

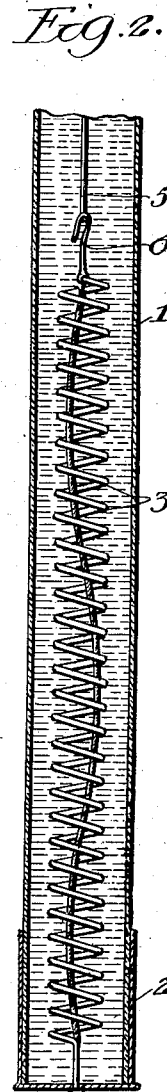
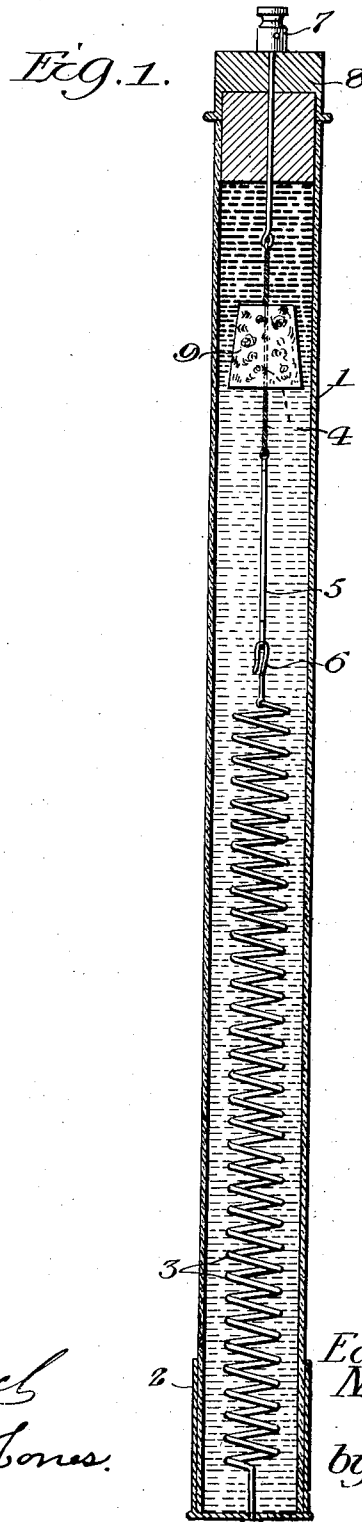
E. O. SCHWEITZER & N. J. CONRAD.

PROTECTIVE DEVICE.

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1,008,496.

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Specification of Letters Patent. Patented Nov. 14, 1911.

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To all whom it may concern:

Be it known that we, EDMUND O. SCHWEITZER and NICHOLAS J. CONRAD, citizens 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 Protective Devices, 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.

Our invention relates to protective devices and more particularly to high potential protective devices, and in its preferred form consists of a fusible element under tension which is designed to open the circuit upon an abnormal change in the current conditions of the circuit.

Our invention is particularly applicable for use with high tension circuits, by which we mean, circuits of some thirty-five hundred volts or over. In our application Serial #550,219, filed March 18th, 1910 we set forth a fuse which can be used in this connection, which fuse is more or less under tension depending upon the pull exerted by a coiled element, but which coiled element or spring has its pull increased by the increased current on short circuit or overload due to the attraction between the convolutions of the element. In this present application we show other features of novelty and advantage. These features contemplate among others the provision of an inclosing element for a portion of, or the whole fuse, which element has poor heat radiating qualities, and serves as an initial barrier to the arc.

We further contemplate the construction of a spring of such a character that its resilience will not be impaired on short circuits and this is of great importance when it is borne in mind that some of the tests show a current rise of hundreds of amperes on short circuit, even though the normal current of the circuit may be three eighths or three tenths of an ampere. In some tests which we have made, we have found that if the regulating spring were not heavy enough, the short circuit would cause the spring to contract and open the fuse and would heat the spring sufficiently to fuse and to weld convolutions of the spring together.

We further find that the use of carbon tetrachlorid or a similar substance of high

dielectric strength partly or wholly inclosing the fuse, or even wholly filling the inclosing tube, causes an extinguishment of the arc in a remarkably efficient manner. We further find that in fuses of this character it is ordinarily not necessary to provide a permanent vent and the absence of the vent, of course, prevents atmospheric influence on the inclosed elements. The structure is such however, that a portion thereof may consist of a plug or other openable device, by virtue of which the device may be opened or ruptured in a portion whereof little or no damage will result, should the force of the breaking fuse and a consequent explosion be sufficient to cause disruption.

We will explain our invention more in detail by reference to the accompanying drawing, illustrating the preferred embodiment thereof in which:

Figure 1 is a sectional view of our improved device, and Fig. 2 is a modification thereof.

In describing the invention, we are describing it in connection with the drawing illustrating one of the first models made, and which sets forth the features. We do not therefore wish to be understood as limiting ourselves to the precise form or character of the elements as set forth herein, such elements being illustrative of other elements of similar functions, which can be used to carry out the invention herein.

Referring now particularly to the drawing, we show a glass tube 1 having an aperture closing cartridge or similar element 2, which closes the glass tube at that end and which is of such character that it can be readily accommodated for mounting. The cartridge 2 carries a spring 3 soldered or otherwise suitably fastened thereto, which spring is preferably under tension when holding under similar tension a fuse 4. The fuse is connected to the spring by the link which engages the hook 6, preferably integrally fastened with the spring. The other end of the fuse is fastened to or carried by a post 7 fastened to a plug 8 carried at the opposite end of the glass tube 1.

