(No Model.)

E. M. HEWLETT.

AUTOMATIC CIRCUIT BREAKER.

No. 567,137. Patented Sept. 8, 1896.

FIG. 1.

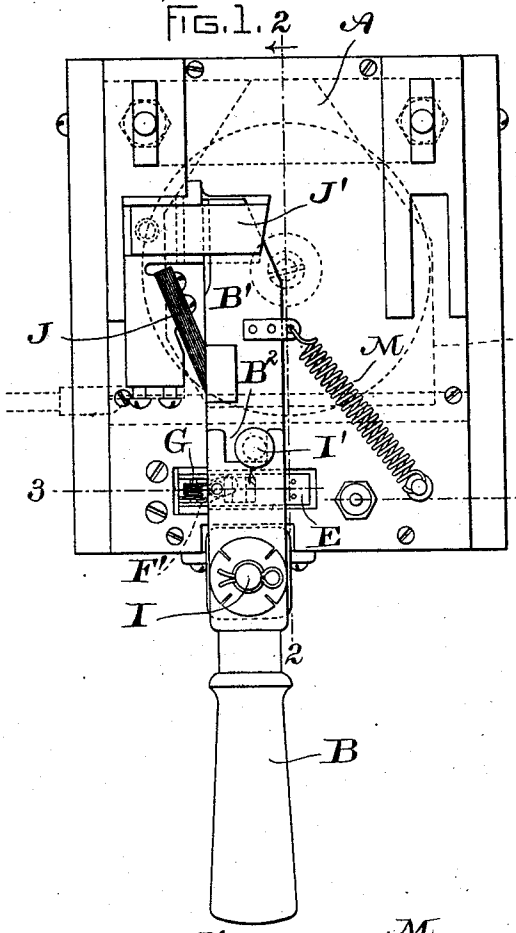


FIG. 2.

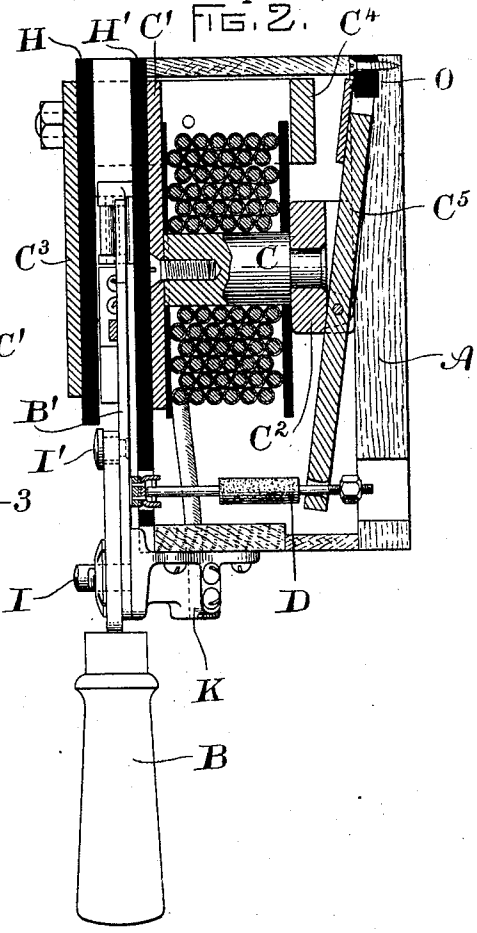


FIG. 3.

