No. 835,388. PATENTED NOV. 6, 1906.

E. J. BERG.

THERMAL CUT-OUT.

APPLICATION FILED JUNE 1, 1903.

Fig. 1.

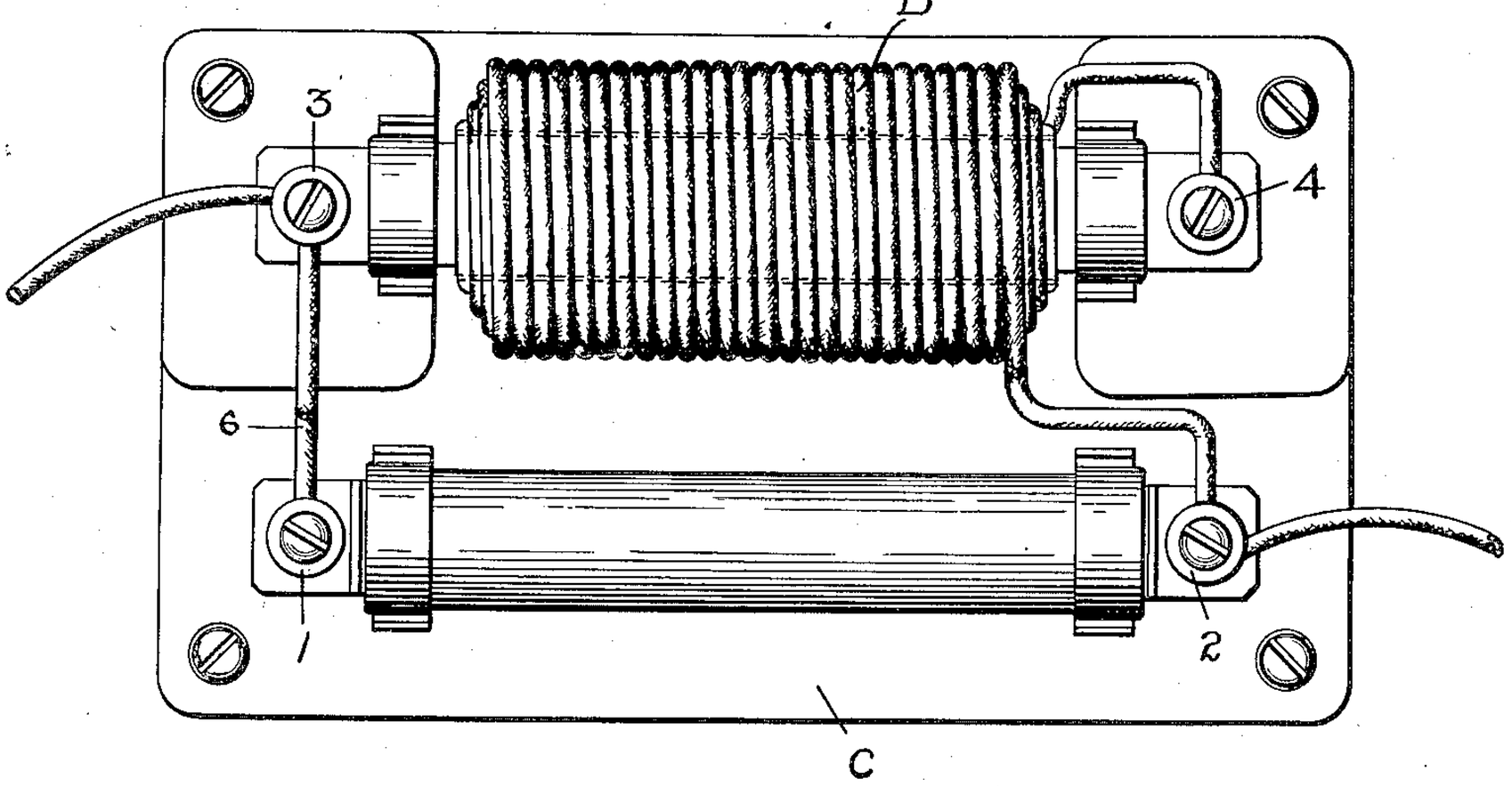


Fig. 2.

