(No Model.) 4 Sheets—Sheet 1.

W. M. SCOTT.

AUTOMATIC MAGNETIC CIRCUIT BREAKER.

No. 592,100. Patented Oct. 19, 1897.

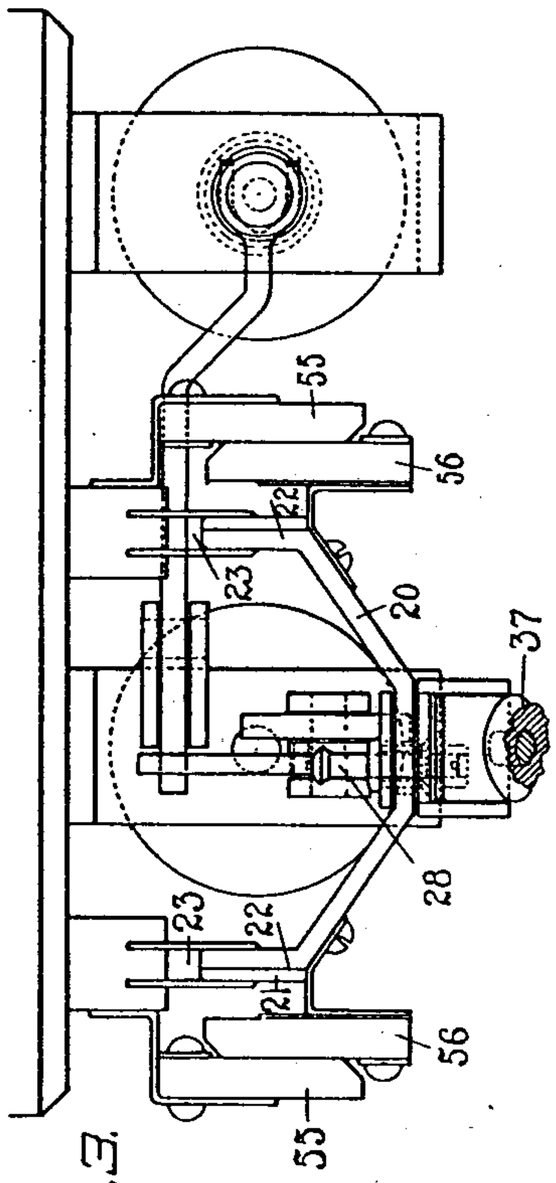

Fig. 3.

