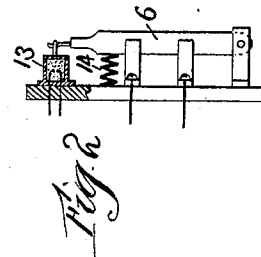
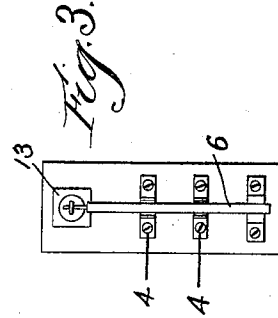
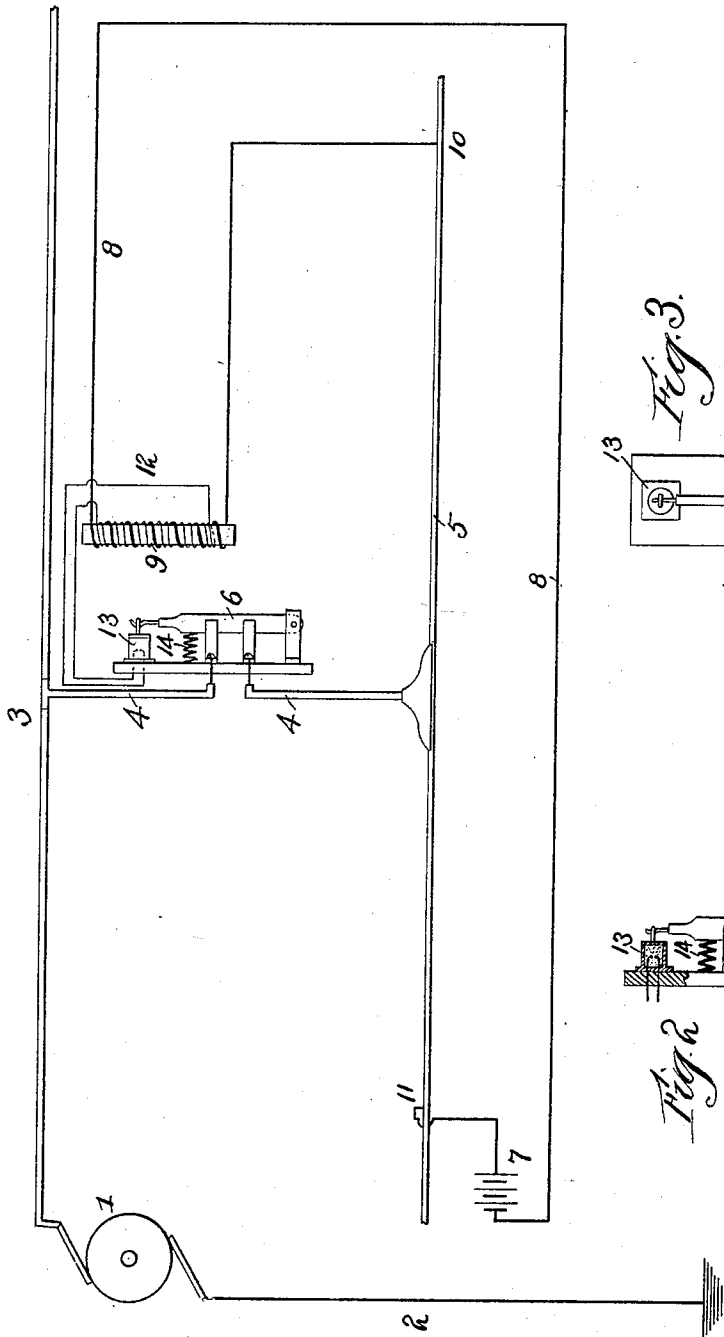


P. H. D'UNGER.
SAFETY DEVICE FOR ELECTRIC CIRCUITS.

No. 552,239.

Patented Dec. 31, 1895.

Fig. 1.



