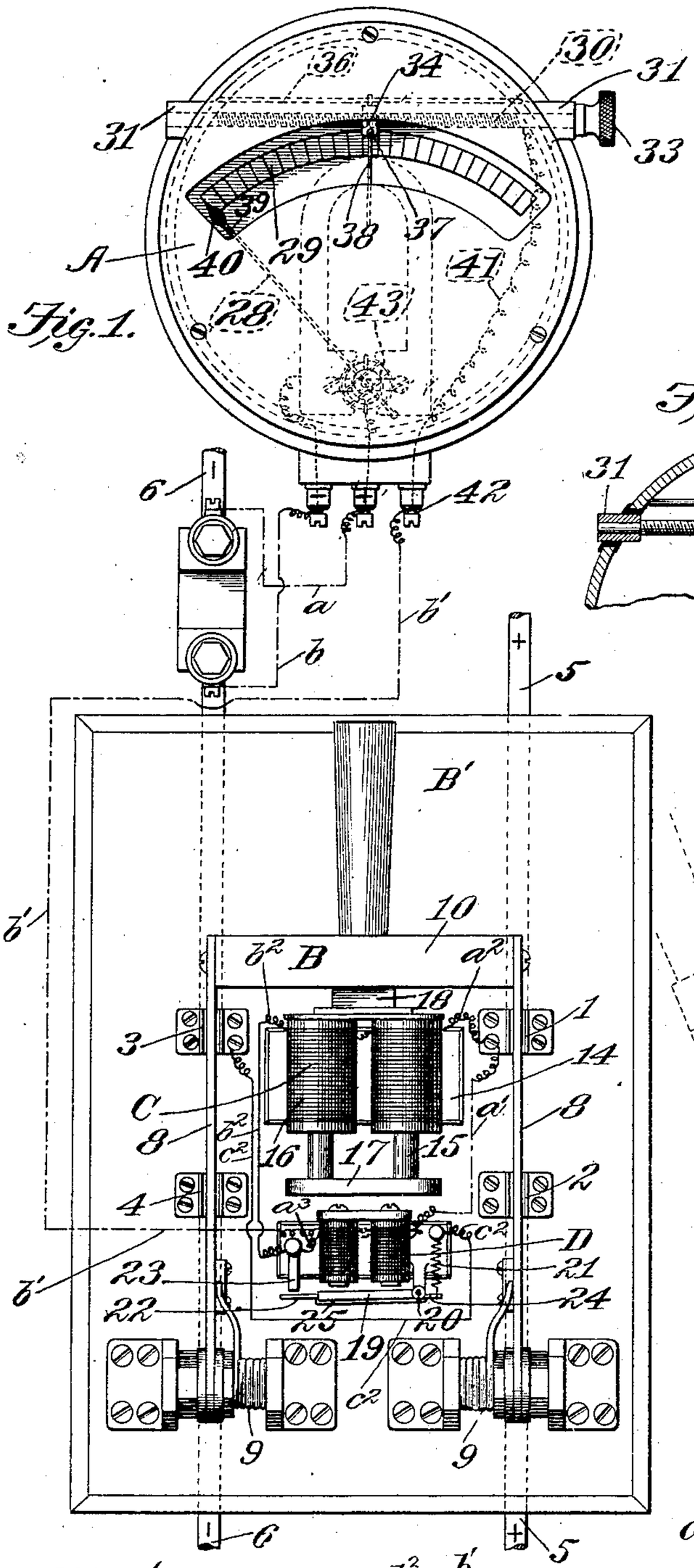


Fig. 2.