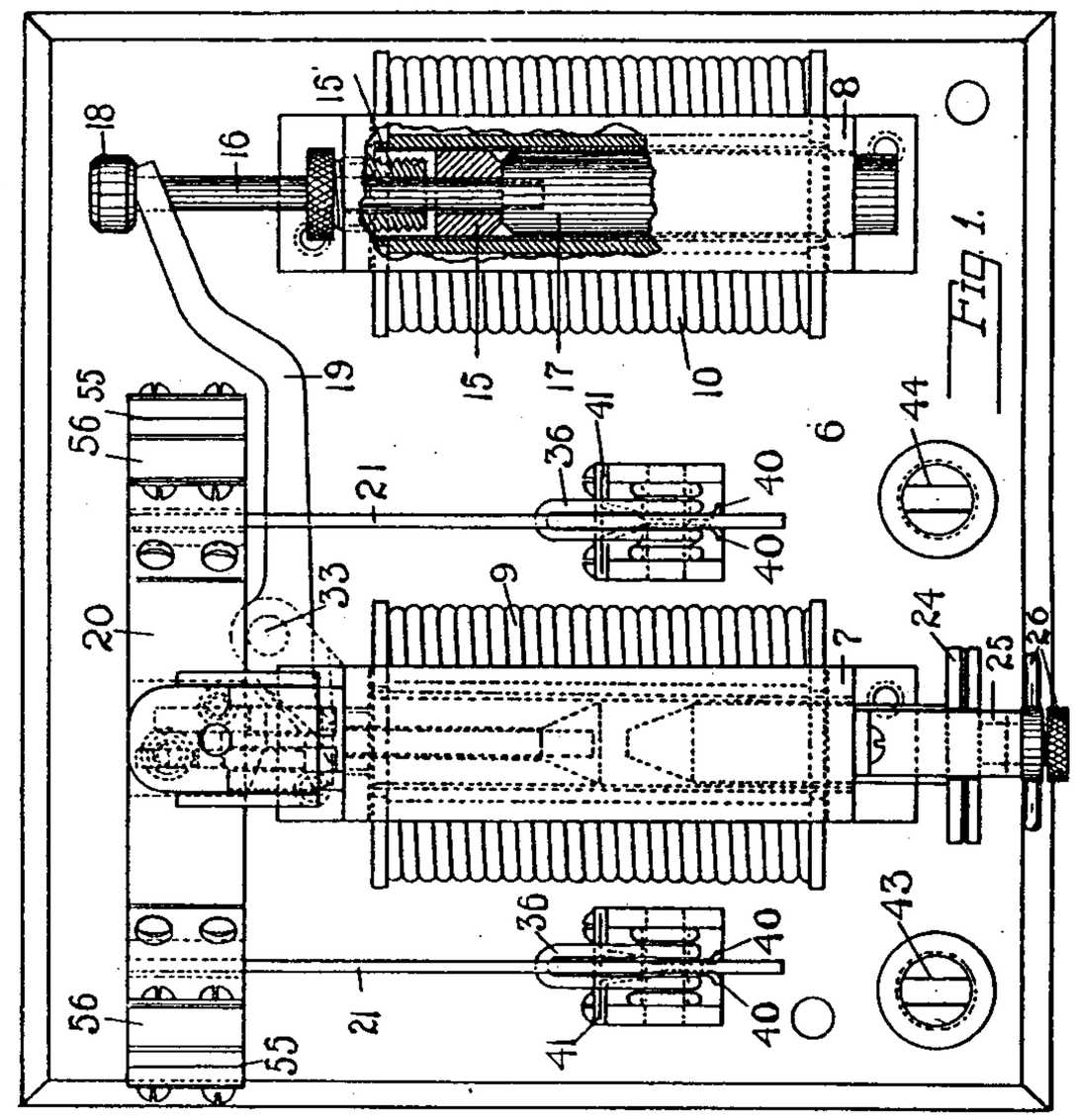

Fig. 1.

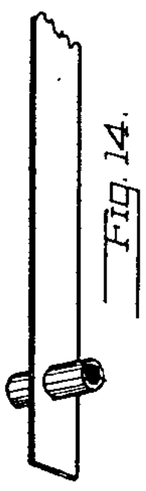

Fig. 14.

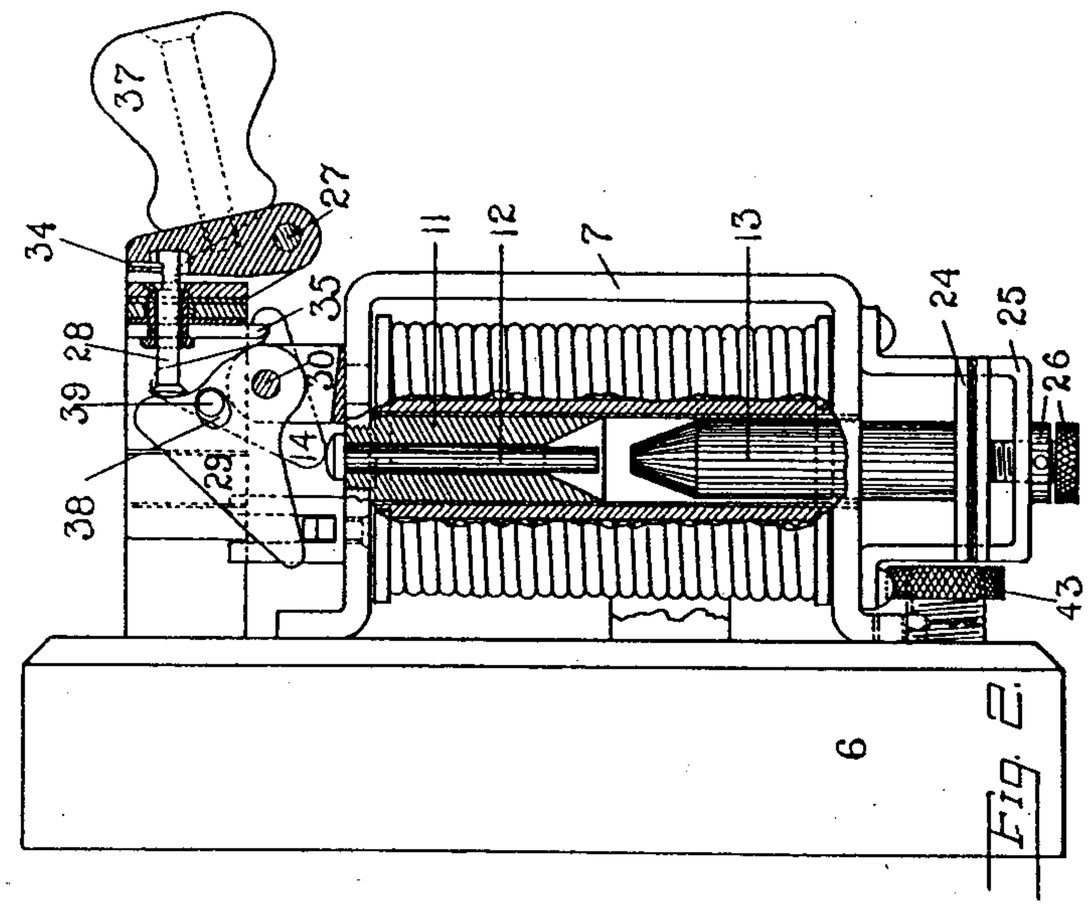

Fig. 2.

WITNESSES

J. W. Stoke Adams

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(No Model.)