Witnesses
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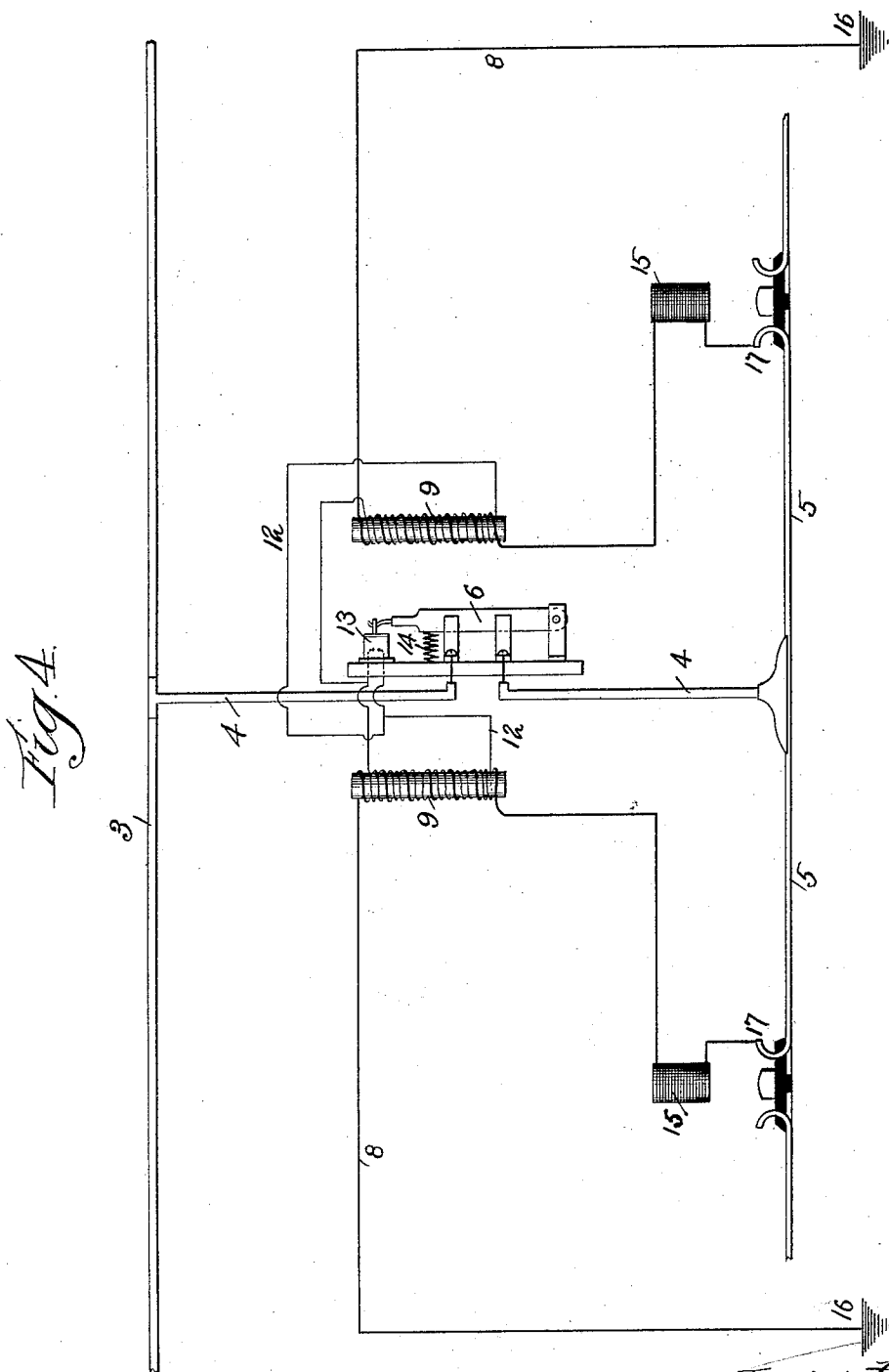
(No Model.)

2 Sheets—Sheet 2.

P. H. D'UNGER.
SAFETY DEVICE FOR ELECTRIC CIRCUITS.

No. 552,239.

Patented Dec. 31, 1895.



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UNITED STATES PATENT OFFICE.

PAUL HENRI D'UNGER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO
WILLIAM PORTER VERITY, OF SAME PLACE.

SAFETY DEVICE FOR ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 552,239, dated December 31, 1895.

Application filed September 16, 1895. Serial No. 562,646. (No model.)

