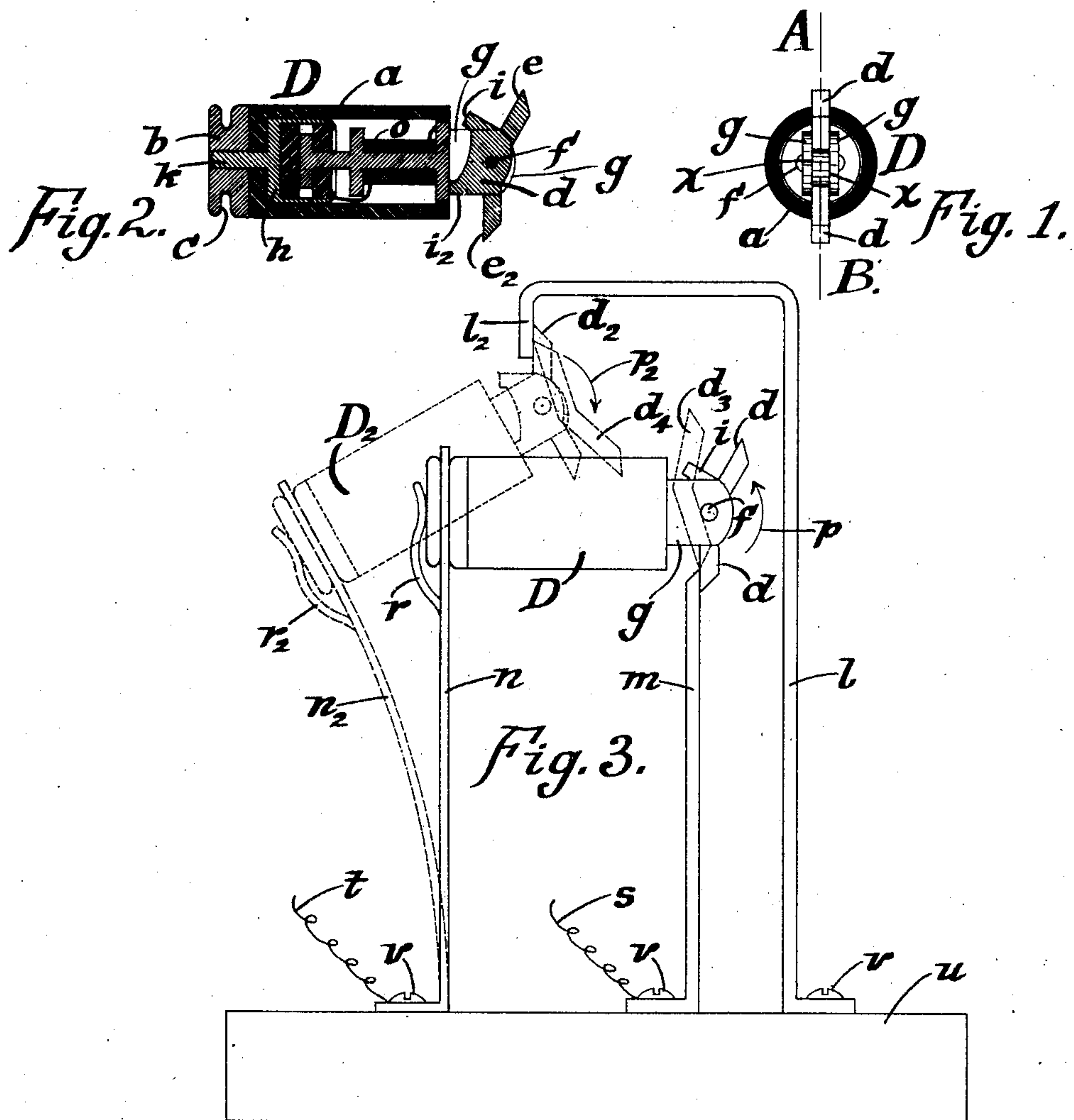


No. 785,407.

PATENTED MAR. 21, 1905.

F. B. COOK.  
SELF RESTORING HEAT COIL.  
APPLICATION FILED MAR. 9, 1904.



**Witnesses:**

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# UNITED STATES PATENT OFFICE.

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## SELF-RESTORING HEAT-COIL.

SPECIFICATION forming part of Letters Patent No. 785,407, dated March 21, 1905.