4 Sheets—Sheet 2.

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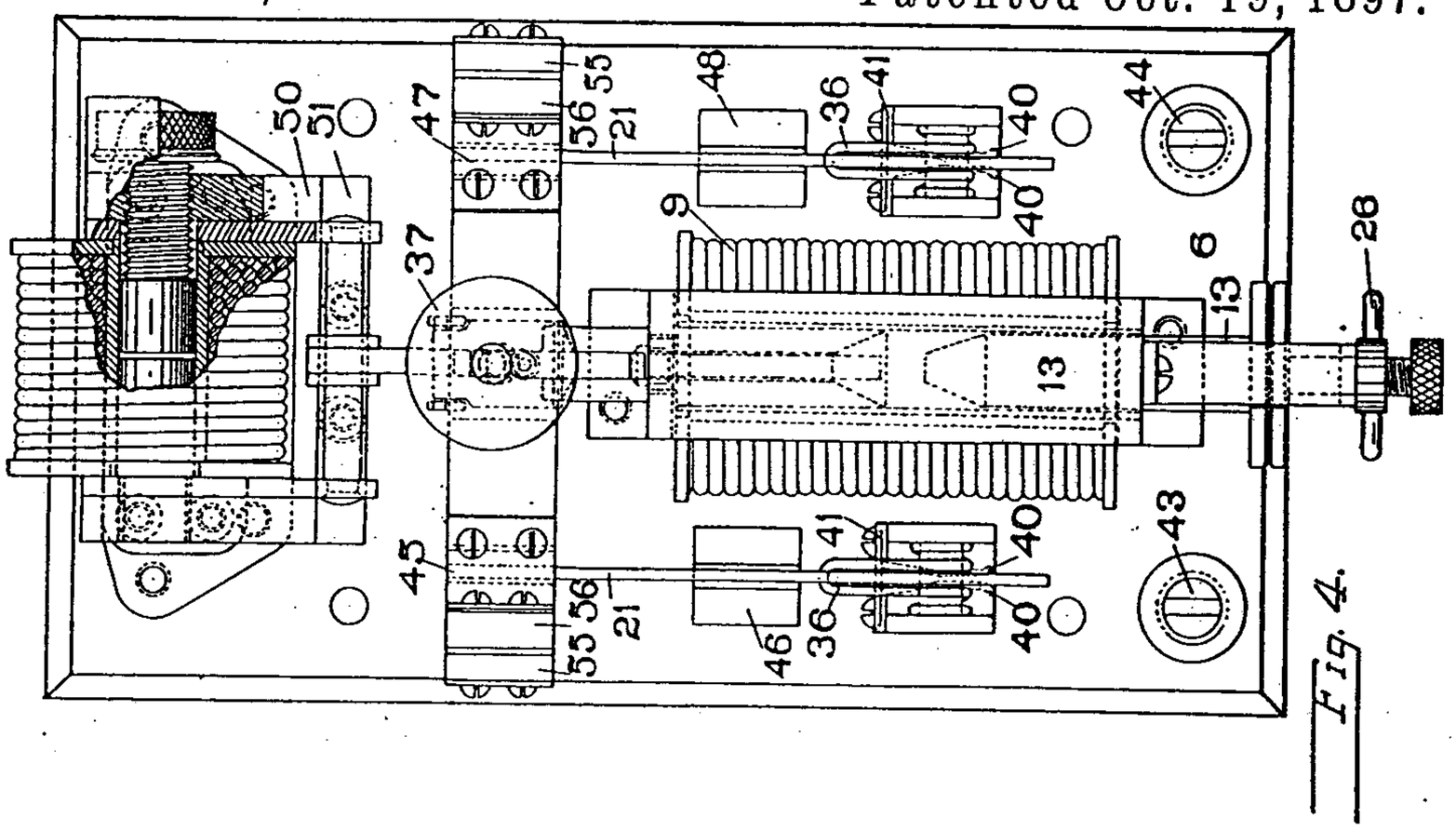

Fig. 4.

