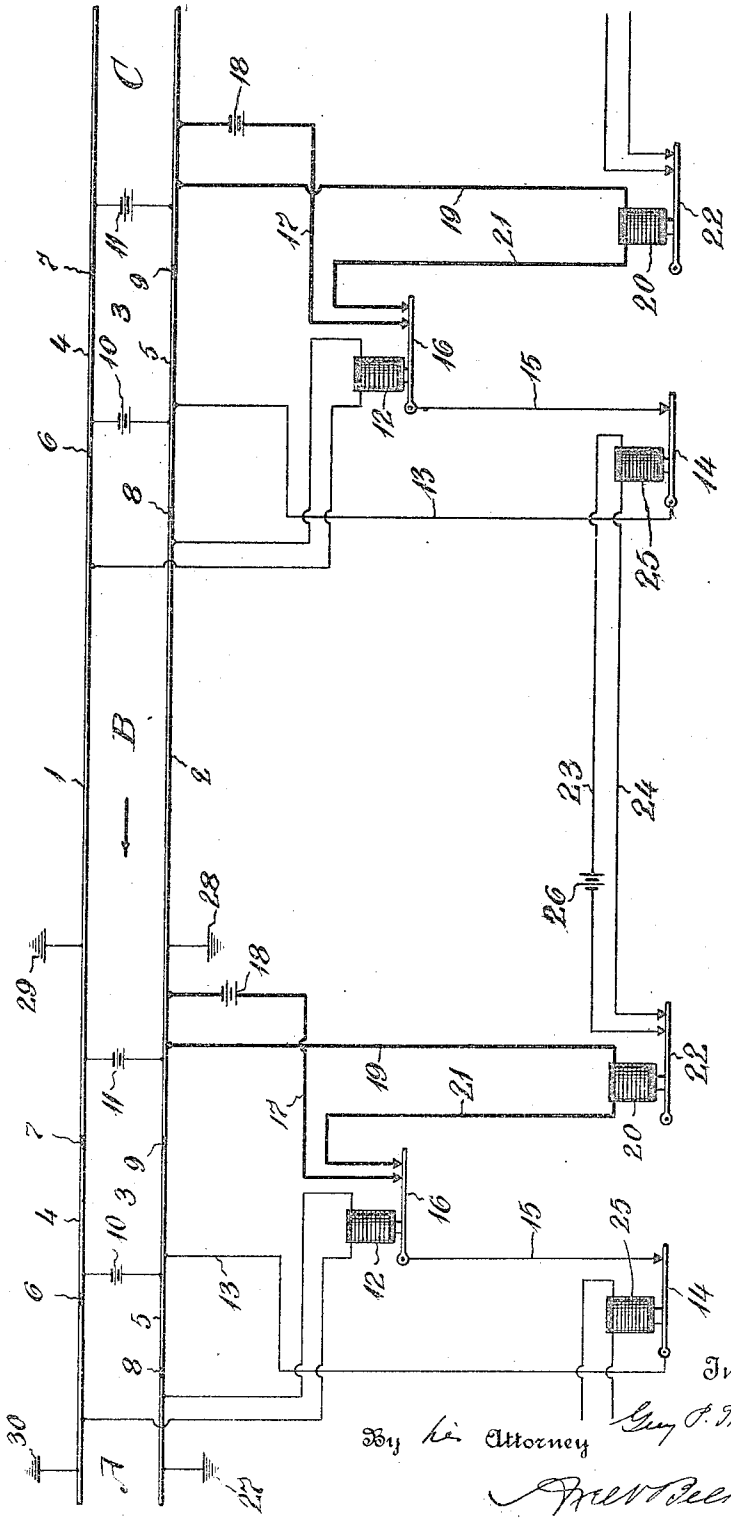
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INSULATION BREAKDOWN DETECTOR.

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INSULATION-BREAKDOWN DETECTOR.

1,255,668. Specification of Letters Patent. Patented Feb. 5, 1918.

Application filed December 20, 1915. Serial No. 67,739.

To all whom it may concern:

Be it known that I, GUY P. THURBER, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Insulation-Breakdown Detectors, of which the following is a specification.

This invention relates to apparatus that will indicate a break-down, or failure, of rail joint insulation and is particularly adapted for use in a railway signaling system such as is disclosed in Patent No. 1,162,890, Dec. 7, 1915.

A feature of the invention is the connecting of a source of current to a rail at both sides of an insulated joint and also connecting a break-down detecting device to the rail on opposite sides of the joint, so that a break-down of the insulation will allow current to flow across the insulation and shunt the detecting device to indicate the break-down of the insulation.