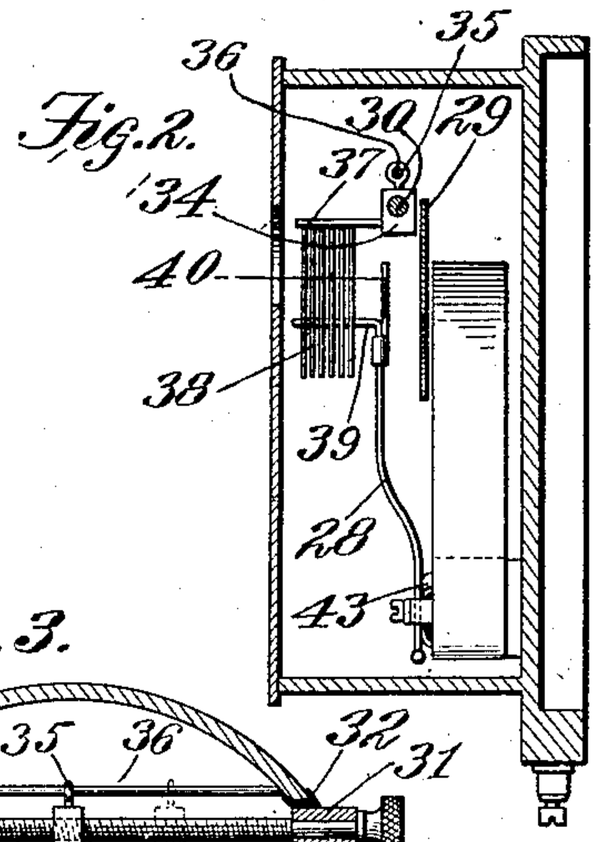


Fig. 3.

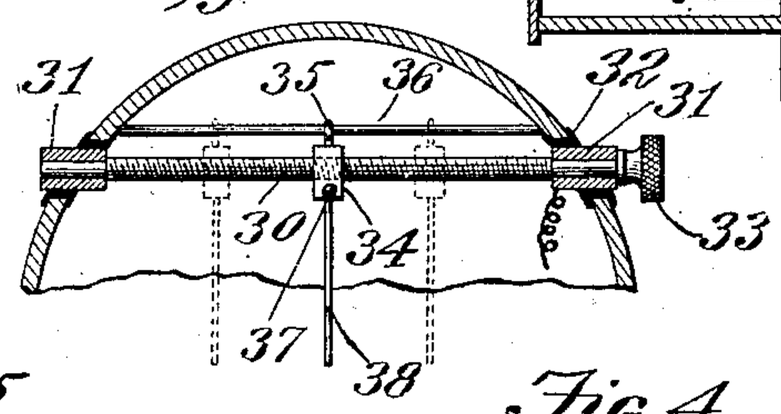


Fig. 4.

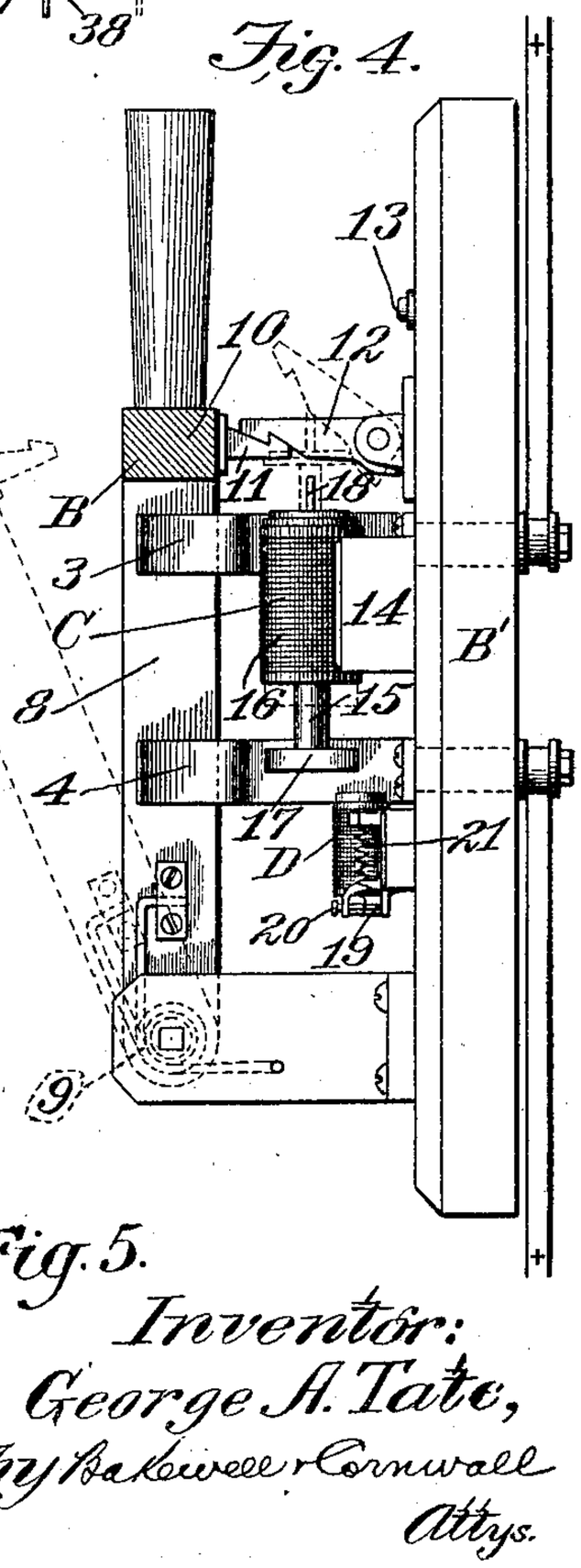
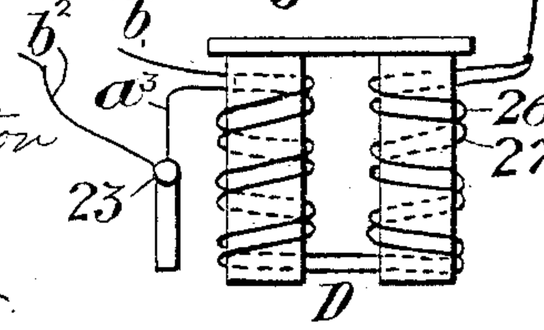


