

C. A. ROLFE.
ELECTRICAL CIRCUIT PROTECTOR.
APPLICATION FILED DEC. 1, 1902.

951,259.

Patented Mar. 8, 1910.

Fig. 1.

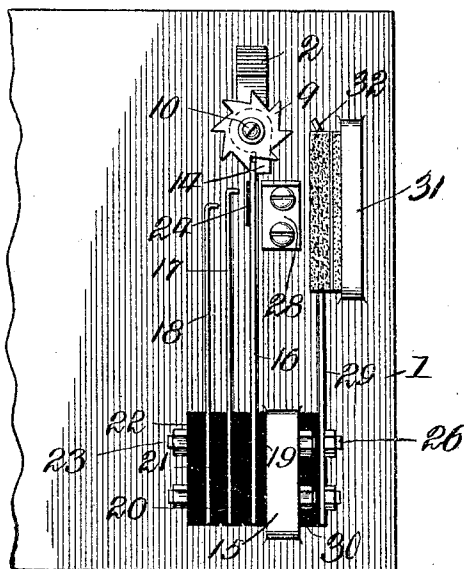


Fig. 2.

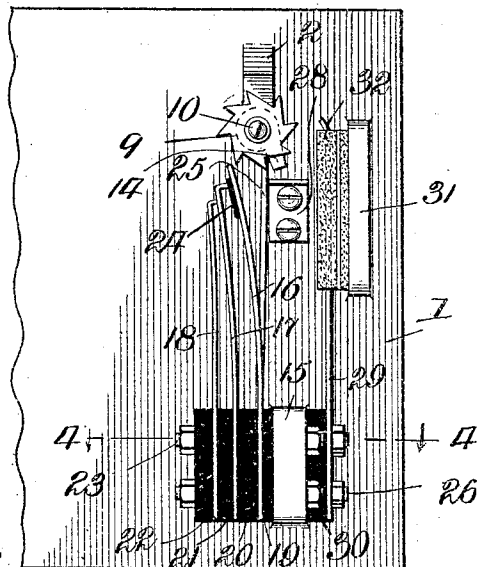


Fig. 3.

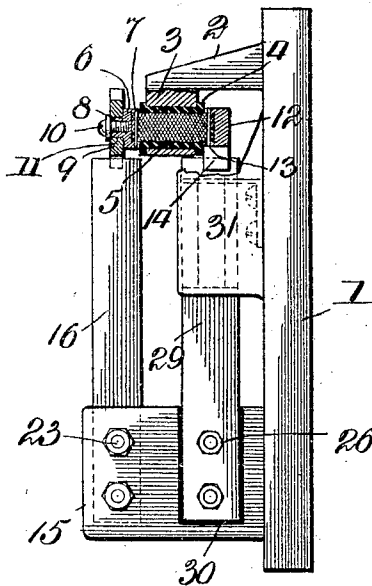
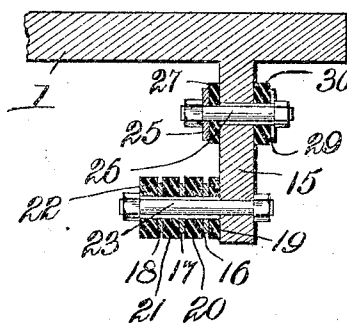


Fig. 4.



Witnesses:

H. S. Gaither
J. C. Lee

Inventor:

Charles A. Rolfe.

by A. Miller Belquist
Attorney.

UNITED STATES PATENT OFFICE.

CHARLES A. ROLFE, OF ADRIAN, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
ROLFE ELECTRIC CO., OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

ELECTRICAL-CIRCUIT PROTECTOR.

951,259.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed December 1, 1902. Serial No. 133,449.

To all whom it may concern:

Be it known that I, CHARLES A. ROLFE, a citizen of the United States, residing at Adrian, in the county of Lenawee and State of Michigan, have invented a certain new and useful Improvement in Electrical-Circuit 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 electrical circuit protective apparatus for protecting electric circuits from the injurious and damaging effects of unduly strong currents and excessively high potentials.

The principal object of my present invention is to provide a simple, practical and inexpensive form of protective device which shall be capable of automatically restoring itself to operative condition.

In an application filed by me, April 21, 1902, Serial No. 104,021, I have shown and described a form of electrical circuit protector which automatically restores itself to operative condition, such restoration consisting in the automatic resetting of parts actuated during operation, after operation has occurred, and the automatic resecuring, as by resoldering of the parts in such reset condition. In my present application I will show a self-restoring electrical circuit protector in which the automatic resetting of the parts preparatory for another operation occurs during the act of operation, instead of after operation, as in my said other application. In the present application the reset parts are resecured, as by resoldering, in the position or condition in which they have been reset.

