(No Model.)

L. W. DOWNES.

FUSIBLE CUT-OUT.

No. 561,159. Patented June 2, 1896.

Fig. 1.

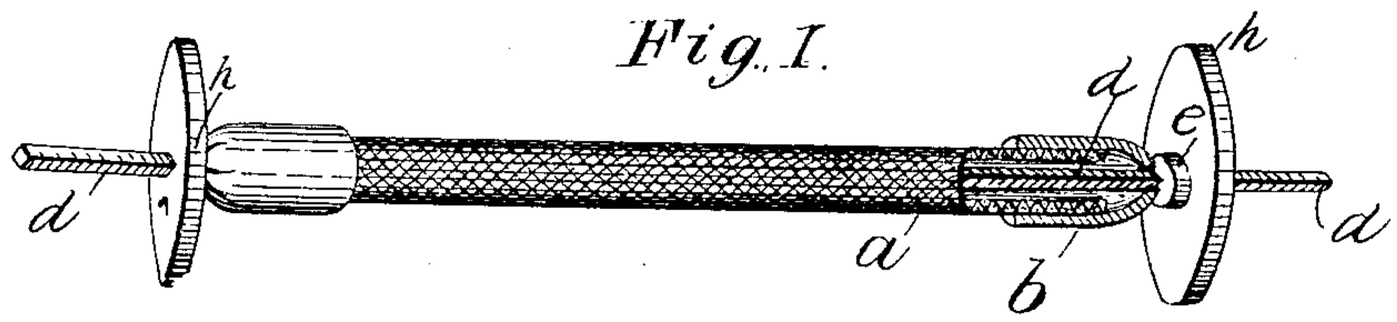


Fig. 2.

Fig. 3.

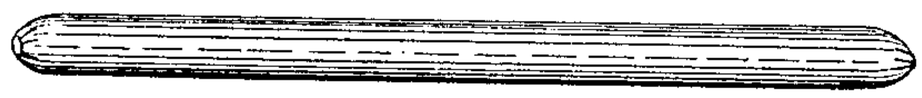


Fig. 4.

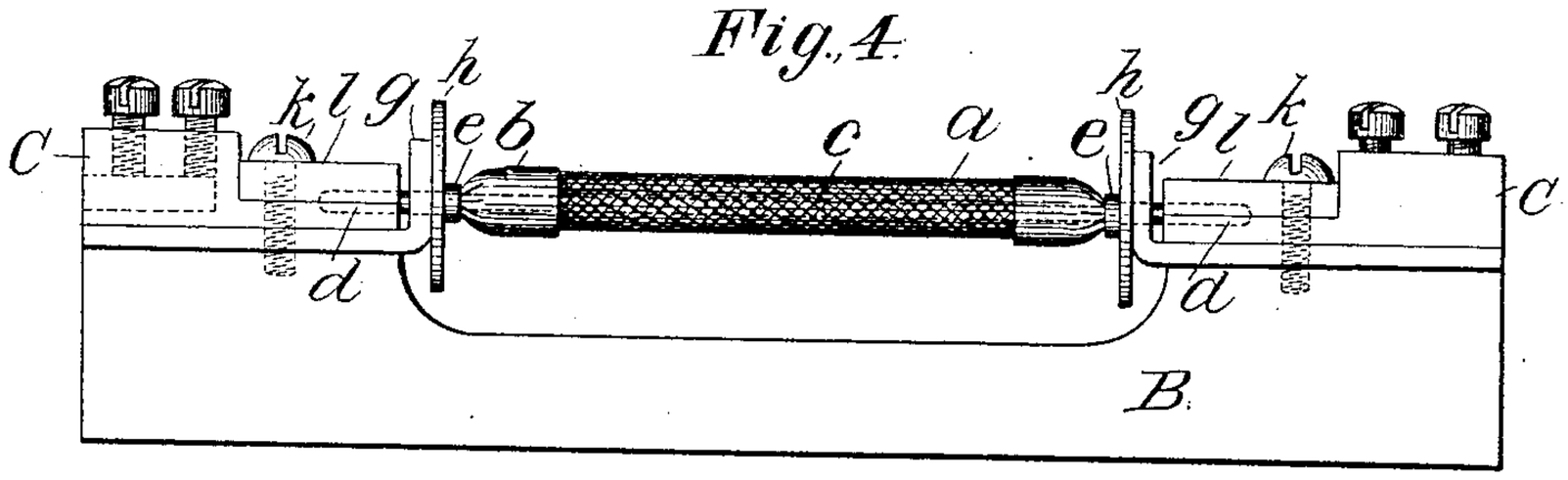


Fig. 5.