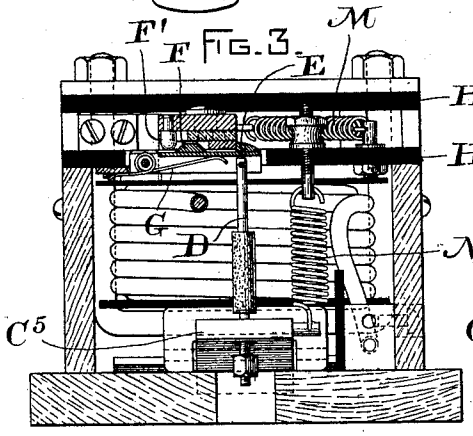
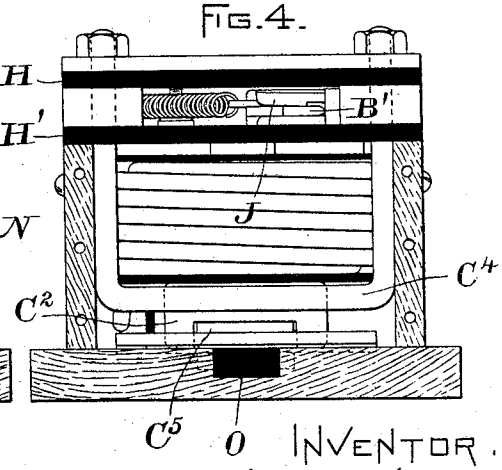


FIG. 4.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 567,137, dated September 8, 1896.

Application filed April 17, 1896. Serial No. 587,888. (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 Automatic Circuit-Breakers, (Case No. 378,) of which the following is a specification.

The present invention relates to automatic circuit-breakers which are operated by an excess of current flowing in the circuit or by hand.

One object of the present invention is to reduce the size and the number of parts to a minimum, thereby cheapening the cost of construction.

The invention further consists in the arrangement of parts in such a manner that one magnetic device serves the double purpose of breaking the circuit at a predetermined overload and at the same time blowing out the arc caused thereby.

A further object of the invention consists in using a single operating-handle, which is secured to the switch-blade in such a manner that it automatically releases the locking device which holds the circuit closed, when it is desired to open the circuit by hand.

The invention also relates to the peculiar construction and arrangement of the magnetic blow-out and switch-releasing mechanism.

In the present invention one energizing-coil is used instead of two, as in other existing constructions, and the magnetic circuit is so arranged that it has two air-gaps, one between the armature, pivoted to the core, which releases the switch-locking mechanism, the other between the opposite end of the magnet-core and the top plate. Between the plate and the core are located the switch-terminals, so that any arc formed by interrupting the circuit will be disrupted by means of the magnetic lines of force passing between the top plate and the core. The parts are so arranged that as the current flowing through the magnetic device increases one air-gap in the magnetic circuit grows less and less until the switch is automatically released, and at that instant the magnetic circuit is closed and remains so until the arc is ruptured and the current ceases to flow, after which it is opened by means of a spring and the air-gap is reëstablished. This is an important part of the invention, for it serves to decrease the reluctance of the magnetic circuit at the time when the lines of force are most needed to interrupt the arc. As the current increases, due to the load, the magnetic circuit is made shorter and shorter, and the blow-out magnet is consequently able to take care of the arc caused by the interruption of the circuit due to a heavy overload.

In the accompanying drawings, attached to and made a part of this specification, I have shown an embodiment of my invention, in which—

Figure 1 is a plan view with the top removed. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 1, and Fig. 4 is an end elevation with the end piece removed.

The box A is made of insulating material, but metal would do equally well. It is divided into two parts, one containing the magnetic device and the other the switch blade and terminals. The magnetic device comprises a core C, to which is secured the piece C^2, the latter forming a support for the armature C^5, which actuates the locking device when attracted toward the U-shaped piece C^4, which forms a portion of the magnetic circuit. On the opposite end of the core C is a plate C′. (Shown by dotted lines in Fig. 1.) Between this plate and the switch-terminals is a piece of insulation H′, and between the switch-terminals and the top plate C^3, forming a part of the magnetic circuit, is a second piece of insulating material H. The U-shaped piece C^4 is secured to the top plate C^3 by suitable nuts.

