(No Model.)

C. F. ELDEN.

ELECTRICAL APPARATUS PROTECTOR.

No. 329,152. Patented Oct. 27, 1885.

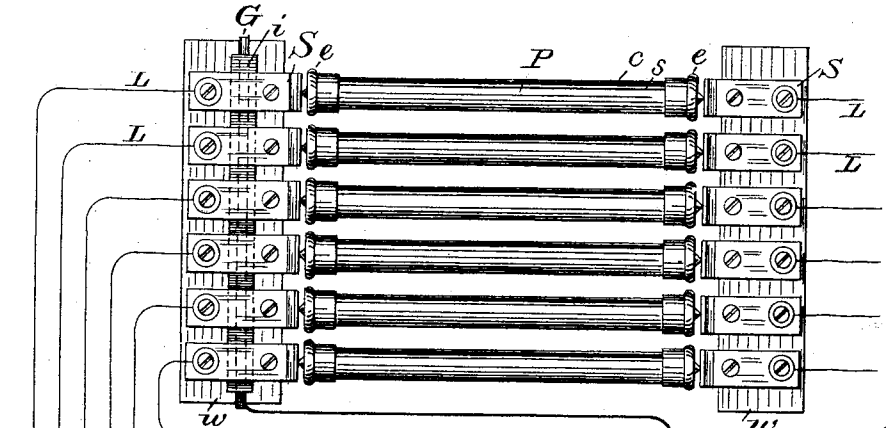

Fig. 1

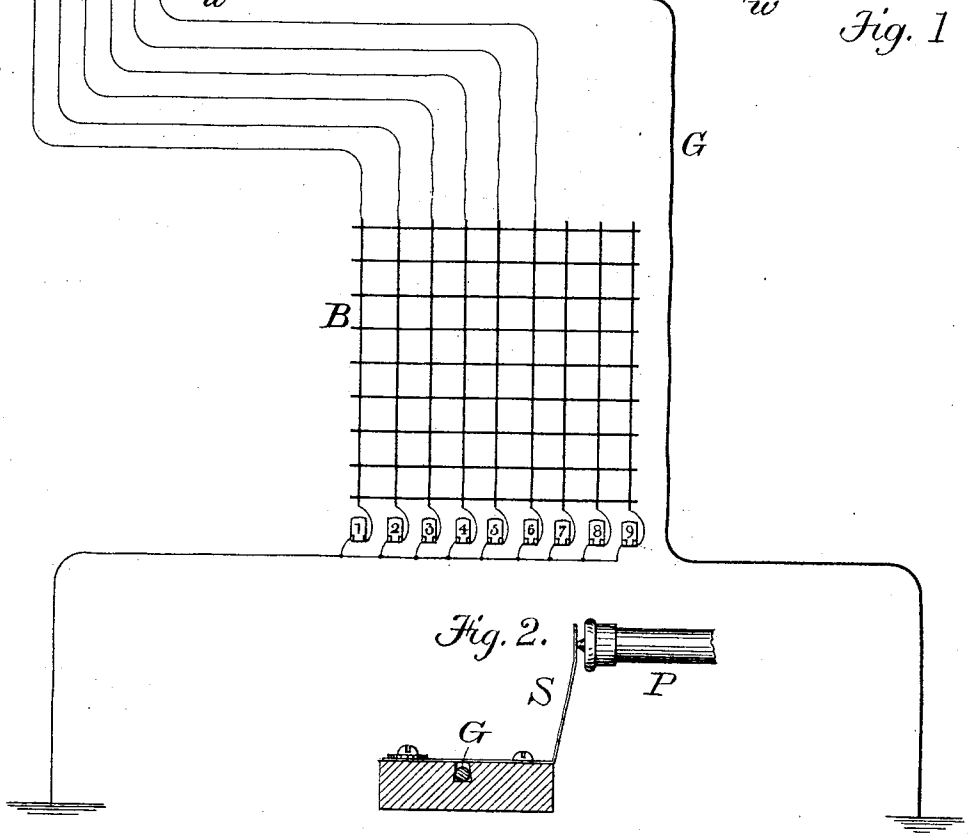

Fig. 2.

Witnesses.
Geo. Willis Pierce
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Inventor
Charles F. Elden.

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UNITED STATES PATENT OFFICE.

CHARLES F. ELDEN, OF MALDEN, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

ELECTRICAL-APPARATUS PROTECTOR.

SPECIFICATION forming part of Letters Patent No. 329,152, dated October 27, 1885.

Application filed June 8, 1885. Serial No. 168,002. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. ELDEN, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Electrical-Apparatus Protectors, of which the following is a specification.