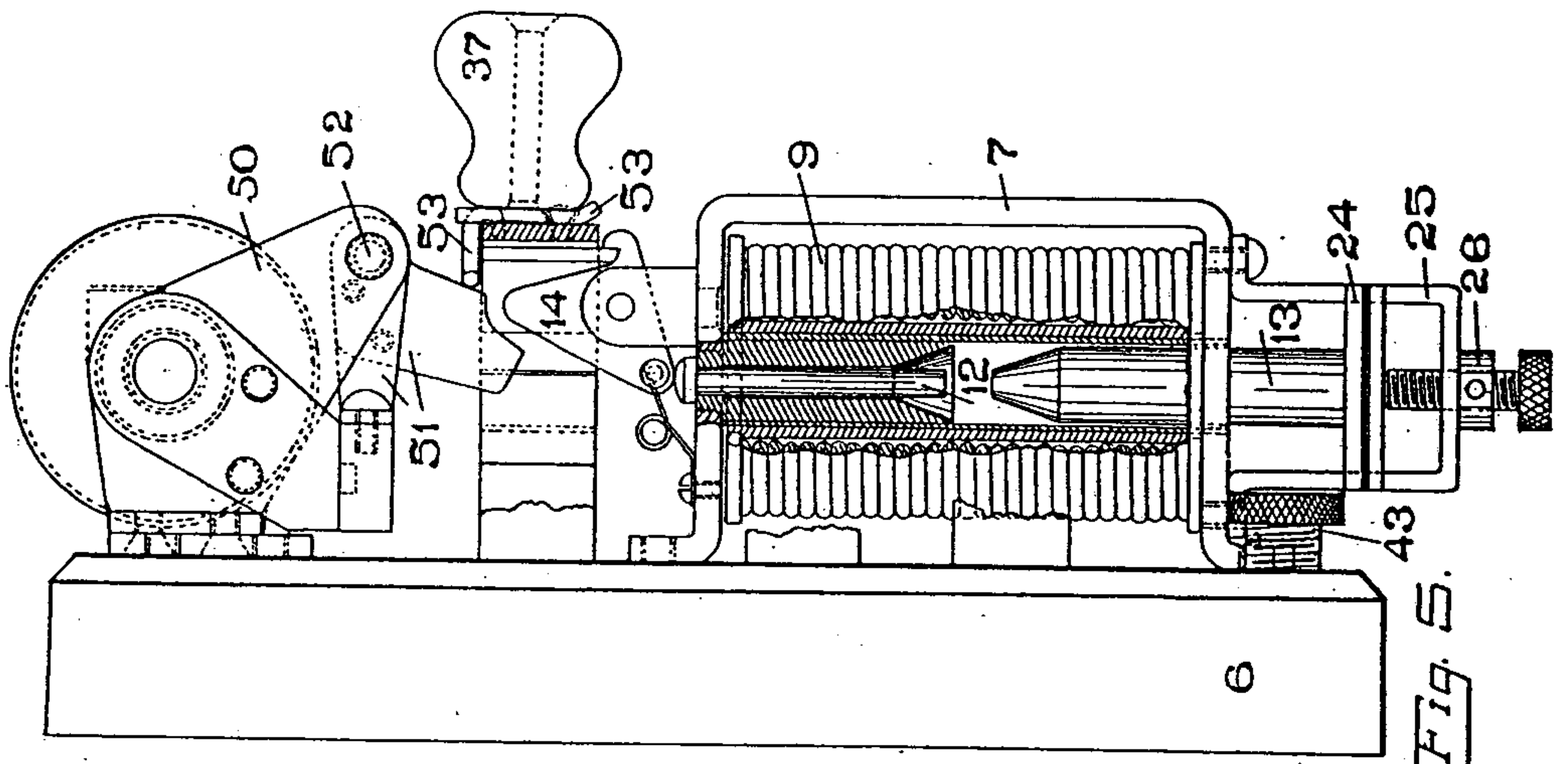

Fig. 5.

WITNESSES:

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4 Sheets—Sheet 3.

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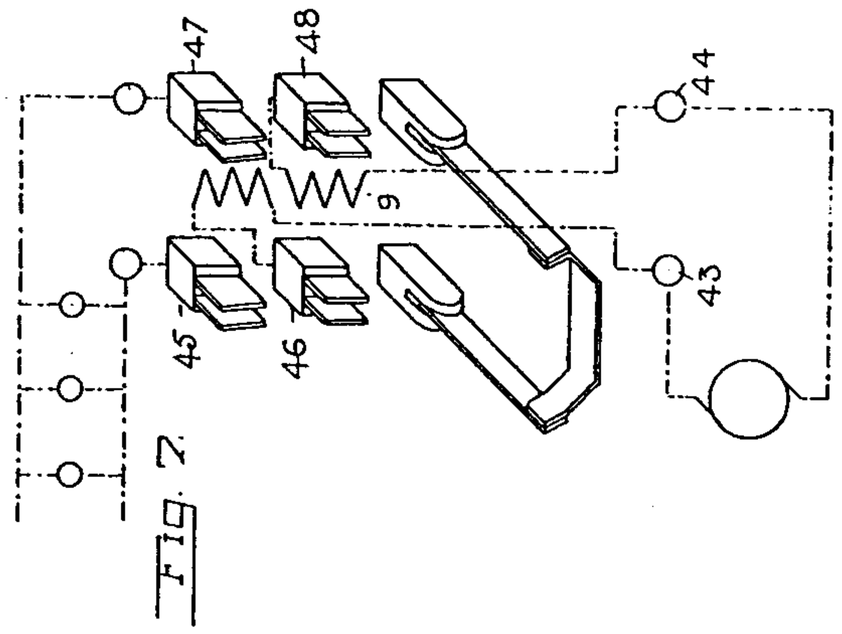

Fig. 7.

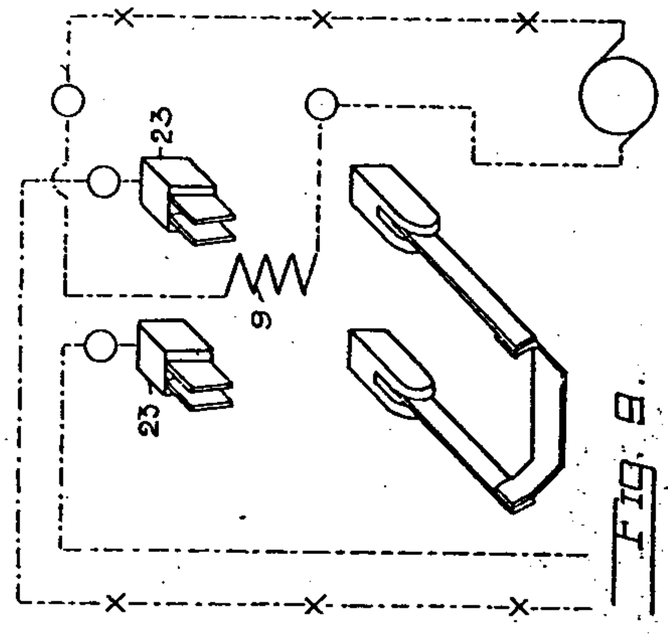

Fig. 9.

