E. A. EVERETT.

MERCURY CIRCUIT BREAKER AND SHUNT FOR SIGNAL RELAYS.

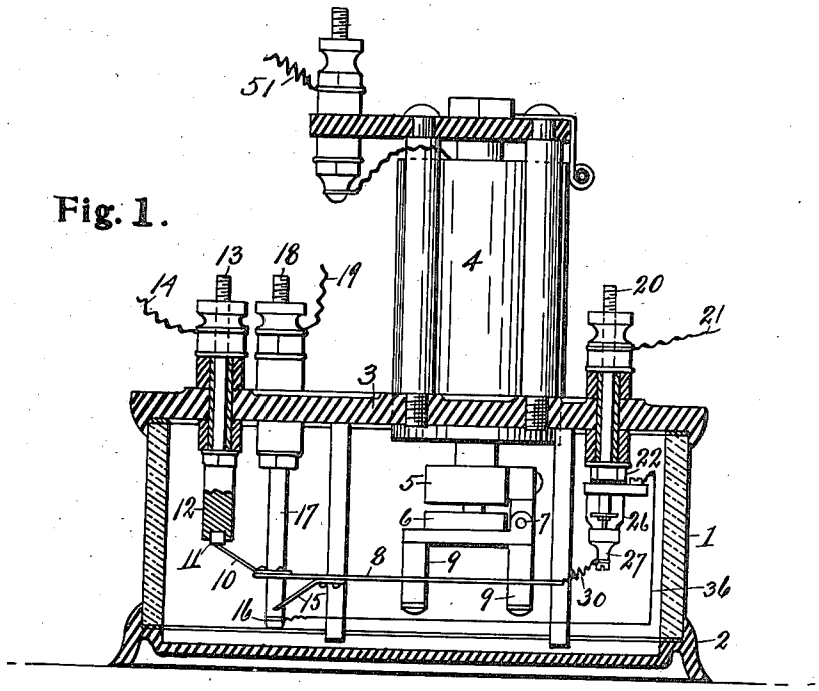
APPLICATION FILED JULY 20, 1908.

990,967.

Patented May 2, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



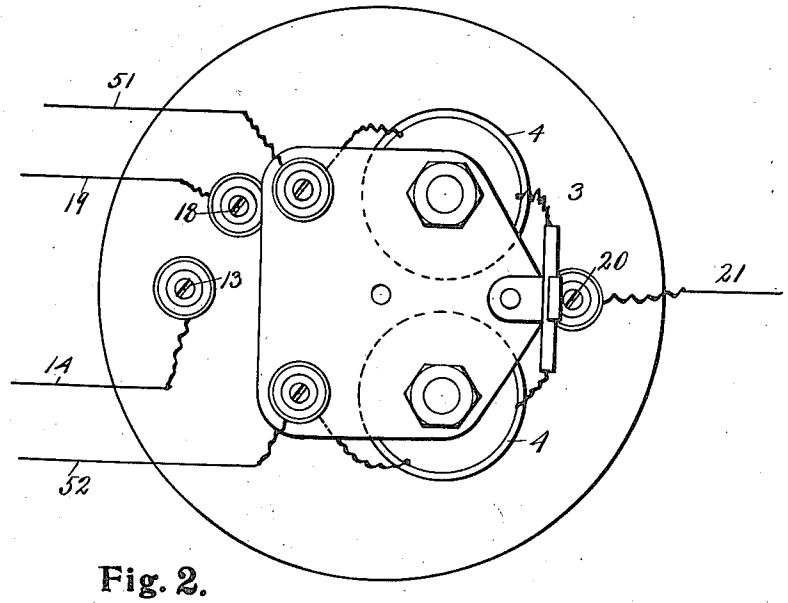


Fig. 2.

Witnesses

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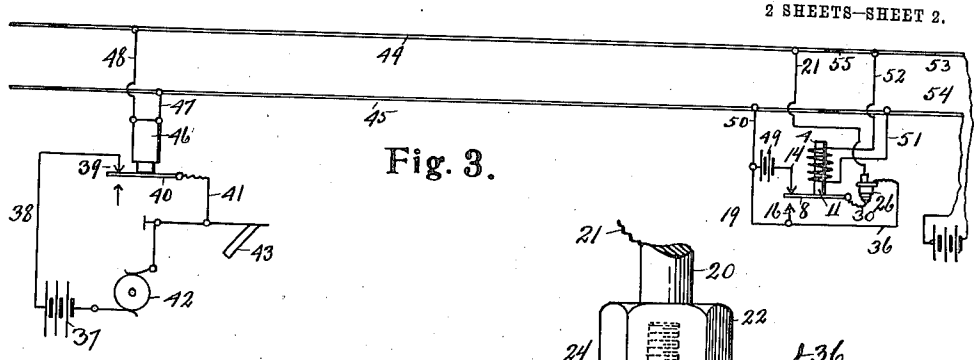

Fig. 3.

