No. 738,803. PATENTED SEPT. 15, 1903.

G. E. HOGLUND.

THERMAL CUT-OUT OR CIRCUIT CHANGER.

APPLICATION FILED JULY 1, 1902.

NO MODEL.

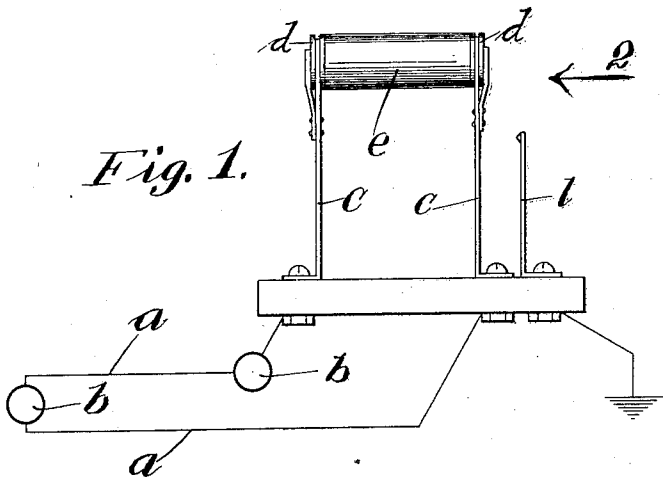


Fig. 1.

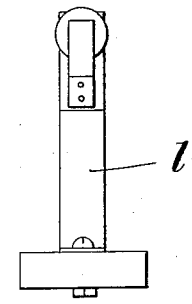


Fig. 2.

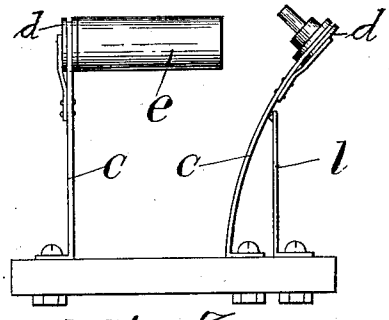


Fig. 3.

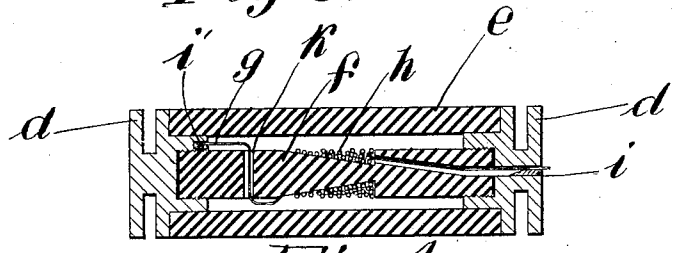


Fig. 4.

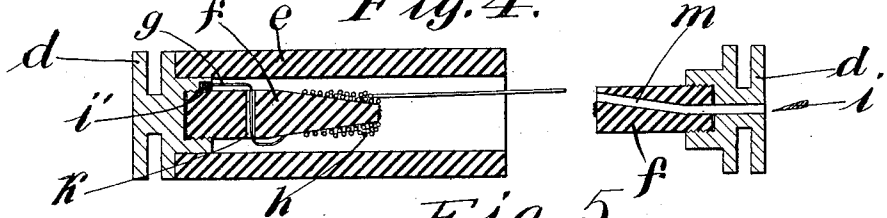


Fig. 5.

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No. 738,803. Patented September 15, 1903.

UNITED STATES PATENT OFFICE.

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THERMAL CUT-OUT OR CIRCUIT-CHANGER.

SPECIFICATION forming part of Letters Patent No. 738,803, dated September 15, 1903.

Application filed July 1, 1902. Serial No. 113,901. (No model.)

To all whom it may concern:

Be it known that I, GUSTAVUS E. HOGLUND, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Thermal Cut-Outs or Circuit-Changers, 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 cut-outs or circuit-changers, and has for its object the avoidance of certain electrical and mechanical defects in devices now in commercial use, as will be hereinafter specified.

Thermal cut-outs of the class to which my invention relates employ a heat-producing element—usually a coil of wire arranged to act when heated upon a heat-responsive element—whereby upon the presence of an undue current the heat-responsive element, usually a mass of softenable material, is permitted to free a switching device controlled by the instrument to cause a change or break in the circuit. In one type of apparatus of the prior art the heat-responsive element has been in the form of a ball or mass of softenable material associated with the heating-coil included in the circuit, the mass of material when cold serving to maintain connection between parts of the circuit, permitting a breakage of the wire when the operating-coil is heated by an abnormal current. In such devices the wire is made fine where it is to be broken, so that it is sure to become fractured to interrupt the circuit.