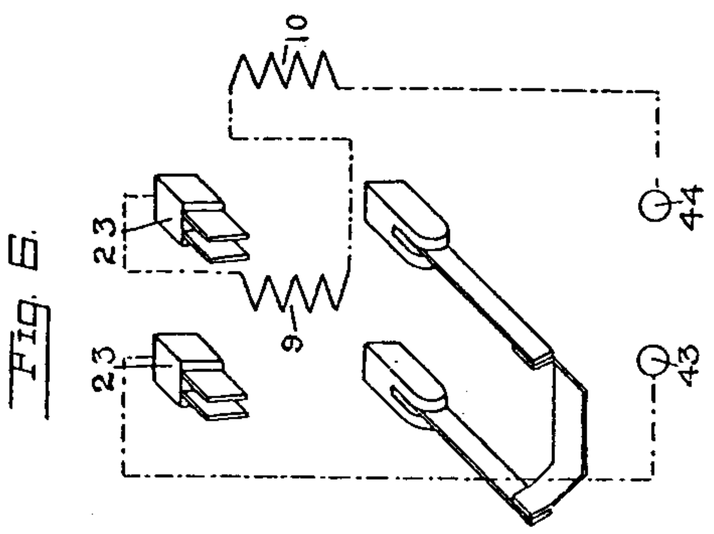

Fig. 6.

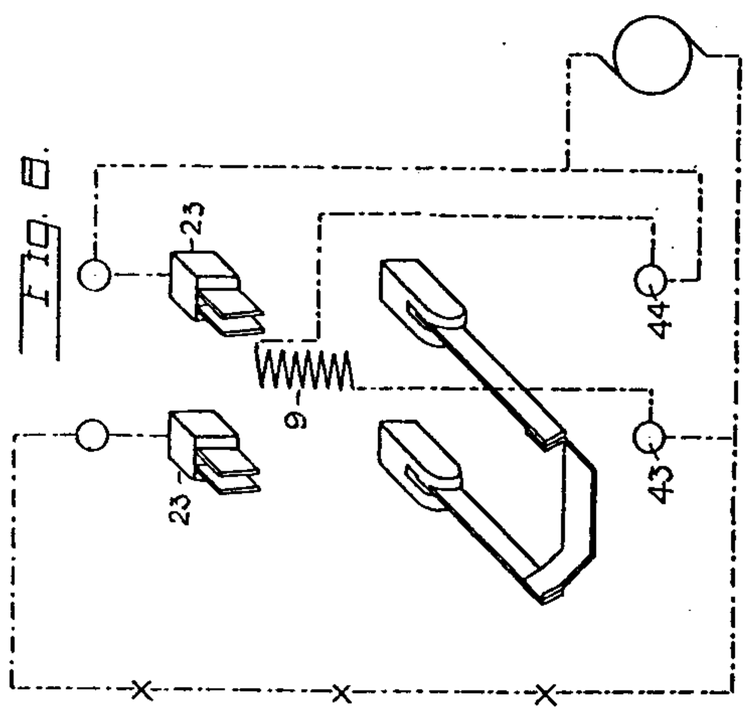

Fig. 8.

WITNESSES

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AUTOMATIC MAGNETIC CIRCUIT BREAKER.

No. 592,100. Patented Oct. 19, 1897.

Fig. 11.

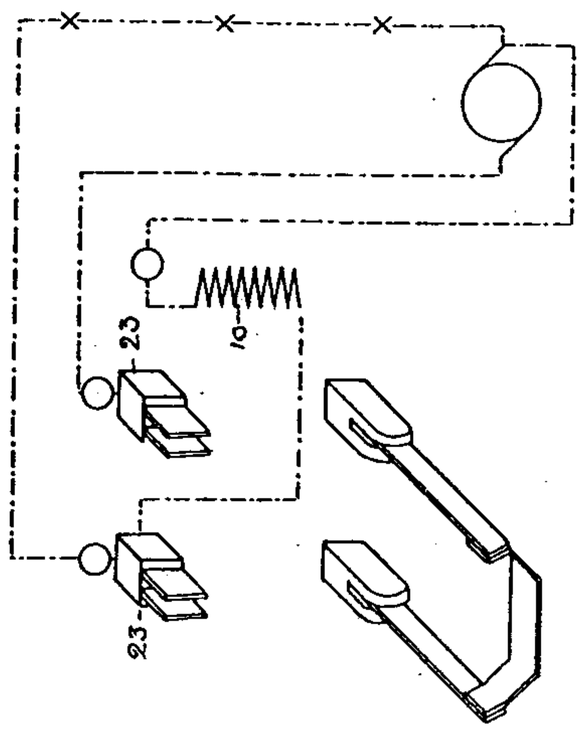


Fig. 13.

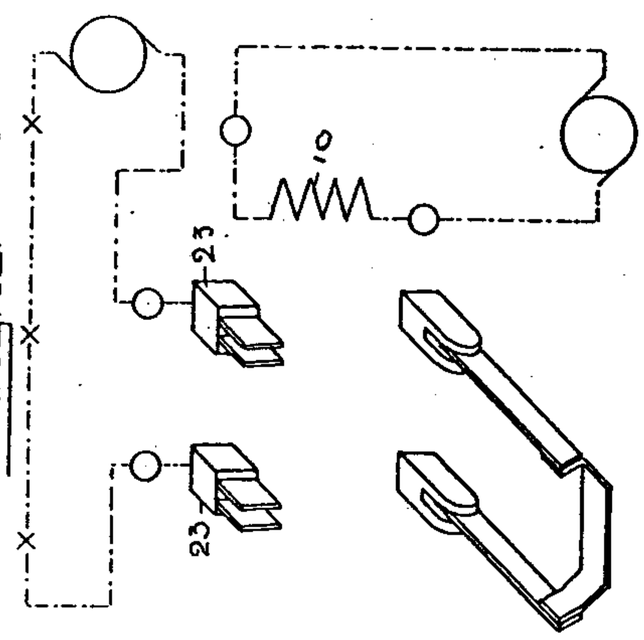


Fig. 10.

