F. W. HARRIS.

ELECTRIC CIRCUIT INTERRUPTER.

APPLICATION FILED MAY 6, 1907.

963,764. Patented July 12, 1910.

Fig. 1.

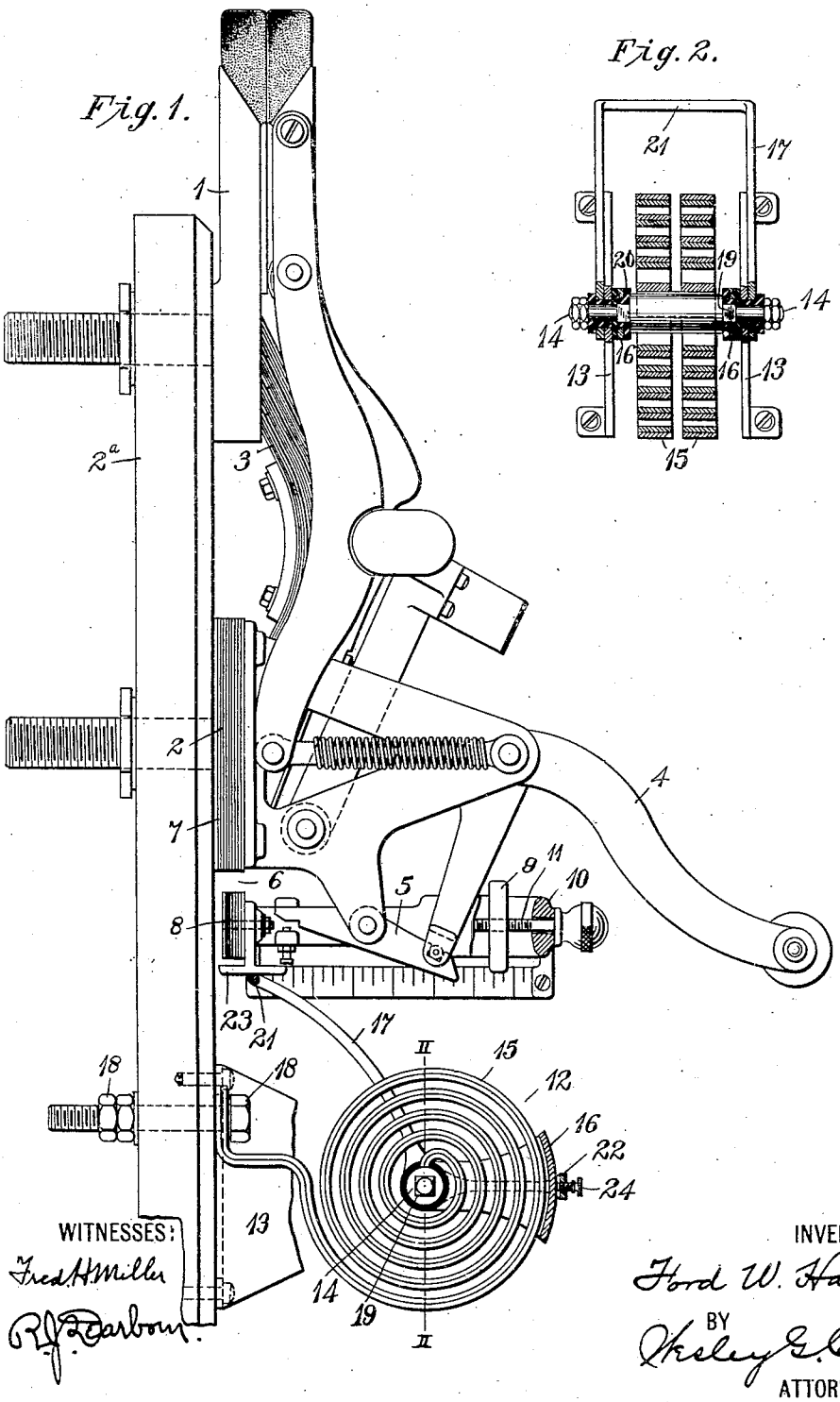

Fig. 2.

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ELECTRIC-CIRCUIT INTERRUPTER.

963,764. Specification of Letters Patent. Patented July 12, 1910.

Application filed May 6, 1907. Serial No. 372,208.

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 Electric-Circuit Interrupters, of which the following is a specification.

My invention relates to automatic interrupters for electric circuits, and it has for its object to provide an improved device of this character that shall be adapted to open the circuit in which it is connected, under predetermined conditions of load and temperature in the translating devices which are supplied from the circuit.

It is a well known fact that electrical apparatus, in general, is capable of sustaining a considerable overload for a relatively short time without injury, while the continuous application of much smaller electric currents may cause material damage. The circuit interrupter of my present invention is responsive to predetermined values of electric current traversing the circuit in which it is connected, but these predetermined values are automatically adjusted by a thermo-responsive device such that the best possible protection for the circuit may be afforded without unnecessarily disturbing its continuity.

Figure 1 of the accompanying drawings is a side elevation of a circuit interrupter constructed in accordance with my invention, and Fig. 2 is a sectional elevation on the line II—II of Fig. 1, which illustrates the construction of the thermo-responsive device constituting a part of the interrupter.

Referring to the drawings, the circuit interrupter here illustrated comprises stationary contact members 1 and 2 which are mounted on an insulating slab or base 2^a, a movable bridging contact member 3, an operating handle lever 4, a latch 5 and a tripping magnet 6. The tripping magnet comprises a stationary core member 7 and a movable core member 8, the effective weight of the latter being adjusted by varying the position of a counter-weight 9.