Another feature comprises the dividing of a track into blocks by means of short insulated sections and the connecting of a source of current to the rails of an insulated section in such a manner that a break-down of the insulation between the insulated section and the adjoining block section will affect the track circuit of the blocks to indicate such break-down.

In the accompanying drawing a complete block with a portion of the two adjoining blocks is shown together with the insulated sections separating the blocks, and the means for indicating a break-down of the insulation of said insulated sections.

The track rails are represented by the reference numerals 1 and 2. The rails are divided into the block sections A, B and C by the insulated sections 3 composed in turn of the insulated rail sections 4 and 5. Insulating joints 6, 7, 8 and 9 separate the insulated sections from the adjoining block sections. Batteries 10 connect the rails 4 and 5 of the short insulated sections. An ordinary form of track circuit consisting of the track battery 11, the rails 1 and 2, and the track relay 12 is identified with each of the block sections A, B and C.

A conductor 13, leading from the rail 5 connects to the armature 14. A second conductor 15 adapted to make contact with the armature 14 leads to the armature 16. A conductor 17 is adapted to make contact with the armature 16 and connects to the block section rail 2. The conductor 17 contains the battery 18. The loop circuit connection between the rail 2 and the rail 5 which has just been described is adapted to be opened or closed to control a train passing over the insulated section as in the copending case to which reference has been made.

A conductor 19 leads from the rail 2 to a break-down detector or indication magnet 20. From the remaining terminal of the magnet 20 leads the conductor 21 adapted to make contact with the armature 16 already referred to. It will be evident that in the normally energized condition of the track relay 12 the armature 16 will bridge the terminals of the conductors 17 and 21 to close a circuit through the detector magnet 20. This circuit may be traced as follows: battery 18, conductor 17, armature 16, conductor 21, detector magnet 20, conductor 19, rail 2, and conductor 17 back to battery.

Upon the failure of current through the magnet 20 for any cause, the armature 22 thereof is released to break contact with the terminals of the conductors 23 and 24 leading to the relay 25 of the block to the rear. A battery 26 in the conductor 23 furnishes energy to hold the relay 25 energized when the circuit is closed at the armature 22. The relay 25 is arranged to control the train controlling circuit at an insulated track section.

The operation of the insulation breakdown detector system disclosed is as follows: A failure of the insulation at the joint 9 between the insulated rail section 5 and the block rail section 2 would permit current to flow from battery 18, conductor 17, armature 16, conductor 15, armature 14, conductor 13, rail 5, across joint 9, rail 2, and conductor 17 back to battery 18. It is evident that when the resistance to the flow of current through the joint 9 drops to a certain value the magnet 20 in shunt thereto will be deënergized and drop the armature 22 to deënergize the relay 25 and thus break the loop circuit at the entrance to the block to the rear to exercise a control over a train passing into that block.

A failure of the insulation at the joint 7 between the insulated rail section 4 and the block rail section 1 will result in current flowing from battery 18 through conductor 17, armature 16, conductor 15, armature 14,

conductor 13, insulated rail section 5, battery 10, rail section 4, across insulated joint 7, battery 11, rail 2, and conductor 17 back to battery 18. It will be seen that current flows in the same direction through the batteries 11 and 18 and overpowers the battery 10. As before the magnet 20 will be shunted when the resistance offered by the joint 7 falls to a low enough value.

A second result of a break-down of the insulated joint 7 is to shunt out and deënergize the track relay 12 at the right-hand end of the block section, since the current from the battery 11 is diverted through the path around the insulated joint 7.

A break-down of the insulated joint 8 may have the following result: Current will flow from battery 18, through conductor 17, armature 16, conductor 15, armature 14, conductor 13, rail 5, across joint 8, from rail 2 of block A to ground as at 27, when the condition of the insulation between the rails and the road bed is such as to permit of such a ground connection, to rail 2 of block B through ground at 28 to conductor 17 back to battery 18. It will be evident that the current from the ground 27 may also flow through ground 29 to the rail 1 and thence to the rail 2 by way of the battery 11. Thus another current path parallel to the circuit through the magnet 20 is established by means of which the detector magnet 20 may be shunted.

A breakdown of the insulated joint 6 may also result in shunting the detector magnet 20. Current may in that case flow from battery 11, rail 2 of block B, conductor 17, battery 18, armature 16, conductor 15, armature 14, conductor 13, rail 5, battery 10, rail 4, across insulation 6, rail 1 of block A, to ground at 30, to rail 1 of block B through ground at 29 back to battery 11.

