No. 774,160. PATENTED NOV. 8, 1904.

F. B. COOK.

SELF SOLDERING THERMAL PROTECTOR.

APPLICATION FILED MAR. 26, 1904.

NO MODEL.

Fig. 1.

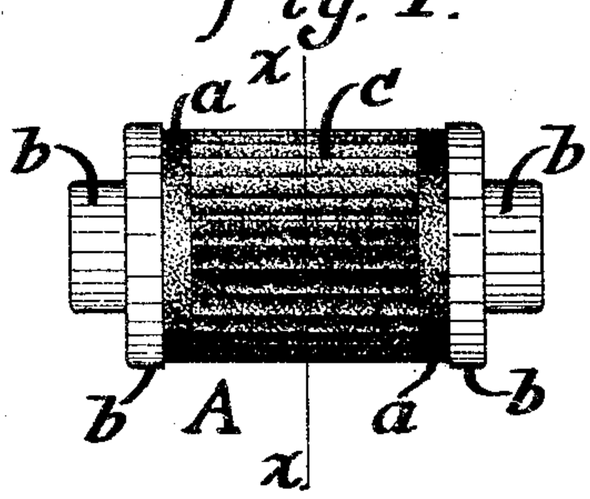


Fig. 2.

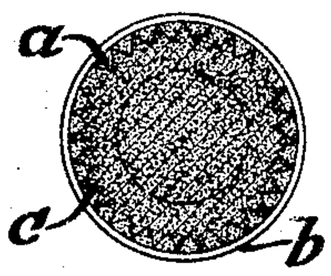
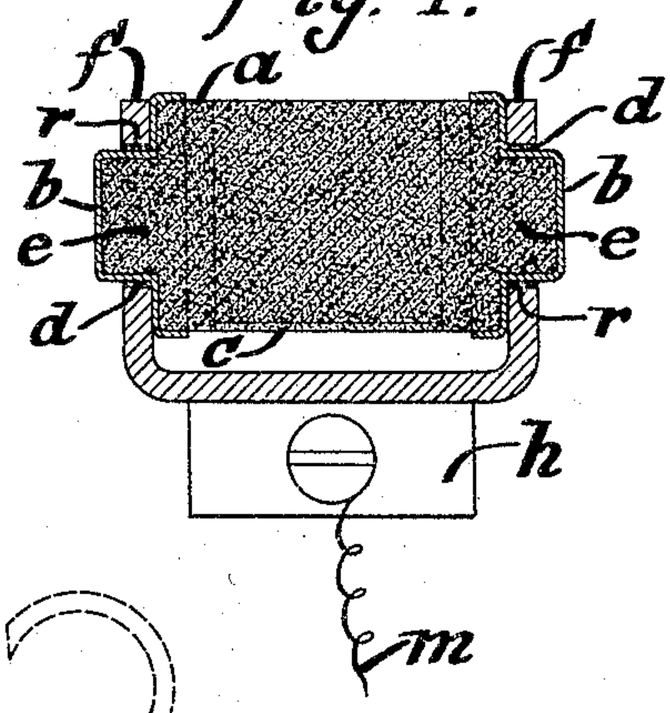


Fig. 4.