In the accompanying drawings, Figure 1 is an elevation of a protective device embodying my present invention, in unoperated condition; Fig. 2 is a similar view of the device after operation; Fig. 3 is a side view partly in section; Fig. 4 is a section taken on line 4—4 in Fig. 2.

The device which I have shown in the drawings to illustrate the invention, comprises a base 1 which is desirably a metal plate. This base is provided with an arm 2 having a depending portion 3 which is bored or hollowed out so that it can contain and support a cylindrical structure which may be called a heat-responsive device or heat

cartridge. This device or cartridge consists of a rubber bushing or collar 4 containing a high resistance graphite plug or pencil 5. This graphite is of such high internal resistance as to generate heat when an unduly strong current is passed through it. Secured to its end is a metal cap 6 which is secured to the graphite stick 5 by a pin 7. The cap 6 is provided with a reduced portion 8 which forms a hub for a star wheel 9, a screw 10 being provided to hold the wheel in position on such hub. A small layer or quantity of solder 11 is arranged between the wheel 9 and the hub 8, and this solder, under normal conditions, holds the wheel rigid with respect to the cap 6 and graphite stick 5. The solder is adapted to be melted or softened, however, when the graphite is heated by the passage of an unduly strong current. At the other end of the graphite stick 5 is a cap 12 also secured to the graphite stick 5 by a pin 13, and this cap 12 is provided with a depending projection or tail piece 14. The rubber or ebonite sleeve or bushing 4 fits loosely in the depending portion 3 of the arm 2 so that the device, consisting of the graphite stick and associated parts, is free to turn relatively to the arm 2. Thus the heat cartridge is made as a structurally independent and unitary structure so that it can be manufactured and sold separately.

The lower portion of the base 1 is provided with a projecting lug 15 at whose outer end three springs 16, 17 and 18 are supported, said springs being separated from one another and from the projection 15, by insulating plates 19, 20, 21 and 22, and the whole held together by bolts 23, 23. The spring 16 extends up and its upper end is adapted to engage one of the teeth in the star wheel 9, as shown in Fig. 1. It has a tendency to spring to the left, referring to Figs. 1 and 2. When it is released so that it can spring in that direction, it strikes against the springs 17 and 18 which extend upwardly alongside of the spring 16 and have their upper ends bent toward the same. A small piece or plate 24 of insulating material is arranged upon the spring 16 so that the spring 17 comes in contact with this insulation and thereby prevents contact between the springs 16 and 17. A spring 25 is secured to and supported by the inner end of the lug 15, said spring being held in

position by a bolt 26 passing through said lug and insulated from the latter by an insulating plate 27. The spring 25 extends upwardly and its upper end is adapted to engage the depending tail 14 of the cap 12, as shown in Fig. 1. The spring 25 is adapted to move or spring to the right, referring to Figs. 1 and 2. A contact plate 28 is secured to the base 1 in position to intercept the spring 25 when it moves. Another spring 29 is secured to and supported by the lug 15, being held in position by the bolt 26. On one side of this spring 29 is an insulating strip 30. The base 1 is also provided with a lug or projection 31 which supports a pair of lightning arrester carbons 32, 32. The spring 29 extends upwardly and makes contact with the outer one of the carbons 32.

The device is connected up in circuit by having the spring 16 connected with the instrument, and the spring 25 connected with the line. The contact plate 28 is suitably connected with ground, as is also the inner lightning arrester carbon 32. One arrangement in which this can be accomplished is to have the plate 1 of metal and connected with the ground, in which case no further connections between the plate 28 and carbon 32 are necessary. The spring 29 is also connected with the line. The springs 17 and 18 are connected with a local alarm circuit. In operation the device normally stands as shown in Fig. 1, in which case circuit is made from the instrument to the spring 16, to the star wheel 9, thence through the cap 6, graphite stick 5, cap 12 and spring 25 to the line. The spring 16 acts upon the star wheel toward the left in Figs. 1 and 2, and the spring 25 acts upon the tail piece 14 in the opposite direction, thereby holding the star wheel and graphite in equilibrium, the springs being substantially the same. As long as the current traversing the circuit is of normal volume, the instrument remains in this condition. When, however, an unduly strong current traverses the circuit, the graphite 5 becomes heated, thereby softening the layer of solder 11, whereupon the star wheel 9 is released, thereby permitting the spring 16 to move, which it does, turning the star wheel 9 a portion of a revolution, as shown in Fig. 2. At the same time that the wheel 9 is released, the restraining force is removed from the spring 25, thereby permitting that spring to operate and strike against the ground plate 28. The circuit is thereby opened by the separation of the end of the spring 16 from the star wheel (Fig. 2) and the line is grounded by the spring 25 striking the ground plate 28. The spring 16, in operating, strikes against the spring 17 and forces the same against the spring 18, whereupon the local circuit is closed and an alarm sounded. After operation, the layer of solder hardens, thereby

holding the star wheel 9 again rigid with the graphite stick 5. The spring 16 is thereupon restored to its original position and placed in engagement with the next tooth of the star wheel 9. The two springs 16 and 25 again equalize each other, the spring 25 being returned to its normal position out of contact with the ground plate 28. In this way each actuation of the device causes the star wheel 9 to be turned a portion of a revolution substantially the length of one of its teeth, whereupon these teeth are engaged one after another with the spring 16. Thus in a certain sense the act of operation may be said to automatically restore the device to operative condition. If lightning or other high potential strikes the circuit at any time, it passes across the lightning arrester carbons 32, 32, and to ground in the usual manner.

