(No Model.)

E. L. ORCUTT.

ELECTRIC SAFETY APPLIANCE FOR RAILROADS.

No. 589,669. Patented Sept. 7, 1897.

Fig. 1.

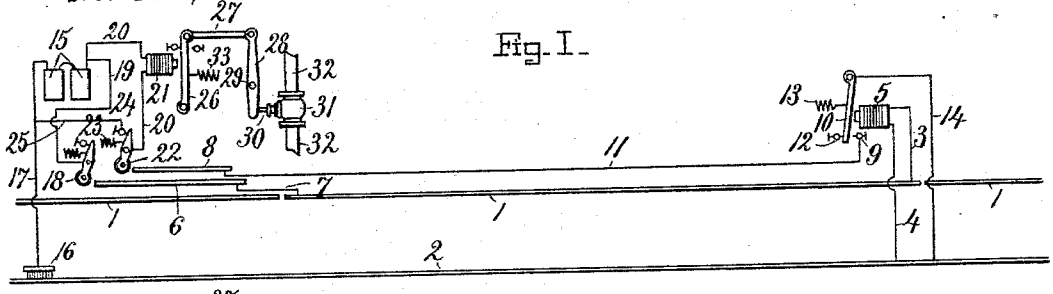


Fig. 2.

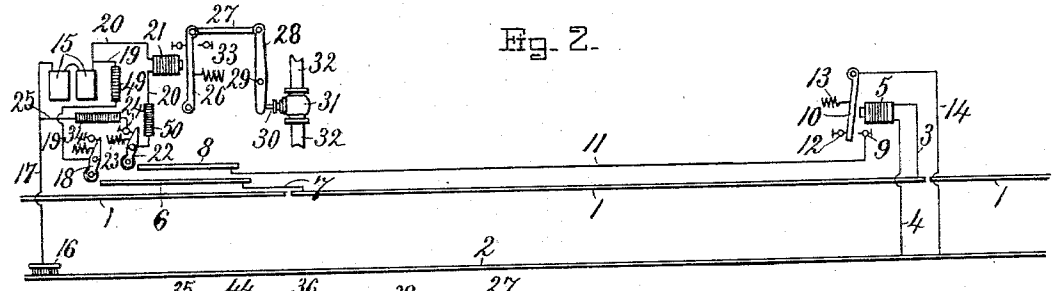


Fig. 3.

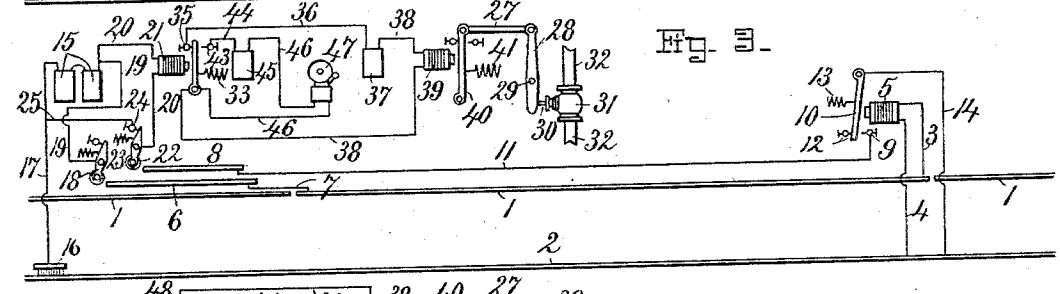


Fig. 4.

