F. W. HARRIS.

CIRCUIT INTERRUPTER.

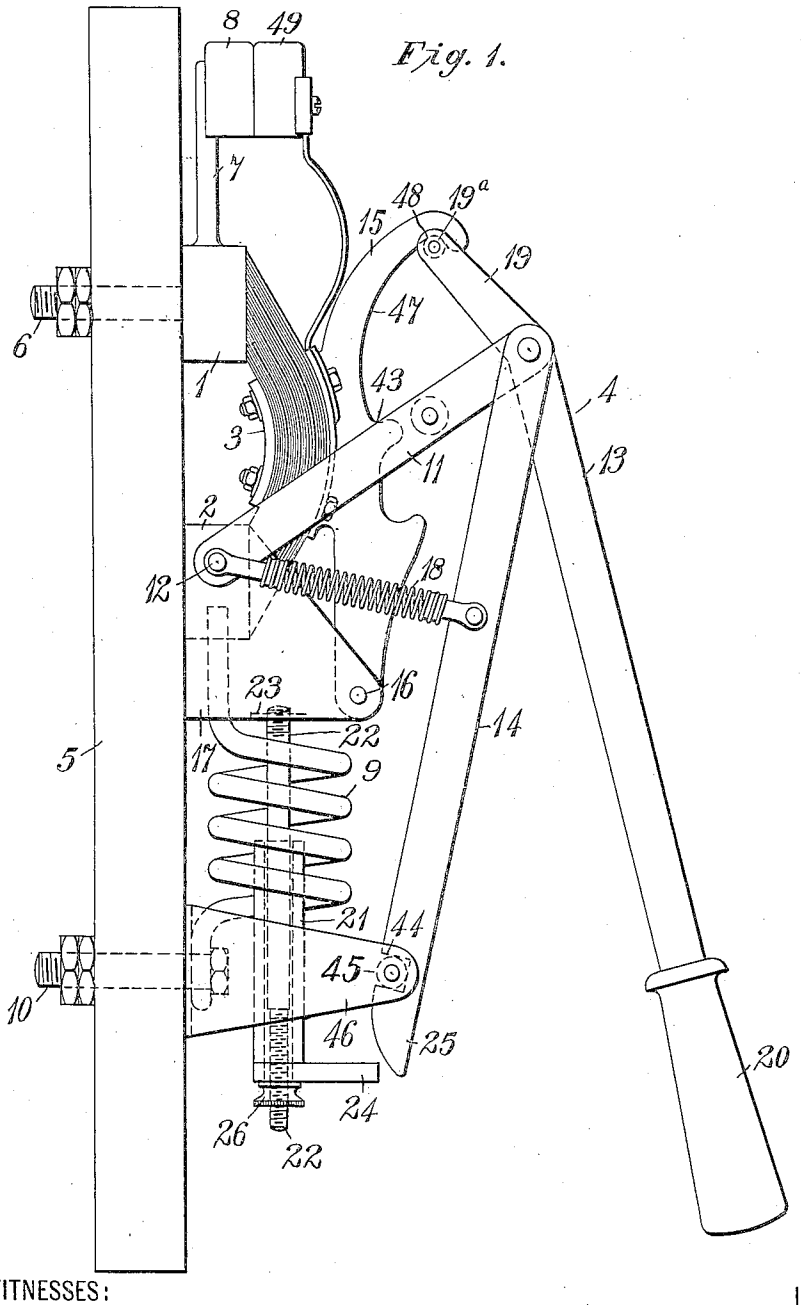
APPLICATION FILED OCT. 5, 1907.

1,123,282.

Patented Jan. 5, 1915.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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2 SHEETS—SHEET 2.

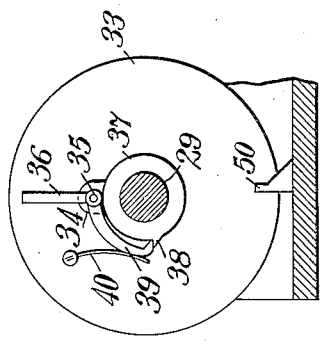


Fig. 3.

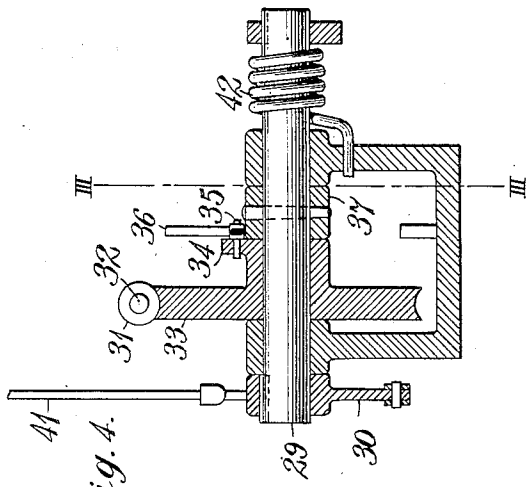


Fig. 4.