The switch is made in two parts B B′. The latter is made of copper or other conducting material beveled at the end where it strikes the side of the box and is pivoted to a stud I, projecting upward from the casting K, to which is secured the connection from the energizing-coil of the magnet. The switch-blade is adapted to make contact with the terminals J J′. The former is made of laminated copper and is adapted to carry the greater amount of current. The latter is a simple two-

blade contact engaging both sides of the blade by spring-pressure. This is arranged to break circuit after that of the contact J and therefore the arcing will be done at this point. The other portion of the switch comprising the handle-releasing mechanism is also pivoted on the same stud with the switch-blade. Mounted on the extension of the handle B is a pin F′, provided with a rounded end, adapted to engage with the cam-surface F, mounted on the arm of the locking device. A spring G tends to hold the lock in the position shown, thus locking the switch-blade against the action of the spring M. Projecting upward from the blade B′ is a stud I′, which limits the movement of the handle B independent of the blade. The slot B^2 in the handle B permits a movement of the pin F′ in order to engage with the cam-surface F to force the projection E down and out of engagement with the blade B′, and the parts further bear such relation to each other that when the handle B is moved far enough to release the locking mechanism the circuit is opened with a snap, for the spring M and lost motion at B^2 between the parts of the handle do not permit of the switch being opened slowly.

For the purpose of adjusting the magnetic pull necessary to open the circuit a spring N is secured to the armature C^5 and some stationary part of the box A and provided with an adjusting-nut for the purpose of regulation.

As the current in the circuit increases the armature C^5 is drawn toward the U-shaped piece C^4, and as the current continues to increase the air-gap between these parts becomes less and less until finally the opposite end of the armature engages with the nut on the rod D and the lug E is pulled out of engagement with the switch-blade, thus allowing it to fly open, due to the action of the spring M. At this instant the armature would be very near or would make momentary contact with the piece C^4, and consequently the magnetic reluctance of the circuit would be greatly decreased and a large number of lines of force would flow upward through the iron to the plate C^3 and back again in the opposite direction to the plate C′, which is a part of the main core. The magnetic lines in passing from the plate C^3 to C′ would be widely distributed over their surfaces, and any arc formed between the plates would be blown outward and away from the main handle. As it is desirable to have a fixed distance between the armature C^5 and the piece C^4, a block O is provided which may be readily replaced if worn, or if it is desired to vary the distance between the armature and the remainder of the magnetic circuit.

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

1. In an automatic circuit-breaker, the combination of a blow-out magnet, a core for the magnet, a U-shaped piece extending parallel to the core and separated therefrom, a plate forming a support for the U-shaped piece, a second plate of magnetic material secured to the core of the magnet, and switch-contacts between the plates.

2. In an automatic circuit-breaker, the combination of a blow-out magnet, a plate forming the top of the core, a second plate of magnetic material parallel to the first and separated therefrom by an air-space, a switch-blade and contacts between the plates, and an armature pivoted to the core of the magnet and adapted to decrease the magnetic reluctance of the circuit of the blow-out magnet.

3. In an automatic circuit-breaker, the combination of parallel magnetic plates separated from each other by an air-space, a switch-blade and contacts, insulation between the plates and the switch-blade and contacts, a U-shaped piece extending parallel to the core of the blow-out magnet, an armature pivoted to the core and adapted to decrease the magnetic reluctance of the circuit, and a block to limit the downward movement of the armature.

4. In an automatic circuit-breaker, the combination of plates separated by an air-space and forming a part of the magnetic circuit of the blow-out, a switch provided with a handle having a limited movement independent of the switch-blade, a spring for breaking the circuit, and a locking-detent actuated by an excess of current in the circuit or by a slight movement of the switch-handle.

5. In an automatic circuit-breaker, the combination of a blow-out magnet, a core for the magnet provided with an enlarged top plate, a piece secured to the lower part of the core and forming a support for an armature, a U-shaped piece extending upward from the bottom of the coil to a plate parallel to the enlarged top plate of the magnet-core, main and arcing contacts between the plates, and an armature for opening the switch and decreasing the magnetic reluctance of the circuit.

6. In a circuit-breaker, the combination of a contact for carrying a certain amount of current, a second or arcing contact for carrying a less amount of current, and, lying in the same horizontal plane with the first contact, a single operating-handle, a mechanically and magnetically operated locking mechanism for the switch, and a blow-out magnet common to both sets of contacts having a variable air-gap in circuit.

In witness whereof I have hereunto set my hand this 13th day of April, 1896.

EDWARD M. HEWLETT.

Witnesses:
B. B. HULL,
A. H. ABELL.