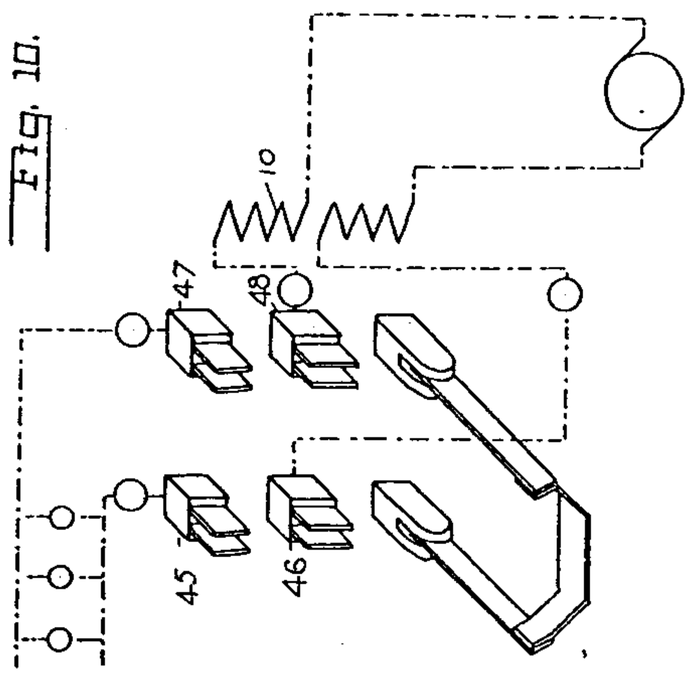
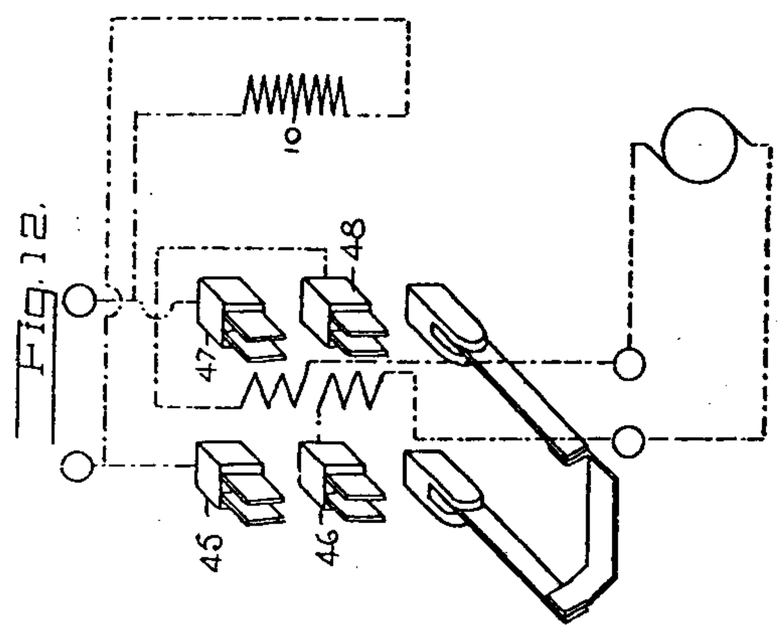


Fig. 12.



WITNESSES

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Thos Ewasdale ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM M. SCOTT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE CUTTER ELECTRICAL AND MANUFACTURING COMPANY, OF NEW JERSEY.

AUTOMATIC MAGNETIC CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 592,100, dated October 19, 1897.

Application filed March 17, 1897. Serial No. 627,978. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. SCOTT, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Automatic Magnetic Circuit-Breaker, of which the following is a specification.

My invention relates to automatic magnetic circuit-breakers, and the object of my improvement is to provide a circuit-breaker which will be actuated to open the circuit or circuits either upon a predetermined maximum or minimum flow of current having convenient means of exact adjustment, means of introducing into the device current or currents in various ways, either to actuate it or to be affected by its actuation, with means for increased efficiency in actuation.

In the accompanying drawings, Figure 1 is a front view of one form of my circuit-breaker, showing two jacketed coils side by side. Fig. 2 is a side view of same in part section. Fig. 3 is a top view of same. Fig. 4 is a front view of another form of my circuit-breaker having double poles and showing but one solenoid-coil and movable core with an electromagnet placed over the core having a pivoted armature. Fig. 5 is a side view of same in part section. Figs. 6 to 13 are diagrams showing various arrangements for introducing currents into the device either to actuate it or to be affected by its actuation. Fig. 14 is a view in perspective of a portion of switch-arm and hub thereon.