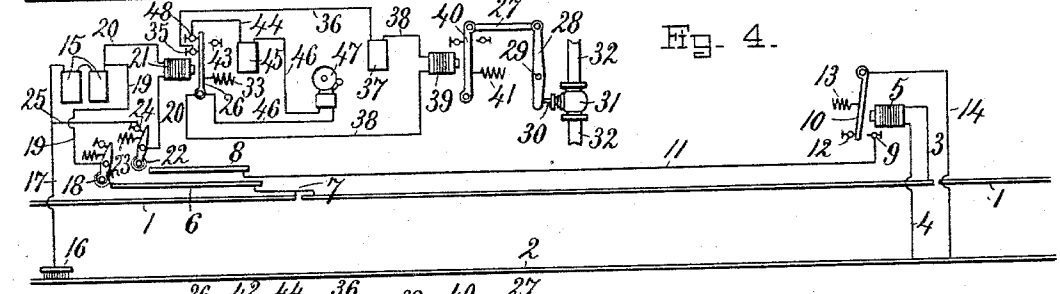
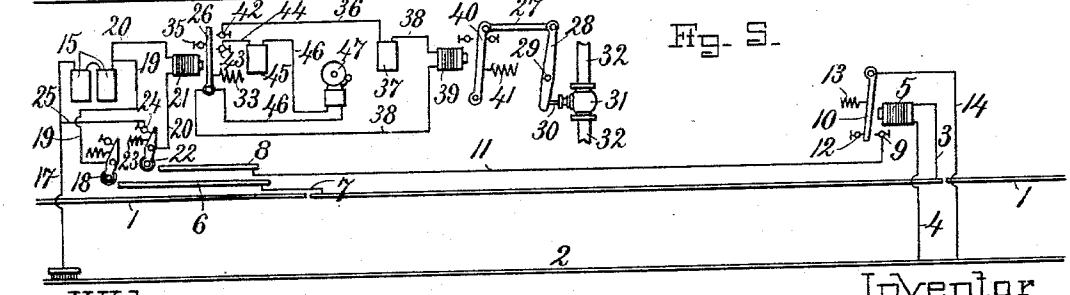


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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ELECTRIC SAFETY APPLIANCE FOR RAILROADS.

SPECIFICATION forming part of Letters Patent No. 589,669, dated September 7, 1897.

Application filed February 6, 1897. Serial No. 622,298. (No model.)

To all whom it may concern:

Be it known that I, EDWARD L. ORCUTT, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Electric Safety Appliances for Railroads, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to improvements in electric safety appliances for railroads, and more especially to appliances in which the track is divided into sections and an electric current is sent as a pilot from the engines into the section of the track into which the engine is about to enter, which electric current causes a communication to be given to the engineer whether the section ahead is safe or dangerous. Several devices for this purpose have been invented and patented by myself and others. Some of these devices have been constructed with one or more incomplete or open circuits on the engine, which at the proper time connect with one or more incomplete or open circuits on the track, but such constructions have been found to be faulty from the fact that they do not give notice of the breaking of any of the apparatus and the failure of the apparatus to work on account of such breaks. To overcome these faults, other devices have been constructed in which one or more complete or closed circuits have been used upon the train, into which one or more circuits arranged upon the tracks have been looped. By this latter arrangement notice has been given to the engineer whenever the apparatus became out of order as well as notice of the condition of the track ahead, but such closed circuits are not so economical to run as are open circuits on account of the necessity of frequent renewal of the batteries or other source of electricity; and it is the object of this invention to so construct the apparatus that the benefits derived from the use of closed circuits will be combined to a more or less degree with the economy derived from the use of open circuits entirely. To accomplish this result, my invention is carried out substantially as illustrated on the accompanying drawings, which form an essential part of this specification, and in which the track and the train apparatus has been shown diagrammatically.

On the drawings, Figure 1 represents the simplest form of my appliance. Fig. 2 represents the same form of the appliance, but showing means employed to keep the load or strain on the source of supply of electricity as constant as possible. Figs. 3, 4, and 5 represent my appliance arranged to govern or control secondary auxiliary circuits on the train.

Similar characters refer to similar parts on the different parts of the drawings.