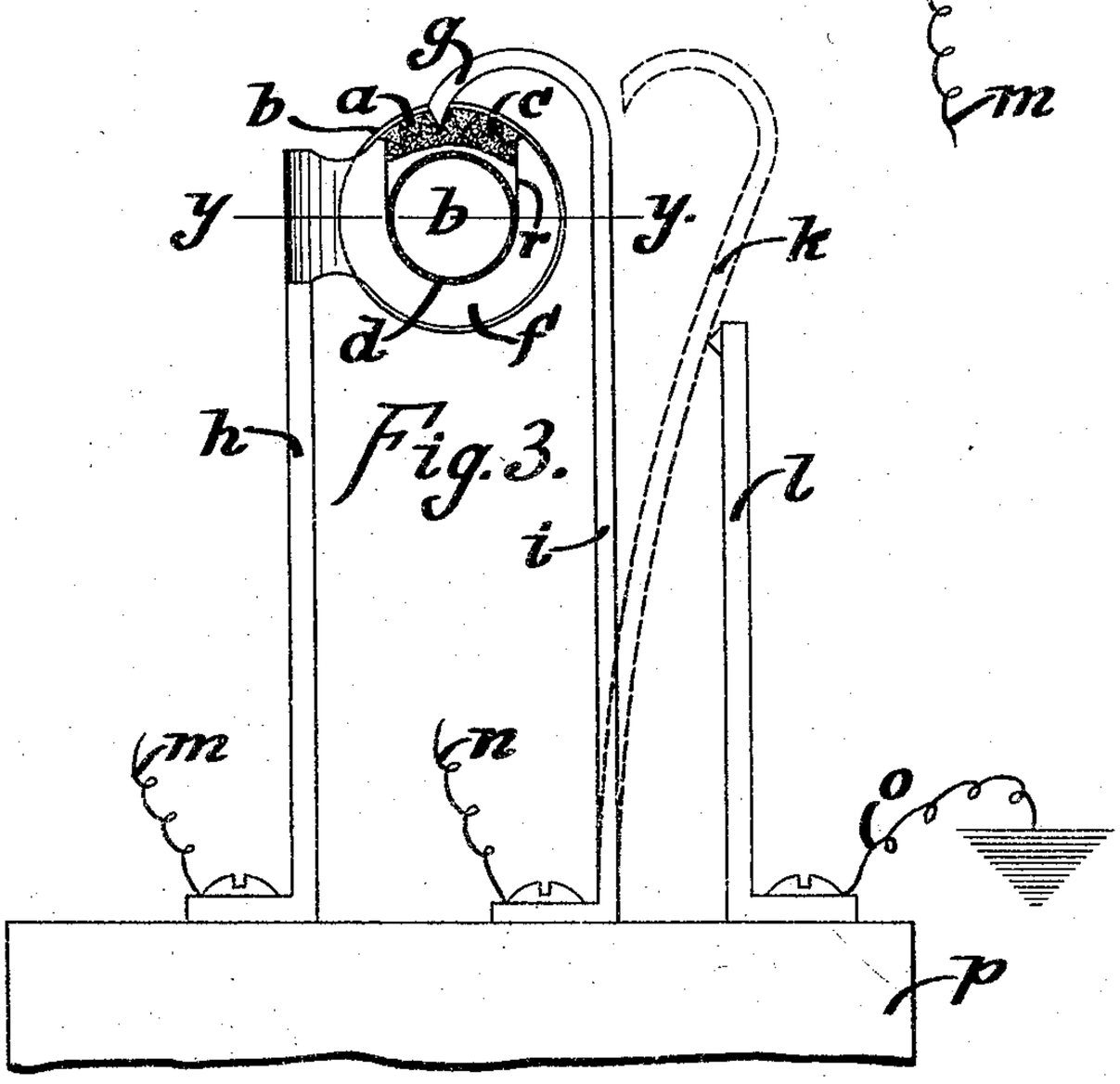


Fig. 3.

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No. 774,160. Patented November 8, 1904.

UNITED STATES PATENT OFFICE.

FRANK B. COOK, OF CHICAGO, ILLINOIS.

SELF-SOLDERING THERMAL PROTECTOR.

SPECIFICATION forming part of Letters Patent No. 774,160, dated November 8, 1904.

Application filed March 26, 1904. Serial No. 200,172. (No model.)

To all whom it may concern:

Be it known that I, FRANK B. COOK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Self-Soldering Thermal Protectors, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to thermal protectors for electric circuits, my object being to provide a simple and efficient protector which automatically restores itself to operative condition after operation.

Heretofore thermal protectors of the self-soldering type have generally been provided with a heat-producing element in the form of a coil of fine wire adapted to soften a fusible material by the heat produced in the said coil upon the passage of an abnormally large current therethrough, and thereby allow the protector to operate, the cooling of the fusible material after operation again restoring the parts of the protector to operative condition. In my present invention I employ a piece of resistance material, preferably graphite, as the heat-producing element and adapt same to soften a heat-susceptible material upon the passage of an abnormally large current therethrough, and thereby allow the said resistance material to turn upon its support and thus control a circuit, the said resistance material being again secured in an operative position by the cooling action of the heat-susceptible material after the device has operated. I also provide a spring member adapted to support the resistance material and to which the latter is normally secured by the heat-susceptible material and another spring member adapted to engage the resistance material and turn same upon its support when the heat-susceptible material is softened.

