

L. W. DOWNES.
ELECTRIC SAFETY FUSE OR CUT-OUT.

APPLICATION FILED JUNE 2, 1900.

NO MODEL.

3 SHEETS—SHEET 1.

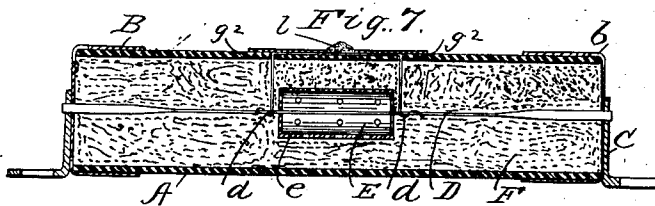
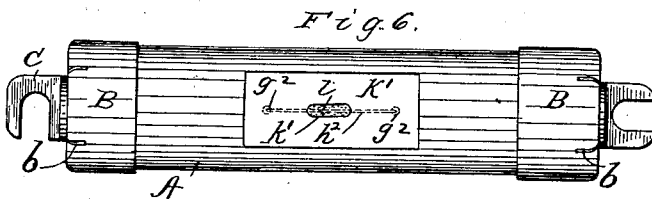
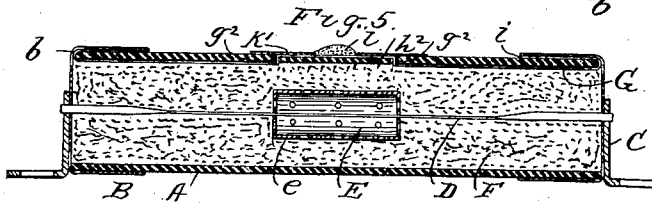
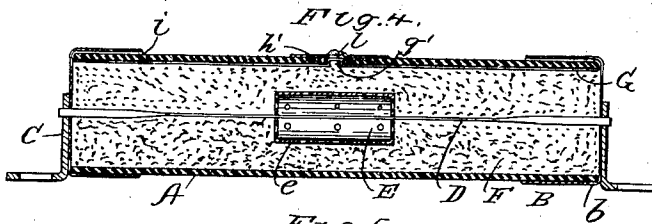
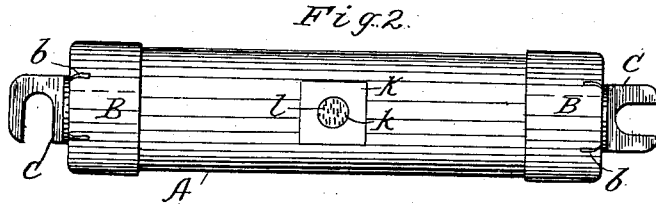
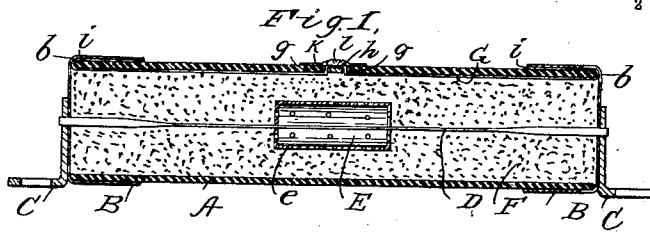
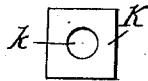


Fig. 3.



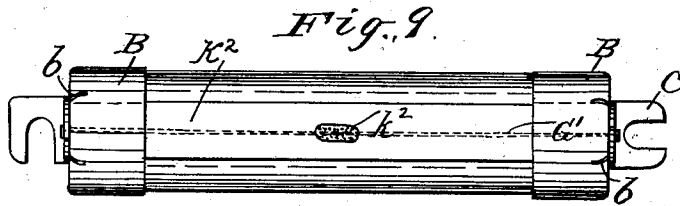
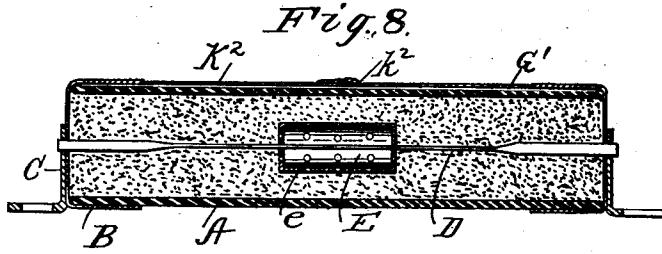
Witnesses
 W. R. Edgelen.
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Inventor
 Louis W. Downes,
 by *[Signature]*
 his attorney.