The rails of the track are divided into sections insulated one from the other. To accomplish this, I divide one rail into the desired number and length of sections, as 1 1, and preferably leave the other rail 2 continuous, substantially as shown. One end of each section of rail 1 is in electrical connection with the other rail 2 by means of the conductors 3 and 4 and the magnet 5, interposed between said conductors. The opposite end of each section 1 is in electrical connection with the contact-plate 6 by means of the conductor 7. It will be seen that the contact-plate 6, conductor 7, section 1, conductor 3, magnet 5, conductor 4, and rail 2 form an incomplete or open circuit, which is composed in part of both rails of the track, and which I term the "track-circuit." A second contact-plate 8 is in electrical connection with the front stop 9 for the armature 10 of the magnet 5 by means of the conductor 11, which armature is normally held in contact with the back stop 12 by means of the spring 13, and is in electrical contact with the rails 2 by means of the conductor 14. It will be seen that the contact-plate 8, conductor 11, front stop 9, armature 10, conductor 14, and rail 2 form an incomplete or other circuit, which I term the "line-circuit," and which is made unbroken by the attraction of the armature 10 when the track-circuit is closed, for the magnet 5, contained therein, is energized, but that said incomplete circuit is opened or broken by the spring 13 when the track-circuit is broken and the magnet 5 demagnetized. The track-circuit and the line-

circuit form the track mechanism, and, as will be seen, said mechanism is composed of open or broken circuits.

Upon the train is carried the train mechanism, and said mechanism is composed of a partial or open circuit containing a brush or trolley to engage the contact-plate and circuits; also a closed circuit also containing a brush or trolley to engage the contact-plate and loop in the line-circuit, and a magnet included within the closed circuit on the train and operating a signaling device either direct or through one or more circuits interposed between it and the signaling device, which device may consist of a valve to govern the supply of steam or motive fluid to a suitable whistle to the engine or to the air-brakes, or said device may consist of a bell, gong, or other audible signal, and this train mechanism is constructed substantially as follows: The train is supplied with a source of electricity 15, which may be in the form of a battery, a dynamo, or any other device to supply electricity, and on the drawings it has been shown in the form of a battery. This battery has one of its poles in constant electrical connection with the continuous rail 2 by means of a suitable brush 16 or other means of electrical contact with said rail—as, for instance, the wheel of the train connected to said battery by means of the conductor 17. The opposite pole of the battery is in electrical connection with the brush 18 by means of the conductor 19, which brush 18 comes into contact with the contact-plates 6 of the different sections of the track as the train is about to enter the section connected to said contact-plate. It will be seen that when the brush 16 is in contact with the contact-plate 6 the brush-circuit will be charged with electricity and there will be a complete or closed circuit formed consisting of the source of electricity 15, conductor 19, brush 18, contact-plate 6, conductor 7, section of rail 1, conductor 3, magnet 5, conductor 4, rail 2, brush 16, conductor 17 to the source of the electricity. This incomplete or open circuit carried on the train I term the "track-charging current."

To the pole of the battery opposite to that connected with the conductor 17 is connected the conductor 20, which conductor contains the magnet 21 and is connected at its opposite end to the pivoted brush 22. A spring 23 acts upon said brush, tending to normally hold it in contact with a stop 24, which stop is in electrical connection with the conductor 17 by means of the conductor 25. From the above description it will be seen that there is a complete or closed circuit formed from the battery 15 through the conductor 20 with its magnet 21, the brush 22, stop 24, conductor 25, and the conductor 17 back to the source of electricity. This circuit I term the "line-circuit charging-circuit," as the brush 22 is adapted to engage the contact-plates 8, contained in the line-circuit of the track mechanism, and by so doing to loop the line-circuit into the line-circuit charging-circuit and to charge the line-circuit, provided, however, that the line-circuit is continuous from the contact-plate 8 through the armature 10 and back to the point of contact between the brush 16 and rail 2.

The armature 26 of the magnet 21 may govern directly the signaling device on the train, as shown in Figs. 1 and 2, and may be included within and govern a circuit or circuits which in turn govern the signaling device or devices, as illustrated in Figs. 3, 4, and 5.