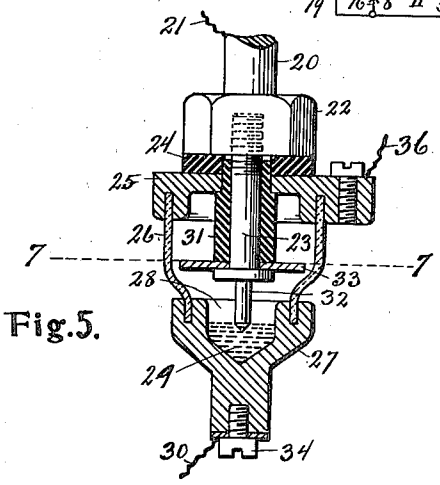

Fig. 5.

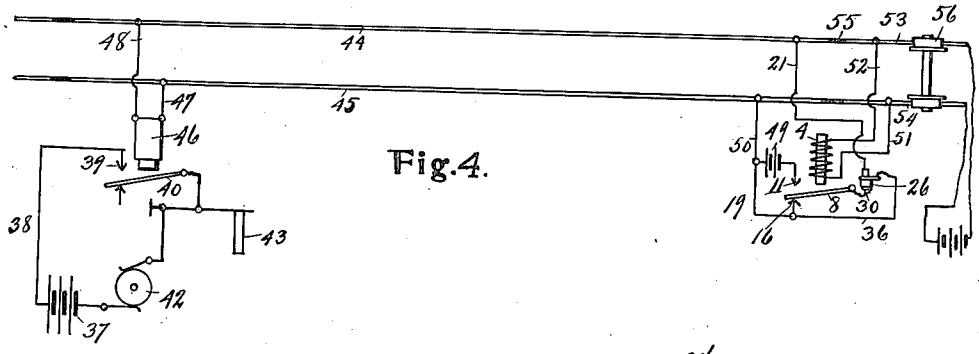

Fig. 4.

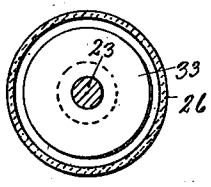

Fig. 7.

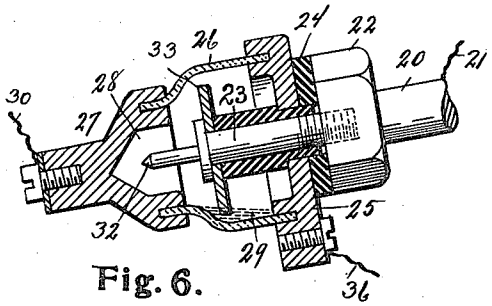

Fig. 6.

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UNITED STATES PATENT OFFICE.

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MERCURY CIRCUIT-BREAKER AND SHUNT FOR SIGNAL-RELAYS.

990,967. Specification of Letters Patent. Patented May 2, 1911.

Application filed July 20, 1908. Serial No. 444,437.

To all whom it may concern:

Be it known that I, EDWARD A. EVERETT, a citizen of the United States, residing at Detroit, in the county of Wayne, State of Michigan, have invented certain new and useful Improvements in Mercury Circuit-Breakers and Shunts for Signal-Relays; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to an automatic circuit breaker and shunt for signal relays, especially designed for use in connection with railway signal systems, and consists in the construction and arrangement of parts hereinafter more fully set forth and claimed.

The object of the invention is to provide means for including in the relay controlled track circuit an automatic emergency circuit breaker and shunt which will, upon injury to the relay or support on which it is mounted, automatically break the relay controlled circuit, which in turn controls the track signal circuit, and at the same time provide a shunt for the track circuit which will afford a path for all earth currents that may be flowing between the rails of the track, thereby obviating all interference with the operation of the relay included in the track circuit and which controls the signal; the arrangement being such as to insure a perfect operation of the signal under all normal conditions and to cause said signal to show danger should an accident occur to the apparatus, such as to interfere with the normal operation thereof.