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2 SHEETS—SHEET 2.



Witnesses.

W R Eddin

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Louis W. Downes

by *[Handwritten signature]*
his Atty.

UNITED STATES PATENT OFFICE.

LOUIS W. DOWNES, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE
D & W FUSE COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPO-
RATION OF RHODE ISLAND.

ELECTRIC SAFETY-FUSE OR CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 737,368, dated August 25, 1903.

Application filed June 2, 1900. Serial No. 18,841. (No model.)

To all whom it may concern:

Be it known that I, LOUIS W. DOWNES, a resident of Providence, Rhode Island, have invented a new and useful Improvement in Electric Safety-Fuses or Cut-Outs, which invention is fully set forth in the following specification.

It has heretofore been proposed to employ in combination with an inclosed main fuse-wire or fusible metallic link a smaller auxiliary fuse-wire connected in the circuit parallel with the main fuse and of such capacity as to be fused at about the same time or immediately after the main fuse-wire becomes disrupted, said auxiliary fuse extending throughout its length along the exterior surface of the casing and serving to indicate by its own condition whether or not the main fuse has been disrupted. Various other arrangements of the auxiliary fuse-wire are possible, the object in every case being to afford, by reason of the auxiliary fuse-wire, an exterior visual indication of the condition of the inclosed main fuse-wire; but in the constructions heretofore proposed and used the indication intended to be thus afforded has not been so readily discernible as is desirable and more or less close inspection has been necessary to determine the same.

According to my present invention I provide means, in conjunction with the auxiliary fuse-wire, whereby there will be effected at the exterior surface of the inclosed fuse a readily-discernible and unmistakable visual indication of the disruption of the main fuse wire or link. These means consist principally of a material or composition in contact with the auxiliary fuse-wire and adapted to be heated thereby upon disruption of the fuse, thus affording the desired indication either by change in its appearance or by discoloring, charring, or blackening of a label applied to the casing, or by both.

The improvements constituting this invention will be best understood by reference to the accompanying drawings, showing the same applied to various arrangements of the auxiliary fuse-wire.

In the drawings, Figures 1, 4, 5, 7, and 8 are longitudinal sectional views, each show-

ing a different arrangement of the auxiliary fuse-wire. Fig. 2 is a plan view of the construction of Fig. 1; Figs. 6 and 9, similar views of the constructions of Figs. 5 and 8, respectively; and Fig. 3 is a detail of the paper label of Fig. 1.

Except for the auxiliary fuse-wire and its accessories the construction of the fuses illustrated in the drawings is substantially the same as that of my Patent No. 569,373, A being a tubular casing, preferably of a fibrous material; B B, metallic caps secured over opposite ends of the casing and having slits or perforations *b*, through which vapors or gases evolved in the casing may escape to prevent explosion or blowing open of the fuse-casing; C C, terminal brackets secured to the caps; D, a main fuse-wire connected between terminal brackets C C and passing through the interior of the casing; E, an air-space about the fuse-wire at about the center thereof, said air-space being formed by a perforated paper-drum *e*.

F is a filling of a suitable material, preferably in a finely-divided state, such as slaked lime, the principal function of which is to dissipate the heat from those portions of the wire which come directly in contact therewith, thus causing the rupture to take place at that part of the fuse which penetrates the air-space, and, furthermore, said material provides a multitude of minute paths or interstices for the escape of the vapor or gas evolved upon the fusing or blowing of the main fuse D.

While I have herein illustrated the improvements constituting my present invention in conjunction with the particular construction of fuse set forth in my patent referred to, it is to be understood that the invention is equally capable of use in other constructions of fuses.