My invention has for its object, first, the provision of improved means for including the wire of the heat-coil in circuit comprising, preferably, an apertured terminal plate into the aperture whereof the wire may project and a plug or wedging device for holding this wire in sufficiently intimate contact with the terminal plate to maintain a good circuit, while readily permitting the terminal plate and the wire to separate when the device is in operation, the construction being such that relative longitudinal movement between the plate and plug and the wire is readily secured when the device is operated upon the presence of abnormal current conditions.

Another object of my invention is to provide as a heat-responsive element a stem or core which when cold has sufficient tensile strength to prevent the separation of spring-engaged terminal plates, but which will readily permit the separation of such terminal plates upon the presence of abnormal current. This feature of my invention enables me to employ a stem of rubber or gutta-percha, which in order to enable it to perform its function has a section thereof weaker than the balance of the stem, this weakened portion of the stem preferably being surrounded by the heat-producing coil, so that the heat may there be concentrated to soften the stem at its reduced portion to permit of the separation of the terminal plates by the springs engaging the same.

I will explain my invention more fully by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a device constructed in accordance with the invention, a circuit that is to be protected being diagrammatically indicated. Fig. 2 is a view of the device shown in Fig. 1 in the direction of the arrow 2. Fig. 3 is a view in elevation of the device shown in Fig. 1 after a disruption of the circuit. Fig. 4 is a longitudinal sectional view of a device of the invention. Fig. 5 is a view of the device shown in Fig. 4 with the parts separated after its operation due to abnormal circuit conditions.

Like parts are indicated by similar characters of reference throughout the different figures.

A circuit *a*, containing instrumentalities *b b*, that are to be protected, is indicated in Fig. 1. This circuit has for its terminals spring-clips *c c*, which preferably engage end terminal plates *d d*, of metal. A cylinder *e*, of insulating material, is interposed between the plates *d d* and forms therewith a containing-space within which is placed a stem

f, composed, preferably, of rubber, which stem has threaded engagement at its ends with the plates *d d*, whereby these plates are normally prevented from being separated by the springs *c c*. The circuit that is to be protected is completed between the plates *d d* by means of a conducting-wire *g*, that is coiled into a heat-coil *h* at an intermediate portion thereof, the stem or core *f* passing through the heat-coil. This wire *g* may be firmly electrically connected with the end plates *d d* through the agency of metal plugs *i' i*, which serve to wedge the wire into good contact with the surrounding metal plate. It will be seen that this means of connection for the wire *g* affords a simple and economical means for renewing a connection after disruption, it being necessary to replace only the rubber stem with its associated coil. When the device is operated upon the presence of abnormal current in the coil *h*, the stem *f* is broken, permitting the wire *g* and the plug *i* to separate, thereby opening the circuit.

It will be seen that the construction is such that a good contact may normally be maintained between the wire *g* and plug *i* without the necessity of having the engagement between these two parts so firm as to prevent the springs *c* from breaking such connection when the protective device is operated.

In order that the stem *f* may more effectively operate, it is made smaller at an intermediate portion thereof, having this portion preferably in the form of a truncated cone, providing a recess for receiving the heat-coil and a shoulder or end surface against which this coil rests, the stem as thus constructed affording a predetermined line of fracture along which the stem is broken when subject to the heat of the coil. The wire *g* at its left end is preferably threaded through a hole *k*, that extends transversely through the stem, and at its right-hand end through a bore *m*, that extends substantially longitudinally of the stem and is placed in line with the aperture containing the plug *i*.

It will be seen that by the device of my invention the size of the wire is not material to the fracture of the circuit, as the mechanical means for including this wire in circuit permit the fracture of the circuit under the usual conditions. The circuit in addition to being opened may also be grounded, if desired, there being illustrated for this purpose a grounded contact *l*, engaged by a contiguous spring *c* when released by a fractured stem *f*.

I have shown two springs *c c* engaging corresponding terminal plates *d d* of the heat-coil for effecting separation between these terminal plates when the device is operated. I do not wish, however, to be limited to the employment of two springs for this purpose.