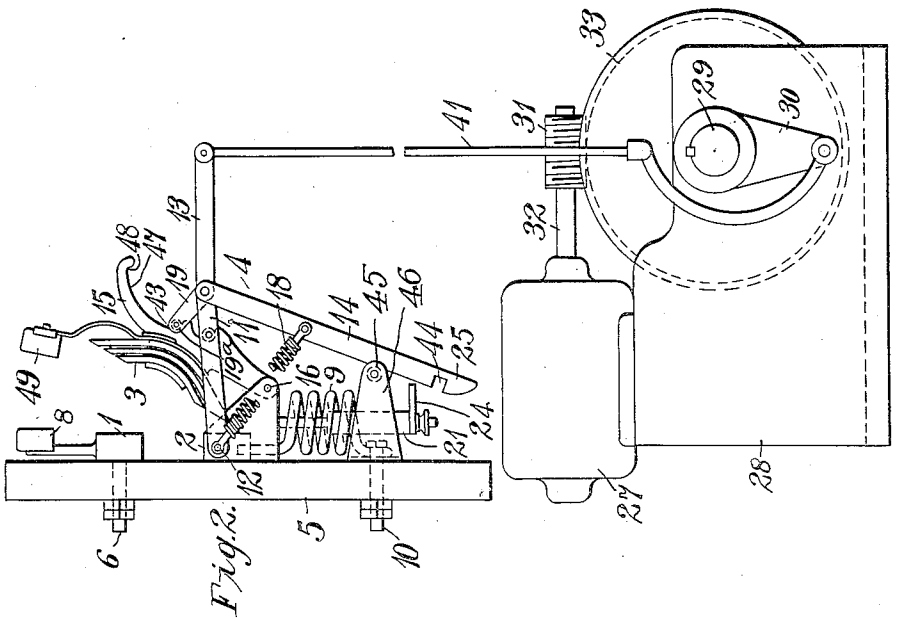


Fig. 2.

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CIRCUIT-INTERRUPTER.

1,123,282. Specification of Letters Patent. Patented Jan. 5, 1915.

Application filed October 5, 1907. Serial No. 396,042.

To all whom it may concern:

Be it known that I, FORD W. HARRIS, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Interrupters, of which the following is a specification.

My invention relates to circuit-interrupters and it has for its object to provide an improved device of the class above indicated that shall be simple and durable in construction and effective in operation.

I provide a circuit interrupter that may be operated manually or otherwise and to which certain predetermined movements are successively applied to close the breaker and complete the circuit through its contact member. The last of these movements permits of a quick and unrestricted opening of the breaker if its contact members effect a short circuit by their engagement or come together under other abnormal conditions. Furthermore, the operating mechanism is so constructed and aranged that successive movements of the operating lever in opposite directions during the closing operation, cause the movable contact member to be actuated in a single direction in two distinct steps corresponding to the movements of the operating lever.

My invention is illustrated in the accompanying drawing, in which—

Figure 1 is a side elevation of a manually operated circuit interrupter constructed in accordance therewith. Fig. 2 is a view similar to Fig. 1 of the circuit interrupter in its open position, the breaker in this figure being equipped with electrically operated means for producing the necessary movements for closing the breaker. Fig. 3 and Fig. 4 are respectively an end elevation and a sectional view of the operating mechanism shown in Fig. 2.

Referring to the drawings, with special regard to Fig. 1, the device here illustrated comprises stationary contact members 1 and 2, movable contact member 3, an operating mechanism 4 and a stationary plate or slab 5 to which the contact members 1 and 2 are secured. The stationary contact member 1 is provided with a projection 6 which extends through the insulating slab 5 and constitutes one terminal of the interrupter. It is also provided with a lateral projection 7 to which an auxiliary arcing contact member 8 is secured. The movable contact member 3 is preferably constructed of laminated copper or other conducting material and is slightly bowed and provided with beveled ends in order that it may form a low resistance connection between the contact members 1 and 2 when the interrupter is closed. The circuit is completed from the terminal 6 through contact terminal 1, movable contact member 3, stationary contact member 2 and an over-load release magnet winding 9 to a terminal 10, the magnet winding being preferably in the form of a helix and connected at its ends to the contact member 2 and to the terminal member 10.