Thus a break-down of any of the joints of an insulated section will have the effect of opening the train controlling loop circuit at the entrance of the block to the rear. It is obvious that the value of the current through any of these insulated joints will depend upon the resistance offered by the joint and when the value of this resistance falls to a certain point the detector magnet will be shunted and drop its armature to open the loop circuit to the rear.

What is claimed, is:

1. In a railway signaling system, traffic rails, an insulated joint in each of said rails, a source of current connected to one rail on opposite sides of the joint therein, an electro-responsive device connected to the same rail on opposite sides of said joint, a source of current connected across the rails on one side of said joints, and a source of current connecting the rails on the other side of said joints, said sources of current being connected to the rails with reversed polarities, whereby a breakdown of the insulated joint in either rail will affect said electro-responsive device.

2. In a railway signaling system, traffic rails, an insulated section in each of said rails, a source of current adapted to be connected to one of said sections and the corresponding traffic rail to control a train passing over said section, an electro-responsive device connected to said rail and to the connection between said source of current and said section, a source of current connecting said rails, and a source of current connecting said insulated sections, said sources of current being connected to the rails with permanently reversed polarities, whereby a weakening of the insulation between said section and either rail will affect said electro-responsive device.

3. In a railway signaling system, traffic rails, an insulated section in each of said rails, a source of current connecting the rails outside said insulated section, a track relay normally held energized by said source of current, means for connecting one of said rails and the insulated section therein to control a train traveling thereover said means including a source of current, and a connection between said insulated sections including a source of current, said first-named and said second-named sources being permanently arranged to act in opposition to said third-named source, whereby upon a break-down of the insulation between the other rail and the insulated section, the source of current energizing said track relay will be overpowered by said other sources to deënergize said track relay.

4. A railway signaling system comprising: track rails, an insulated train controlling section in one of said rails, a conductor including a source of current and connected at one end to said rail, a conductor including an electro-responsive device and connected at one end to said rail, a conducting member arranged to normally connect the free ends of said conductors to complete a circuit including said source of current and said electro-responsive device, and a connection between said conducting member and said insulated rail section whereby said source of current and said electro-responsive device are each normally connected to said rail and to said insulated section.

5. A railway signaling system comprising: track rails, insulated train controlling sections in one of said rails dividing the track into block sections, a conductor connected to said rail and including a source of current, a conductor connected to said rail and including an electro-responsive device, said conductors terminating in contacts, a member electrically connected to said insulated section and arranged to normally bridge said contacts, and means controlled by the condi-

tion of an adjoining block section to control the position of said bridging member.

6. A railway signaling system comprising: track rails, oppositely disposed insulated sections in said rails dividing said track into block sections, a conductor including a source of current and connected at one end to one of said rails, a conductor including an electro-responsive device and connected at one end to the same rail, a conducting member arranged to normally connect the free ends of said conductors to complete a circuit including said source of current and said electro-responsive device, a connection between said conducting member and the insulated section in said rail, a connection between said oppositely disposed insulated sections, and a connection including a battery between the rails outside of said insulated sections.

7. A railway signaling system comprising: track rails, oppositely disposed insulated sections in said rails dividing said track into block sections, a track circuit for each block including a source of current and an electro-responsive device, a conductor including a source of current and connected at one end to one of said rails, a conductor including an electro-responsive device and connected at one end to the same rail, a conducting member arranged to normally connect the free ends of said conductors to complete a circuit including said source of current and said last-named electro-responsive device, said first-named electro-responsive device of an adjoining block being arranged to control said conducting member, a connection between said conducting member and the insulated section in said rail, and a connection between said oppositely disposed insulated sections.

8. A railway signaling system comprising: track rails, oppositely disposed insulated sections in said rails dividing said track into block sections, a track circuit for each block including a source of current and an electro-responsive device, a conductor including a source of current and connected at one end to one of said rails, a conductor including an electro-responsive device and connected at one end to the same rail, a conducting member arranged to normally connect the free ends of said conductors to complete a circuit including said source of current and said second-named electro-responsive device, said first-named electro-responsive device of an adjoining block being arranged to control said conducting member, a conductor connecting said conducting member and the insulated section in said rail, a controller for said last-named conductor, said controller being controlled by the condition of the second-named electro-responsive device of another insulated section, and a connection between said oppositely disposed insulated sections.

Signed at Pittsburgh, in the county of Allegheny and State of Pennsylvania, this 11th day of December, A. D. 1915.

GUY P. THURBER.

Witnesses:
MAX H. SROLOVITZ,
CATHERINE LYNCH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."