The above object is attained by the mechanism illustrated in the accompanying drawings, in which:—

Figure 1 is a sectional view through a relay adapted to control the track circuit provided with my improved circuit breaker and shunt. Fig. 2 is a top plan view of said relay. Fig. 3 is a diagrammatical view of a block signal system for railways, showing the application of my invention in the relay controlled track circuit thereof, and illustrating the normal condition of the parts. Fig. 4 is a similar view showing the position of the parts when a train enters one of the blocks. Fig. 5 is an enlarged sectional view through my circuit breaker and shunt. Fig. 6 is a similar view of the apparatus tilted so as to break the track circuit which controls the signal and provide a shunt therefor. Fig. 7 is a horizontal section through the circuit breaker and shunt, as on line 7—7 of Fig. 5.

Referring to the characters of reference, 1 designates the cylindrical glass case of a signal relay which is seated in a suitable base 2, preferably of insulating material and is provided with a top 3 upon which is mounted the electromagnet 4 and the several binding posts, and from which is suspended within the glass case the operative parts comprising the pole piece 5 of the electromagnet, the armature 6 which is pivotally mounted as at 7 and carries the usual conductor arm 8 insulated therefrom by the sleeves 9. The outer end of said arm 8 carries the contact spring 10 adapted to engage a contact point 11 at the lower end 12 of the binding post 13 which passes through the top 3, and to which is connected the circuit wire 14. Depending from the under side of the arm 8 is a spring contact 15 adapted, when the armature falls, to engage a back contact 16 on the lower end 17 of the binding post 18 which passes through the top and to which is connected the circuit wire 19.

Mounted in the top 3 of the relay case and projecting therethrough is a binding post 20 to which is connected the circuit wire 21. The lower end of said post which depends within the relay case is provided with a head or nut 22 adapted to screw onto the upper end of the threaded stem 23 against the washer 24 of insulating material through which said stem passes, said washer lying upon the cap plate 25 (see Fig. 5) which, like the stem 23 is formed of iron or other conductive material. Said cap and stem comprise two of the parts of the circuit breaker and shunt device which besides said parts consists of a glass body portion 26, mainly cylindrical in form, the upper end of which is secured in said cap and the lower end of which is reduced in diameter and is secured in a base or bottom 27 of conductive material, said bottom being in the form of a cup and having a well or recess 28 therein adapted to contain mercury 29. Attached to the bottom portion of said cup by means of a binding screw 34, and leading

to the rear end of the conductor arm 8 is a wire 30 which establishes electrical connection between said arm and the bottom of said circuit breaking device. The iron stem 23 is insulated from the cap plate 25 by the sleeve 31 of insulating material, as clearly shown in Figs. 5 and 6. Depending from the lower end of said stem is a contact point 32, the lower end of which is normally immersed in the mercury 29. Secured upon the lower end of the stem 23 above the contact pin 32 is a circular metallic disk 33 whose diameter is less than the interior diameter of the glass body 26, as clearly shown in Fig. 7. Leading to one margin of the metal cap 25 and secured thereto by a binding screw 35 is a circuit wire 36 which is connected to the back contact 16 and which forms a part of the emergency shunt circuit, as hereinafter explained.

In order to illustrate the application of this invention, Figs. 3 and 4 have been employed wherein is shown diagrammatically the signal circuit, the track circuit, and the relay controlling the track circuit of a block signal system, together with the normal and emergency shunt circuits designed to form a path for the earth currents flowing between the rails of the track and thereby avoid any interference, by said currents, with the operation of the relay in the track circuit which directly controls the signal circuit. Referring to said last mentioned figures, the signal circuit consists of the battery 37, the circuit wires 38, the contact point 39, the armature 40 and the circuit wire 41 which includes the motor 42 adapted to operate the signal 43. The track circuit includes the rails 44 and 45 respectively, the relay 46 connected by the circuit wires 47 and 48 therewith, the battery 49, the circuit wires 50 and 14, the armature conductor arm 8, the circuit breaker and shunt, and the circuit wire 21. The circuit of the relay 4 which is adapted to actuate the armature conductor arm 8 consists of the circuit wires 51 and 52 respectively which are connected with the coil of the relay 4 and with the track rails 53 and 54 which are insulated from the rails 44 and 45, as shown at 55.

In the normal operation of the signal system illustrated herein, the presence of a train or a car in the block comprising the track rails 53 and 54, as illustrated by the truck wheels 56 in Fig. 4, will short circuit the relay 4 and cause its armature carried conductor arm 8 to drop and cut out the battery 49 from the track circuit comprising the rails 44 and 45, by opening said circuit at the point 11, thereby deënergizing the relay or magnet 46 allowing its armature 40 to fall away from the point 39 and open the signal circuit, whereby the mechanism controlling said signal will set it at danger, as shown at 43 and in a manner well understood in the art. It has been found, that, in systems of this character, the presence of earth currents flowing between the rails 44 and 45 will at times energize or influence the relay 46 sufficiently to cause the armature 40 thereof to stick to the pole piece of said relay even when the battery 49 is cut out of the track circuit and prevent the opening of the signal circuit at the point 39. To afford a path for said earth currents and prevent the influence thereof upon the relay 46, a shunt circuit for the track rails is provided in the conductor wire 50 connected with one of the track rails, the conductor wire 19, the contact point 16, the armature conductor arm 8, the conductor wire 30, the circuit breaker and shunt device and the conductor wire 21 connected to the other of said rails, which path or circuit is of low resistance and is automatically closed by the dropping of the conductor arm 8 onto the point 16 permitting the earth currents to flow over said path or shunt circuit while the track circuit remains open at the point 11.

