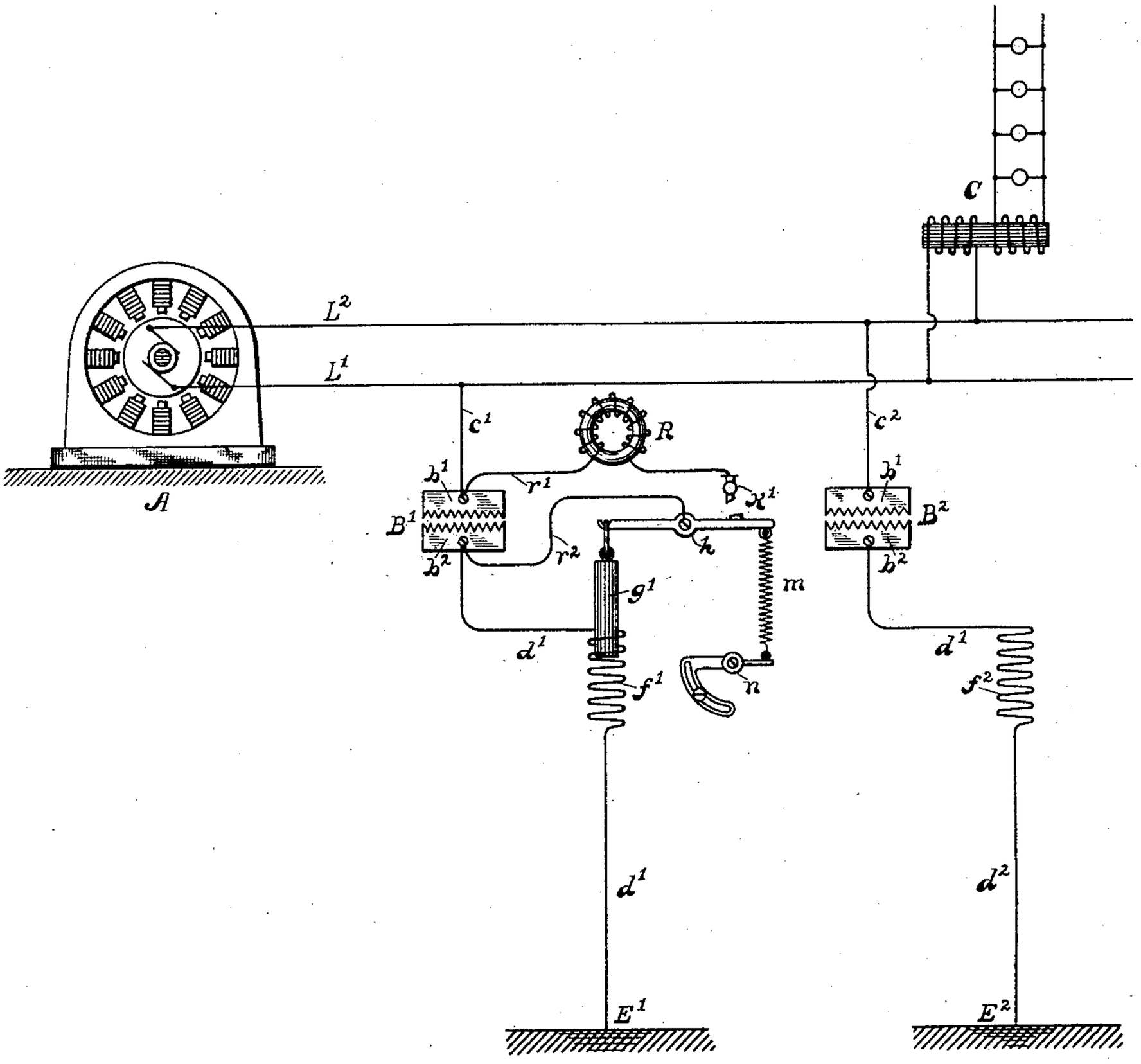
(No Model.)

A. WURTS & O. H. BALDWIN.

LIGHTNING ARRESTER.

No. 433,430. Patented July 29, 1890.