Referring now to Fig. 1, G represents the auxiliary fuse, consisting in this instance of a fine wire of German silver or other suitable metal threaded through two small openings *g g*, formed through the casing A at about the center thereof. A short portion or part *h* of the wire is thus caused to lie against the outer surface of the casing A, the opposite

ends of the wire being carried along the inner surface of the casing in contact with the filling F and out of the open ends thereof. The extremities of the auxiliary fuse-wire are finally bent over against the outer surface of the casing, as clearly shown at *i i*. The metallic caps B B press against and make electrical contact with extremities *i i*, thus forming between the terminals C C a second path for the current by way of the auxiliary fuse parallel to the main fuse. *l* is a material in contact with the portion *h* of the auxiliary fuse-wire adapted to be sufficiently heated thereby upon disruption of the fuse to afford the desired indication either by change in the appearance of the material *l* when the same is exposed to view, as shown in the drawings, or by discoloring, charring, or blackening of a paper label K by the heat of material *l*, or by both. The label K, of paper or equivalent material, is pasted or cemented to the surface of casing A around the material *l* and is shown as having an opening *k* therein in which said material is located and through which it is exposed to view. Any suitable material *l* may be employed—for example, sulfo-cyanid of mercury, which may be mixed with water and mucilage and applied in the form of a thick paste in a semiliquid or plastic state. It subsequently dries and hardens.

The operation of the fuse of Fig. 1 is as follows: Current of normal strength passes through the fuse without affecting the fuse-wires, the larger portion of the current being of course carried by the main fuse D. Upon the current becoming abnormal main fuse D will be at once disrupted at the air-space E, thus throwing the entire charge onto auxiliary fuse G. As the filling F serves to dissipate to a considerable extent the heat generated by the abnormal current in those parts of the auxiliary fuse which are in contact therewith, the heating of said fuse becomes most intense in the portion *h* thereof, instantly melting the same and heating the sulfo-cyanid of mercury *l*, causing it to char and blacken or discolor that part of the label which is subjected to the heat and exude in bubbles and change its color, (from a whitish to a brownish hue,) thus indicating that the fuse has been burned out.

The advantage of this device over similar devices heretofore known to me is the entire absence of any discharge in the shape of a flash or of burning on the surface of the tube or casing, the fine auxiliary fuse-wire being completely incased in material which prevents such a discharge. Furthermore, the disruption being confined by reason of the heat-dissipating action of the filling F to short portion *h* of the fuse which lies outside of the casing A the sparking or burning, if any, would necessarily be so slight as to cause no possible danger or injury, the condition of the fuse being nevertheless readily perceptible. Any suitable form and arrangement of auxiliary fuse may be employed for heating

the material *l* upon disruption of the main fuse.

In the modification illustrated in Fig. 4 instead of lacing the auxiliary fuse-wire through two perforations in the casing the loop *h'* (corresponding to part *h* of Fig. 1) projects outwardly through a single opening *g'* in the casing. In other respects the construction is the same as that of Fig. 1. The operation is also substantially the same.

In the fuse shown in Figs. 5 and 6 the openings $g^2 g^2$ in the casing through which the auxiliary fuse-wire is laced are farther apart than the corresponding openings of Fig. 1, thus causing a longer portion or part h^2 of the fuse-wire G to extend along the outside of the casing. In this case the paper strip K', which is applied to the casing with adhesive material, covers the part h^2 of the fuse-wire, except at the elongated opening h' , where it is covered by a suitable material, such as sulfo-cyanid of mercury, as before. The operation of this form of the fuse is substantially the same as that above described.

The fuse illustrated in Fig. 7 is the same as that of Figs. 5 and 6, with the exception that instead of the opposite ends of the auxiliary fuse-wire extending from the openings $g^2 g^2$ along the inner surface of the casing to contact with the caps B B said ends are carried downwardly through the filling F and joined to the main fuse-wire D at points *d d* on opposite sides of drum *e*. The operation of this form of fuse is substantially the same as that of the others.

In Figs. 8 and 9 I have illustrated one manner of employing the material *l* with an auxiliary fuse-wire which extends entirely along the exterior of the casing. Referring to said figures, the auxiliary fuse-wire G' (including the short portion or part to which material *l* is applied) extends along the upper side of the casing A from end to end thereof. The terminal caps B B press tightly against and make electrical contact with the ends of said fuse-wire. Over that part of fuse-wire G' which lies between the caps there is placed a covering K², preferably of heavy paper, which is secured to the outer surface of the casing A by any suitable adhesive material. An elongated opening k^2 may be formed in the paper over the middle of the fuse-wire and about the material *l*.