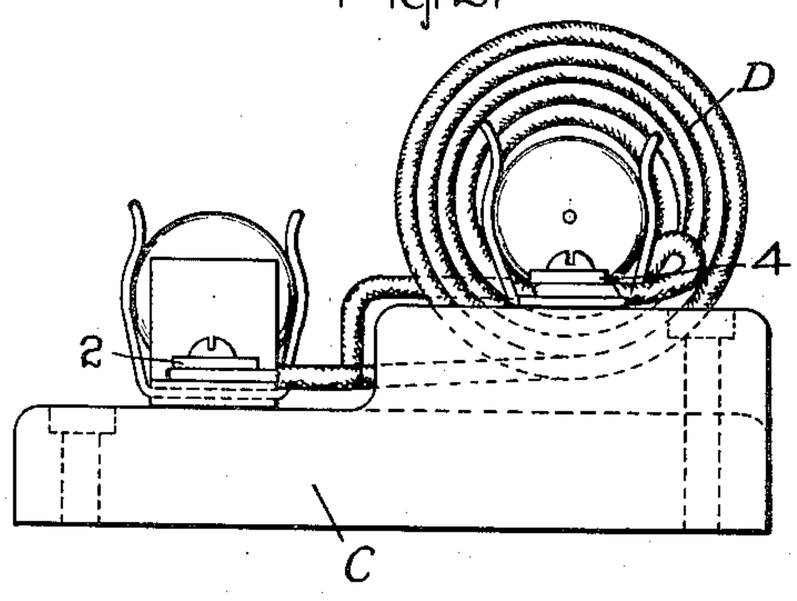


Fig. 3.

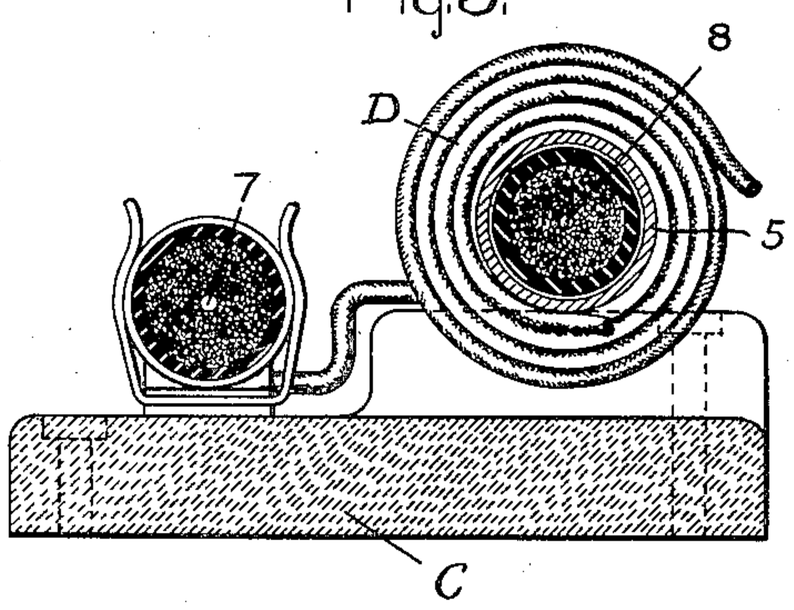
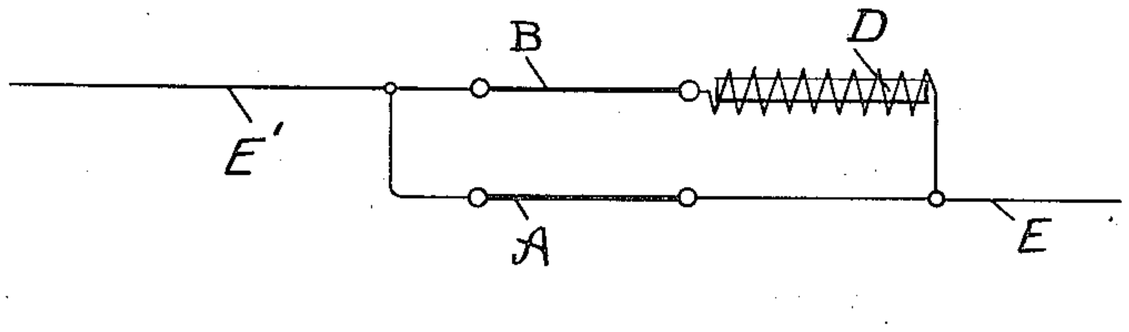


Fig. 4.



WITNESSES:

Robt. C. Chapman.

Helen A. Ford

INVENTOR,

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by Albert G. Davis Atty.

UNITED STATES PATENT OFFICE.