The operating mechanism 4 comprises a pair of links 11 which are pivotally supported upon the ends of a stationary shaft 12 at the sides of the contact terminal 2, an operating bell-crank lever 13 which is pivotally attached to the outer extremities of the links 11, a locking bar or latching member 14 and a supporting arm 15 that is pivotally mounted at 16 between brackets 17 with which the stationary slab 5 is provided. One extremity of the latching member 14 is pivotally secured to the outer extremities of the links 11 and an intermediate point in this bar is connected to the stationary shaft 12 by a helical spring 18. One arm 19 of the bell-crank lever 13 is relatively short and is provided with a roller 19^a near its outer extremity that is adapted to engage the outer cam surface of the arms 15, the other arm of the lever being relatively long and provided with a handle 20.

A movable cylindrical core member 21 is adjustably mounted on a substantially vertical shaft or bolt 22 which projects downwardly from a cross strip 23 with which the brackets 17 are provided. The lower extremity of the core member is provided with a lateral projection 24 which is adapted to engage a curved or beveled extremity 25 of the latching member 14. The lower extremity of the rod 22 is screw-threaded and is provided with an adjusting nut 26 by which the downward movement of the core member is limited. It will be readily understood that a greater number of ampere turns in the electro-magnet 9 is required to lift the core member 21 when it is considerably below its mid-position, relative to the magnet winding, than are required when it

is only slightly displaced from this position and, consequently, that the value of electric current traversing the magnet winding which is necessary to raise the core member to effect the interruption of the circuit, as hereinafter explained, may be determined by the adjusting nut 26.

The operation of the device is effected by a suitable movement of the handle lever 20 and this movement may be obtained either manually or by means of the mechanism illustrated in Figs. 2, 3, and 4, to which reference may now be had. An electric motor 27 is mounted upon a stationary frame 28 which serves also to support a rotatable shaft 29 to which an operating arm 30 for the circuit interrupter is secured. A worm gear 31 is driven by the motor shaft 32 and meshes with a worm wheel 33 that is rotatably mounted on the shaft 29. The worm wheel 33 is provided with a hub projection 34 which carries a pin shaft 35. The pin shaft 35 is substantially parallel to the center line of the shaft 29 and a small bell-crank lever 36 is rotatably mounted on the pin shaft. The shaft 29 is provided with a collar 37 which is keyed to it and is provided with a projecting tooth 38 which is adapted to engage an extremity 39 of the bell-crank lever 36. The extremity 39 of the bell-crank lever is held in engagement with the outer surface of the collar 37 by means of a spring 40. The operating arm 30 is connected to the lever 13 by means of a link 41 and the shaft 29, to which the arm 30 is secured, is provided with a spring 42 which normally holds the lever 13 down and thereby serves either to hold the breaker closed or to permit the interruption of the circuit in a minimum length of time.

The operation of the device is as follows: Assuming that the interrupter occupies the position shown in Fig. 2 in which the roller projection 19^a engages an indentation 43 in the cam surface of the arm 15, the operating lever 13 must first be raised until a notch 44 near the lower extremity of the latching member 14 engages a roller 45 that is supported by brackets 46 on the slab 5. During this operation the contact member 3 is moved inwardly toward the stationary contact members 1 and 2, although engagement of these coöperating members is not effected. The operating lever 13 is now given a downward movement and the contact member 3 is thereby forced into engagement with the stationary contact members 1 and 2 by reason of the roller projection 19^a traveling over the cam surface 47 of the bar 15 and engaging a second indentation 48, as shown in Fig. 1 of the drawing.

If an overload occurs when the circuit interrupter is closed or if, from any cause, the circuit traversing the magnet winding 9 exceeds a predetermined amount, the core member 21 will be raised and the latching member 14 will be released by the engagement of the projection 24 with the extremity 25 of the bar. The movable contact member 3 is formed of resilient copper brushes which are compressed when the contact member 3 engages the stationary contact members 1 and 2. When the compressing force is removed by reason of the downward movement of the roller 19^a the lever 15 will be thrown outwardly, as will be seen by those versed in the art.

One of the principal advantages in my improved circuit interrupter lies in the fact that the last movement of the operating handle in closing the breaker is a downward movement which tends to quickly remove the operating mechanism and thus permits of an unrestricted opening of the interrupter, if an excessive current traverses the magnet winding as soon as the contact members are initially brought into engagement. The resiliency of the contact member 3 and the spring support for the contact member 49, together with the action of gravity, effects the separation of the main contact members. The initial engagement, will, of course, be established between the auxiliary contact members 8 and 49 which are usually constructed of carbon or other suitable material.

