

No. 687,576.

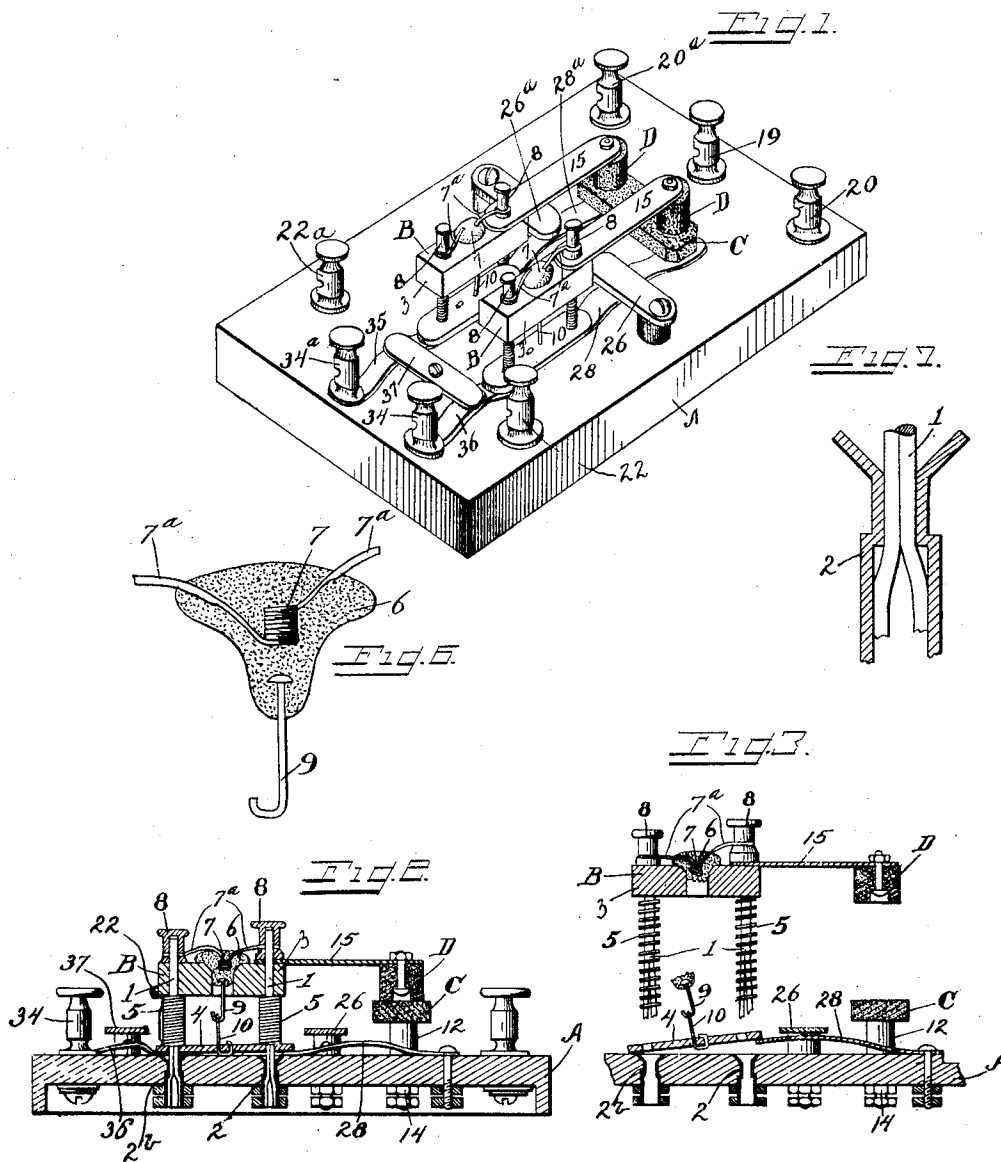
Patented Nov. 26, 1901.

C. A. ROLFE.
ELECTRICAL PROTECTOR.

(Application filed Dec. 1, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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Fig. 4.

