

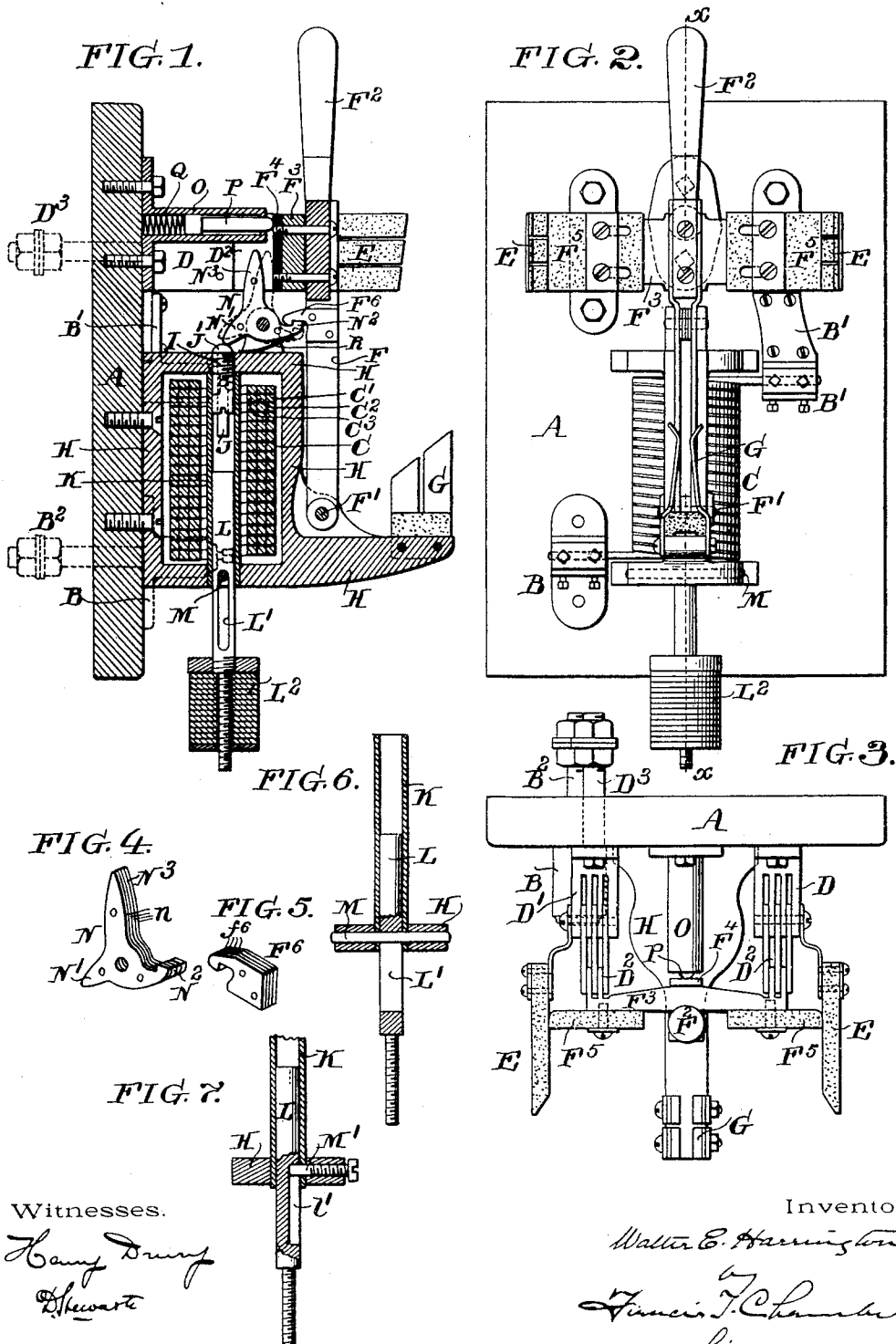
(No Model.)

2 Sheets—Sheet 1.

W. E. HARRINGTON.
MAGNETIC CIRCUIT BREAKER.

No. 585,030.

Patented June 22, 1897.



UNITED STATES PATENT OFFICE.

WALTER E. HARRINGTON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR
TO THE CUTTER ELECTRICAL AND MANUFACTURING COMPANY.

MAGNETIC CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 585,030, dated June 22, 1897.

Application filed December 26, 1895. Serial No. 573,259. (No model.)

To all whom it may concern:

Be it known that I, WALTER E. HARRINGTON, a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and Improved Magnetic Circuit-Breaker, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to automatic magnetic circuit-breakers, and has for its object to provide a circuit-breaker in which the cut-out switch will be actuated to sever the connection of the circuit in which it is placed with a rapidity bearing an inverse ratio to the amount of excessive current flowing through the circuit.

It is well known that electromagnetic apparatus is subject to great injury from excessive flow of current, and when the excess is very great the apparatus, the wires, and the circuit-breaker, which is provided to guard against injury of an excessive flow, are frequently strained, injured, and destroyed.