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

1. In a thermal cut-out or circuit-changer, the combination with a heat-producing element in the form of a heat-coil, of a heat-responsive element, terminal plates for said heat-coil, means whereby the wire of the heat-coil may be separably secured to one of said terminal plates, and means whereby the separable connection of the wire with the terminal plate is broken upon the response of the said heat-responsive element to abnormal current, substantially as described.

2. In a thermal cut-out or circuit-changer, the combination with a heat-producing element in the form of a heat-coil, of a heat-responsive element, terminal plates for said heat-coil, an aperture in one of said terminal plates, one end of the wire of the heat-coil being inserted within said aperture, a plug fitting in said aperture for separably engaging the wire with said terminal plate, and means whereby the separable connection of the wire with the terminal plate is broken upon response of said heat-responsive element to abnormal current, substantially as described.

3. In a thermal cut-out or circuit-changer, the combination with a heat-producing element in the form of a heat-coil, of a heat-responsive element, terminal plates for said heat-coil, an aperture in one of said terminal plates, one end of the wire of the heat-coil being inserted within said aperture, a metal plug fitting in said aperture for separably engaging the wire with said terminal plate, and means whereby the separable connection of the wire with the terminal plate is broken upon response of said heat-responsive element to abnormal current, substantially as described.

4. In a device of the class described, the combination with metallic terminal plates adapted for inclusion in a circuit, of spring mechanism included in said circuit and tending to separate said terminals, a core of heat-responsive insulating material normally uniting the terminal plates to prevent their separation by said spring mechanism, a small section of said core having a reduced diameter whereby a line of fracture is determined, and means associated with said section of reduced diameter and included in said circuit, abnormal current through said circuit causing said means to heat the core whereby said core is fractured at said reduced section thereby permitting separation of the terminal plates, substantially as described.

5. In a device of the class described, the combination with metallic terminal plates adapted for inclusion in a circuit, of spring mechanism included in said circuit and tending to separate said terminals, a core of heat-responsive insulating material normally uniting the terminal plates to prevent their separation by said spring mechanism, a small section of said core having a reduced diameter whereby a line of fracture is determined, and a heat-coil connecting said terminal plates and surrounding said reduced section of said

core, abnormal current flowing through said circuit causing said heat-coil to heat said reduced section whereby the core is ruptured at said reduced section thereby permitting separation of the terminal plates, substantially as described.

6. In a device of the class described, the combination with metallic terminal plates adapted for inclusion in a circuit, of spring mechanism included in said circuit tending to separate said terminal plates, a core of heat-responsive insulating material normally uniting the terminal plates to prevent their separation by said spring mechanism, a small section of said core having a reduced diameter whereby a line of fracture is determined, a heat-coil surrounding said reduced section, one end of said heat-coil being permanently connected to one of said terminal plates, a bore through one end of said core, an aperture in said other terminal plate registering with said bore, the other end of said heat-coil passing through said bore and into said aperture, and a plug for said aperture whereby the end of the heat-coil extending into said aperture may separably and electrically engage with said terminal plate, abnormal current through said heat-coil included in said circuit causing said reduced section of the core to become heated whereby said core is ruptured at said reduced section to permit separation of the terminal plates and disengagement of the end of said heat-coil normally connected to one of said terminal plates by said plug, substantially as described.

7. In a device of the class described, the combination with metallic terminal plates adapted for inclusion in a circuit, of spring mechanism included in said circuit tending to separate said terminal plates, a core of heat-responsive insulating material normally uniting the terminal plates to prevent their separation by said spring mechanism, a small section of said core having a reduced diameter whereby a line of fracture is determined, a heat-coil surrounding said reduced section, one end of said heat-coil being permanently connected to one of said terminal plates, a bore through one end of said core, an aperture in said other terminal plate registering with said bore, the other end of said heat-coil passing through said bore and into said aperture, and a metal plug for said aperture whereby the end of the heat-coil extending into said aperture may be separably and electrically engaged with said terminal plate, abnormal current through said heat-coil included in said circuit causing said reduced section of the core to become heated whereby said core is ruptured at said reduced section to permit separation of the terminal plates and disengagement of the end of said heat-coil normally connected to one of said terminal plates by said plug, substantially as described.

In witness whereof I hereunto subscribe my name this 25th day of June, A. D. 1902.

GUSTAVUS E. HOGLUND.

Witnesses:
HARVEY L. HANSON,
JOHN STAHR.