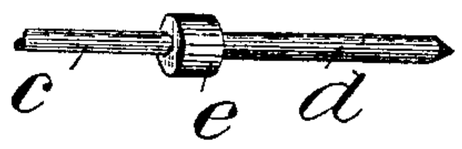
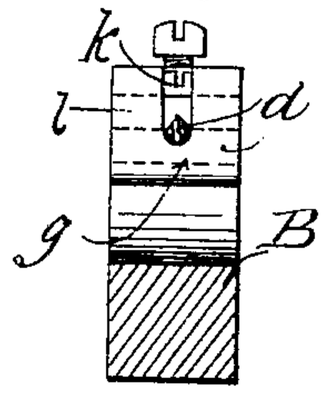


Fig. 6.



Witnesses
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Geo. Lewis.

Inventor.
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UNITED STATES PATENT OFFICE.

LOUIS W. DOWNES, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR OF ONE-HALF TO WILLIAM C. WOODWARD, OF SAME PLACE.

FUSIBLE CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 561,159, dated June 2, 1896.

Application filed April 17, 1895. Serial No. 545,986. (No model.)

To all whom it may concern:

Be it known that I, LOUIS W. DOWNES, of Providence, Rhode Island, have invented a new and useful Improvement in Fusible Cut-Outs for Electrical Circuits, which improvement is fully set forth in the following specification.

The present invention has reference to the construction of fusible cut-outs adapted to be included in an electric circuit for the protection of the instruments therein from high-potential currents. Such safety devices or cut-outs comprise, as an essential element, a short piece of metal foil or easily-fusible wire, which becomes a part of the circuit to be protected. On circuits of four hundred or five hundred volts or more blowing of a fuse, whether inclosed in a box or exposed, is frequently accompanied with injurious results—either the destruction of the cut-out or the ignition of neighboring substances, if these be of an inflammable nature. If, however, the fuse-wire be inclosed (as has been done heretofore) in a tube, the effects above noted are avoided, the fuse-wire simply melting out with a little snap. With rubber tubing, however, the heat developed in the fuse-wire previous to its blowing is often sufficient to melt the tube, while glass and porcelain, on the other hand, are too fragile to be used with advantage and economy. The necessity of renewing such tubes every time a fuse-wire melts is another disadvantage.

The mere inclosing of the fuse-wire in a tube is not a protection against the forming of an arc when the current broken by rupture of the fuse is much above fifteen or twenty amperes. My experiments have shown that the efficiency of the device as a protector in such case depends largely upon the material of the tube, the manner in which it is constructed, and the proportion of the internal air-space relatively to the fuse. According to my invention the inclosing tube is formed, preferably, of asbestos, which, besides its well-known insulating and heat-resisting properties, is flexible, which, for reasons that will be explained, is important. I am aware that a fusible strip has been wound into a spiral with a superposed strip of asbestos paper, and that a similar strip has also been cemented and clamped under pressure between strips of asbestos; but in neither of these forms would the objects of my invention be accomplished. The asbestos tube is enough larger than the fuse to contain a definite quantity of air. My experiments show that the action is satisfactory when the tube has a sectional area about nine times that of the cross-section of the inclosed fuse-wire. The ends of this flexible tube are crimped down until the edges closely surround the fuse-wire, and in the preferred construction the ends of the tube are provided with caps or thickened portions, which increase the stiffness of the tube at the ends. In such a device, when the fuse is ruptured by a high-potential current, the inclosed air is in a very brief space of time expanded by the heat to several times its original volume, causing a rush of heated vapor out of the ends of the tube, which currents, being in opposite directions, tend to blow out any arc which might for an instant have been formed. The crimped ends of the tube have sufficient stiffness to resist the pressure until the latter accumulates to a sufficient extent to cause the action above described. On the other hand, they are sufficiently yielding to open gradually under pressure and prevent an explosion, which would occur if the ends were of inflexible material.