ERNST J. BERG, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

THERMAL CUT-OUT.

No. 835,388. Specification of Letters Patent. Patented Nov. 6, 1906.

Application filed June 1, 1903. Serial No. 159,512.

To all whom it may concern:

Be it known that I, ERNST J. BERG, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Thermal Cut-Outs, of which the following is a specification.

The present invention relates to thermal cut-out devices for protecting electrical apparatus from the injurious action of excessive or abnormal currents and more especially to the so-called "multiple-fuse" type of such devices.

As is well known, the multiple-fuse type of cut-out usually comprises a primary fuse having a low melting-point and large current-carrying capacity and a secondary fuse connected in parallel therewith and having a relatively high melting-point and low current-carrying capacity. When the current rises gradually above the normal, the primary fuse melts first, but instead of the current arcing across between the severed ends thereof through the gases of volatilization, as is usual where a single fuse is employed, it passes by way of the secondary fuse which momentarily resists the melting action of the excess current and then breaks without forming gases to carry the arc.

It has been found, however, that where excessive current is applied to a circuit suddenly, as by lightning or a short-circuit, the time element required to heat up the two fuses is such that the secondary will melt either before or concurrently with the primary, and thereby nullify the advantages of the multiple-fuse arrangement over the ordinary single fuse.

The object of my invention is to provide a multiple-fuse cut-out with means for causing the growth of current to lag in the secondary fuse sufficient to insure the advance rupture of the primary fuse.

The invention will be readily understood upon reference to the following description, taken in connection with the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a plan of a multiple-fuse arrangement embodying one form of my invention. Fig. 2 is a right-hand elevation thereof. Fig. 3 is a central transverse section, and Fig. 4 is a conventional diagram of connections.

In the arrangement shown in the drawings the primary and secondary fuses A and B are mounted upon a common support or base C, of insulating material, by means of ordinary metallic clips provided with binding-posts 1, 2, 3, and 4. An induction-coil D, having a tubular iron core 5 is, for convenience, supported by the inclosing casing of the secondary fuse B and has its ends connected, respectively, to one end of the main circuit-conductor E at the binding-post 2 and to the end of the secondary fuse B at the binding-post 4. The other ends of the fuses are joined by a connector-wire 6, secured to binding-posts 1 and 3, to one of which the other end of the main circuit-conductor E′ is secured. Thus, as indicated in Fig. 4, the secondary fuse B and its series-connected induction-coil D are connected in multiple with the primary fuse A, so that under normal working conditions a part of the current traverses the primary fuse and a part the secondary fuse and its coil D, producing substantially the same degree of temperature in both fuses; but when the amount of current in the main circuit is suddenly increased the flow in the primary fuse is correspondingly increased and its temperature suddenly raised to the point of melting, whereas the tendency of the flow of current to increase through the secondary fuse B is momentarily checked by the inductive action of the coil D thereon, so that the rise in temperature in the secondary fuse is caused to lag relatively to that of the primary fuse A, thereby insuring the advance rupture of the latter fuse.

The fuses shown in the drawings are of the usual cartridge type with a filling of sand or powdered insulating material. The fusible conductor 7 of the primary fuse A is a soft metal with a relatively low melting-point, while the fusible conductor 8 of the secondary fuse B is harder, with a higher melting-point and practically non-volatile.

I do not desire to be restricted to the construction or arrangement of parts shown and

described, for it is apparent that they may be changed and modified without departing from my invention.

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

1. In a multiple-fuse arrangement, the combination with one of the fuses, of means for causing the current to vary less rapidly therein than in the other fuse.

2. In a multiple-fuse arrangement, the combination with one of the fuses, of electro-reactive means to cause the current to vary less rapidly therein than in the other fuse.

3. In a multiple-fuse arrangement, the combination with one of the fuses, of an inductance device connected in series therewith.

4. The combination of a fuse having an inductance device connected in series therewith, and a second fuse connected in multiple with the first fuse and its inductance device.

5. The combination of a fine-wire fuse, an induction-coil connected in series therewith, and a primary fuse connected in multiple with the fine-wire fuse and its induction-coil.

6. A thermal cut-out comprising a fusible member, and an iron core and an inductance-coil surrounding said member.

7. A thermal cut-out comprising a fusible member having an inclosing casing, a tubular iron core about said member, and an inductance-coil wound upon said core.

In witness whereof I have hereunto set my hand this 29th day of May, 1903.

ERNST BERG.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.