In Figs. 1 and 2 the armature 22 is connected by means of the connecting-rod 27 to the end of the lever 28, which lever is fulcrumed at 29 to some stationary part of the engine or train, the opposite end of said lever being connected to the valve-rod 30 of the valve 31, which valve is inserted within the pipe 32, leading from the supply of the motive fluid to a suitable whistle, or said valve may be arranged to control the operation of the brakes on the train, as is thought to be more desirable. As the normal condition of the circuit containing the magnet 21 is complete or closed said magnet will be energized and the armature attached and drawn toward said magnet against the influence of the spring 23, which position of the armature will cause the valve 31 to be closed. Should the line-circuit charging-circuit become broken or open from any cause, the magnet 21 will fail to be energized and the spring 33, acting on the armature, will cause the operation of the lever 28 to open the valve and sound the whistle, set the brakes, or otherwise notify the engineer that said circuit is broken.

If so desired, the conductor 25 may be supplied with a resistance 34, as shown in Fig. 2, substantially equal to the resistance of the line-circuit, so that the load upon the source of electricity will be constant or substantially constant whether the line-circuit is looped into the line-circuit charging-circuit or not. This construction does not cause so great a strain upon the generator as would be the case if the load upon the generator was materially increased whenever the line-circuits were looped into the line-circuit charging-circuit.

The operation of the device, as illustrated in Figs. 1 and 2, is as follows: The train with the track-circuit charging-circuit and the line-circuit charging-circuit carried on it moves upon the rails of the track, and when about to enter one of the sections into which the track is divided the brushes 18 and 22 come in contact with the respective contact-plates 6 and 8 of said section, which plates are placed upon the track in such a position that their brushes will engage and leave them prior to the entrance of any part of the train into the section of the track connected to said contact-plate 6 a little in advance of the engagement of the brush 22 with its contact-plate 8, and by this arrangement the track-circuit will be charged and accom-

plish its work prior to the charging of the line-circuit. If the track-circuit is complete and unbroken from the contact-plate 6 through the magnet 5 and back to the point of contact between the brush 16 and the rail 2, the magnet 5 will be energized and its armature 10 will be attached, so as to come into engagement with the stop 9, and thereby complete or close the line-circuit between the contact-plate 8 through armature 10 and back to the point of contact between the brush 16 and rail 2. Thus it will be seen that if the track-circuit is complete and by charging it it completes the line-circuit the condition of the line-circuit charging-circuit will not be charged by looping in the line-circuit, and consequently the valve 31 will remain closed and no signal be given. If the track-circuit is shunted by means of a car or other obstruction upon the track electrically connecting the two rails of the track anywhere between the contact-plate 6 and the connection of the section 1 with the conductor 3, or if the track-circuit is broken by the breaking of any of the rails contained therein, or the misplacing of a switch, or is broken by the breaking of any of the conductors contained within the track-circuit, then the magnet 5 will fail to be energized by the track-circuit charging-circuit and the line-circuit will remain in its normal condition or broken at the armature 10. This broken or open condition of the line-circuit will cause the line-circuit charging-circuit to be broken or open when the line-circuit is looped into it, which will cause the demagnetizing of the magnet 21 and allow the spring 33 to operate the valve to open it and sound the whistle or set the brakes.

In Figs. 3, 4, and 5 the armature 26 is included within and governs one or more secondary or auxiliary circuits, which circuits may normally be all open circuits or closed circuits, or they may be combined open and closed circuits, as is thought to be the more desirable. In these constructions each of the circuits controlled by the armature 26 includes a magnet the armature of which governs and controls an independent and separate signal, and, as illustrated on the drawings, each circuit is provided with a separate supply of electricity.

In Figs. 3 and 4 one of the secondary circuits controlled by the armature 26 consists of the armature itself, the stop 35, against which the armature is held by the influence of the magnet 21, the conductor 36 connecting said stop with one pole of the supply of electricity 37, said supply of electricity and the conductor 38 connecting the other pole of the supply of electricity with the armature 26 and including the magnet 39. Thus it will be seen that these circuits are normally closed circuits, as the magnet 21 is normally energized and its armature 26 is thereby held in contact with the stop 35. It will also be seen that said circuits will be automatically broken or opened by the action of the spring 33 when the line-circuit charging-circuit or the line-circuit is broken, as above described. The armature 40 of the magnet 39 is connected to and operates the valve 31 in a manner similar to that described in connection with the description of Figs. 1 and 2, said armature being provided with the spring 41 to operate the valve 31 when the magnet 39 is demagnetized.