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UNITED STATES PATENT OFFICE.

ALEXANDER WURTS AND OSCAR H. BALDWIN, OF PITTSBURG, PENNSYLVANIA, ASSIGNORS TO THE WESTINGHOUSE ELECTRIC COMPANY, OF SAME PLACE.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 433,430, dated July 29, 1890.

Application filed July 1, 1889. Serial No. 316,144. (No model.)

To all whom it may concern:

Be it known that we, ALEXANDER WURTS and OSCAR H. BALDWIN, citizens of the United States, residing in Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Lightning-Arresters, (Case No. 334,) of which the following is a specification.

The invention relates to the class of devices employed for protecting electric circuits and apparatus from the injurious effects of lightning-discharges and of the generated currents which are liable to continue to flow through the circuits established through the lightning-arrester by the lightning-discharges.

The invention relates particularly to circuits supplied by alternating electric currents.

The object of the invention is to provide means for withdrawing or interrupting the arc formed by the lightning-discharge across the lightning-arrester by the automatic action of the current which tends to flow through the circuit established by the lightning.

The invention consists, generally, in constructing a lightning-arrester of the usual form with discharge-plates having confronting discharge points or surfaces, one of the plates being designed to be connected with the main-line conductor and the other with the earth, and in connecting in circuit between the main line and the earth a self-induction or reactive coil which will be traversed by the current flowing through the lightning-arrester. This device consists of a coil or solenoid provided with a movable core, which will be drawn into the coil or solenoid by the flow of the current therethrough, thus establishing an increasing reactive effect of counter electro-motive force, the effect of which will be to either extinguish the arc across the interrupter or reduce the current flowing to a very small amount. For the purpose of insuring that the arc shall be interrupted in case the current be of such strength that the counter electro-motive force developed by the device should not be sufficient to entirely prevent its flow, a shunt-circuit may be automatically closed around the arrester through a reactive coil after the current flowing has been materially reduced in strength. This shunt-circuit is closed only momentarily, but a sufficient length of time to withdraw the arc from the arrester. The opening of the shunt-circuit will not cause a spark of sufficient size to cause injury to the terminals of the interrupting device, because of the reduction in the current caused by the reactive coils. It will be evident that this form of device is especially applicable to circuits using the alternating, intermittent, or undulatory electric currents, since the reduction of the current is dependent upon the action of the reactive coils under the influence of such currents.

The invention will be described more particularly in connection with the accompanying drawing, which is a diagram illustrating the general organization of the apparatus.

Referring to the drawings, A represents a generator of alternating, intermittent, or undulatory electric currents of any suitable character. From this generator main lines L' L^2 lead to any desired work-circuit. There is represented a converter C as being connected with the lines L' L^2. Other converters or electrical apparatus may be connected. Leading from the line L' there is shown a conductor c', connected with one plate b' of the lightning-arrester B'. The other plate b^2 is connected by a conductor d' with the earth at E'. In the conductor d' there is connected a coil or solenoid f', provided with a movable core g'. This core is suspended in any convenient manner, as by a lever h, so that it can be drawn into the solenoid a greater or less extent. A spring m, attaching it to the adjusting device n, is employed for determining the position of the core g' when at rest. It is normally nearly withdrawn from the coil. If, now, a lightning-discharge should pass from the line L' to the plate b' and across the open space to the plate b^2, escaping to the earth at E', the tendency will be for the generated current from the generator A to follow through the path thus established and maintain the arc. The immediate tendency of both the lightning-discharge and the suc-

