(No Model.)

G. W. & W. MINGLE.

PROTECTOR FOR ELECTRICAL INSTRUMENTS.

No. 385,770. Patented July 10, 1888.

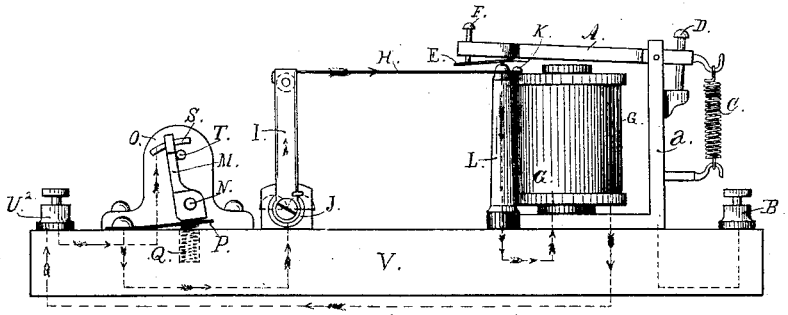

Fig. 1.

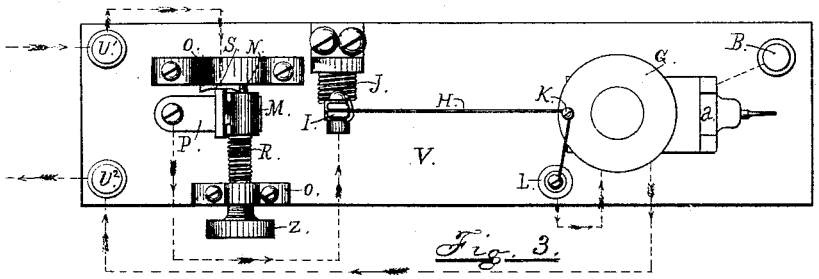

Fig. 3.

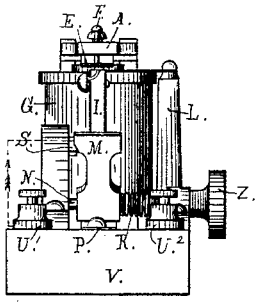

Fig. 2.

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UNITED STATES PATENT OFFICE.

GEORGE W. MINGLE AND WILLIAM MINGLE, OF PHILADELPHIA, PENNSYLVANIA.

PROTECTOR FOR ELECTRICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 385,770, dated July 10, 1888.

Application filed March 1, 1887. Serial No. 229,293. (No model.)

To all whom it may concern:

Be it known that we, GEORGE W. MINGLE and WILLIAM MINGLE, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Protectors for Telephones and other Electrical Instruments; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to devices for protecting telephones and other electrical instruments from injury by lightning or other excessive electric currents. It seems to be conceded that the most effective method of accomplishing this object is by the use of one or more sections of fine or fusible wire in the circuit. In all these devices the energy of the primary current is being depended on to fuse said fine wire. It has been clearly demonstrated that such wire will, especially when backed by an electro-magnet of high resistance—an essential part of all instruments requiring protection—transmit a current sufficiently powerful to destroy said electro-magnet. In striving to obviate this fine wires have been used, often composed of an alloy of fusible metal of such low conductivity as to greatly interfere with the ordinary work of the circuit by the resistance they offer.

Efforts at improvement have been made in which an electro magnet is used in the device for the purpose of holding its armature in contact with a ground-post, cutting off the instrument to be protected by short circuiting the current. This would be effective if the current be sufficiently powerful to fuse the wire, as would all other devices; but in the event of the current being of that class termed "feebly dangerous" the electro-magnet in the latter device would stand very much in need of a protector itself, or the strong current grounded in the building would be seriously objectionable. We claim to overcome all these difficulties by not depending on the energy of the primary current.

It is our object in this invention by a combination of well-known elements to evolve from the primary current the threefold energy of the extra current due to self-induction, often called a "secondary current" as in contradistinction to the primary current.

Our invention has the further object of providing a device which we designate the "safety-switch." Said switch is actuated by automatic mechanism and is adapted to enable the operator to safely restore the ruptured fusible wire.

To the best of our knowledge and belief neither of these essential features of our device has ever in any manner been used in devices of this kind or for this purpose.

In describing our invention we will for convenience use the term "fusible wire," not that it is composed of a fusible alloy or that it is so fine as to be liable to accidental rupture. It can be of the best copper and in sectional area three times that of the wire ordinarily used for this purpose.

In the drawings which accompany and form part of this specification similar letters refer to similar parts throughout the several views.

Figure 1 is a side elevation or view with one of the bearings and insulated handle of the safety-switch removed; Fig. 2, a left-hand end view, and Fig. 3 a plan or top view with the armature removed.

A is an armature pivoted to a suitable support, *a*. Said armature is provided with a retractile spring, C, and at its longer or contact end with a spring-tongue, E, vertically adjustable by screw F. The throw of said armature is adjustable by means of screw D. Said armature and all parts in metallic contact therewith are directly connected with the ground at binding-post B.

G is an electro-magnet; H, a section of fusible wire, said wire being retained in suitable position to receive contact of armature A by insulated pin or hook K in upper disk of magnet G.

L is a connecting-post, adapted by binding-screw at its upper end for electrical connection with fusible wire H.