I deem it unnecessary to describe the circuit interrupter in detail, since its structure is shown and described in Patent No. 633,772, granted September 26, 1899, to the Westinghouse Electric & Manufacturing Company, as assignee of Gilbert Wright and Christian Aalborg, and is well known in the art. Furthermore, in my present invention, the circuit interrupter illustrated is intended to be indicative of devices of this general class without imposing limitations as to any specific structure.

The value of electric current which will actuate the circuit interrupter is dependent upon the effective weight of the movable core member 8 and also upon the length of the air gap between the stationary and movable core members. As above indicated, the effective weight of the movable core member 8 may be adjusted by varying the position of the counter-weight 9 which is mounted on a rocking arm 10. The counter-weight is in the form of a traveling nut and is moved longitudinally with respect to the rocking arm 10 by means of a screw-threaded rod 11, in a well known manner.

In order to provide an automatic adjustment of the air gap between the stationary and movable core members 7 and 8, a thermo-responsive device 12, which coöperates with the interrupter, is mounted on the insulating slab 2^a. This device comprises a supporting bracket 13, a shaft 14 which is rotatably mounted in and insulated from the bracket 13, a pair of thermo-responsive spirals 15, a clevis 16 which is insulated from the shaft and is stationary relative thereto, and an adjusting member 17 which is rotatably mounted on and insulated from the shaft 14. The inner ends of the spirals 15 are electrically connected together by means of the shaft 14 to which they are firmly secured, while their outer extremities are affixed to terminal studs 18 which are secured to the insulating slab 2^a and may be so connected in circuit that all or a portion of the current in the main circuit shall traverse the spirals.

The thermo-responsive device may be connected in a circuit which is distinct from and independent of the main circuit that is completed through the circuit interrupter, however, if desired. For example, the terminals 18 may be connected to the interrupted field circuit of a dynamo-electric machine, while the interrupter is adapted to control the armature circuit of the same machine.

Each of the spirals is built up of a plurality of resilient conducting strips having unlike co-efficients of expansion so that

variations in temperature cause such a movement of their inner ends that a rotative movement of the shaft 14 is produced. The clevis 16 is of such shape that it does not interfere with the movement of the spirals and its extremities are provided with holes which engage square shoulders 19 on the shaft 14, being insulated therefrom by sleeves 20. In this way, rotative movements of the shaft produce corresponding movements of the clevis 16. The adjusting member 17 consists of two bell-crank levers which are joined together at their extremities to form two U-shaped arms 21 and 22. The arm 21 engages a projection 23 on the movable core member 8 and the arm 22 may be clamped to the clevis 16 by a set-screw 24.

The operation of the device is as follows: Assuming that the arm 22 of the adjusting member 17 is clamped to the clevis 16, by means of the set-screw 24, in such position that the arm 21 supports the core member 8 in position to insure the desired air gap between it and the stationary core member 7 when no current traverses the circuit interrupter; an excessive current of comparatively brief duration, if sufficient to produce a flux corresponding to the width of the air gap and the adjustment of the counter-weight 9, will cause the core member 8 to rise and effect withdrawal of the latch 5. If a current of a lesser value than that just mentioned traverses the circuit for a sufficient length of time to heat the spirals 15 and thus cause them to expand, they will effect rotation of the shaft 14 and consequent movement of the parts 16 and 17 to decrease the width of the air gap between the members 7 and 8. In this way, interruption of the circuit will be effected by a lesser current traversing the circuit for considerable length of time as well as by a current of greater value continuing for a short time.

By suitable adjustment of the member 17, relative to the clevis 16 and the position of the counter-weight 9 on the bar 10, the circuit interrupter may be calibrated in accordance with such limiting currents of both long and short duration as may be desired.

I claim as my invention:

1. In a circuit interrupter, the combination with stationary and movable contact members, a latch for holding the members normally in engagement, and a tripping magnet for the latch having a movable core member, of two double-strip current-conducting spirals having rigidly mounted outer ends and rigidly connected but jointly movable inner ends, a device for supporting the movable core member in its no-load position, and means for adjustably connecting said device to the inner ends of the spirals.

2. In a circuit interrupter, the combination with stationary and movable contact members, a latch for holding the members in engagement, and a latch tripping magnet having a movable member, of current-conducting spirals having rigidly supported outer ends, a device for supporting the movable member of the tripping magnet in its no-load position, and an adjustable connection between said supporting device and the inner ends of the spirals.

3. In a circuit interrupter, the combination with stationary and movable contact members, a latch for holding the members in engagement, and a tripping magnet for the latch having stationary and movable core members, of a current-conducting spiral having a rigidly supported end, a device for supporting the movable core member in its no-load position, and means for making an adjustable connection between said device and the free end of the spiral.

4. In a circuit interrupter, the combination with stationary and movable contact members, a latch for holding the members in engagement, and a tripping magnet for the latch having a movable core member, of a thermo-responsive device comprising electric-current-carrying spirals having stationary ends and movable ends, and means for adjusting the no-load position of said core member, said means being operatively connected to the movable ends of the spirals.

5. In a circuit interrupter, the combination with stationary and movable contact members, a latch for holding the members in engagement, and a tripping magnet for the latch having a movable core member, of a thermo-responsive device comprising electric-current-carrying spirals having stationary ends and movable ends, a clevis operatively connected to the movable ends of the spirals, and a member adjustably attached to the clevis and operated to adjust the position of said movable core member in accordance with the expansion and contraction of the spirals.

In testimony whereof, I have hereunto subscribed my name this 30th day of April, 1907.

FORD W. HARRIS.

Witnesses:
J. C. Dow,
Birney Hines.