To all whom it may concern:

Be it known that I, PAUL HENRI D'UNGER, of Chicago, Illinois, have invented certain new and useful Improvements in Safety Devices for Electric Circuits, whereof the following is a specification.

My invention is intended for use on heavy circuits in which a breakage of the circuit would result in danger to life or to the machinery employed.

It consists in interposing a switch in the circuit and so arranging this switch that it will be opened automatically when a breakage in the circuit occurs. To this end I combine with the switch a chamber containing an explosive, the explosion of which will open the switch directly or release it so that it may be opened by other means, and I further combine with said devices an induction-coil whose secondary fires the explosive above mentioned and whose primary is formed in whole or in part of the circuit to be protected.

In the accompanying drawings I have shown my invention as applied to a trolley-line for convenience; but of course it may be applied to other circuits.

In the drawings, Figure 1 is a diagram showing the invention as applied to a section of the trolley-line. Fig. 2 is a side view of the switch. Fig. 3 is a plan view of the same, and Fig. 4 is a diagram showing the invention applied to a section of the trolley-line and using the current from the trolley-line for the primary of the induction-coil.

In the drawings, 1 represents a dynamo, which furnishes the electricity for the circuit to be protected.

2 is the ground connection from the dynamo.

3 is the main feeder.

4 is the connection from the main feeder to the trolley-line 5.

6 is the switch interposed in the connection 4.

7 is an auxiliary source of electricity, and 8 is a part of the circuit extending from the source 7, through the primary of an induction-coil 9, and connecting with the trolley-line 5 at a point 10. The opposite pole of the bat-

tery or other source of electricity 7 is connected to the trolley-line at a point 11.

12 represents the secondary circuit from the induction-coil. It extends into a chamber 13, connected with the switch 6 and filled with an explosive which is fired by the spark between the terminals therein, as seen in Fig. 2. The switch-bar 6 is connected to the chamber 13 in the position shown in the figures, and the circuit is then closed. When the explosive in the chamber 13 is fired the switch is released and is thrown open, partly by the spring 14 and partly by the force of the explosive, and the current is shut off from the trolley-line.

Suppose now the apparatus to be as shown and the current to be flowing from the dynamo 1 over the line 3, connection 4, and trolley-line 5. At the same time a current is flowing from the auxiliary source 7 over the line 8, through the primary of the induction-coil 9 to the trolley-line at 10, and along the latter to the point 11, thence back to the source 7. If now the trolley-line breaks at any place between the points 10 and 11 this auxiliary circuit will be broken, with the result that a current will be induced from the secondary 12, and a spark will pass between the terminals in the chamber 13 and fire the explosive therein, thus throwing the switch 6 and cutting off the current from the trolley-line 5, with the result that said trolley-line is perfectly harmless.

In the arrangement shown in Fig. 4, instead of using an auxiliary source of electricity, I take a current from the trolley-line, pass it through a resistance-coil 15, thence through the primary of the induction-coil, and to the ground 16. Where a section of the trolley-line is connected with the feeder at its middle I use two of these safety-circuits, one at each end; but if the connection with the feeder is made at one end of the section, then a single safety-circuit will be sufficient. With this modified arrangement, if the trolley-line breaks, the current through the primary of the induction-coil is broken and an induced current flows through the secondary and fires the explosive in the chamber 13, as already ex-

plained. To prevent the firing when it is desired to shut down or shut off the main current, a condenser or a rheostat may be interposed; but as these devices will be used in the ordinary manner of their use I have not thought it necessary to show them or to further describe them.

It is of course obvious that my invention may be modified in many ways without departing from its spirit.

I claim—

1. In combination with an electric circuit, a switch included therein, an induction coil whose primary includes a portion of said circuit, a body of explosive material connected with the switch, and the secondary circuit of

said coil, having its terminals in said explosive and adapted to fire the same, substantially as set forth.

2. In combination with an electric circuit, a switch included therein, an auxiliary circuit including a portion of the main circuit, an induction coil whose primary is included in said auxiliary circuit, and a body of explosive adapted to operate the switch and to be fired by the secondary of said induction coil, substantially as set forth.

PAUL HENRI D'UNGER.

Witnesses:

W. S. BATES,
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