The invention also includes improvements in the mounting of the cut-out, as will be hereinafter explained.

In the accompanying drawings, Figure 1 is a perspective view, partly in section, of the preferred construction of the asbestos tube or jacket. Figs. 2 and 3 are similar views representing different constructions. Fig. 4 is an elevation of a fuse and its mounting. Fig. 5 is a detail of the fuse-wire and its shank; and Fig. 6 is an end elevation, partly in section, looking at one of the guards.

Preferably I form the body *a* of the protecting-tube of asbestos yarn braided around a mandrel in any suitable braiding-machine or loom-braider. The pieces of this tubing when cut to the desired length are then placed on another mandrel, moistened in a silicate-of-soda solution, and rolled in powdered soapstone or similar solution to fill up the inter-

stices, it being important that the walls of the tube should be impervious to air. I then place over the ends of the braided tube caps or end pieces *b*. These are made of sheet-asbestos, or, as it is sometimes called, "asbestos paper." As shown, the ends of these caps are crimped down to reduce the opening to about the size of the fuse-wire. When the fusing of the contained wire occurs, the explosive force simply expands the crimped paper at the ends of the tube instead of fraying the braided ends, as would otherwise be the case, thus permitting the same tube to be used repeatedly.

Fig. 2 represents a protective tube made of spirally-wound asbestos paper. This form of tube may be used with that class of fuses which are soldered between broad metal end pieces, and which consequently could not be inclosed in a tube such as shown in Fig. 1.

Fig. 3 shows a tube made in the form illustrated in Fig. 1, but of asbestos paper.

Fig. 4 shows the entire cut-out. B represents the base, which may be of porcelain or other insulating material. It supports the brass terminal blocks C, to which the main circuit-wires are connected in any convenient way. The fuse-wire *c*, Fig. 5, is provided with copper tips *d*, which are turned to fit a slot or slots cut in the guard *g*. The chief object of this arrangement is to prevent overfusing—that is to say, the inserting of fuses which are too large to protect the circuit. Fuses of different capacity will have tips of different sizes, and hence it will not be possible to insert in the guards *g* fuses larger than the cut-out is proportioned for. The terminals of the fuse-wire have small collars *e*, against which the caps *b* abut, and on the other side of the collars are disk-shaped shields *h*, made of incombustible insulating material, which are designed to receive the discharge from the ends of the tube and protect the guards.

Guards *g* are attached to terminal blocks C by means of screws *k*. Screw *k* also serves to clamp the tops *d* of the fuse-wire between the terminal blocks C and the top plates *l*.

The guards *g* constitute a permanent part of the mounting and are not removed with the fuse. To insert a fuse, screw *k* is loosened, so that clamp-plate *l* can be tilted, tip *d* is inserted in the slot in vertical face of guard *g* and in the groove between block C and plate *l*, and the latter is clamped down upon it by screw *k*. The tube *a* with its caps *b* and shields *h* are removed and replaced with the fuse.

It is obvious that the insertion and removal of a fuse can be very quickly performed.

Having thus described my invention, what I claim is—

1. In a safety cut-out, a fuse-wire combined with a tubular sheath of insulating and incombustible material inclosing said fuse-wire and confining a body of air, said sheath having contracted expansible ends, substantially as described.

2. In a safety cut-out, the combination with the fuse-wire, of an inclosing tube made of a flexible sheet of asbestos, confining a body of air, and having contracted expansible ends, substantially as described.

3. In a safety cut-out, the combination with the fuse-wire, of an inclosing tube of asbestos having end portions thicker than the body and crimped or contracted to fit closely around the fuse-wire, substantially as described.

4. In a safety cut-out, the combination with the fuse-wire, of an inclosing tube composed of a body portion of asbestos provided with caps of flexible material crimped at their ends to embrace the fuse-wire, substantially as described.

5. In a safety cut-out, the combination with the fuse-wire, of an inclosing tube composed of braided asbestos rendered impermeable as specified, and provided with contracted expansible ends, substantially as described.

6. In a safety cut-out, the combination with the fuse-wire having terminal tips, of the inclosing tube of asbestos provided with expansible contracted ends, and the disks or shields around the terminal tips of the fuse-wire, substantially as described.

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

LOUIS W. DOWNES.

Witnesses:
S. J. MURPHY,
JOHN HENSHAW.