Now the object of my invention is to provide means whereby the movement of the cut-out switch shall be directly affected by the amount of current passing through the circuit, so that the greater the current the more rapidly will the switch leave its contacts and move away from them, thus at the same time breaking the circuit more quickly and avoiding excessive arcing between the cut-out switch and the terminals as it leaves contact with them. This I accomplish by so constructing and arranging the cut-out device that the magnetic armature shall not only perform its usual function of dropping the latch which holds the cut-out lever in position to close the circuit, but shall also act upon the lever in such a way that the momentum of the moving armature will be utilized to give a push or blow to the lever and in a direction which will force it away from its contacts in the circuit, and it will readily be seen that as the rapidity of motion of the armature depends upon the amount of current flowing through the magnet by which it is actuated, and which magnet is, as usual, in series with the switch, the violence and rapidity of the blow given to the switch-lever

will be directly proportioned to the amount of abnormal current flowing through the circuit.

My invention consists also in certain improvements in details of construction of magnetic circuit-breakers.

The nature and especially the details of my novel device will be best understood as described in connection with the drawings in which they are illustrated, and in which—

Figure 1 is a side sectional view of my improved magnetic circuit-breaker on the line *xx* of Fig. 2. Fig. 2 is a front view of the circuit-breaker; Fig. 3, a plan view; Figs. 4 and 5, respective views illustrating the method of construction of the latching device; Fig. 6, a view, partly in section, illustrating my method of holding the core-plunger in position; Fig. 7, a similar view showing a modification of the same device, and Figs. 8, 9, and 10 are side elevations showing modifications of the same device.

A indicates the slab to which the circuit-breaker is secured.

B is a binding-post to which one part of the circuit-wire is secured, C indicating a solenoid-coil, one end of which is secured to the terminal B, while the other end is secured to a connecting device B', which in turn is electrically connected with the switch-jaw D. The other switch-jaw D' is connected with a terminal D², to which the circuit-wire can be attached.

At D² D³, I have indicated the jaws proper of the switch, and at E E, I have indicated carbon terminals electrically connected with the switch-jaws.

F is a switch-lever which is pivoted at F' and, as shown in Figs. 1, 2, 3, 8, and 9, is provided with a handle F². This lever carries the switch F³, having jaws adapted to contact with the jaws D². As shown, the switch-lever also carries a plate F⁴ upon its face, upon which plate the blow of the armature-core is delivered. Secured to the switch F³ are carbons F⁵ F⁵, so placed as to come in contact with the carbons E when the switch is closed and to remain in contact until after the switch proper is fully opened, this being a known and familiar device for preventing arcing at the terminals of the switch proper.

At F⁶, Figs. 1 and 5, I have shown a latch-

ing device secured to the lever F, and I have designated the latch in Fig. 10, which serves the same purpose, although quite different in form, by the same letter.

5 G indicates a spring-catch secured on the framing H of the circuit-breaker, the function of which is to catch and hold the lever F when it falls downward in opening the switch.

I indicates a short metallic tube secured to the portion of the frame H which passes over the top of the magnet C, as shown, by screwing into it said tube, projecting down for a short distance through the center of the solenoid-coil.

15 J indicates a pin moving freely through the tube I and having a head J', which normally rests upon the top of said tube.

K indicates a lining-tube for the solenoid-coil. L is the armature-plunger working within the coil and is shown within the tube K. As shown in Figs. 1 and 6, it is made with a slot L', through which and through holes in the bottom of the tube K passes a pin or rod M, which is inserted through a hole in the lower part of the framing H, and thus serves to hold the tube K in position and to form a stop upon which the plunger L normally rests. In the construction shown in Fig. 1 the lower end of the plunger L is threaded, and upon it can be secured weights, (indicated at L²), and which are adjusted in accordance with the minimum amount of current under which the plunger is intended to move. The construction shown in Fig. 7 is a simple and perhaps obvious modification of that indicated best in Fig. 6, the stop-pin (here indicated by M') not passing through the slot in the plunger L, but simply into a longitudinal slot, (indicated at L'.)

40 N is a pivot catch or latch turning on a pin secured to the frame H and, as shown in Figs. 1 and 4, provided with three arms N' N² N³, the arm N² being shaped to engage with the catch device F⁶ and thereby latch the lever F and the switch it carries in position to close the circuit.

The arm N' lies immediately above the head J' of the pin J, so that whenever the said pin is driven upward by the plunger L striking its lower end it will force the arm N' up and the arm N² down, thereby releasing the latch which holds the lever in position. The third arm N³ of the latch N extends upward and lies normally in a position in front of but some distance away from the plate F⁴, secured on the front of the lever F, and, as is evident, the forcing upward of the arm N' will not only release the catch-arm N², but will force the arm N³ against the plate F⁴ with a rapidity and violence proportioned to the blow given by the upwardly-moving plunger L, and thus obviously the force tending to propel the cut-out lever away from its contact-jaws will be directly proportioned to the amount of current flowing through the solenoid-magnet which is in series with the switch.