In fuses embodying the invention herein described the relative capacities of the main and auxiliary fuse-wires may be such that said fuses will be simultaneously disrupted on the passage of an abnormal current, the auxiliary fuse serving merely to effect the indication above explained and performing no function in the prevention of an arc or the disruption of the main fuse, or the relative capacities of the fuse-wires may be such that the main fuse-wire becomes disrupted first, the auxiliary fuse-wire by momentarily carrying the whole charge acting in a well-known manner to prevent arcing at the main fuse-

wire. In the latter case the auxiliary fuse-wire would serve the double function of effecting an indication of the condition of the fuse and of preventing arcing.

5 In employing herein the term "fuse-wire" in referring to the several fuse-links I intend by said term to include links of any suitable form—such, for example, as metallic strips or bands.

10 What I claim is—

1. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse, and a suitable material applied, in a semiliquid or plastic state, into contact with the auxiliary fuse and adapted upon disruption of the latter to be heated to afford at the exterior surface of the device a visual indication of the condition of the main fuse-wire.

20 2. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse, and a suitable material applied, in a semiliquid or plastic state, into contact with the auxiliary fuse said material being located at the exterior surface of the casing and adapted upon disruption of the auxiliary fuse to be heated to afford at the exterior surface of the device a visual indication of the condition of the main fuse-wire.

30 3. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse-wire, and a suitable material applied, in a semiliquid or plastic state, into contact with a part of the auxiliary fuse-wire at the exterior of the casing and adapted upon disruption of the auxiliary fuse-wire to be heated, thus affording at the exterior of the device a visual indication of the condition of the main fuse-wire.

40 4. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse-wire outside of and extending along the exterior surface of the casing, and a suitable material applied, in a semiliquid or plastic state, into contact with the auxiliary fuse-wire and adapted upon disruption of said wire to be heated to afford at the exterior of the device a visual indication of the condition of the main fuse-wire.

50 5. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse-wire, a suitable material in contact with the auxiliary fuse-wire and adapted upon disruption of the latter to be heated, and a label applied to the surface of the casing in association with the material and adapted to be discolored by the action thereof upon disruption of the auxiliary fuse-wire.

60 6. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse-wire, a suitable material applied to the casing in contact with a part of the auxiliary fuse-wire at the exterior of the casing and adapted upon disruption

tion of the latter to be heated, and a label applied to the surface of the casing in association with the material and adapted to be discolored upon disruption of the auxiliary fuse-wire. 70

7. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse, a suitable material in contact with the auxiliary fuse and adapted upon disruption of the latter to be heated, and a label applied to the surface of the casing in association with the material and adapted to be charred or blackened by the heat of said material upon disruption of the auxiliary fuse. 75

8. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse-wire, a suitable material applied to the casing over a part of the auxiliary fuse-wire and adapted to be heated upon disruption of the same, and a label applied to the exterior surface of the casing in association with said material and adapted to be charred or blackened by the heat of the same upon disruption of the auxiliary fuse-wire. 80

9. In an electric fuse or cut-out, a casing, a main fuse-wire inclosed by said casing, an auxiliary or indicating fuse-wire outside of and extending along the exterior surface of the casing, a suitable material applied to the casing over a portion of the auxiliary fuse-wire and adapted to be heated upon disruption of the latter, and a label applied to the exterior surface of the casing over the auxiliary fuse-wire and associated with said material whereby the heat thereof upon disruption of the auxiliary fuse-wire will char or blacken the label or part thereof. 85

10. In an electric fuse or cut-out, an enveloped main fuse-wire, an auxiliary fuse, and a material applied in a semiliquid or plastic state into contact with said auxiliary fuse and adapted to change color upon disruption of the auxiliary fuse-wire. 90

11. In an electric fuse or cut-out, a main fuse-wire, an inclosing casing therefor, an auxiliary or indicating fuse-wire, and a covering of suitable material applied to a part of the auxiliary fuse-wire at the outer side of the casing and adapted to change color upon disruption of said auxiliary fuse. 95

12. In an electric fuse or cut-out, a main fuse-wire, an inclosing casing therefor, an auxiliary or indicating fuse-wire and a label applied to the surface of the casing and having an opening therein beneath which opening the auxiliary fuse-wire extends along the surface of the casing. 100

In testimony whereof I have signed this specification in the presence of two subscribing witnesses. 105

LOUIS W. DOWNES.

Witnesses:

JAMES H. THURSTON,
IRA L. FISH. 110