No. 689,836. Patented Dec. 24, 1901.

A. D. WHEELER.

ELECTRIC CUT-OUT.

(Application filed Mar. 2, 1901.)

(No Model.)

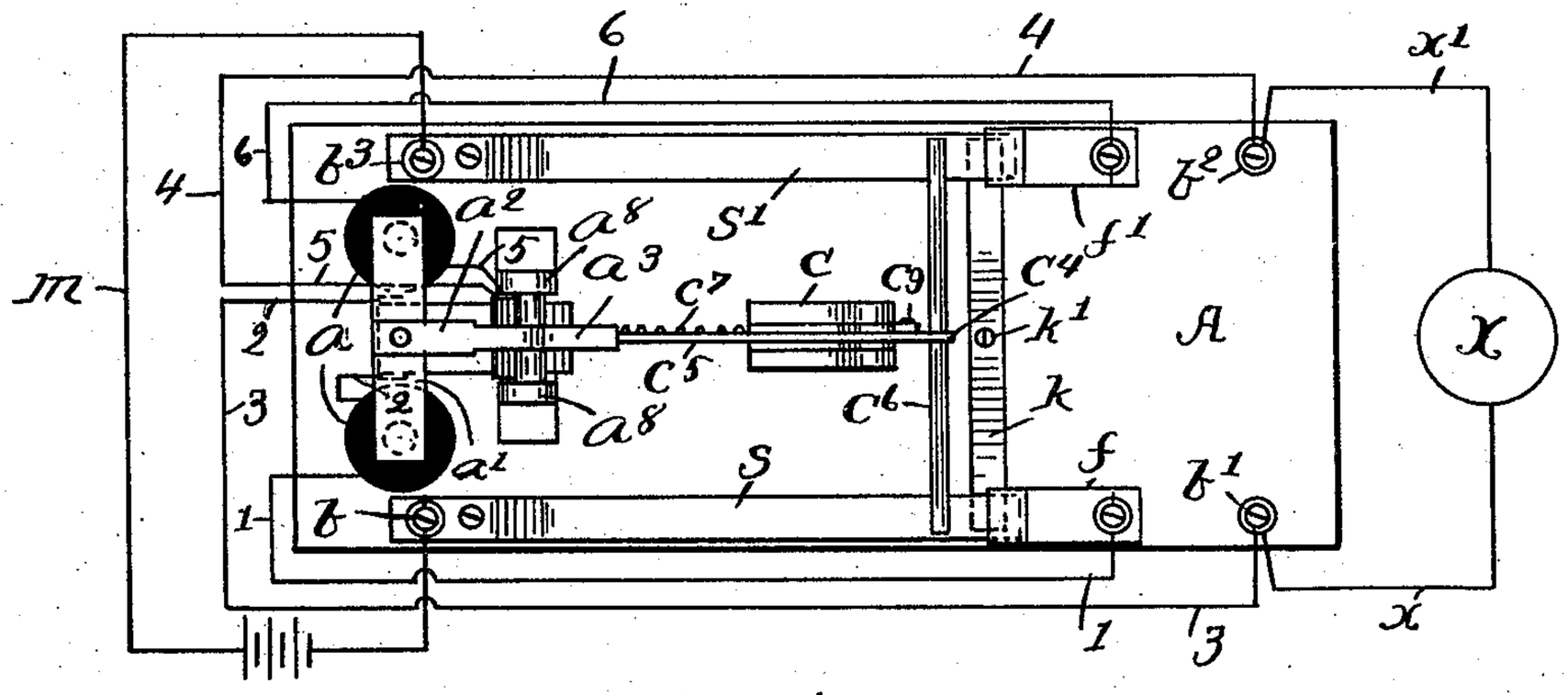

Fig. 1.

