No. 883,943. PATENTED APR. 7, 1908.

C. E. EVELETH.

REVERSE CURRENT CIRCUIT BREAKER.

APPLICATION FILED MAY 25, 1904.

Fig. 1.

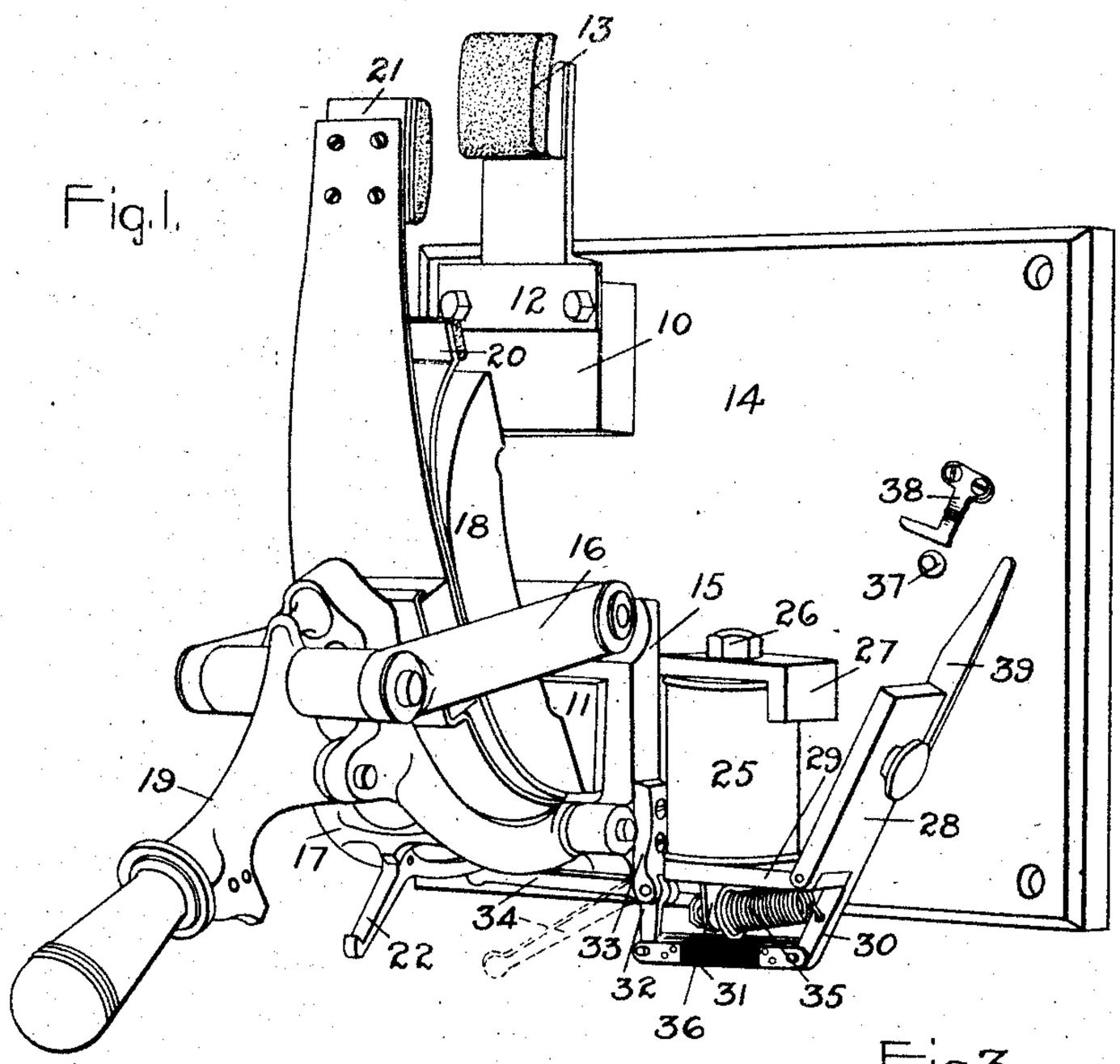
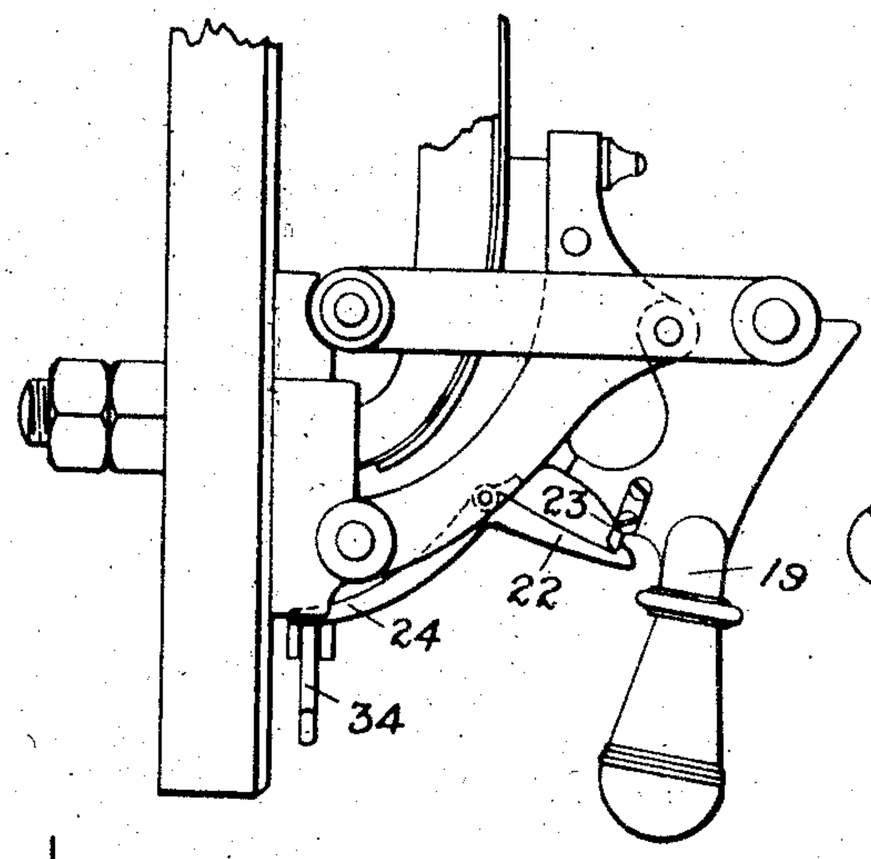
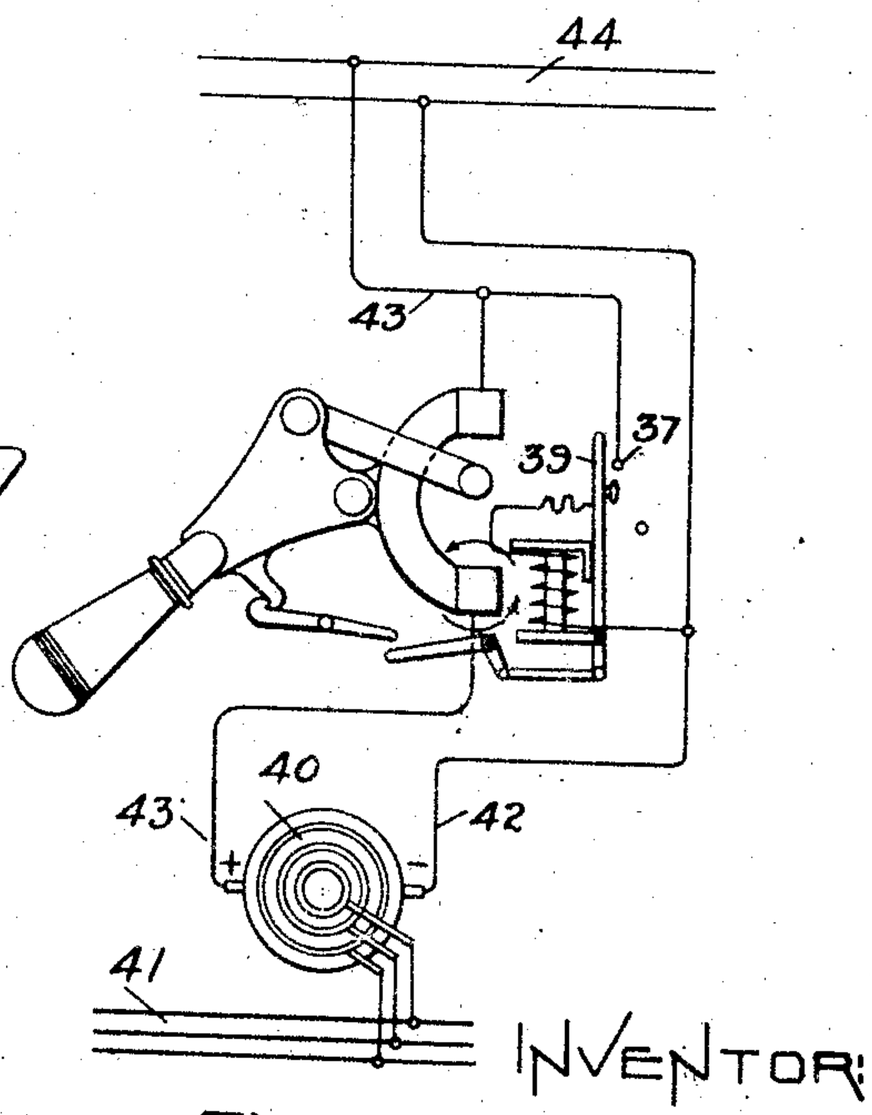


Fig. 3.