I will more particularly describe my invention by reference to the accompanying drawings, illustrating same, in which—

Figure 1 is a side elevation of the protective device. Fig. 2 is a cross-sectional view of the protective device, taken on line $x\,x$ of Fig. 1. Fig. 3 is a view showing the protective device in an operative position in relation with its contact-springs and circuit-conductors, with a portion of the protector shown in cross-section; and Fig. 4 is a cross-sectional view of the protector and its supporting-spring, taken on line $y\,y$ of Fig. 3.

Like characters refer to like parts in the several figures.

a is a cylindrical piece of resistance material, preferably graphite, provided with a hub e at each end thereof and a series of teeth c therearound, each tooth being adapted to engage a circuit-controlling means. The hubs $e\,e$ are preferably coated with a metallic plating $b\,b$, which extends over small end portions of the cylindrical portion of the resistance material a, as shown, the said plating b providing a surface with which the heat-susceptible material d readily unites. Spring h is provided with ears $f\,f$, which are slotted at $r\,r$, respectively, the latter being adapted to engage the respective hubs $b\,b$ therein, as shown. The heat-susceptible material d normally secures the hubs $b\,b$ to the respective ears $f\,f$, and thereby prevents the protector A from being turned. The heat-susceptible material d may be a metallic solder or a fusible wax, as the tension in ears $f\,f$ is such that they tend to spring together, and thereby make good contact with the metallic plating covering the ends of the cylindrical portion a, not depending upon the conductivity of the heat-susceptible material d for a contact. Spring i is provided with a curved portion g, adapted to engage a tooth c of the protector, the tension in i tending to turn the protector A upon its supports $f\,f$. l is a ground plate against which spring i rests when released from the protector. Springs h and i and plate l may be mounted on any suitable support p. Conductors m, n, and o are connected to h, i, and l, respectively, conductor o being preferably connected to earth.

The circuit through the protector is from line conductor m, through spring h, ears $f\,f$, plating $b\,b$, resistance material a, and spring i to line conductor n.

When an abnormally large current trav-

erses the resistance material *a*, the heat produced therein softens the heat-susceptible material *d* and allows spring *i* to turn the protector A upon its supports *f f*, and thereby release itself from the tooth *c*, with which it was engaged, and break the circuit through the protector, spring *i* taking the position *k*, Fig. 3. When the heat-susceptible material cools, the hubs *b b* are again secured to their respective supports *f f* in a new operative position, thereby permitting catch *g* to be again engaged with a tooth *c* of the protector, as before. The protective device may be operated over again and again, as just described, each time restoring itself to operative condition.

I do not wish to limit this invention to the particular details of construction as herein shown, as many modifications may be made without departing from the principles involved.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a thermal protector for electric circuits, a piece of resistance material for inclusion in the circuit, means to which the resistance material is normally held in a fixed position by a heat-susceptible material, and means for turning the said resistance material upon its support when the heat-susceptible material is softened.

2. In apparatus of the class specified, the combination of a resistance-body for inclusion in the circuit, and provided with a series of engaging devices, a heat-susceptible material normally holding the resistance-body in a fixed position, and means for engaging an engaging device and thereby turning the resistance-body upon its support, upon the passage of an abnormally large current through the device.

3. In apparatus of the class specified, the combination of a homogeneous resistance-body for inclusion in the circuit, and provided with a series of engaging devices, a heat-susceptible material securing the said resistance-body against rotation, means to which the resistance-body is secured by the heat-susceptible material, and a circuit-controlling means adapted to engage an engaging device and to turn the said resistance-body upon its support when the heat-susceptible material is softened.

4. In a thermal protector for electric circuits, the combination of a homogeneous resistance-body, a series of engaging devices secured to the said resistance-body, means for normally holding the resistance-body against rotation, and a circuit-controlling means adapted to engage an engaging device and to bring the said engaging devices successively into engaging position, when the heat-susceptible material is softened.