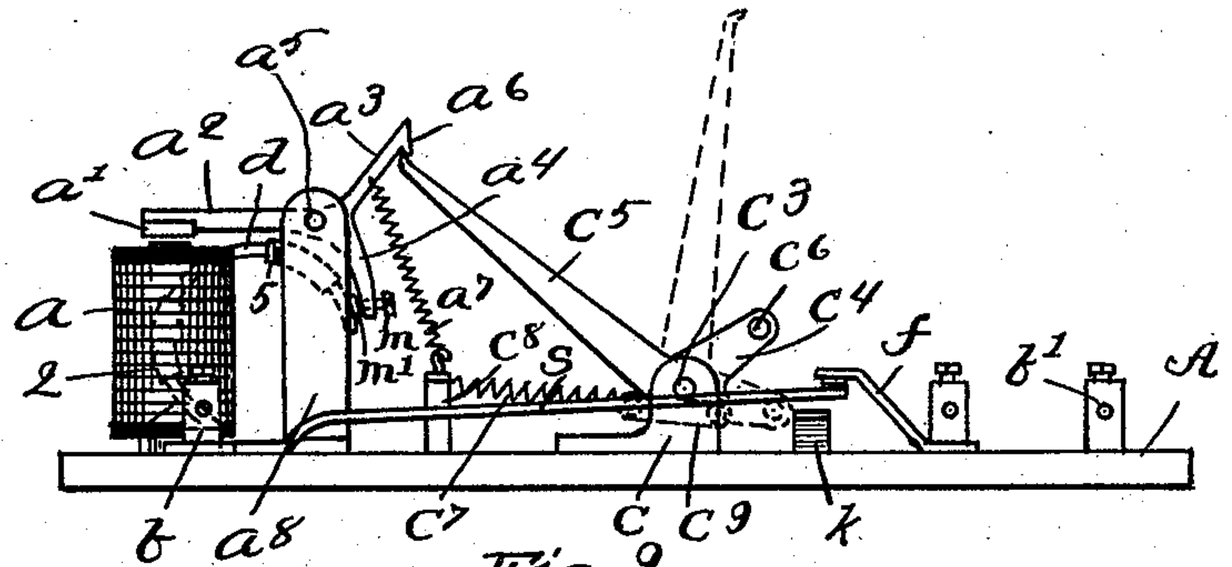

Fig. 2.

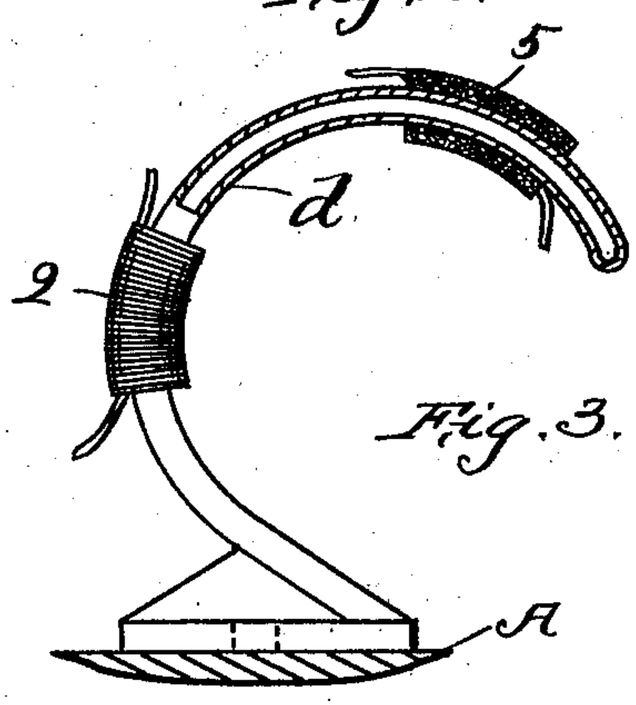

Fig. 3.

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UNITED STATES PATENT OFFICE.

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ELECTRIC CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 689,836, dated December 24, 1901.

Application filed March 2, 1901. Serial No. 49,569. (No model.)

To all whom it may concern:

Be it known that I, ALDEN D. WHEELER, of Hydepark, in the county of Norfolk and State of Massachusetts, have invented an Improvement in Electric Cut-Outs, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

The object of this invention is to construct an electric cut-out for the protection of instruments against the effects of abnormal currents, either direct or alternating, which will preserve the continuity of the main circuit when the circuit of the instrument to be protected is disconnected therefrom and which will reduce to a minimum the possibility of the formation of an arc between the disconnected circuits.

In accordance with this invention two circuit-breakers are employed, one for each side of the circuit of the instrument to be protected, and a spring-actuated operating device is provided for said circuit-breakers, which also forms a component part of a shunt-circuit closer and also a component part of a main-circuit closer, adapted when said operating device is actuated to first electrically connect the said circuit-breakers, and thereby close a shunt-circuit around the instrument, and almost instantly thereafter to simultaneously operate both circuit-breakers to open the circuit at both sides of said instrument and at the same time preserve the continuity of the main circuit. Means are provided for automatically releasing said spring-actuated operating device, comprising, essentially, an electromagnet, which is included in the circuit of the instrument to be protected, and its pivoted armature, which is adapted in its normally-retracted position to hold a detent in position to hold said spring-actuated operating device in its retracted or "set" position, said electromagnet being wound to be affected only by an abnormal current, and additional means are further provided for releasing said spring-actuated operating device mechanically comprising, essentially, a thermal device adapted and arranged to move said detent out of engagement with said spring-actuated operating device when an abnormal current heats said thermal device—as, for instance, an alternating current, which would not electromagnetically operate said pivoted armature.