Application filed March 9, 1904. Serial No. 197,295.

*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-Restoring Heat-Coils, 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 of the "self-soldering" type, my object being to provide such a protector which automatically restores itself to operative condition after operation. To this end I employ a heat-concentrating device provided with an oscillating lever at one end thereof which is normally secured in an operative position by a fusible material, but which is free to oscillate on a pivot when the fusible material is softened, and a means apart from the heat-coil against which the said lever strikes when the heat-coil operates, and thereby restores the lever to its normal operative position relatively to the heat-coil. The device is preferably mounted upon a spring member which moves the said device as a whole when the latter operates; but it is not essential to thus move the device. Any arrangement may be employed by which a means apart from the heat-coil engages the said lever after same is operated, and thereby restores it to operative position, where it is secured by the fusible material becoming cool.

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

Figure 1 is an end view of the heat-coil. Fig. 2 is a cross-sectional view of the heat-coil, taken on line A B of Fig. 1; and Fig. 3 is a view of the heat-coil and operating and restoring springs, the operated position of the heat-coil being shown in dotted lines.

Like characters refer to like parts in the several figures.

The conducting member *g* is split at its outer end, so as to form two ears, between which is pivoted the oscillating lever *d* by a pin *f*. The lever *d* is secured to the ears on *g* in an operative position by a fusible mate-

rial *x* on each side of *d*. The middle portion of *g* is formed into a spool for containing the heat-producing winding *o*, and the inner end of *g* is secured within a hollow conducting member *h*, but insulated therefrom by suitable insulating-washers. An insulating-sleeve *a* is slipped over a threaded portion *k* and incloses the inner portions of the heat-coil, the sleeve *k* being held in place by a grooved nut *b*, which is adapted to engage a spring member *n* in the groove *c*. The terminals of winding *o* are conductively connected to *g* and *h*, respectively. The lever *d* is provided with an arm *e*<sup>2</sup>, adapted to engage a contact member *m* when the heat-coil is in an operative position; with an arm *e*, adapted to engage the portion *l*<sup>2</sup> of restoring member *l* when the heat-coil operates, and thereby restore the lever *d* to operative position; with a stop *i*<sup>2</sup>, adapted to limit the movement of *d* when the heat-coil is reset, and with a stop *i*, adapted to limit the movement of *d* when the heat-coil operates. The portions *e* and *i* are similar to the portions *e*<sup>2</sup> and *i*<sup>2</sup>, respectively, thus making the heat-coil reversible—that is, allowing the heat-coil to be turned half over and used the same as originally. Spring *n* and members *m* and *l* may be mounted on any suitable base *u*.

The circuit through the heat-coil is from line-conductor *t*, through spring *n*, grooved nut *b*, stem *k*, conducting member *h*, winding *o*, the ears on *g*, fusible material *x*, arm *e*<sup>2</sup>, and contact member *m* to line-conductor *s*.

When an abnormally large current traverses the winding *o* for a short time, it heats winding *o*, which heat is conducted by conducting member *g* to the fusible material *x*. When this heat is sufficient, the fusible material softens and allows the lever *d* to turn upon the pin *f* and release itself from the contact member *m*, thereby breaking the circuit through the heat-coil, the heat-coil *D* and spring *n* taking the positions *D*<sup>2</sup> and *n*<sup>2</sup>, respectively. When the lever *d* releases itself from contact member *m*, it turns upon the pin *f* in the direction of arrow *p* from the position *d* to the relative position *d*<sup>2</sup>, the heat-coil *D* in the meantime moving a slight distance toward the position *D*<sup>2</sup>. The lever *d* then remains in the position *d*<sup>2</sup> rela-



tively to the heat-coil, while the heat-coil moves toward the position  $D^2$  far enough to bring the lever  $d$  in the position  $d^1$ , where it strikes the restoring member  $l^2$ . The heat-coil then continues its motion until it reaches the position  $D^2$ , the lever  $d$  being turned upon pin  $f$  in the direction of arrow  $p^2$  by the member  $l^2$  from the position  $d^1$  to position  $d^2$ , when stop  $i^2$  strikes against a portion of  $g$ , and thereby stops the movement of the heat-coil  $D$  and the rotation of lever  $d$  upon pin  $f$ . The parts of the heat-coil are now restored to their normal relative operative position, where they are secured by the cooling action of the fusible material  $w$ , which again unites the lever  $d$  to the ears of  $g$ . The heat-coil as a whole may now be reset to operative position, lever-arm  $e^2$  being again engaged with contact member  $m$ . The operation and restoration of the apparatus as thus described may be repeated as many times as desired.