In Fig. 1, 6 is the base-block of non-magnetic material upon which are mounted two magnetic jackets 7 and 8, each containing a solenoid-coil 9 and 10, respectively. Each coil surrounds a non-magnetic tube, which contains at its upper end a fixed magnetic core, and below the fixed magnetic core a movable core. The fixed core 11 has passing through it longitudinally a movable magnetic pin 12, adapted to communicate the impact of core 13 to latch 14, the ends of the fixed and movable cores being so shaped that a portion of one is adapted to overlap a portion of the other, so that the shortest distance between the two is less than their axial separation. The fixed core 15 has passing through it longitudinally the movable non-magnetic rod 16, secured to the movable core 17, and is provided with a head 18, adapted to engage with lever 19. The section of one or both of these cores immediately at point of contact may be reduced to obtain increased pull. The switch-bridge 20 is mounted upon arms 21. The contacts of the switch-bridge are at 22 adapted to engage with the switch-jaws 23. (Best shown in Fig. 3.) The movable core 13 is provided at its lower end with plate 24, slotted at either side so as to ride on guides of frame 25, which carries on its lower side the set-screw and lock-nut 26, adapted for adjustment of the core. This plate 24 has marked upon it a point or line by means of the relation between which and marks placed upon the vertical portion of the frame 25 adjustment may be ascertained.

To the switch-bridge 20 is pivoted at 27 a block supporting a handle 37, having a limited pivotal movement. Near the upper end of this block is loosely seated one end of a pin 28, kept under the control of said block by stop-pin 34, driven into the block and projecting into a detent in said pin 28. When the handle 37 is pushed forward in the operation of closing the switch, it presses pin 28 forward to engage lever or cam 29, which I shall hereinafter designate as "cam" to more readily distinguish it from the lever 19. Cam 29 is pivoted at 30 and is actuated to press upon the end of lever 19, which is pivoted at 33, causing it to engage with head 18 of the pin 16 and to lift the movable core 17 to its highest position in the coil, and at the same time latch 14, being spring-actuated, engages the lower edge 35 of the bridge, holding the switch closed against the action of the springs 36, wound around the pivots of arms 21. The slot 38 in cam 29, into which projects stop-pin 39, fixed upon latch 14, permits of such further movement of the cam 29, after the closing and latching of the switch, as may be necessary to allow lever 19 to fall away

from head 18. When handle 37 is released, it falls back to the limit of its pivotal movement, which may be regulated by the pin 28, having an enlarged head to prevent it from being drawn through the bridge. The said pin 28 is drawn backward by the weight of handle 37 away from cam 29, so that lever 19 falls away from head 18, leaving the movable core 17 free to fall at the moment of interrupted current or predetermined underflow. Upon the fall of core 17 the head 18 will again contact with lever 19, causing the edge of slot 38 to contact with stop 39, actuating latch 14 to release the switch-arm.

Adjustment of core 17 may be secured by any suitable means of limiting the distance which the core may be drawn upward into the coil. A non-magnetic washer may be used to prevent the sticking of cores 17 to fixed core 15.

Another form of adjustment for cores 17 and 15 is to have core 15 in two parts, as shown in Fig. 1—that is, 15 being the fixed core and 15′ being the adjustable core adapted to move to and from core 15 for the purpose of changing flow, thereby altering the pull between 15 and 17 without changing the distance between them.

The arms 21 are pivoted at some distance from their lower ends, so that portions of the arms rotate about the opposite side of their pivots from that of the switch-bridge and are adapted to engage with spring clips or jaws 40 to gradually arrest their motion until they come in contact with stop-plates 41 to finally arrest them. The hubs upon the arms provide adequate bearing for the arms upon their pivots and determine the position of the arms in their supporting-lugs independently of the springs 36 which actuate them. The carbons 55 are yieldingly attached to the support of the contact-jaws 23 to contact with carbons 56, attached to switch blades or arms 21 to prevent arcing at the main contacts.

The binding-posts, as shown in Fig. 1, are at 43 and 44. 43 is connected with one of the contact-jaws 23, the other contact-jaw 23 being connected with one end of coil 9 and the other end of the coil 9 connected through the underload-coil 10 with the binding-post 44, as shown in diagram in Fig. 6. The following means may be employed for the actuation of the switch by the cumulative or differential effect of two or more coils, the same being either in series with the switch or in a circuit or circuits independent of it, either in whole or in part.

The overload-coil may be in two sections, so connected as to mutually assist each other, one section being on each side or leg of the circuit, as shown in diagram in Fig. 7, or the coil may be in shunt to the circuit in which the switch to be operated upon is placed, as shown in Fig. 8, or the coil may be in a circuit entirely independent of the switch, as shown in Fig. 9. The winding of the underload-coil may be varied in a similar manner either when used independently or in combination with any of the above arrangements—as, for instance, said coil may be in two sections so connected as to mutually assist each other, one section being on each side or leg of the circuit, as shown in Fig. 10; or it may be in shunt with the main circuit, as shown in Fig. 11, where a single-pole switch is employed, and in Fig. 12, where a double-pole switch is employed; or it may be in a separate circuit from that to be opened by it, as shown in Fig. 13.

Additional binding-posts are added to the base as means for introducing into the device one or more currents either to affect or be affected by the actuation of the device, as above described.

Supposing the switch to be closed in the position shown in Fig. 2 upon the occurrence of a predetermined overflow, the magnetic core 13 is drawn upward to impact the pin 12 to actuate the latch 14, thus opening the circuit, or instead of the overflow, upon the occurrence of an interrupted or a sufficiently-below-normal current, the movable core 17 is permitted to fall and actuate lever 19 to actuate through cam 29 the latch 14 to release the switch. Where it is desired to have a double-pole switch, the bridge 20, instead of being the conducting medium between the contact-jaws 23, as above described, may be insulated from the arms 21, said arms being adapted to act as bridges to contact the contact-jaws 45 with 46 and 47 with 48, as shown in Fig. 4. It will be noticed that instead of these connecting-bridges being horizontal, as the bridge shown in Fig. 1, they are in a vertical position when closed and move in vertical planes parallel with each other, and the jaws of opposite polarity are thus separated by a greater distance than otherwise would be available in the limited space, and the bridges of opposite polarity move in different planes separated from each other.

