J. SACHS & F. D. REYNOLDS.

SAFETY FUSE.

APPLICATION FILED MAR. 22, 1906.

959,807. **Patented May 31, 1910.**

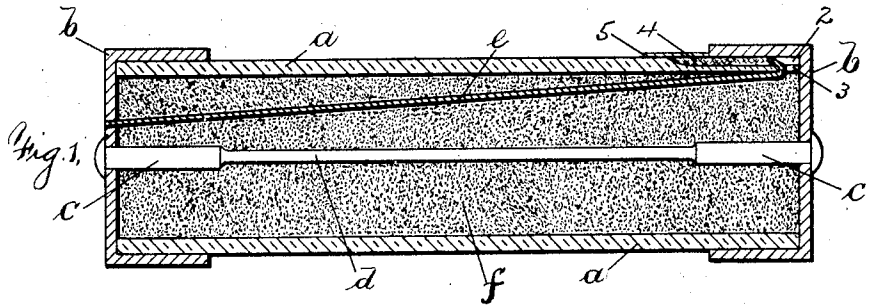

Fig. 1.

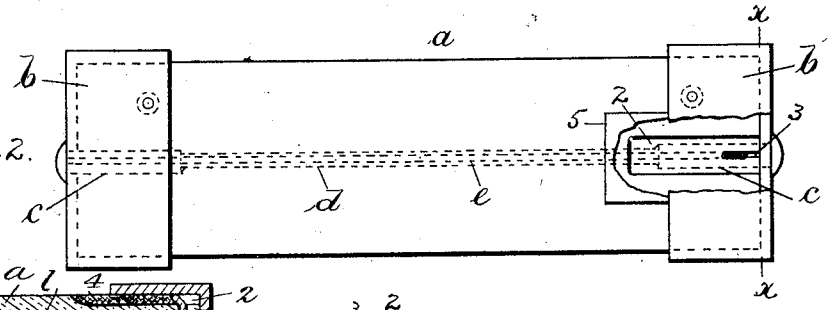

Fig. 2.

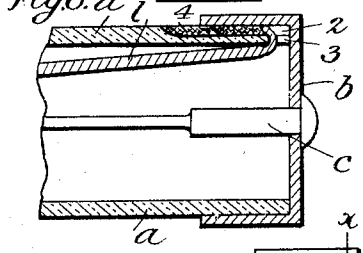

Fig. 8.

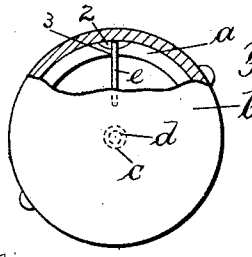

Fig. 3.

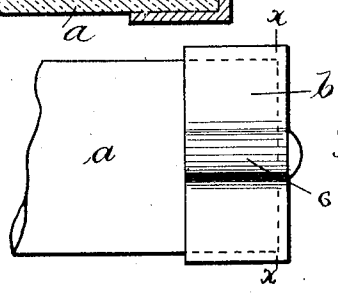

Fig. 6.

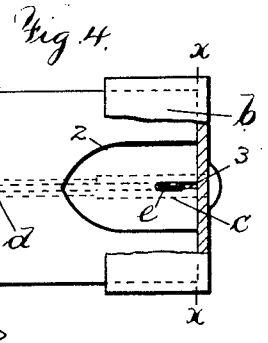

Fig. 4.

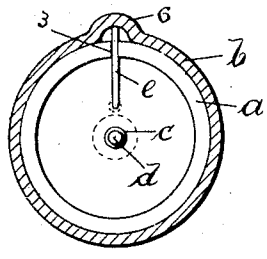

Fig. 7.

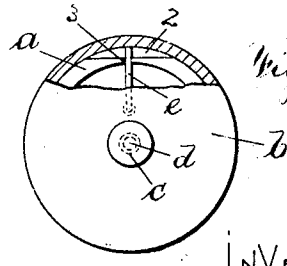

Fig. 5.

WITNESSES

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THEIR ATTY

UNITED STATES PATENT OFFICE.

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SAFETY-FUSE.

959,807. Specification of Letters Patent. **Patented May 31, 1910.**

Application filed March 22, 1906. Serial No. 307,310.

To all whom it may concern:

Be it known that we, JOSEPH SACHS and FRANK D. REYNOLDS, both citizens of the United States, and residents of the city of Hartford, in the county of Hartford and State of Connecticut, have invented an Improvement in Safety-Fuses, of which the following is a specification.

Our present invention relates to safety fuses and particularly to that class of safety fuse devices commonly known as indicating inclosed fuses. Heretofore such fuses have been constructed with a fusible indicator wire wholly outside of the fuse casing, or partly within threaded through and partly outside of the fuse casing; or wholly within the casing and provided with means filling an aperture through the casing for visually indicating the rupture of the fuse strip employed therein.

Now the object of our present invention is the provision of an inclosed safety fuse in which the means which operate upon the blowing of the fuse strip making an indication of the same, are directly beneath or within the end caps or ferrules and between the same and the tube or casing.

In carrying out our present invention, we employ a tube or casing, end caps therefor, a fuse strip electrically connected with said end caps or suitable terminals and an indicator wire within the said tube having a portion at one end so associated with the inside of one of said end caps that the point of rupture is between the same and the adjacent portion of the tube or casing. Correlated with said end cap and portion of the indicator wire, we prefer to employ means for indicating at the edge of the end cap the blowing of the fuse.