Fig. 5.



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UNITED STATES PATENT OFFICE.

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MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 726,479, dated April 28, 1903.

Application filed November 29, 1901. Serial No. 84,115. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. TATE, a citizen of the United States, residing at the city of Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Mechanism for Controlling Electric Circuits, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a view showing the measuring instrument, the circuit-breaker, and the magnets in front elevation, the various circuits being indicated. Fig. 2 is a side elevation, partly in section, of the measuring instrument. Fig. 3 is a fragmentary front view, partly in section, of said instrument. Fig. 4 is a side elevation, partly in section, of the circuit-breaker and the magnets; and Fig. 5 is a diagrammatic view showing the winding of the auxiliary magnet.

My invention relates to mechanism for controlling electric circuits, my objects being to automatically break the circuit or give an alarm through the agency of some movable part, as the pointer of an electrical measuring instrument, controlled by the current flowing through said circuit, and also to operate the circuit-breaker or alarm by means of a shunt-circuit controlled by such beforementioned movable part.

To these ends and also to improve generally upon mechanisms of the character indicated my invention consists in the various matters hereinafter described and claimed.

Referring now more particularly to the drawings, A represents an electrical measuring instrument, which is indicated as an ammeter.

B represents a switch or circuit-breaker, C the main operating-magnet, and D an auxiliary magnet. For convenience and compactness the circuit-breaker and the magnets are mounted upon the same board or base B′. The circuit-breaker here selected to illustrate my invention has spring-terminals 1, 2, 3, and 4, arranged in pairs, the terminals 1 and 2 being connected to the positive conductor 5, which is interrupted between said terminals, and the terminals 3 and 4 being similarly connected to the negative conductor 6, said conductors being in the circuit desired to be controlled, (usually the main working circuit.) Pivotally-supported blades 8, adapted to contact, respectively, with the terminals upon each side of the circuit in a well-understood manner, are provided with means—as, for example, torsion-springs 9—tending to force said blades out of engagement with said terminals, and upon the cross-bar 10, connecting said blades, is a hook 11, adapted to be engaged by a hook 12, pivotally supported upon the base B′. The base being usually held vertically, the the hook 12 normally lies in position to engage the hook 11. If desired, a rubber button or the like 13 can be secured to the base in rear of the hook 12 for the purpose of throwing the hook forwardly whenever it is raised and also for preventing marring of the base by said hook. In practicing my invention it is only necessary that there be provided some means for engaging and holding the blade-yoke in circuit-making position and that this means be capable of being released to permit the blades to be thrown out of said position, and it will therefore be apparent that many forms of latches can be substituted for the hooks 11 and 12. Suitably supported, as by an insulating-block 14, below the hook 12 is a solenoid-magnet C, whose cores 15 extend through the helices 16 and are connected together at their projecting ends by the cross-piece 17, the upper of which lies below and in line with the hook 12 and is provided with a thin vertical plate 18, which when the magnet is energized and the cores are drawn upwardly strikes the hook 12 and throws the same out of engagement with the hook 11, thus permitting the blades to be thrown out of contact-making position, whereby the main circuit is broken. The circuit through said solenoid is controlled by the auxiliary magnet D, whose armature 19 is pivoted, as at 20, and normally held away from the cores by means of a spring 21. Said armature carries at its free end a contact piece or finger 22, which when the armature is attracted engages a fixed contact piece or pieces 23. A second finger 24 pro-