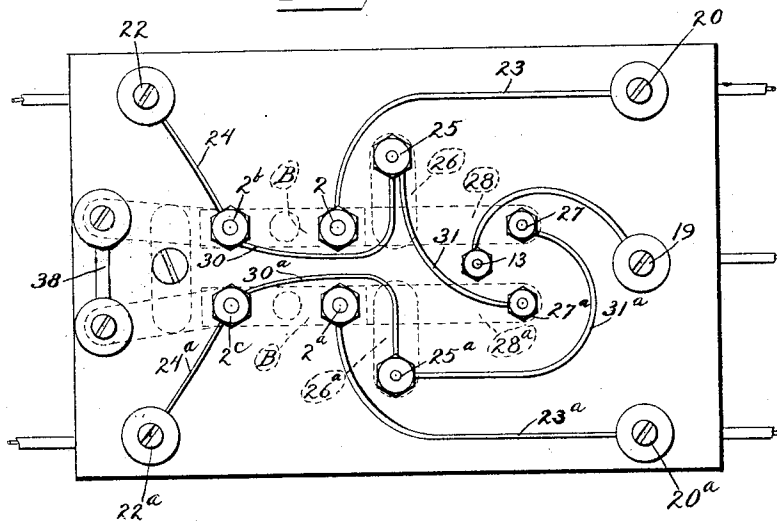
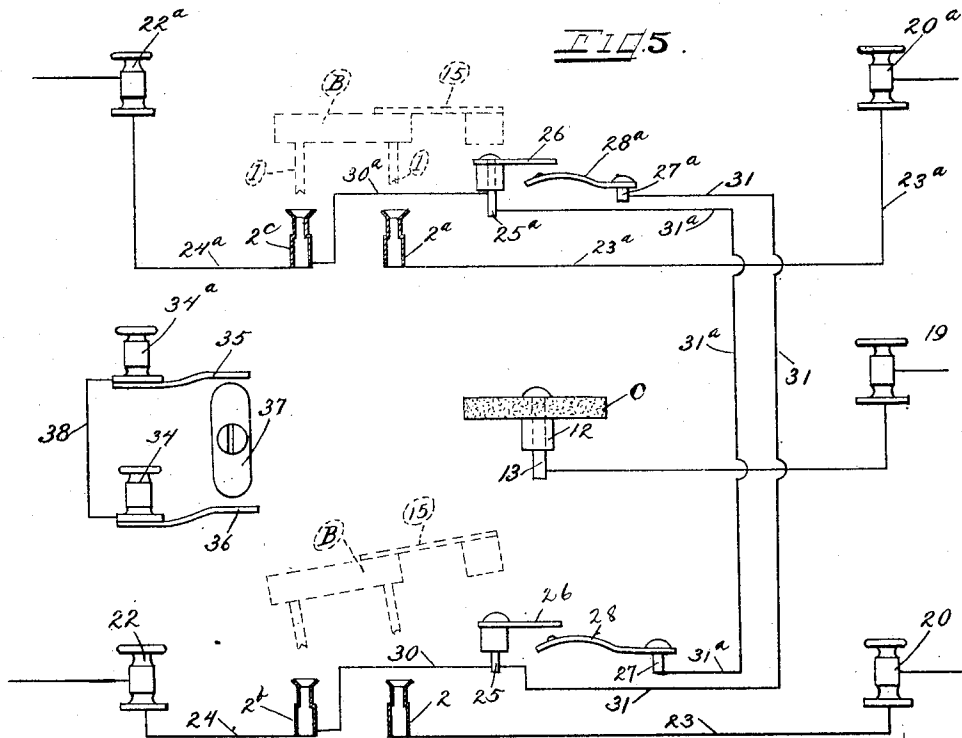


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTRICAL PROTECTOR.

SPECIFICATION forming part of Letters Patent No. 687,576, dated November 26, 1901.

Application filed December 1, 1899. Serial No. 738,788. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. ROLFE, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Electrical Protectors, of which the following is a specification.

My invention relates to instruments which are adapted to protect electrical circuits and apparatus or devices thereon from the injurious effects of lightning and unduly-strong currents.

Prominent objects of my invention are to render unnecessary the use of fuses or like cut-out devices in the ground-circuit for preventing injury by the continuous discharge of lightning over that circuit, to provide an effective and highly-improved construction of cut-out device for operating upon the passage of an unduly-strong or sneak current, and to combine in a single instrument a construction which shall be thoroughly efficient in guarding against both unduly-strong and sneak currents and lightning.

To the attainment of the foregoing and other desired ends my invention consists in matters hereinafter set forth.