Should an accident happen to the relay or its support such as to cause the relay to become overturned and the circuit breaker and shunt included in the track circuit to assume a position shown in Fig. 6, the track circuit will be broken by the flow of the mercury 29 from the well or receptacle 28 and from contact with the point 32, at the same time said mercury will flow into and fill the hollow formed by the shape of the glass body 26 and make an electrical connection between the metal cap 25 and the metal disk 33, thereby forming an emergency shunt circuit for the track rails consisting of the wire 21, the stem 20, the disk 33 and cap 25, and the circuit wires 36, 19, and 50, thereby affording a path of low resistance for the earth currents and preventing the possibility of said currents interfering with the operation of the relay 46 which controls the signal circuit, allowing said circuit to open at the point 39 to set the signal at danger, and call attention to the presence of some trouble in the system. Were it not for the presence of the auxiliary or emergency shunt circuit just described which provides a path for the earth currents flowing between the rails, a failure of the relay 46 through the influence of said currents to allow the signal circuit to open, might result in serious damage before it was discovered that the relay 4 was out of order or incapable of performing its normal function.

A righting of the relay 4 or its restoration to a normal condition will cause the mercury 29 to flow into the receptacle through the contact point 32 and the metallic bottom or base 27 of the circuit breaker and shunt device.

Having thus fully set forth my invention,

what I claim as new and desire to secure by Letters Patent, is:—

1. In a circuit breaker and shunt device for signal relays, the combination of a track circuit, a relay having its armature and contact included therein, a main shunt, normally open, connected across the track, excluding the battery and including the armature when the latter is released, an emergency shunt connected across the track and excluding the battery and armature, and means for closing said emergency shunt independently of the movement of said armature.

2. In a circuit breaker and shunt device for railway signaling apparatus, the combination of a track circuit, a relay having its armature and contact included therein, an emergency shunt connected across the track and excluding the battery and armature, and an automatic circuit controller associated with the relay and included in the track circuit and shunt, to open the track circuit and close the shunt, by a movement of the relay out of its normal position.

3. A circuit breaker and shunt device for railway signaling apparatus, comprising a track circuit, a relay having its armature and contact included therein, a shunt excluding the armature and connected with the rails of the track, an automatic circuit controller associated with the relay and included in the track circuit and shunt to automatically open the track circuit and close the shunt by a movement of the relay out of its normal position.

4. A circuit breaker and shunt device for railway signaling apparatus, comprising a track circuit, a main shunt connected across the track, an emergency shunt, also connected across the track, a circuit controlling device included in the track circuit and in said shunts, said device comprising means actuatable upon a movement thereof out of its normal position to break the track circuit and main shunt, and close the emergency shunt.

5. A circuit breaker and shunt device for railway signaling apparatus, comprising a track circuit, a relay having its armature and contact included therein, a main shunt normally open connected across the track, excluding the battery and including the armature when the latter is released, an emergency shunt connected across the track and excluding the battery and armature, and means associated with said relay for breaking the track circuit and main shunt, and closing the emergency shunt upon a tilting of said relay out of its normal position.

6. In a railway signaling apparatus, the combination of a normally closed track circuit, a normally open shunt connected to the track rails, a circuit controlling device incorporated in said circuit and said shunt, a fluid conductive element in said device movable from its normal position upon a tilting of said device to open said track circuit and close said shunt.

7. In a railway signaling apparatus, the combination of a normally closed track circuit, a normally open shunt connected with the track rails, a circuit controlling device incorporated in said circuit and shunt having two pairs of contact terminals, a fluid conductive element in said device coöperative with said contact terminals to normally close the track circuit through two of said contacts and adapted to flow from its normal position upon a tilting thereof to close said shunt by connecting the other pair of contacts and open the track circuit by flowing from the contact terminals thereof.

In testimony whereof, I sign this specification in the presence of two witnesses.

EDWARD A. EVERETT.

Witnesses:
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O. B. BAENZIGER.