The latching devices, by which the lever is held in position, are subject to violent blows and considerable strains, and much trouble has been found in obtaining a latch which will not be liable to break under the strains to which it is subjected. This trouble I have obviated, securing at the same time a cheap and thoroughly serviceable latch, by building up the two members of the latch—to wit, F⁶ and N—of a number of thin steel plates, as indicated at f⁶ and n, these plates being riveted together so as to form latch members of the desired thickness and strength. Obviously they can be machined after they are assembled, and obviously, also, they are, in the first place, not liable to have cracks in them, because the thin metal is not so apt to crack as a thicker piece, while if a crack should occur in one plate it would not be communicated to the adjacent pieces.

In the construction shown in Figs. 1, 2, and 3 a spring device is provided, as is usual, to push the switch-lever away as soon as it is unlatched. This, in the construction shown, consists of a plunger P, contained in a casing O, which also contains a spiral spring Q, the plunger being pushed into the casing and the spring compressed when the lever is closed and the spring acting, of course, to thrust the plunger out and to thrust the lever away as soon as the latch is loosened.

In the construction shown in Fig. 8 a pivoted latch (indicated at N⁴) is secured to the switch-lever F and formed with a slot N⁷, through which passes a pin N⁸, which pin is also secured to the switch-lever. The catch is provided with a jaw N⁵, which engages with another member of the latching device secured to the frame H, and in operation when the pin J is driven up by the action of the core-plunger it moves the latch N⁴ on its pivot N⁶, first disengaging its jaw N⁵ and then forcing it into contact with a pin N⁸, thus communicating the blow of the plunger directly to the lever F, as in the case of the construction already described. In this figure the lever F, when the switch is closed, lies in a horizontal position, and the switch is opened by lifting the free end of the lever, the spring and spring-plunger Q and P' being placed in proper position and, as shown, connecting with the lever by a link P².

In the construction shown in Fig. 9 the pivot-latch lever here indicated is a bell-crank lever having arms N⁹ and N¹⁰ and is pivoted to a projection of the frame H at N¹¹, the arm N¹⁰ having a hooked nose which engages with the other member of the latch, (indicated at F⁶), while the end of the arm N⁹ lies in contact with the head J' of the pin J. The plate F⁴, secured to the lever F, is slotted, as indicated at f⁴, so that when the arm N⁹ of the latch-lever is thrust upward it will pass into the slot and permit the head J' of the pin J to impinge directly upon the plate F⁴.

In the construction shown in Fig. 10 a latch-

lever having arms N^{12} and N^{13} is pivoted at N^{14} to a projection from the frame H, the arm N^{13} being hooked and engaged with the corresponding latch member F^6 on the lever F, while the arm N^{12} , as before, rests upon the head J' of the pin J. In this construction the arm N^{12} when thrust upward clears block F^4 , which is subject to the direct blow of the pin J.

10 All the devices indicated in the drawings are operative and efficient in carrying out the proof of my invention, but I believe that indicated in Figs. 1, 2, and 3 to be the most perfect, and I prefer to accumulate the momentum of moving parts as much as possible in the blow which is delivered to the switch-lever, and for this reason it is obviously desirable that the blow should be delivered through the pivoted latch-lever, as otherwise the momentum of the latch which it necessarily must have in releasing the switch-lever would be lost.

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

25 1. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a solenoid-coil and core vertically movable therein, a switch-arm approximately parallel to the core when the switch is closed and an independently-movable means above the core for communicating the force of the impact of the movable core to the switch-arm to throw it out of contact.

35 2. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a solenoid-coil and core vertically movable therein, a switch-arm approximately parallel to the core when the switch is closed and an independently-movable means above the core for changing the direction of and communicating the force of the impact of the movable core to the switch-arm at right angles therewith to throw it out of contact.

45 3. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a solenoid-coil and core vertically movable

therein, a switch-arm approximately parallel to the core when the switch is closed, a latch adapted to engage with the switch and to be actuated by the movement of the movable core to release the switch and an independently-movable means above the core for communicating the force of the impact of the movable core to the switch-arm after the same has been released by the latch to force it out of contact.

4. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a solenoid-coil and core vertically movable therein, a switch-arm approximately parallel to the core when the switch is closed, a latch adapted to engage with the switch and to be actuated by the movement of the movable core to release the switch and an independently-movable means of changing the direction of and communicating the force of the impact of the movable core to the switch-arm after the same has been released by the latch to force it out of contact.

5. In an automatic magnetic circuit-breaker the combination with a switch and contacts of a solenoid-coil and core vertically movable therein and a pivoted member having the following essential features: a part adapted to receive the impact of the movable core, a part adapted to latch and unlatch upon its actuation the switch and a part adapted upon its actuation by the movable core to impinge the switch after it has been unlatched to force it out of contact.

6. In a magnetic circuit-breaker the combination with a switch and contacts of a solenoid-coil and a core movable therein and a pivoted latch N having arms N' , N^2 and N^3 , the movable core adapted to impinge upon the arm N' and thereby to disengage the arm N^2 from the switch-lever and to drive the arm N^3 against the said switch-lever.

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Witnesses:

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