My invention consists of a means for preventing the effects of abnormally-strong currents of electricity upon circuits where such currents would operate injuriously, combined with means for preventing the like effects due to charges of atmospheric electricity.

It has been found by experiment that the maximum distance through which the formation of an arc due to electric-lighting currents is possible is less than four inches, and that the insertion of a fusible strip extending between points in the protected circuit four inches apart forms an effective guard. It has also been found that a charge of atmospheric electricity will jump this space in its path to earth after melting the fusible strip. To facilitate the passage of such a charge to earth it is desirable to provide a ground-wire of high conductivity; but this ground-wire must not be placed between the points connected by the fusible strip, for if this were done the distance through which the formation of an arc due to a current is possible would be reached it would be halved or greatly shortened, and for this reason I have devised the present invention.

My invention therefore consists in combining with one or more fusible safety-strips a ground-wire or earth-connection located upon the inner or protected side of the safety-strip in close proximity thereto. I prefer to use the arrangement of safety-strip invented by Theo. N. Vail, which consists of a fusible strip of foil or wire, a non-conducting inclosing-case therefor, and metal end pieces or caps held in position by two spring-strips electrically connected with the respective terminals of the divided circuit, as shown and described in Patent No. 322,214, dated July 14, 1885.

The accompanying drawings illustrate the invention. Figure 1 is a plan view of the arrangement and connection of the protector, showing its application to a telephone-exchange and its relation to the protected instruments and to the subscribers' lines. Fig. 2 is a view of a modification.

In Fig. 1, B is a switch-board, as for a telephone-exchange, upon which a series of main lines L L are grouped. Each line contains an instrument, as 1 2 3, &c., and is connected to ground. Located near the instruments, and between said instruments and the main line, there is in each circuit a protector, P, against strong currents. This protector as preferably constructed is described above and consists of a cylinder of insulating material, *c*, a longitudinal slot in which contains a fine fusible wire or strip of foil, *s*. The divided circuits L have their terminals respectively connected to caps *e e* upon opposite ends of the protectors. The caps *e* also form the terminals of the fusible strip. The springs S form a convenient means for connecting the protectors into circuit. To guard against electric-light currents, the space between the two caps *e e* should equal or exceed four inches. On the protected side of the strips P, in close proximity to the springs S, but separated therefrom by an air-space, as shown in Fig. 2, or by a strip of insulating material, *i*, Fig. 1, I place a ground-wire or earth-connection, G. If the wire G were placed outside the protector P or intermediate its length, a strong current might form an arc between a wire, L, and the wire G; but by placing G upon the inside of P a strong current will first fuse strip *s*, but cannot form an arc. A charge of atmospheric electricity, however, while it might fuse strip *s*, could jump to the conductor G, and thus pass to earth. If no earth-conductor G were provided, a charge of atmospheric electricity after fusing protector P would jump to the opposite terminal or diffuse itself among the other lines to the interruption of business and possibly damage to the instruments. Where a considerable number of these protectors P are used the springs S are fixed to wooden strips *w*, one of which is grooved to receive the wire G.

What I claim, and desire to secure by Letters Patent, is—

1. A circuit-protector consisting of the combination of a fusible wire or strip of metal located in the protected circuit between points sufficiently distant to prevent the for-

mation of an arc, and a ground-wire in close proximity to the end of the fusible strip on the protected side.

2. In an electric-circuit protector, the combination of a fusible wire or strip of metal located in the protected circuit with a ground-connection located in close proximity to the end of the fusible strip on the protected side.

3. A protector for electrical circuits, consisting of a fusible wire or strip of foil, a non-conducting support therefor, metal end pieces for the said support electrically connected with the ends of the said strip, and the terminals of the divided circuit, combined with a ground-wire or earth-connection.

4. The combination of a telephone-exchange, from which a series of subscribers' wires radiate to sub-stations, a series of strips of easily-fusible wire or foil, one strip included in each circuit, and a ground-wire or earth-connection in close proximity to the fusible strip, located on the exchange side of the strip, but insulated therefrom.

5. The combination of a series of circuit-protectors, each consisting of a fusible strip or wire supported in a groove in a cylinder of insulating material, metal caps upon the ends of the cylinders, to which the fusible strip is electrically connected, springs for holding the protectors in position, respectively forming the terminals of a series of divided circuits, said springs located upon a grooved insulating-strip containing a ground-wire which is insulated from the said springs.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of June, 1885.

CHARLES F. ELDEN.

Witnesses:

WM. B. VANSIZE,

GEO. WILLIS PIERCE.