In the accompanying drawings, Figure 1 is a perspective view of a combined strong-current protector and lightning-arrester embodying my invention. Figs. 2 and 3 are views, partly in section and partly in elevation, of a portion of this instrument, Fig. 2 showing the instrument in an unoperated condition and Fig. 3 showing it after or during operation. Fig. 4 is a plan view of the bottom of the instrument. Fig. 5 is a diagrammatic view of the instrument and its connection with the ground and with the circuit to be protected. Fig. 6 is a view of a detail of construction, and Fig. 7 is a fragmental view of a portion of the device.

In the drawings I have shown a form of strong-current protector which, with other forms of protectors embodying the same general principles of construction and operation, is shown and described in my applications for United States Patents, Serial Nos. 618,795 and 618,796, both filed January 11, 1897, and both for thermal cut-out devices. In these applications I have claimed the

broader features of the form of protector herein shown; but I have not claimed the same specifically, because I did claim specifically the other forms of device. In this application I will therefore claim the herein-shown form specifically, but do not desire to be construed as abandoning its broader features because they are claimed in my said other applications. This form of strong-current protector consists of a base A, made of insulating material, such as slate or porcelain, and a couple of jump-out devices B B, which are connected in on opposite sides of the circuit and arranged to operate or jump out, so as to break or open the circuit upon the passage therein of an unduly-strong or a sneak current. Each jump-out or circuit-breaking device B comprises a couple of long metallic rods 1 1, which are arranged to fit into corresponding metallic sockets 2, 2^a, 2^b, and 2^c, secured in the base A; a block 3, rigidly connecting the upper ends of the metallic rods 1 1; a slide 4, arranged to slide upon the lower ends of said rods 1 1; springs 5 5, tending normally to force the slide 4 in a direction away from the block 3; a fusible or softenable button 6, arranged upon the block 3 and containing a coil 7 of fine or high-resistance wire whose ends are connected with the upper ends of the rods 1 1 by wires 7^a 7^a and thumb-nuts 8 8 on said rods, and a hook 9, carried by the softenable or fusible button 6 and engaging a hook 10, carried by the slide 4. The fusible or softenable button 6 is normally hard, and consequently holds the slide 4 against being forced along the rods 1 1 by the springs 5 5, Fig. 2. When an unduly-strong current passes in the circuit, however, the button 6 softens or melts, and thereby releases the hook 9, as shown in Fig. 3, whereupon the springs 5 5 act upon the block 3, so as to elevate the same and cause the rods 1 1 to be withdrawn from their sockets. As matters of further improvement in the present invention the coil of wire 7 is confined in the upper part of the fusible button 6 and the hook 9 is engaged by the lower part of the button and is entirely dissociated from the coil of wire. This allows a freer and quicker action of the button and makes it much more sensitive.

The wires 7^a 7^a, leading to the coil 7, are made relatively coarse, whereby they will not fuse, but will reliably convey the current to the coil, and thereby insure the action of the button. The rods 1 1 have their lower ends split and made so as to tend to spring apart, and the sockets 2, 2^a, 2^b, and 2^c have their lower ends enlarged, as shown in Fig. 7, whereby the split portion of the rods may spread or separate, and thereby both lock themselves in position and preserve their spring tension. This form of strong-current protector has proved to afford absolute, efficient, trustworthy, and infallible protection against both sneak - currents and unduly-strong currents, such as power and lightning currents.

The device also embodies a lightning-arrester, by which lightning intruding upon the circuit can be allowed to pass to ground. The lightning-arrester shown embodies a ground-carbon C, which is connected with the ground, and a couple of line-carbons D D, which are understood to be connected with the opposite sides of the circuit. The ground-carbon is supported by a support 12 and has a connecting-screw 13 passed through it and secured in a socket 14 in the base of the instrument. These carbons D D are coated with shellac in accordance with the invention of my application, Serial No. 723,654, filed July 13, 1899, for a lightning-arrester, and the line-carbons D D rest normally against the ground-carbon C, so that the lightning can readily pass from the line-carbons and ground-carbon, while at the same time actual contact will not be made between these carbons. In accordance with my present invention the line-carbons are automatically separated from the ground-carbon, so as to prevent the passage of lightning from the line to the ground upon the passage of an unduly-strong or a sneak current upon the line. This, it will be seen, absolutely prevents all danger to the line, for when the line is opened by the passage of such currents it will be impossible for either these or other currents or lightning to pass to the ground, it being observed that in many instruments now in use either lightning or heavy currents can pass from the line to the ground after the operation of the instrument, and thereby continue to threaten or injure the line after the trouble is supposed to have been removed. As a simple arrangement for thus separating the line-carbons D D from the ground-carbon C at such times the line-carbons are respectively connected with the jump-out devices B B by strips 15 15, whereby when either of the jump-out devices is operated the corresponding line-carbon D will be lifted and separated from the ground-carbon C, as shown in Fig. 3. As a preferred arrangement these strips 15 15 are composed of metal, whereby they also serve to connect the carbons D D with the line. By such arrangement it will be seen that the instrument by means of