ceeding current is to draw the core g' farther into the coil, thus increasing the reactive effect produced thereby until, if the parts be so proportioned, the counter electro-motive force developed will be sufficient to nearly, if not quite, interrupt the flow of the current through that circuit. The parts may be so organized as to thus cause the interruption of the current. In some instances, however, it may be desired to have less length of wire in the solenoid than would be required to completely interrupt the flow of the current, for the reason that if too great an amount of wire is employed the ohmic resistance of the circuit becomes too large. If, therefore, it is simply desired to reduce the strength of the current to a predetermined amount, a shunt-circuit may be closed automatically around the plates b' b^2, for withdrawing the arc therefrom. This shunt-circuit may be immediately interrupted. This may be accomplished by means of a contact-point k', against which the lever h is thrown by a downward movement of the core. The lever h is connected by a conductor r^2 with the plate b^2, while the point k is connected with the plate b' by the conductor r'. A reactive coil R may be included in the conductor r'. It will thus be evident that the shunt-circuit will be closed through the reactive coil R when the core g' is drawn a pretermined distance into the solenoid f'. The current will therefore be shunted around the lightning-arrester, and the combined reactive effects of both the coil R and device f' will be opposed to the current. The lever h will immediately rebound from the point k', opening this circuit and thus interrupting the connections entirely. This operation will be repeated whenever a lightning-discharge takes place across the arrester, and the continuation of an arc across the same will be prevented. There is shown in connection with the line L^2 a similar arrester B^2, having the plate b', connected with the line L', and the plate b^2, connected by the conductor d^2, through a solenoid f^2, with the earth E^2. The core and other apparatus shown in connection with the arrester B' are not repeated in connection with the arrester B^2; but it will be understood that similar apparatus is to be applied thereto.

We claim as our invention—

1. The combination, with a generator of alternating electric currents, of a lightning-arrester connected with the circuit of the generator, and a self-adjusting reactive device connected in the circuit of said arrester, and consisting of a core and a surrounding solenoid movable with reference to each other under the influence of current traversing the coil, for increasing the coefficient of induction under the influence of the current traversing said arrester.

2. The combination, with a generator of alternate electric currents, of a lightning-arrester connected therewith and an adjustable reactive device connected in the circuit with said lightning-arrester.

3. The combination, with a source of alternating electric currents, of a lightning-arrester connected therewith, a reactive coil connected in series with the lightning-arrester, and a normally-open shunt-circuit around said lightning-arrester.

4. The combination, with a source of alternating electric currents, of a lightning-arrester connected therewith, a reactive coil connected in series with the lightning-arrester, a normally-open shunt-circuit around said lightning-arrester, and a reactive coil included in said shunt-circuit.

5. The combination, with a source of alternating electric currents, of a lightning-arrester connected therewith, a solenoid connected in series with the lightning-arrester, a core movable with reference to said solenoid for increasing the self-induction of the same under the influence of a current traversing the solenoid, a circuit-closing device operated by a relative change in position of said core and solenoid, and a shunt-circuit around the lightning-arrester, the connections of which are completed by the operation of said circuit-closing device.

6. The combination, with a source of alternating electric currents, of a lightning-arrester connected therewith, a solenoid connected in series with the lightning-arrester, a core movable with reference to said solenoid for increasing the self-induction of the same under the influence of a current traversing the solenoid, a circuit-closing device operated by a relative change in the position of said core and solenoid, and a shunt-circuit around the lightning-arrester, the connections of which are completed by the operation of said circuit-closing device, and means tending normally to interrupt the connections of the shunt-circuit.

7. The combination, with a source of alternating electric currents, of a lightning-arrester B', a solenoid f' and its core g', a shunt-circuit r' r^2 around the lightning-arrester, a self-inductive device R, included in the shunt-circuit, and a circuit-closing point k', through which the connections of the shunt-circuit are completed when the core is drawn within the solenoid.

8. A device for protecting electric circuits, consisting of discharge-plates confronting each other, a self-induction device or reactive coil connected with one of said plates, a core movable with reference to said coil for increasing the self-induction, and a spring or weight normally tending to oppose such relative movement, thereby tending to oppose such increase of coefficient of self-induction.

9. A device for protecting electric circuits, consisting of discharge-plates confronting each other, a self-induction device or reactive

coil connected with one of said plates, a core movable with reference to said coil for increasing the self-induction, a spring or weight normally tending to oppose such relative movement, and a normally-open shunt-circuit around the discharge device, and a reactive coil included in said shunt-circuit.

In testimony whereof we have hereunto subscribed our names this 28th day of June, A D. 1889.

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Witnesses:
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