Fig. 2.





WITNESSES:

Robt. L. Chapman

Helen Orford

INVENTOR:

Charles E. Eveleth

by Albert G. Davis

Atty

UNITED STATES PATENT OFFICE.

CHARLES E. EVELETH, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

REVERSE-CURRENT CIRCUIT-BREAKER.

No. 883,943. Specification of Letters Patent. Patented April 7, 1908.

Application filed May 25, 1904. Serial No. 209,617.

To all whom it may concern:

Be it known that I, CHARLES E. EVELETH, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Reverse-Current Circuit-Breakers, of which the following is a specification.

The present invention relates to circuit-breakers and more particularly to means for automatically opening the breaker when the direction of the current flow through the main circuit is reversed. Such devices are of varied application, a common instance of which may be found where a plurality of rotary converters are used to feed direct current bus-bars. Under such conditions if the rotary converter is accidentally disconnected from its source of supply, the current from the bus-bars would return to the rotary converter and drive it as a motor. By the operation of my invention the rotary converter is cut out of circuit.

My invention is in the nature of an improvement upon the device disclosed in Patent No. 630,539, granted August 8, 1899 to E. M. Hewlett.

It is well known that a magnetic field is produced adjacent to a conductor when current passes through it.

The present invention depends upon this principle, and it consists in providing novel means located in the magnetic field adjacent to the circuit-breaker contacts for controlling the operation of the tripping mechanism of the breaker, according to the direction of current flow in the breaker circuit.

Specifically my invention comprises a polarized magnet provided with an armature and connecting mechanism tending at all times to trip the circuit-breaker. The polarized magnet is located adjacent to one of the contacts of the circuit-breaker so as to lie within the magnet field produced adjacent thereto. When no current is flowing through the breaker the flux of the magnet is sufficient to hold the armature from tripping the breaker, and when the direction of the current flow of the circuit is normal the flux of the circuit-breaker is in a direction to assist the flux of the magnet, but when the direction of current flow in the main circuit is reversed the flux about the circuit-breaker contact is reversed and is sufficient to neutralize the flux of the magnet and thereby permit the circuit-breaker to be tripped.

The nature of the invention will more fully appear upon reference to the following description taken in connection with the accompanying drawing, and the scope of the invention will be particularly pointed out in the appended claims.

In the accompanying drawing Figure 1 is a perspective view of a circuit-breaker provided with a reverse current device constructed in accordance with my invention; Fig. 2 is a side elevation of the lower portion of the circuit-breaker; and Fig. 3 is a diagram of circuits illustrating one application of the invention.

The circuit-breaker herein disclosed comprises two main contact studs 10, 11, a copper shunt contact 12, and a carbon shunt contact 13 all fixedly secured to an insulating base 14. A yoke 15 of brass or other non-magnetic material partially surrounds the lower stud 11 and serves as a support for the inner ends of the cramping frame 16, and the contact supporting frame 17. The main bridging contact 18, which is composed of a bundle of laminations of spring copper or other conducting material, is secured to the upper end of the frame 17 and is adapted to be cramped into engaging position by an operating lever 19 which is pivotally connected to the frames 16 and 17 and combines with the latter to produce a toggle action. Shunt contacts 20 and 21 are connected to the main brush 18 and coöperate with the fixed contacts 12 and 13 respectively as clearly shown in Fig. 2. The circuit-breaker is held in closed position by means of the latch 22 pivoted to the frame 17 and adapted to engage a lug 23 on the operating lever 19. The latch 22 is provided with a rearwardly extending arm which terminates adjacent to the under side of the lower contact stud. This circuit-breaker is of a well known type and constitutes no part of my invention, but is herein disclosed merely for the purpose of illustrating its application.

The reverse current attachment comprises a magnet consisting of a shunt spool 25 mounted on a hardened steel core 26 having pole pieces 27 29, the former of which is composed of hardened steel, all suitably secured to the circuit-breaker base 14. An armature 28 is pivoted to the outer end of the pole

piece 29 and is provided with an extension 30 which is connected by an insulating link 31 to a bell crank lever 32 which is pivoted to a block 33 securing one of the legs of the yoke 15 of the circuit-breaker. The arm 34 on the bell crank lever 32 extends beneath the inner end of the latch 24 of the circuit-breaker and is adapted to be forced into engagement therewith to trip the breaker. This function is performed by an adjustable coiled tension spring 35 located between the extension 30 and a fixed support 36. The base 14 is also provided with a contact stud 37 and a deflecting guard 38. The stud 37 is located in the path of movement of a spring contact finger 39 secured to and extending beyond the upper end of the armature 28. The guard 38 is shaped so as to carry the finger 39 above the stud 37 upon the outward movement of the armature 38 and to permit contact between said finger and stud upon the inward movement of said armature.