I is a lever or arm of dual function. Said lever is provided with a lateral trunnion, around which is coiled a spring, J, which actuates said lever to a partly-rotative movement in the vertical plane. Said lever is further-

more provided with a suitable binding screw at its upper end, which adapts it for electrical connection with fusible wire H. The primary function of said lever is to give tension to said wire H. All of the aforesaid elements, with the exception of armature A and insulated pin K, are in the circuit, and in combination constitute the protecting feature of the device.

The safety switch of the device consists of the lever-switch M, which is adapted to a partly-rotative movement. It is provided with lateral trunnions N, journaled in insulated bearings O O, one of said trunnions being provided with an insulated handle or knob, Z, by which said lever may be safely manipulated, said lever being furthermore provided with a base of angular formation, by which it is adapted by pressure of spring Q to be retained in either a vertical or horizontal position when so placed. Said lever is normally in the path of the current, its upper contact being with metallic segment S, said contact being assured by pressure of spring R, the ends of said spring being free, it not being designed to affect the rotary movement of said lever M. The lower end of said lever is adapted for electrical contact with metallic strip P, said contact being assured by pressure of spring Q, both contacts of lever M being further assured by their sliding nature. The aforesaid lever is so located as to adapt it to be thrown from its contact with S by impact of lever I, in the discharge of its secondary function, when said lever I is released by the rupture of wire H by the secondary current.

T is a pin in one of the insulated bearings O, adapted to limit the movement of switch-lever M in that direction.

U′ and U″ are binding-posts for connecting the circuit-wires.

The entire device is mounted on a base of wood or other non-conductive material. All of the aforesaid elements are normally in the circuit.

The course of the current is, as indicated by the dotted lines, entering by post U′, thence to S, by lever *m* to P, thence to lever I, by wire H to connecting-post L, to electro-magnet, to post U″, thence to instrument to be protected.

The operation of the device is as follows: The armature being suitably adjusted, so as to resist the attraction of the electro magnet G, under normal influences there can, of course, be no interruption of the ordinary work of the circuit; but in the event of lightning or abnormal currents resulting from contact with conductors of dynamo currents the electro-magnet G would shunt itself from the circuit by actuating the ground-connected armature to short-circuit the current by making contact with wire H, and said armature, being released by shunt of magnet G, would be actuated by its retractile spring to break the contact with wire H, said break resulting in the evolution of the extra current and its resultant spark, instantly deflagrating said wire at the point of make and break of contact. Theoretically, we know the cause; but so closely contiguous in point of time are the movements of the several elements that human observation fails to detect whether it is the make or break of contact that causes the rupture of said wire. It will be noticed that the circuit is completely open, not grounded, as is the case with many devices of this kind, thus avoiding all possible danger resulting from having strong currents grounded in the building.

The operation of the safety-switch is as follows: The rupture of wire H releases lever I, which, in discharge of its secondary function, impacts on switch-lever M, throwing it from its contact with S, thereby causing a secondary break in the circuit. In this condition the ruptured wire H may be replaced with safety, even though the cause of its rupture still exists, which being done switch-lever M may be restored to its contact with S by means of its insulated handle.

We do not claim either of the several elements, as we know them to be in general use.

What we claim as new, and desire to secure by Letters Patent, is the several combinations whereby we attain desirable results, which, to the best of our knowledge and belief, have never yet been attained in devices of this class or in any manner used for this purpose. They constitute the distinctive feature of our invention, and are—

1. In a protection for telephones and other electrical instruments, a ground-connection, in combination with an electro-magnet, its armature having a ground-connection and section of fusible wire with which said armature makes electrical contact when the attraction of the electro-magnet is abnormally increased by lightning or other electrical currents, said magnet and said wire being normally in the circuit, said electro-magnet being adapted to shunt itself from the circuit and evolve extra 1 2 current by actuating said ground-connection to make and break contact with said fusible wire, substantially as described, and for the purpose set forth.

2. In a protector for telephones and other electrical instruments, a lever or arm of dual function, said lever being actuated by a spring to a partly-rotative movement and being provided at its upper end with a binding-screw, which adapts it for electrical connection with aforesaid fusible wire, the primary function of said lever being to give tension to said fusible wire, said lever being in combination with fusible wire, insulated hook K, connecting-post L, electro-magnet, and ground-connected armature, said armature being suitably pivoted to a support and provided with a retractile spring and at its contact end with a spring-tongue vertically adjustable by means of a screw and making contact with the fusible wire, substantially as described and set forth.

3. In a protector for telephones and other electrical instruments, a safety-switch lever

provided with lateral trunnions journaled in insulated bearings, said switch-lever being provided at its lower end with an angular formation and on one of its trunnions with an insulating-handle, for purposes set forth, said switch-lever being in combination with the electrodes or contact-points S and P and with the springs Q and R, said switch-lever being adapted to effect a secondary break in the circuit by being thrown from its contact with electrode S by impact of partly-rotating lever I in the discharge of its secondary function, the aforesaid elements being in combination with lever I, fusible wire, electro-magnet, and ground-connected armature, all the aforesaid elements being in combination and mounted on a base of wood or other insulating material, substantially as described, and for the purpose herein set forth.

In testimony whereof we have hereunto subscribed our names in the presence of two subscribing witnesses.

GEORGE W. MINGLE.
WILLIAM MINGLE.

Witnesses:
FRAS. C. THOMAS,
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