jects from the pivoted end of the armature, and said fingers are preferably connected by a copper strip 25, lying along the outer armature-face. The coils of this auxiliary magnet are preferably provided with double windings 26 and 27, respectively, for a purpose to be more fully hereinafter described.

In the type of ammeter illustrated, 28 indicates the needle or pointer, mounted in any suitable manner and being in the ammeter-circuit, as usual, said pointer traveling over a scale 29. Extending across the scale-plate is a threaded rod 30, which is journaled in bearings 31, seated in the casing-wall of the instrument and insulated therefrom, as by rubber bushings 32, the projecting end of said rod being provided with a thumb-nut 33. A nut or traveler 34 upon the said rod has an eye 35, through which passes a guide-wire 36, whose ends are fixedly secured to the ammeter-casing, whereby rotation of the rod serves to cause travel of the nut. From a finger 37 upon said nut depends a contact-brush 38, which brush is preferably composed of small copper wires. The said brush hangs across the scale-plate, so that its position can be seen by the attendant and is of sufficient length to lie in the path of travel of a contact-finger 39 upon the needle 28. Preferably this finger is produced by merely bending the end of the needle outwardly, as shown in Fig. 2, the usual pointer end 40 being attached to the needle below its bent end. A wire 41 electrically connects one of the bearings 31 with a terminal 42 upon the ammeter-casing. The shunt-circuit, which includes the ammeter, is taken from the negative side of the main circuit, and the wires a and b connect the line conductor 6 with the positive and negative poles of the ammeter, respectively, so that the current flows, as usual, from front to rear of the armature 43, upon which the needle 28 is mounted and with which it is in electrical contact. A wire a' leads from one of the terminals upon the positive side of the circuit-breaker, here shown as the terminal 1, to the coils about the auxiliary magnet D, and from one of said coils (the coil 26) a wire b' leads to the ammeter-terminal 42, which is in electrical connection with the rod 30, and therefore with the brush-terminal 38. A wire a^2, taken from the positive side of the main circuit at substantially the same point from which the wire a' leads, connects with the coil of the solenoid-magnet C, and the other end of said coil is connected by the wire b^2 with the contact piece or terminal 23, while a wire c^2, through the medium of the spring 21, connects the armature 19 (or the fingers thereon) with the terminal 3 upon the negative side of the main circuit. A wire a^3 connects the coil 27 of the magnet D with the terminal 23. The brush-contact 38 having been set at the point which will be reached by the needle 28 when the current in the main circuit is at its greatest desired amperage, the circuit-breaker is thrown and locked by the catch 12 to complete the main circuit and the ammeter operates in the usual manner, the circuit through the auxiliary magnet D being broken between the contact-finger 39 and the brush 38 and the shunt-circuit through the solenoid-magnet being broken between the terminals 22 and 23, the spring 21 serving to hold said terminal 22 away from the terminal 23. When, however, the needle is carried to the point at which it indicates the maximum amperage which it is desired that the main current shall have, it contacts with the brush 38, and thus completes the circuit through the coils of the auxiliary magnet D, energizing said magnet and through its armature-supported contact-finger 22 completing the circuit through the solenoid-magnet C. The cores of the solenoid-magnet are at once quickly raised, and the plate 18 strikes a sharp blow upon the hook 12, which is thereby raised, causing the springs 9 to throw the blades 8 out of engagement with the terminals 1, 2, 3, and 4, and the main circuit is thus broken. The instant that the armature 19 is attracted and the terminals 22 and 23 thus brought into interengagement the coil 27 is included in a circuit formed by the line conductor 5, the wire a', the said coil, the wire a^3, the terminal 23, the armature 19, with its terminals, the spring 21, the wire c^2, and the line conductor 6, whereby the said auxiliary magnet is energized irrespective of the contact between the needle 28 and the brush 38, and therefore the circuit including the solenoid-magnet D is held closed a sufficient length of time notwithstanding any oscillation of the needle. As will be readily apparent, the ammeter is included in its usual shunt-circuit and is subjected to only the light current necessary to operate the needle and the auxiliary magnet D. The working magnet C is also included in a shunt-circuit, and the current traversing the same can be made heavy enough to quickly operate the cores with sufficient force to disengage the hook 12 without the necessity of passing this stronger current through the ammeter, the said working magnet being included in a circuit which does not include the ammeter. Thus the ammeter is operated by its usual light current, but serves to control a shunt-circuit carrying a stronger current by which the working magnet C is effectively operated. Furthermore, the main circuit is controlled by a movable part operated by said main circuit, and this movable part is preferably the needle or like member of a measuring or indicating instrument.