In the diagram of Fig. 3, 40 designates a rotary converter which is fed from a suitable source of alternating current through the supply mains 41 and is connected by means of leads 42 43 to a direct current distributing line 44. The circuit-breaker is connected in the lead 43. The shunt coil 25 has one terminal connected to the lead 42 and the other to the contact finger 39 and the stud 37 is connected to the lead 43 at a point between the circuit-breaker and the direct current mains 44.

In the operation of the mechanism above described the spring 35 at all times tends to move the armature 28 outward and consequently to trip the circuit-breaker, thus bringing all the parts into the position illustrated in Fig. 1. Prior to closing the circuit-breaker the armature 28 must be moved inward so as to lower the arm 34 of the bell crank lever 32 out of engagement with circuit-breaker latch 22 as indicated by the dotted line position of the arm 34 in Fig. 1. As this is done the circuit through the shunt coil 25 is momentarily closed at the stud 37. This is sufficient to polarize the core 26 and the pole piece 27, so as to maintain the armature 28 closed. When the circuit-breaker is closed the current which flows from the one contact stud to the other through the bridging contact 18 produces a magnetic field adjacent to the studs. The direction of the flux in this field will depend upon the direction of the current through the breaker. Assuming the normal direction of current flow to be from plus to minus, as indicated by the signs in Fig. 3, the flux in the field about the stud 11 will be in the direction indicated by the full-line arrows in said figure. The coil 25 is wound so as to polarize the core 26 in the same direction. Thus it will be seen that with a normal current in the circuit-breaker, the magnetic field about the stud 11 will assist in holding the armature 26 closed, but when the direction of current flow is reversed, as when the alternating-current supply is cut off, the direction of the flux about the stud 11 will be reversed and the flux in the core 26 will be opposed and neutralized, so that the armature 28 will be no longer held in contact with the pole-piece 27, but will be free to respond to the pull of the spring 35 to trip the circuit-breaker.

Although the core 26 and pole-piece 27 of the magnetic circuit including the armature 28 are composed of hardened steel, it is clear that other parts of magnetic circuit instead of those named might be composed of such material. It will also be apparent that other alterations and modification may be made in the device disclosed without departing from the spirit and scope of my invention; moreover, any other means of developing a normal flux of magnetism in the core independent of the distributed current might be employed, such as a local battery or exciter current; I have not deemed it necessary to show this as it is a well known equivalent of a permanent magnet. I therefore do not wish to be limited to the specific construction herein disclosed but aim to cover by the terms of the appended claims all such alterations and modifications.

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

1. The combination of a circuit-breaker, tripping means therefor, and controlling means for said tripping means mechanically connected thereto and comprising a polarized core located in the magnetic field adjacent to the breaker contacts, an armature, a shunt coil, and contacts operated by the closing of the armature to momentarily close the circuit through the shunt coil.

2. The combination of a circuit-breaker, mechanical tripping means therefor normally tending to trip the breaker, and means for controlling said tripping means located in the magnetic field adjacent to the breaker and comprising a polarized magnetic circuit including an armature, a shunt coil, and means for closing the circuit through said coil so as to repolarize the core independently of the magnetic field after the core has been demagnetized by a reversal in the direction of the flux in said field.

3. The combination with a dynamo-electric machine, of a circuit-breaker therefor, and means located in the magnetic field adjacent to the breaker contacts and comprising a polarized magnet for causing the circuit to open when the current in the dynamo-electric machine reverses, and means for giving an initial magnetomotive force to said magnet while the circuit-breaker is being reset.

4. The combination of a circuit breaker, tripping means therefor, and electromagnetic means for controlling said tripping means having its magnetic circuit within the magnetic field produced by the electric circuit through said breaker and eccentrically disposed with reference to said field.

5. The combination with a circuit breaker comprising fixed contact studs, a movable bridging contact and tripping means, of electromagnetic means for controlling said tripping means having its magnetic circuit within the magnetic field adjacent to one of the breaker contact studs and eccentrically disposed with reference to said field.

6. The combination of a circuit breaker, tripping means therefor, and electromagnetic means, having its magnetic circuit within the magnetic field produced by the electric circuit through said breaker, and eccentrically disposed with reference to said field for controlling the operation of the tripping means according to the direction of flux in said magnetic field.

7. The combination of a circuit breaker comprising fixed contact studs, a movable bridging contact and tripping means, of electromagnetic means, having its magnetic circuit within the magnetic field adjacent to one of the breaker contact studs and eccentrically disposed with reference to said field, for controlling the operation of the tripping means according to the direction of flux in said magnetic field

In witness whereof, I have hereunto set my hand this 23d day of May, 1904.

CHARLES E. EVELETH

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.