No. 712,107. Patented Oct. 28, 1902.

M. O. TROY.

THERMAL CUT-OUT.

(Application filed Dec. 11, 1899.)

(No Model.)

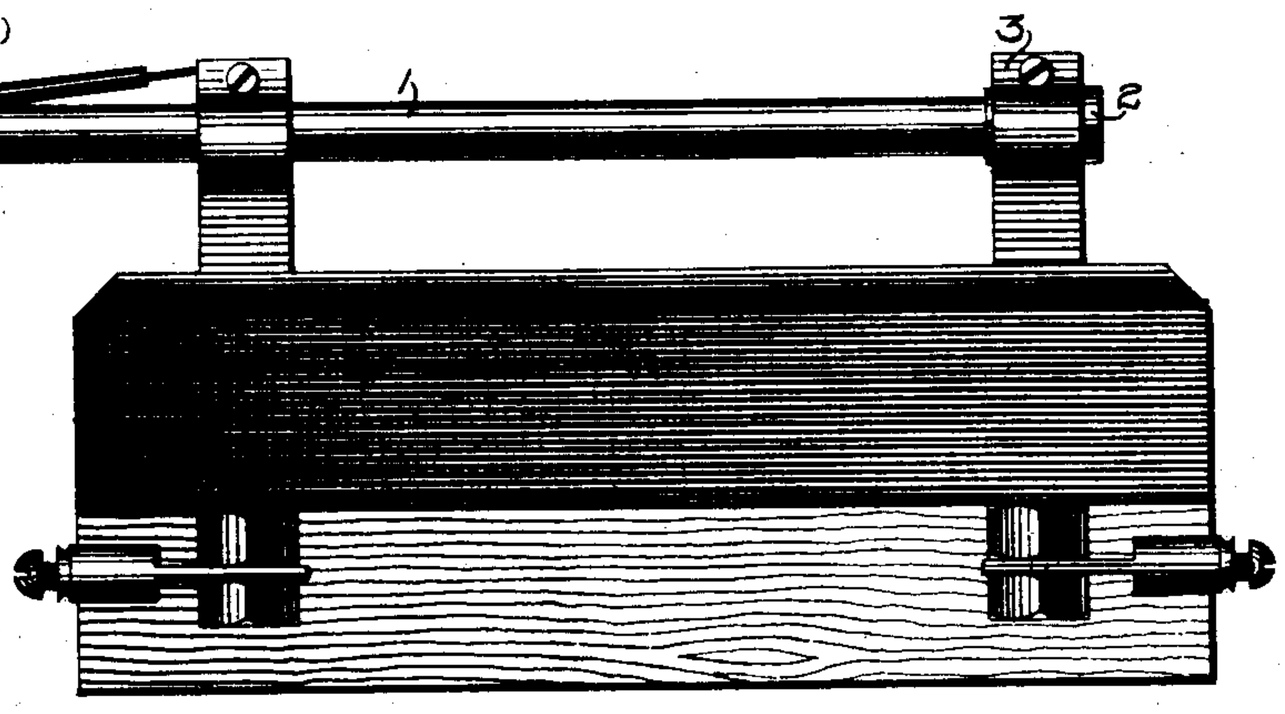

Fig. 1

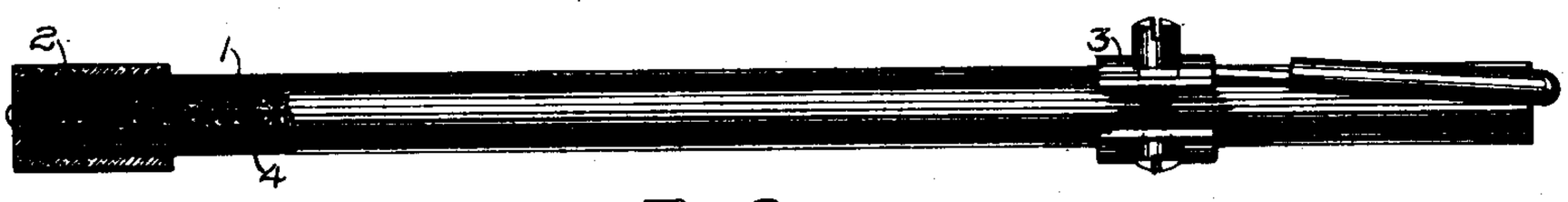

Fig. 2

Fig. 3

Witnesses.
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UNITED STATES PATENT OFFICE.