What I claim as my invention is:—

1. In apparatus of the class specified, the combination of a stick or body of graphite, a toothed wheel mounted at the end of the graphite, a small quantity of solder normally holding the wheel in position, and a spring adapted to engage one of the teeth of said wheel and arranged to turn the wheel so as to bring the teeth into engagement one after another when released by the softening of the solder, substantially as described.

2. In apparatus of the class specified, the combination of means for controlling the circuit, a device operable upon the passage of an excess current in the circuit and having a rotary member, means whereby said device is automatically reset in operative condition during operation, and means for grounding one side of the circuit upon operation of said device, substantially as described.

3. In apparatus of the class specified, the combination of means for controlling the circuit, a device operable upon an excess of current in the circuit, said device having a plurality of devices each adapted to engage the circuit controlling means, and the latter being adapted and arranged to bring said engaging devices into engaging position one after another, and means for grounding one side of the circuit upon each operation of the excess operated device, substantially as described.

4. In apparatus of the class specified, the combination of a heat concentrating device, a body or mass of material adapted to become affected by the heat generated in said device, a wheel having a plurality of engaging devices, said wheel being subject to said body or mass of material, a spring adapted to engage the engaging devices of said wheel one after another and adapted also to turn the wheel to bring said engaging devices successively into engaging position, an abut-

ment associated with said heat concentrating device, a grounding spring normally held in restraint by said abutment, the abutment being released so as to permit it to
5 be moved by the spring when the body or mass of material is softened by the generation of heat in the heat concentrating device, and a ground contact with which said grounding spring comes into contact when
10 freed, substantially as described.

5. In apparatus of the class specified, the combination of a body or stick of graphite having one end provided with a cap having a hub portion, a toothed wheel fitted over
15 said hub portion, a layer or small quantity of solder holding said wheel normally rigid with said cap, a second cap at the other end of the stick of graphite, said cap having a depending abutment, a circuit controlling
20 spring adapted to engage the teeth of said wheel and to turn the same to bring the teeth successively into engaging position when the solder is softened by heat generated in the graphite, a grounding spring
25 normally held in restraint by said abutment, which latter is released by the release of the wheel upon the softening of the solder, and a ground contact with which said grounding spring comes into connection when freed,
30 substantially as described.

6. In apparatus of the class specified, a heat cartridge consisting of a structurally independent and unitary element having a rotary member, means for holding said member
35 normally against rotation, and means for releasing the same on the passage of an unduly strong current, substantially as described.

7. In apparatus of the class specified, a
40 heat cartridge consisting of a structurally independent and unitary element having a rotary member, a heat concentrating device, and means susceptible to heat for normally holding the rotary member against move-
45 ment, and for releasing the same on the generation of heat by the heat concentrating device, substantially as described.

8. In apparatus of the class specified, a heat cartridge consisting of a structurally independent and unitary element having a
50 rotary member, a heat concentrating device, and a small quantity of solder normally holding the rotary member against rotation, but releasing the same when heated by heat generated in the heat concentrating device,
55 substantially as described.

9. In apparatus of the class specified, the combination of a line spring, and a heat cartridge comprising a rotary member adapted to engage the line spring, a heat
60 concentrating device, and means operable by the generation of heat in said heat concentrating device for controlling said rotary member, substantially as described.

10. In an electrical circuit protector, a
65 heat cartridge having provisions for automatically resecuring itself in operative condition, and provided with a supplemental engaging device.

11. An electrical controller comprising a
70 heat cartridge provided with a self soldering star wheel, and a strip spring secured at one end and having its free end engaging said star wheel.

12. An electrical circuit protector com-
75 prising a heat cartridge consisting of a structurally independent and unitary element having a toothed rotary member, solder holding the rotary member normally against movement, a heat concentrating de-
80 vice arranged to soften the solder when heated by an unduly strong current, a strip spring engaging said rotary member, a base by which the strip spring is carried, and a support for the heat cartridge carried by
85 said base.

In witness whereof, I hereunto subscribe my name this 28th day of November A. D., 1902.

CHARLES A. ROLFE.

Witnesses:

A. MILLER BELFIELD,
I. C. LEE.