The heretofore-mentioned brush-terminals with which the needle-supported contact-piece engages have a slight resiliency, which permits them to yield sufficiently to prevent injury to the needle and its supporting parts should the needle-supported contact be suddenly thrown into engagement. Manifestly, if desired, two contact members, such as 38, can be employed, the needle playing between them

and thus causing operation of the controlling mechanism at either desired extreme condition of the controlled circuit. Furthermore, the main magnet C can be employed to operate a bell, and thus sound an alarm instead of breaking the circuit.

I am aware that many minor changes in the construction, arrangement, and combination of the several parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a mechanism of the character indicated, a normally closed main circuit, two shunt-circuits therefrom adapted to carry currents of different strengths, a movable part controlled by one of said shunt-circuits, a mechanism for breaking said main circuit controlled by the other of said shunt-circuits, and means whereby said shunt-circuit controlling said main-circuit-breaking mechanism is controlled by said movable part; substantially as described.

2. In a mechanism of the character indicated, a normally closed main circuit, two shunt-circuits taken from said main circuit at different points, a movable part controlled by one of said shunt-circuits, a mechanism for breaking said main circuit controlled by the other of said shunt-circuits, and means whereby said shunt-circuit controlling said main-circuit-breaking mechanism is controlled by said movable part; substantially as described.

3. In a mechanism of the character indicated, a main circuit, a shunt-circuit therefrom and including an indicating mechanism having a movable part, a second shunt-circuit from said main circuit and including a main-circuit-controlling mechanism, and a third shunt-circuit from said main circuit and including a magnet whose armature controls said circuit-controlling mechanism circuit, said magnet-circuit being controlled by said movable part; substantially as described.

4. In a mechanism of the character indicated, a main circuit, a shunt-circuit therefrom including and controlling a movable part, a normally open circuit including said movable part and a terminal adapted to cooperate therewith, a second movable part controlled by said normally open circuit, a mechanism for controlling said main circuit, and a circuit controlling said mechanism, said last-mentioned circuit being controlled by said second movable part and excluding the first-mentioned movable part; substantially as described.

5. In a mechanism of the character indicated, a main circuit, a movable part controlled thereby, a circuit including a circuit-controlling mechanism, a magnet whose armature controls a terminal of said circuit-controlling mechanism circuit, a circuit including said magnet and controlled by said movable part, and means operative upon said magnet reaching its attracted, circuit-closing position for holding the same in said position irrespective of said movable part; substantially as described.

6. In a mechanism of the character indicated, a main circuit, a shunt-circuit from one side thereof and including and operating a movable part, a relatively fixed terminal with which said movable part is adapted to contact in its movement, a magnet having two coils, an armature for said magnet, connection between one side of both of said coils and the side of said main circuit other than that from which said shunt-circuit is taken, connection between the other side of one of said coils and said relatively fixed terminal, a second relatively fixed terminal, connection between said second relatively fixed terminal and the other of said magnet-coils, a main magnet, connection between one end of the coil thereof and the before-mentioned point in said main circuit to which both coils of said first-mentioned magnet are connected, connection between the other end of said main magnet-coil and said second relatively fixed terminal, a conductor carried by said armature and adapted to engage said second relatively fixed terminal, and connection between said conductor and the said side of the main circuit from which said shunt-circuit is taken; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 27th day of November, 1901.

GEORGE A. TATE.

Witnesses:
GEORGE BAKEWELL,
GALES P. MOORE.