I do not wish to limit this invention to the particular construction as herein shown. The scope of same is intended to include any combination of apparatus wherein an oscillating lever of a thermal cut-out or protector is automatically operated and automatically reset to operative position by means apart from the cut-out after the device has operated.

I do not claim, broadly, the heat-coil shown in this invention; but

What I do claim as new, and desire to secure by Letters Patent, is—

1. The combination with a thermal cut-out or protector for electric circuits, of an oscillating lever normally held in operative position, means for operating the lever upon an abnormally large current in the device, and means apart from the cut-out for restoring the lever to operative position.

2. The combination with a thermal cut-out or protector for electric circuits, of an oscillating member forming a part thereof, a heat-susceptible material holding the said member in an operative position, a circuit-controlling means adapted to engage the said member and to operate the latter when the heat-susceptible material is softened, and means apart from the cut-out for restoring the oscillating member to operative position.

3. The combination of a resistance-body for inclusion in a circuit, an oscillating lever electrically connected with the resistance-body, a circuit-controlling means adapted to engage the lever and tending to oscillate same and thereby break the circuit and cementing material for holding the lever against oscillation, and means apart from the whole for restoring the lever to its normal operative condition after operation.

4. The combination with an excess-current-operable device, of an oscillating member forming a part thereof and secured in an operative position by a heat-susceptible material, suitable stops for limiting the motion of the

oscillating member, a suitable support for the device, a circuit-controlling spring adapted to engage the oscillating member and to operate same upon an excess of current in the circuit, and means apart from the device whereby the oscillating member is restored to its normal, relative, operative position after operation.

5. The combination with an excess-current-operable device comprising a heat-producing member, a heat-conducting member, and a lever pivoted to the heat-conducting member and normally secured thereto by a heat-susceptible material, a spring for engaging the excess-operable device and adapted to operate same when the heat-susceptible material is softened, a second spring adapted to engage the said lever and to turn same upon its pivot when the device operates, and a third spring adapted to limit the operation of the said device and thereby restore the said lever to its normal, relative position upon the said pivot, substantially as described.

6. The combination with a thermal cut-out or protector for electric circuits, of a pivoted member normally held in operative position, means for operating the pivoted member upon an excess of current in the circuit, and means apart from the device for restoring the pivoted member to operative position.

7. With a device of the character described, the combination of a pivoted member for inclusion in the circuit, means for operating the device as a whole, means for operating the pivoted member, and means apart from the device for restoring the pivoted member to relative operative position after operation.

8. With a device of the character described, the combination of a pivoted member for inclusion in the circuit, means for holding the pivoted member in operative position, means for operating the pivoted member under abnormal circuit conditions, and means apart from the device for restoring the pivoted member to operative position.

9. The combination with an excess-current-operable device, of a pivoted member electrically connected therewith, a heat-susceptible material normally holding the pivoted member in operative position, means acting on the pivoted member and tending to break the heat-susceptible material, and means apart from the device adapted to reset the pivoted member to operative position.

10. In a thermal cut-out or protector for electric circuits, the combination of a resistance-body for inclusion in the circuit, a pivoted detent for inclusion in the circuit, means for operating the detent upon an abnormal current, and thereby controlling a circuit, and means apart from the whole and adapted to reset the detent to operative position.

11. The combination with a thermal cut-out or protector for electric circuits, of a pivoted detent, means for normally securing the detent in operative position, means for operat-

ing the detent under abnormal circuit conditions, means apart from the cut-out and adapted to reset the detent after operation, and suitable stops adapted to limit the motion of  
5 the detent.

12. In apparatus of the class specified, the combination of a pivoted detent, means for normally holding the detent in a set position, means for operating the device under abnor-

mal current conditions and means apart from the device for resetting the detent to operative position.

In witness whereof I hereunto subscribe my name this 7th day of March, A. D. 1904.

FRANK B. COOK.

Witnesses:

JNO. F. TOMPKINS,

FREDERICK R. PARKER.