Similar to the construction described in our first aforesaid co-pending application, the increase of current in the convolutions of the spring causes an attraction between said convolutions and this, simultaneously with the heating of the fuse due to increased current, causes a rupture of the fusi-

ble element. This causes a break between the terminals of the circuit, which is not only equal to the distance that the spring has been distended but also in addition the length of the fusible element, and in some cases the length of the link 5, as that falls to the bottom being carried only by the hook 6.

It will be seen that a very large gap is provided when the fuse is ruptured or blown. If the force of the explosion is sufficient, the plug gives way before the other parts and this will not cause any damage, the parts being mounted in a switchboard for such a contingency. Further our invention contemplates the provision of the spring 3, in such form that a violent short circuit will not heat the spring sufficiently to deprive it entirely of its resilience.

We further make the action of this protective device positive by covering the fuse in whole or in part by an element of material which is a poor conductor of heat. We have found that cork has given good results under the circumstances, and we show such an element made of cork 9 partly inclosing the fuse. This cork forms a good initial barrier to the arc. We also find that a suitable material of high dielectric strength surrounding or partly surrounding those parts where the gap is to occur upon rupture of the fuse is of great advantage. This material may be liquid or fluid or in such a finely divided form that it readily fills in spaces vacated by the blown fuse and the withdrawn link 5. The material which has given us exceptionally good results is a liquid, carbon tetra-chlorid. This has a high dielectric strength and readily aids in preventing or extinguishing the arc, caused by the rupture of the fusible element within the device. We find that we get good results from different characters of structures by keeping the whole tube full of liquid or the whole fuse submerged, or by the liquid filling the device only up to the top of the cork, or even by having the liquid level below the fusible element, when said element is in its normal condition.

When the device is used so that the spring is at its lower end so that the liquid also incloses the spring, the said liquid tends to prevent heating of the spring. In Fig. 2 we show the use of a flexible conducting cord 10 in parallel with the spring to give the device increased current carrying capacity.

While we have herein shown and particularly described the preferred form of our invention, we do not limit ourselves to the precise structure herein shown, but

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A device of the character described, having an insulating casing, a fuse within

the casing, an envelop for said fuse substantially occupying all the available cross-sectional space across a portion of said casing, and means to maintain said fuse under tension.

2. A device of the character described having an insulating casing, a fuse within the casing, an envelop for said fuse substantially occupying all the available cross-sectional space across a portion of said casing, said envelop having a hole for said fuse slightly larger than said fuse, and means to maintain said fuse under tension.

3. A device of the character described having an insulating casing, a fuse therein, and a diaphragm through which said fuse passes of inert material which will not combine with the products of combustion upon operation of the fuse.

4. A device of the character described having an insulating casing, a fuse therein, and a diaphragm through which said fuse passes of inert material which will not combine with the products of combustion upon operation of the fuse, said diaphragm having a hole for said fuse only slightly larger than said fuse and which diaphragm serves as a barrier to the formation of an arc upon operation of the fuse.

5. In a device of the class described in combination, a case forming a chamber, a fuse mounted in said chamber, and a solid arc intercepting member inclosed in said chamber, through which the fuse is threaded, said member being supported on said fuse and occupying in excess of fifty per cent. of the cross section of said chamber.

6. A device of the class specified having a fuse, a device located between the fuse terminals and adapted to serve as an intercepting device for the fuse arc, a bath of liquid arc extinguishing material arranged to flow between the fuse terminals upon the operation of the fuse, and means for lengthening the fuse gap when the fuse operates.

7. A device of the class specified having a fuse, a spring acting upon the same, an envelop supported on and closely inclosing said fuse for intercepting the fuse arc, and a liquid bath submerging said fuse and envelop also for use in extinguishing the fuse arc.

8. A device of the class specified having a fuse, a spring acting upon the same, an envelop supported on and closely inclosing said fuse for intercepting the fuse arc, and a liquid bath immersing the fuse and envelop.

9. A device of the class described having a fuse in a fuse chamber, and also having a solid envelop confining a portion of said fuse and a bath of arc extinguishing liquid submerging said fuse and envelop.

10. A device of the class specified, having a fuse and means for inclosing a portion of the fuse in an envelop of solid material, and

another portion of the fuse in a liquid bath.

11. A device of the class specified having a fuse in a fuse chamber, and also having a solid envelop confining a portion of said fuse, and a bath of arc extinguishing liquid filling the remainder of the fuse chamber.

12. A device of the class specified comprising a tubular casing, terminals at the ends of said casing, a fuse within the fuse chamber formed by said casing, a spiral spring acting upon said fuse, a piece of cork inclosing a portion of the fuse, and an arc extinguishing liquid filling the remainder of the fuse chamber.

13. A device of the class specified having a fuse and a barrier of solid material through which the fuse is extended, the aperture for the fuse in said barrier being of substantially the same size as the fuse, a bath of arc extinguishing liquid, in which the fuse and barrier are immersed, and a spring maintaining the fuse under tension.

14. A device of the class specified having a casing providing a fuse chamber, a fuse therein, a spring normally maintaining said

fuse under tension, a barrier of solid material, through which said fuse is extended, the aperture for the fuse in said barrier being of substantially the size of the fuse, and the barrier being smaller than the interior of the fuse chamber, and a bath of arc extinguishing liquid in the fuse chamber.

15. A device of the class specified having its fuse inclosed in a body of expansible material, having an opening for the fuse of substantially the size of the fuse, whereby when the fuse blows said material tends to fill the fuse aperture.

16. A device of the class specified having its fuse inclosed in a piece of cork, having an aperture of substantially the size of the fuse.

In witness whereof, we hereunto subscribe our names this fifth day of April A. D., 1910.

EDMUND O. SCHWEITZER.
NICHOLAS J. CONRAD.

Witnesses:

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