the jump-out or circuit-breaking devices B B protects the instrument under protection perfectly against strong currents and sneak-currents, and by means of the lightning-arrester, consisting of the carbons C and D D, protects the same against lightning, and also that when the circuit is opened by sneak or an unduly-strong current the lightning-arrester is operated so as to prevent all possibility of trouble upon the line or the ground circuit by the passage of the unduly-strong current or the lightning thereupon.

From the foregoing it will be seen that when the device is in normal condition the circuit will be made through both of the jump-out devices B B; but when either one or both of such devices operate the line will be opened and the instrument under protection thereby protected. As a matter of further improvement I arrange to have the outside line closed through the device when either one or both of the jump-out devices B B operate, so that the continuity of the line will not be broken and other instruments, should there be any others thereon, will not have their operation interfered with. The arrangement I have employed for so doing is shown in Figs. 4 and 5, the former of which is a view of the bottom of the device, with certain of the parts on top thereof shown in dotted lines. The wires from the instrument under protection are brought to binding-posts 20 and 20^a, Fig. 1, on opposite sides of the ground binding-post 19. The outside line-wires are brought to binding-posts 22 and 22^a at the opposite end of the base A. The binding-posts 20 and 20^a are connected with the sockets 2 and 2^a by wires 23 and 23^a, respectively, and the binding-posts 22 and 22^a are connected with sockets 2^b and 2^c by wires 24 and 24^a. The sockets 2^b and 2^c are also connected by wires 30 and 30^a with binding-screws 25 and 25^a, which support horizontally-arranged contacts 26 and 26^a, Fig. 1, on the upper side of the device. The binding-screws 25 and 25^a are in turn respectively connected by wires 31 and 31^a with another set of binding-screws 27 and 27^a, the screws 25 and 25^a being respectively connected with the screws 27 and 27^a on the opposite sides of the circuit. The screws 27 and 27^a are connected to and hold in position metallic spring-strips 28 and 28^a, which extend forwardly from such screws under the inner ends of the metallic contacts 26 and 26^a to an extent to allow their free ends to come into position below the ends of the slides 4 4 of the jump-out devices B B. When the instrument is in normal condition before operation, the jump-out devices B B hold the spring-strips 28 and 28^a depressed and out of contact with the contacts 26 and 26^a, as shown in Fig. 2; but when the jump-out devices B B are actuated, so as to jump out from their sockets, the corresponding spring-strips 28 and 28^a spring upwardly and make contact with the corresponding contacts 26 and 26^a, as shown in Fig. 3.

When the device is in normal condition, the connections with the jump-out devices will be made by the wires 22 and 23 and 22^a and 23^a. When the upper jump-out B, Fig. 4, operates alone, the outside line will be closed through wires 24 and 30, contact 26, spring-strip 28, and wires 31^a, 30^a, and 24^a. When the lower jump-out B alone is operated, the outside line will be closed through wires 24, 30, and 31, spring-strips 28^a, contact 26^a, and wires 30^a and 24^a. When both of the jump-outs B B are operated, the outside line will be closed through wires 24 and 30, the contact 26, spring-strips 28, wire 31^a, and the wire 31, spring-strip 28^a and contact 26^a, and thence through wires 30^a and 24^a.

I also desirably provide means whereby the operation of either one of the jump-outs B B will close a local circuit, and thereby call the attention of the attendants to the fact that the device has operated. In the arrangement shown the one side of the local circuit is brought to one of a couple of binding-screws 34 34^a at one end of the device, and these binding-screws are provided with spring-strips 35 36, which extend forwardly and under an elevated contact 37 and also under the ends of the jump-out devices B B. The two binding-screws 34 34^a are electrically connected by a metallic strip 38 on the bottom of the device, as shown in Fig. 4. The other side of the circuit is connected to the contact 36. Obviously when either of the jump-outs B B is operated the corresponding spring-strip 35 will rise, and thereby close the local circuit through it and the elevated contact 36, and also that when both of the jump-outs operate both of the spring-strips 35 35 will rise and close the circuit in the same way—doubly, as it were.