Figure 1 represents a plan view of a cut-out embodying this invention, showing in diagram the circuits and connections. Fig. 2 represents a side elevation of the cut-out. Fig. 3 is a detail showing the thermal device in side elevation and partial section.

On the base-plate A are suitably disposed two similarly-constructed circuit-breakers s f s' f', and said circuit-breakers are connected, respectively, to the wires x x' of the circuit containing the instrument, as X, to be protected. Said circuit-breakers consist of a fixed member, as f f', and a movable member, as s s', and said movable members are disposed and arranged to normally coöperate with or engage the under side of their respective fixed members. Means are provided for electrically connecting said movable members and for thereafter simultaneously disconnecting both of said movable members from their respective fixed members, thereby first closing a shunt around the instrument to be protected and then opening the circuit at both sides of said instrument, while at the same time preserving the continuity of the main circuit.

The above results are accomplished as follows: To a suitable stand or support C, disposed on the base-plate A between said movable members s s', is pivoted, as at c^3, a bell-crank lever, its arms, as c^4 and c^5, extending at substantially right angles to each other. One of said arms, as c^4, is comparatively short, and near its end and extending therethrough at substantially right angles in parallelism to its axis is disposed a cross-bar, as c^6, of suitable conducting material, which is adapted by downward or upward movement of the arm c^4, bearing it, to be moved, respectively, into or out of engagement with both of said movable members s s' simultaneously, or substantially so. A spring c^7 is fastened at one end to a suitable post, as c^8, and at the other end to said bell-crank lever, as at c^9, for holding said lever, with its cross-bar c^6, in engage-

ment with said movable members *s s'*, and the strength of said spring is sufficient to overcome the strength of said movable members and to simultaneously move and hold them out of engagement with said fixed members *f f'*. Means are provided for holding said bell-crank lever in its retracted position and for automatically releasing it to allow it to operate said movable members *s s'*, comprising, essentially, an electromagnetic device and a thermal device, one or the other of which will be operated by an abnormal current. An electromagnet *a* is mounted on the base-plate, and its armature *a'* is secured to one arm a^2 of the triple-armed lever, pivoted at a^5 to a suitable yoke or support a^8 and normally held in retracted position by a spring a^7. One arm a^3 of said armature-lever is turned upward and has a projecting portion or detent a^6 disposed and arranged to engage and hold the outer end of the arm c^5 of the bell-crank lever, and to thereby normally hold the cross-bar c^6 in its retracted position out of engagement with said movable members *s s'*. The third arm a^4 of said triple-armed lever extends downward into the path of movement of the thermal device. To the base A, between the coils of said magnet *a*, is fixed one end of a Bourdon spring or tube *d*, and said spring is disposed and arranged so that its other end engages with said downwardly-projecting arm a^4 of said triple-armed lever. Said tube is sealed and contains some substance, such as ether, the expansibility of which is highly sensitive to changes in temperature, and said tube is wound with two coils of wire, as 2 and 5, respectively, connected in series with the coils of said electromagnet *a*. A set-screw *m*, projecting through said arm a^4 and boss *m'* on said arm, furnishes means for adjusting the engagement between said spring and arm. To said base A a spring-acting bow-shaped strip of conducting metal *k* is fixed, as at *k'*, and said strip *k* is disposed and arranged beneath the movable members *s s'* and is adapted to be engaged at its opposite ends, respectively, by said movable members *s s'* when said movable members are forced down.

The wire with which the coils of the electromagnet *a* are wound is large enough to allow a normal current to flow therethrough without attracting the armature *a'*, and the wire of the windings of the Bourdon spring is likewise large enough to permit the passage of a normal current without heating said spring.

In operation it will be seen that when an abnormal current passes through said electromagnet the armature will be attracted and will thereby release the spring-actuated bell-crank lever, which will operate to first electrically connect the movable members *s s'*, thereby forming a shunt-circuit and minimizing the possibility of the formation of arcs, and almost instantly thereafter will move the movable members *s s'* simultaneously out of engagement with their respective fixed members *f f'* to break the circuit on both sides of the protected instrument and by reason of electrically connecting said movable members *s s'* will preserve the continuity of the main circuit and will also almost instantly move said contact-pens into engagement with said strip *k* to provide a supplemental path for the current between the two movable members. If for any reason said abnormal current should fail to magnetically attract said armature, said abnormal current will heat the said Bourdon spring as it passes through the coils thereon, and as it is well known that heat will straighten out such springs it will therefore be seen that when said spring is thus heated its free end will be moved and will positively push said arm of said triple-armed lever, and thereby release said spring-actuated operating device to break the circuit.

The thermal releasing device as herein shown is provided with especial reference to abnormal alternating currents; but I do not desire to limit my invention to using an alternating current, as it is evident that the device may be used to equal advantage with a direct current without departing from the spirit and scope of my invention.