In the drawing, Figure 1 is a central longitudinal section of the safety fuse embodying our present invention. Fig. 2 is a plan view of the same, showing a portion of one of the end caps as broken away. Fig. 3 is an elevation and partial section on line x, x, Fig. 2. Fig. 4 is a plan of one end of the safety fuse, the end cap being in section illustrating a modification of our invention. Fig. 5 is an elevation and partial section on line x, x, Fig. 4. Fig. 6 is a plan view of a further modification of the invention; Fig. 7 is a section on line x, x, Fig. 6, and Fig. 8 is a partial longitudinal section of a further modification of the invention.

a designates a casing, preferably tubular and made of paper fiber or any other suitable insulating material. End caps b preferably of metal, are employed and are adapted to fit over the ends of the tubular casing a. Fuse strip terminals c are electrically connected to the end caps b, and extending between and electrically connected with the fuse terminals c, we employ a fuse strip d. Pins or other suitable fastening devices connect the end caps and casing. At one end of the tube a, the outer surface thereof is provided with a recess 2 preferably longitudinally disposed therein and this end of the tube a, preferably centrally of the recess 2, is provided with an end slit or small notch indicated at 3.

e is the shunt circuit indicator wire electrically connected at one end with one of the end caps b; the opposite end of the shunt circuit indicator wire e is passed through the slit 3 in the opposte end of the tube a and the extremity thereof arranged to extend into the recess 2 in such a manner as to be in close relation with or actually bear against and form a point of more or less perfect electrical contact with the inner surface of the other end cap b, which is being fitted to position on the tube a, engages this end of the indicator wire e and presses the same down to the normal postion shown in the drawings, the indicator wire being of sufficient resiliency to maintain the contact.

We do not limit ourselves to the manner in which the indicating portion of the wire is brought into the aperture between the ferrule and tube, nor to the actual contact thereof with the inner surface of the cap as the structure is fully operative with an imperfect electrical contact.

It will be manifest that due to the contact connection between the ferrule and the indicator wire e, the latter will rupture at this point, but this indicator wire may be reinforced throughout its entire length with the exception of that portion thereof extending between the point of contact with the ferrule at its free end and the adjacent portion of the tube as shown in Fig. 8 or other means may be employed to increase the resistance or lower the carrying capacity under rupture conditions of that part of the indicator wire between the ferrule and the tube in order to insure that this will be the point at which the indicator wire will rup-

ture. Within the recess 2 in the end of the tube *a* and extending to or beyond the edge of the ferrule, we may employ a material 4 of a more or less combustible nature such as impregnated cotton or twine, and a plug, label or paster 5 may be placed into or over that portion of the said recess extending to or beyond the edge of the ferrule, and together with these devices, we may employ a small quantity of an explosive or combustible material, such as a fulminate or gun powder compound, within the recess, the flashing of which, together with the blowing of the indicator wire will disrupt, blow out, char, or discolor the other materials employed and so indicate the rupture of the fuse strip.

The recess 2 provided in the outer surface of the tube *a* may be a groove as indicated in Figs. 1, 2 and 3, or may be formed by a straight cut or flattened portion as indicated in Figs. 4 and 5; or the tube *a* may not be recessed at all, one of the end caps being provided with a rib indicated at 6, into which the free end of the shunt circuit wire extends and makes the fusible contact.

It will also be understood that we may, if desirable to do so, employ a filling of any insulating material preferably in a loose condition as indicated at *f*, without departing from the nature and spirit of our invention.

We claim as our invention:

1. A safety fuse comprising a tube, end caps therefor, a fuse strip inclosed therein, and means between an end cap and the tube for indicating the condition of the said fuse strip.

2. A safety fuse comprising a tube, end caps therefor, a fuse strip inclosed therein, a wire electrically connected at one end with one of the said end caps and having a portion at its opposite end between an end cap and the tube and means between an end cap and the tube for indicating the condition of the fuse strip.

3. A safety fuse comprising a tube, end caps therefor, a fuse strip inclosed therein and a wire electrically connected at one end with one of the said end caps and having an imperfect contact at its opposite end between the same and the other end cap.

4. A safety fuse comprising a tube, end caps for the said tube, there being a recess on one end of said tube and between the same and the adjacent end cap, a fuse strip electrically connected with said end caps and a wire electrically connected at one end with one of said end caps and having a portion at its opposite end in the said recess which is so disposed as to afford an exterior indication of the condition of the said fuse strip.

5. A safety fuse comprising a tube having a recess in its outer surface at one end thereof, end caps for the said tube, a fuse strip electrically connected with said end caps and a wire electrically connected at one end with one of said end caps and at its opposite end being in contact with the other end cap within the said recess, which latter is so disposed as to afford an exterior indication of the condition of the said fuse strip.

6. A safety fuse comprising a tube, end caps therefor, a fuse strip inclosed therein, a wire electrically connected at one end with one of the said end caps and having a portion at its opposite end between an end cap and the tube and means extending from the said portion for visually indicating the rupture of the fuse.

7. A safety fuse comprising a tube having a recess in its outer surface at one end thereof, end caps for the said tube, a fuse strip electrically connected with the said end caps, a wire electrically connected at one end with one of the said end caps and electrically connected at its opposite end with the other end cap by a free contact within said recess, and means within the said recess beneath the end cap to indicate the rupture of the fuse.

8. A safety fuse comprising a tube having a recess in its outer surface at one end thereof, end caps for the said tube, a fuse strip electrically connected with the said end caps, a wire electrically connected at one end with one of the said end caps and at its opposite end having a portion in contact with the other end cap within said recess and means within and filling the said recess beneath the said end cap to indicate the rupture of the fuse.

Signed by us this eighth day of March 1906.

JOSEPH SACHS.
FRANK D. REYNOLDS.

Witnesses:
FRANK N. ALLEN,
W. R. CROKE.