It will be seen from the foregoing that the invention provides absolutely reliable and accurate protection against both strong currents, sneak-currents, and lightning, that when the device is operated the circuit is closed through it, so as not to interrupt the continuity of the outside line, and also that the operation of the device by a strong current will render the lightning-arrester inoperative, and thereby prevent trouble by preventing the passage of strong currents or lightning to the ground.

What I claim as my invention is—

1. A protector comprising means for opening the circuit upon the intrusion thereon of abnormal currents; a lightning-arrester; and means for rendering the lightning-arrester inoperative upon the operation of the circuit-opening means.

2. The combination with a device adapted for breaking the circuit; of a lightning-arrester comprising a ground-carbon, and one or more line-carbons; and connections between the circuit-breaking device and said carbons, whereby the operation of the former causes the separation of the ground-carbon, and the line carbon or carbons.

3. The combination of a couple of circuit-breaking devices constructed so as to rise when actuated; a ground-carbon; a couple of line-carbons, arranged above and in close proximity to the ground-carbon, and respectively connected electrically and mechanically with the circuit-breaking devices so as to connect said carbons with the line, and also to cause the same to be actuated so as to withdraw them from the ground-carbon upon the operation of the circuit-breaking devices.

4. In a protector, a circuit-breaking device comprising a couple of metallic rods adapted to fit into suitable sockets; a block connecting the upper ends of said rods; a slide adapted to slide upon the lower ends of the same; spring means tending to force the slide in a direction away from the block; and a device responsive to abnormal currents associated with the block, and connected with the slide so as to hold the same against the movement of the springs.

5. In a protector, a circuit-breaking device comprising a couple of metallic rods adapted to fit into suitable sockets; a block connecting the upper ends of said rods; a slide adapted to slide upon the lower ends thereof; a couple of springs respectively inclosing the rods and tending normally to separate the slide and the block; a device responsive to abnormal currents, and consisting of a mass or button of fusible or softenable material associated with a coil of fine wire; and connections between said heat-responsive mass and the slide for holding the latter against movement by the springs.

6. In a protector, a device responsive to abnormal currents, consisting of a mass or button of fusible or softenable material; a coil of wire associated therewith; and a connector, such as a hook, extending from the button and dissociated from the coil of wire, the said coil and connector being secured to opposite ends of said mass of material.

7. A protector comprising a couple of circuit-breaking devices, each consisting of a bodily-removable jump-out device; a lightning-arrester consisting of a ground-carbon and a couple of line-carbons, all of said carbons being coated with a permanent and adhesive insulating material, and the line-carbons being above and in close proximity to the ground-carbon; and metallic strips connecting the jump-out devices, both mechanically and electrically, with the line-carbons.

8. The combination with a couple of circuit-breaking devices; of a couple of spring-strips respectively held under tension by said circuit-breaking devices when the same are in normal condition, and released from tension upon the operation of said devices; a couple of contacts arranged so that when released the spring-strips make contact therewith; and connections between the circuit-breaking devices and the spring-strips of the opposite sides of the circuit, and also between said contacts and the circuit-breaking devices and

outside line, whereby the outside line will be closed through the protector when either one or both of the jump-out devices operates.

9. The combination with two circuit-breaking devices; of a couple of spring-strips held under tension thereby; an elevated contact adapted to make connection with said spring-strips when the same are released by the operation of the circuit-breaking devices; and connections for connecting the secured ends of the spring-strips with one side of a local circuit, and the elevated contact with the other side of such circuit.

10. The combination with the split rod or plug, of uniform thickness throughout its

length, and made so that the split portions tend to spring apart; of the socket therefor having an enlarged inner portion.

11. The combination with two independently-operable circuit-breaking devices, either of which can be operated alone to break the circuit; of means for closing the circuit upon the operation of either one or both of said devices.

Signed by me at Chicago, Illinois, this 25th day of November, 1899.

CHARLES A. ROLFE.

Witnesses:

A. MILLER BELFIELD,
I. E. MELDRUM.