The circuits and connections as herein shown include the electromagnet *a* in the circuit of the instrument to be protected.

The main circuit, as M, is connected to binding-post *b*, which is or may be in direct contact with the movable member *s*, and the current passes through movable member *s*, fixed member *f*, wire 1, one of the coils of the magnet *a*, winding-wire 2 of said Bourdon spring, wire 3, binding-post *b'*, wire *x*, instrument to be protected X, wire *x'*, binding-post b^2, wire 4, winding-wire 5 of said Bourdon spring, the other coil of said magnet *a*, wire 6, fixed member *f'*, movable member *s'*, and binding-post b^3 to the main circuit. It will be seen, therefore, that when said movable members *s s'* are held out of engagement with said fixed members *f f'* the current will pass through movable member *s*, cross-bar c^6, strip *k*, and movable member *s'*, and the continuity of the main circuit will be thereby preserved. It will therefore be seen that the instrument to be protected is first shunted out and then cut out and the continuity of the main circuit is at all times preserved.

I claim—

1. In an electric cut-out, the combination of two circuit-breakers, one for each side of the circuit of the instrument to be protected, a spring-actuated operating device for said circuit-breakers, a detent for holding said spring-actuated operating device in retracted or "set" position, an electromagnet and a Bourdon spring both operated by the passage of an abnormal current through the circuit for operating said detent to release said operating device, substantially as described.

2. In an electric cut-out, the combination of two circuit-breakers, one for each side of

the circuit of the instrument to be protected, a spring-actuated operating device for said circuit-breakers, a component part of which coöperates with said circuit-breakers to serve as a shunt-circuit closer and also as a main-circuit closer, a detent for holding said spring-actuated operating device in retracted or "set" position and means operated by the passage of an abnormal current through the circuit for operating said detent to release said operating device, substantially as described.

3. In an electric cut-out, the combination of two circuit-breakers, and an operating device therefor, comprising a spring-actuated bell-crank lever bearing a cross-bar adapted to be moved into or out of engagement with both of said circuit-breakers and a detent for holding said spring-actuated operating device in retracted or "set" position and means operated by the passage of an abnormal current through the circuit for operating said detent to release said operating device, substantially as described.

4. In an electric cut-out, the combination of two circuit-breakers, an operating device therefor, comprising a spring-actuated bell-crank lever bearing a cross-bar of conducting material adapted to be moved into engagement with said circuit-breakers to shunt and thereafter cut out the instrument and also preserve the continuity of the main circuit, a detent for holding said spring-actuated operating device in retracted or "set" position and means operated by the passage of an abnormal current through the circuit for operating said detent to release said operating device, substantially as described.

5. In an electric cut-out, the combination of two circuit-breakers, an operating device therefor, comprising a spring-actuated bell-crank lever having a cross-bar of conducting material adapted to be moved into engagement with said circuit-breakers to shunt and thereafter cut out the instrument and also preserve the continuity of the main circuit, a detent for holding said spring-actuated operating device in retracted or "set" position and means operated by the passage of an abnormal current through the circuit for operating said detent to release said operating device, and a strip of conducting material, disposed beneath said circuit-breakers, and adapted to be engaged by said circuit-breakers when moved downward by said operating device and to thereby furnish a supplementary path for the current between said circuit-breakers, substantially as described.

6. In an electric cut-out, the combination of two circuit-breakers, one for each side of the circuit of the instrument to be protected, a spring-actuated operating device therefor, a detent for holding said spring-actuated operating device in its retracted position, a thermal device and an electromagnet both included in said circuit, a pivoted armature carrying said detent, and being also in engagement with said thermal device for releasing said operating device upon the passage of an abnormal current, substantially as described.

7. In an electric cut-out, the combination of two circuit-breakers, one for each side of the circuit of the instrument to be protected, a spring-actuated operating device therefor, a pivoted bell-crank lever, a detent borne on one arm of said lever for holding said spring-actuated operating device in retracted position, a sealed Bourdon tube or spring fixed at one end to the base and having its free end in engagement with the other arm of said bell-crank lever and two coils of wire around said tube, each connected in series with one of the circuit-wires for heating said tube upon the passage of an abnormal current to thereby straighten said tube and operate said bell-crank lever to release said spring-actuated operating device, substantially as described.

8. In an electric cut-out, the combination of a circuit-breaker, a spring-actuated operating device therefor, a detent for holding said spring-actuated operating device in "set" position, a Bourdon spring adapted to be operated by the passage of an abnormal current through the circuit, for positively pushing said detent out of engagement with said spring-actuated operating device, and an electromagnet also included in the circuit, the armature of which is carried by an arm connected with the detent, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALDEN D. WHEELER.

Witnesses:
W. E. DECROW,
B. J. NOYES.