Instead of having two coils and movable cores, as shown in Fig. 1, I may have a single jacketed coil and movable core as already described for the overflow actuation, with an electromagnet 50, as shown in Fig. 4, fixed over the latch which holds the switch-bridge and armature 51, pivoted at 52, adapted to be held by the magnet either against the force of gravity or spring actuation during the normal flow of current and upon the interruption of the current or below-normal flow to leave the magnet and strike latch 14, actuating it to release the switch-bridge. The knob 37 is mounted on the plate 53, attached to switch-bridge and having a certain amount of play. The upper part of this plate 53 protrudes over the switch-bridge and is adapted when forced forward by the hand in the operation of closing the switch to engage with the armature forcing it against the electromagnet, where it is held during the normal

flow of current, and upon releasing the hand the plate falls away from the armature, leaving it free to fall upon the interruption of the current to actuate the latch. By having the core of the electromagnet in two parts, one fixed and the other movable, the movable one may be threaded through the end plate and provided with a knurled head, so that adjustment may be obtained by regulating the distance between the ends of the movable and fixed cores.

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

1. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a spring adapted to actuate the switch, a latch adapted to restrain the switch against the action of the spring, two coils each provided with a movable core, one core adapted to be actuated by a predetermined magnetic flux to rise in the coil and a pin adapted to communicate the force of the core's movement to the latch to release the switch, the other core adapted to be held within its coil during normal magnetic flux and to fall upon the occurrence of an interrupted or predetermined subnormal magnetic flux and a rod attached to the core, a lever adapted to be actuated thereby and a cam adapted to be actuated by the lever to actuate the latch to release the switch.

2. In an automatic magnetic circuit-breaker the combination with a switch and contacts of springs adapted to actuate the switch, a latch adapted to restrain the switch against the action of the springs, two coils, each provided with a fixed and movable core, one movable core adapted to be actuated by a predetermined magnetic flux to rise in the coil and a pin adapted to communicate the force of the core's movement to the latch to release the switch, the other movable core adapted to be held within its coil during normal magnetic flux and to fall upon the occurrence of an interrupted or predetermined subnormal magnetic flux and a rod attached to the core, a lever adapted to be actuated thereby and a cam adapted to be actuated by the lever to actuate the latch to release the switch.

3. In an automatic magnetic circuit-breaker the combination with a switch and contacts of springs adapted to actuate the switch, a latch adapted to restrain the switch against the action of the springs, a coil provided with a movable core, a rod attached to said core, a lever adapted to actuate and to be actuated by said rod, a cam adapted to actuate and to be actuated by said lever and also adapted to actuate the latch, a resetting-handle pivoted on the switch-arm with limited movement adapted to actuate the cam to actuate the lever to raise the movable core simultaneously with the closing and latching of the switch.

4. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a coil and movable core, a rod attached to the movable core, a lever adapted to engage with the rod to actuate the rod and to be actuated by the rod, a cam adapted to engage with said lever to actuate and to be actuated by said lever, a resetting-handle pivoted to the switch-arm adapted to actuate the cam to actuate the lever and a latch adapted to be actuated by said cam upon its being actuated by the movement of the core communicated to it through the rod and lever to release the switch-arm.

5. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a coil and a core vertically movable therein, said core adapted to be held within the coil during normal flow of current through the coil but to fall by force of gravity upon an interrupted or predetermined below-normal flow, a rod attached to the movable core, a lever adapted to engage with the rod and to be actuated by the rod, a cam adapted to engage with the said lever and to be actuated by it and a latch adapted to restrain the switch and to be actuated by the cam upon the movement of the movable core communicated to it through the rod and lever to release the switch.

6. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a coil having a movable core, switch-arms provided with hubs as means of adequate bearings on their pivots and guards to maintain each arm at a fixed distance from either side of its pivot-lug to afford space for the springs actuating said switch-arms, spring-jaws attached to each of said lugs as means of receiving the projecting ends of the switch-arms to check, and stop-plates back of the spring-jaws to finally arrest, the pivotal movement of the switch-arms.

7. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a coil having a fixed and movable core, a latch adapted to engage with the switch, springs adapted to actuate the switch-arms, contact-jaws adapted to receive portions of the switch-arms, an electromagnet and a pivoted armature placed above the latch, said armature adapted upon interrupted or predetermined below-normal flow of current to leave the electromagnet and impinge the latch to actuate it to release the switch, the movable core adapted to be actuated by a predetermined overflow of current, the pin movable through the fixed core adapted to communicate the movement of the movable core to the latch to actuate it to release the switch-arms and drive them from contact.

8. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a coil, a fixed and movable core, an electromagnet and a pivoted armature, a latch adapted to engage with the switch, the pivoted switch-arms and contact-jaws for same, the plate mounted on switch-bridge having a limited movement thereon and having its upper part protruding over the front of the

switch-bridge adapted when forced forward by the hand in the operation of closing the switch to engage with the armature of electromagnet to force it against the magnet and upon releasing the hand the said plate adapted to fall away from the said armature to leave it free upon interrupted or predetermined underflow of current to leave the magnet and impinge the latch to actuate it to release the switch-arms.

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Witnesses:
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