The necessary movements above described are accomplished by the motor 27 in connection with the mechanism illustrated in Figs. 3 and 4. If the device occupies the position shown in Fig. 2 and the motor 27 is operated to produce a clockwise rotation of the worm wheel 33 the projection 38 from the collar 37 will be engaged by the extremity 39 of the bell-crank lever 36. A rotation of the shaft 29 of the operating lever 30 must be effected and the initial upward movement of the lever 13 will be produced. After the rotation of the worm wheel 33 has progressed through one-half a revolution the outer extremity of the bell-crank 36 engages a stationary pawl 50 and the shaft 29 is released. The spring 42 will then produce a rapid return of the shaft and the lever 30 which will effect the final closure of the circuit breaker or will serve to immediately move the operating mechanism of the breaker to its open position, if the current traversing the winding 9 is excessive, immediately upon the engagement of the contact members.

It is conceivable that variations in the size and arrangement of details in the breaker may be effected without departing from the spirit of my invention and other devices may be employed in lieu of that illustrated in the drawings to produce the desired movement for closing the circuit interrupter, consequently, I desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In a circuit interrupter, the combination with stationary and movable contact members, a pivotally mounted supporting arm for said movable member and a cam associated with said arm, of an operating lever coöperatively associated with said cam, pivotally mounted links for pivotally supporting said lever, a latch member depending from the pivotal support of the said lever, means for restraining said latch member and means for releasing said latch member.

2. A circuit interrupter comprising stationary and movable contact members, an arm for supporting the movable contact member having a cam surface and being pivotally mounted at its lower extremity, links pivoted at their inner ends to one of the stationary contact members, an operating bell-crank lever pivotally connected to the outer extremities of the links, said bell-crank lever being provided with a roller projection that engages the cam surface, a latching member for said lever, resilient means for acting upon said latching member, and a release mechanism for tripping said latching member, said bell-crank operating lever requiring an upward and a downward movement for effecting the engagement of the contact members.

3. In a circuit interrupter, the combination with stationary and movable contact members, a pivotally mounted supporting arm for said movable member and a cam associated with said arm, of an operating lever coöperatively associated with said cam, pivotally mounted links for pivotally supporting said lever, means coöperating with said operating lever and said links for latching the movable contact member in its closed position, and means for releasing said latching means.

4. In a circuit interrupter, the combination with stationary and movable contact members, a pivotally mounted supporting arm for said movable member and a cam associated with said arm, of an operating lever coöperatively associated with said cam, pivotally mounted links for pivotally supporting said lever, and means coöperating with said operating lever and said links for latching the movable contact member in its closed position.

5. In a circuit interrupter, the combination with stationary and movable contact members, a pivotally mounted supporting arm for said movable members and a cam associated with said arm, of an operating lever coöperatively associated with said cam, pivotally mounted links for pivotally supporting said lever, a latch member depending from the pivotal support of the said lever, and resilient means for restraining the said latch member and for opening the interrupter.

6. In a circuit interrupter, the combination with stationary and movable contact members, a pivotally mounted supporting arm for said movable members and a cam associated with said arm, of an operating lever coöperatively associated with said cam, pivotally mounted links for pivotally supporting said lever, a latch member depending from the pivotal support of the said lever, resilient members interposed between the pivotal support of the said links and points intermediate the ends of the said latch member, a stationary member for coöperating with the said latch member for restraining the same, and means for releasing the said latch member.

7. In a circuit interrupter, the combination with stationary and movable contact members, a pivotally mounted supporting arm for the said movable members and a cam associated with the said arm, of a bell crank lever coöperatively associated with the said cam, a pivotally mounted link for pivotally supporting said bell crank lever, a latch member depending from the pivotal support of the said bell crank lever, means for restraining the said latch member and means for releasing the said latch member.

8. A circuit interrupter comprising stationary and movable contact members, an arm for supporting the movable contact members having a cam face and being pivotally mounted at its lower extremity, links pivoted at their inner ends to one of the stationary contact members, an operating bell crank lever pivotally connected to the outer extremities of the links, said bell crank lever being provided with a roller projection that engages the cam surface, a latching member coöperating with said operating lever and said links, resilient means for acting upon said latching member, and a release mechanism for tripping said latching member.

In testimony whereof, I have hereunto subscribed my name this 26th day of Sept., 1907.

FORD W. HARRIS.

Witnesses:
C. A. TUCKER,
BIRNEY HINES.