MATTHEW O. TROY, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

THERMAL CUT-OUT.

SPECIFICATION forming part of Letters Patent No. 712,107, dated October 28, 1902.

Application filed December 11, 1899. Serial No. 739,887. (No model.)

To all whom it may concern.

Be it known that I, MATTHEW O. TROY, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Thermal Cut-Outs, (Case No. 1,299,) of which the following is a specification.

This invention relates to that type of thermal cut-outs in which a fusible or vaporizable conductor is employed to interrupt the circuit when the current attains a sufficient strength to destroy the conductor. Conductors which fuse when the current reaches an abnormal value are commonly employed, the fuse being vaporized by the arc at the point where it gives way. If currents are of high voltage and large amperage, when the fuse gives way the arc follows it for its entire length and is a source of danger from fire and is liable to injure the conducting-terminals to which the fuse is attached. I provide for the safe interruption of such arcs by confining the conductor within an envelop in which is a material which prevents free distribution of the vapors developed by the arc and in which the fuse is so arranged as to blow at a point remote from the open end of the envelop, thereby giving direction to the expulsion of the generated vapors and safely extinguishing the arc. Strictly speaking, conductors might be employed which are not fusible in the ordinary understanding of the term, such as thin strips of carbon. I include within the term "fuse," however, all conductors which give way under excessive current and spring an arc.

In carrying out my invention I inclose the fuse within a non-conducting tubular envelop one end of which is closed and the other end open, the fuse being carried through the open end and secured to a terminal on the outside of the tube some distance from its open end. The fuse itself is so constructed as to have the section or spot of low-current-carrying capacity near the closed end, thus determining its blowing at that point. Thus when the current attains a value beyond the carrying capacity of the point or spot of low capacity the fuse "blows" and the material of which it is composed by the drawing of the arc is vaporized, the arc rapidly elongating until it attains a value beyond the power of the current to maintain and then is extinguished. A fibrous or porous medium is placed between the fuse and the inclosing tube which absorbs the gaseous arc products and condenses them by chilling, thereby facilitating the rapid extinguishment of the arc. If, as occasionally happens, the arc is maintained until the entire length of the fuse is consumed, it is interrupted at the open end by the expulsive action of the generated gases, air, and arc products and in all cases is safely extinguished before the terminals are damaged.

The novel features of my invention will be hereinafter more fully described and will be definitely indicated in the claims.

In the accompanying drawings, which illustrate the invention, Figure 1 is a side elevation of a thermal cut-out embodying my improvements. Fig. 2 is an enlarged view, partly in section, showing the construction of the fuse; and Fig. 3 is a detail view showing the fibrous envelop in which the fusible conductor is inclosed.

I provide around the fuse an inclosing envelop 1, (see Fig. 2,) which may be formed of indurated fiber or other non-conducting non-inflammable material. I preferably arrange this in the form of a tube one end of which is closed by a metal cap 2, which constitutes one terminal of the cut-out. This cap seals one end of the inclosure, and the end of the fuse-wire is fixed in good electrical engagement with the end of the cap, which may be done by soldering or otherwise. The other end of the fuse is carried through the open end of the tube and fixed to a metal terminal 3 on the outside of the same. Between the inner wall of the inclosing tube and the fuse is a filling of incombustible porous material 4, which acts as an absorbent of gaseous products of the arc and also by its close relation to and engagement with the fuse chills the arc-gases and assists in the extinguishment of the arc. I preferably use for this purpose asbestos, a tube of which may be arranged to surround the fuse and which may be slipped into the tube with the latter and secured to the cap, closing one end of the containing-tube by any adhesive, such as cement or glue. The fuse is so arranged