5. In a thermal cut-out for electric circuits, the combination of a homogeneous resistance-body, a series of engaging devices encircling the said body, means to which the resistance-body is normally secured by a heat-susceptible material, and an engaging means adapted to engage an engaging device and to bring the said engaging devices into successive engaging position with their engaging means, and in so doing to open the circuit through the cut-out, substantially as described.

6. A device operable upon an excess of current, comprising a homogeneous resistance-body, a heat-susceptible material for holding the said body against rotation, and means adapted to engage the resistance-body and tending to turn same and break the heat-susceptible material, the said means turning the resistance-body and opening the circuit when the heat-susceptible material is softened.

7. A device operable upon an excess of current, comprising a homogeneous resistance-body, means acting upon the said body and tending to turn same, a heat-susceptible material for holding the resistance-body against rotation, and means for supporting the device in an operative position.

8. A device operable upon an excess of current, comprising a piece of resistance material, engaging devices electrically connected therewith, a circuit-controlling means tending to rotate the said resistance material, a suitable support for the device, and a fusible material normally securing the device to the support.

9. In a protective device for electric circuits, the combination of a homogeneous resistance-body provided with a series of engaging devices electrically connected therewith, means for normally holding the said engaging devices and resistance-body against rotation, and means for turning same upon an abnormally large current, and thereby controlling a circuit.

10. In a thermal cut-out for electric circuits, the combination of a cylindrical piece of resistance material provided with a series of engaging devices therearound and a hub on each end, a suitable support for the said hubs, a heat-susceptible material securing the said hubs to their support and thereby holding the cut-out against rotation, and means for engaging the engaging devices and thereby turning the resistance material, when the heat-susceptible material is softened.

11. In a thermal protector for electric circuits, the combination of a cylindrical piece of homogeneous resistance material provided with a series of teeth therearound and a hub on each end, a metallic plating for the said hubs, a spring-support for the said hubs and adapted to engage same, a heat-susceptible material securing the said hubs to their spring-support, and a circuit-controlling spring adapt-

ed to engage a tooth of the device and to turn the latter upon its support, upon the passage of an abnormally large current through the protector, and thereby open the circuit, substantially as described.

12. In a thermal protector for electric circuits, a piece of graphite for inclusion in the circuit, a heat-susceptible material normally securing the graphite in a fixed position, and means for turning the graphite upon its support when the device operates.

13. In a protective device for electric circuits, the combination of a graphite block in the form of a rotary detent, means for normally holding the graphite against rotation, and means for turning the graphite, upon an abnormally large current in the circuit, and thereby controlling a circuit.

14. In a thermal protector for electric circuits, the combination of a cylindrical piece of graphite provided with a series of teeth thereabout and a cylindrical projection on each end, a metallic plating for the said projections, a spring-support adapted to engage the said projections and thereby support the graphite, a heat-susceptible material securing the said projections to their spring-support and thereby securing the protector in an operative position, and a circuit-controlling spring adapted to engage a tooth of the protector and by such engagement to turn the latter upon its spring-support, upon the passage of an abnormally large current through the protector, and thereby open the circuit, substantially as described.

15. A device operable upon an excess of current, comprising a homogeneous resistance-body, a heat-susceptible material for holding the said body against rotation, and means adapted to engage the resistance-body and turn same to a new operative position, when the heat-susceptible material is softened, in which position it is secured by the cooling of the latter, substantially as described.

16. A device operable upon an excess of current, comprising a homogeneous resistance-body and engaging devices electrically connected therewith, means to which the device is secured by a heat-susceptible material, and means for turning the device to a new operative position, when the heat-susceptible material is softened, in which position it is secured by the cooling of the latter, substantially as described.

17. In a thermal protector for electric circuits, a piece of resistance material for inclusion in a circuit, means for normally holding the resistance material in an operative position, and means for abnormally turning same to control a circuit.

18. A device operable upon an excess of current, comprising a piece of resistance material, a heat-susceptible material for holding the resistance material in operative position, and means for moving the resistance material to a new operative position when the heat-susceptible material is softened, in which position it is secured by the cooling of the latter.

In witness whereof I hereunto subscribe my name this 24th day of March, A. D. 1904.

FRANK B. COOK.

Witnesses:

HARRY B. ELMERS,

FREDERICK R. PARKER.