that at some suitable point intermediate its terminals within the tubular inclosure is a spot or section of relatively low current-carrying capacity, as shown at 5, so as to determine its giving way at that point. This result may be satisfactorily assured by forming the fuse of two wires or conductors of different thickness and soldering the adjacent ends. This is indicated in Fig. 3 by a difference of thickness in the lines which represent the fuse. The joint should be located some little distance away from the closed end of the tubes. I have found that with currents of six thousand volts a tubular inclosure ten inches long in which the joint is about four inches from the closed end of the tube gives excellent results, the arc being usually extinguished before it passes more than four or five inches from the closed end of the tube. Occasionally the arc will be maintained to the open end of the tube, in which case the force of the escaping gases prevents it from passing around the end of the tube to the terminal.

The cut-out may be employed for any service for which such devices are commonly employed to interrupt the circuit in which it is installed or to protect the terminals of a circuit-breaker or similar apparatus by being placed in shunt relation to them. The fuse may be connected in circuit by means of clips embracing the containing-tube, as indicated in Fig. 1, which clips are suitably connected with the terminals of the circuit, one clip spanning the metal cap at the closed end of the tube and the other forming a connection with the fuse leading from the open end of the tube.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A thermal cut-out comprising a fuse surrounded by an inclosure and surrounded by air throughout the tube, one end of which is closed and the other open to the atmosphere, the fuse extending axially of said inclosure from end to end.

2. A thermal cut-out comprising a fuse surrounded by an inclosing non-conducting tube one end of which is closed and the other open to the atmosphere, said fuse extending through the open end of the tube and fixed outside of the same between its ends.

3. A thermal cut-out comprising an electric conductor of definite current-carrying capacity, a pressure-resisting non-conducting inclosing wall therefor closed at one end and open to the atmosphere at the other, and a non-conducting porous filling between the wall and the fuse.

4. A thermal cut-out comprising an electric conductor of determined current-carrying capacity, a tubular pressure-resisting inclosure therefor, through which the fuse extends, said inclosure being closed at one end and open at the other, and a filling of asbestos between the conductor and the inclosure.

5. A thermal cut-out comprising a conductor of determined current-carrying capacity, an inclosing tube therefor closed at one end and open to the atmosphere at the other, and a porous non-conducting filling between the conductor and the inclosure, the conductor extending through the open end of the inclosure and terminating between its ends on the outside thereof.

6. A thermal cut-out comprising a conductor of determined current-carrying capacity fixed at one end to the closed end of a pressure-resisting containing-tube through which current is led, and a terminal for the other end on the outside of the tube, said conductor having a point of decreased current-carrying capacity within the tube.

7. A thermal cut-out comprising a conductor of determined current-carrying capacity fixed at one end to the closed end of a pressure-resisting containing-tube, and a terminal for the other end on the outside of the tube, said conductor having a point of decreased current-carrying capacity within the tube closer to the closed than the open end.

8. A thermal cut-out comprising an electric conductor composed of two lengths of different current-carrying capacities connecting respectively with opposite terminals, and a non-porous pressure-resisting inclosing tube surrounding the point of junction of the two parts.

9. A thermal cut-out comprising an inclosing tube open to the atmosphere at one end, two conductors of different size, the smaller size having its free end fixed to a terminal on the closed end of the tube, and the larger size being led through the open end of the tube to a terminal fixed to the latter on the outside of the tube.

10. A thermal cut-out comprising a conductor of determined current-carrying capacity, an inclosing tube therefor closed at one end and provided with a terminal to which one end of the conductor is connected, a filling material of a porous nature between the conductor and the tube, and means for securing said filling material to the closed end.

In witness whereof I have hereunto set my hand this 8th day of December, 1899.

MATTHEW O. TROY.

Witnesses:

DUGALD MCKILLOP,

CHAS. B. BETHUNE.