In Fig. 5 the circuit, composed of the conductor 36, supply of electricity 37, conductor 38, magnet 39, and armature 26, is shown as an open circuit, as the conductor 36 is connected to the stop 42, which is only in contact with the armature 26 when the line-circuit charging-circuit is broken. In this construction the signal is given to the engineer when the valve 31 is closed, said valve being normally held open by the action of the spring 41, as shown.

In Figs. 3 and 5 the second secondary circuit, controlled by the armature 26, consists of the armature itself, the stop 43, with which the armature is brought in contact by the action of the spring 33 when the line-circuit charging-circuit is broken, the conductor 44 connecting said stop with one pole of the supply of electricity 45, said supply of electricity and the conductor 46 connecting the other pole of the supply of electricity with the armature 26, said conductor including the magnet or magnets which operate the bell or gong 47. Thus it will be seen that these circuits are normally open circuits, as the magnet 21 is normally energized and holds its armature 26 away from contact with the stop 43, thus breaking these circuits at this place. It will also be seen that said circuits are automatically closed by the action of the spring 33 upon the armature 26 when the magnet 21 is demagnetized by the breaking of the line-circuit charging-circuit or the line-circuit, as above described. When these circuits are closed, it will cause a current of electricity to pass through the magnets of the bells 47 and cause them to be sounded.

In Fig. 4 the secondary circuit, composed of the conductor 44, supply of electricity 45, conductor 46, magnet of bell 47, and armature 26, is shown as a normally closed circuit, as the conductor 44 is connected to the stop 48, which is normally in contact with the armature 26, and is only broken when the magnet 21 is demagnetized, as above described. In this construction the signal is given to the engineer by the breaking of the circuit only.

From the above description of Figs. 3, 4, and 5 it will be seen that the secondary circuits shown in Fig. 3 are one closed and one open, while those shown in Fig. 4 are both closed and those shown in Fig. 5 are both open, and it will be readily understood that open or closed circuits may be combined in any way desired; also that only one of the secondary circuits may be used if such a construction is required.

It is obvious to any one skilled in the art

to which this invention appertains that the several circuits might derive their supply of electricity from one and the same source, if so desired.

When a series of track-circuits are charged in turn by connecting track-circuit charging-circuit, including a source of electricity, carried on the train to said track-circuit and thereby closing the circuit through the track-circuit, it has been found that there would be a flushing or overabundance of current carried into the track-circuits from the source of electricity, and when the track-circuit is so charged there is a liability of having the circuit shunted by the leakage of the current across the track from one rail to the other rail. This shunting of the circuit or leakage of the current causes a waste of electricity and unnecessary drag upon the source of electricity, reducing its capacity to supply the other circuits connected therewith, and is liable to cause the usual damage where too great a current is drawn from a source of electricity. To prevent such a flushing, I provide the track-circuit charging-circuit with a resistance 49, which on Fig. 2 of the drawings has been shown as included in the conductor 19. The amount of resistance caused is sufficient to allow only such amount of current to be given to the track-circuit as is necessary to energize the magnet 5, and on account of the low potential of the current with which the track-circuit is thereby charged there is very little liability of the current leaking from one rail to the other and thereby shunting the track-circuit.

It will be understood that the resistance 49 may be used or not, as is thought to be the most desirable, and that it might be placed in various parts of the track-circuit charging-circuit, if so desired. It will also be understood that the closed circuit in the train mechanism might be supplied with a resistance 50 between the source of electricity 15 and the brush 22, as shown in Fig. 2, which resistance will act similar to and produce the same result as the resistance 49 in the open circuit when a circuit in the track mechanism is looped in the closed circuit on the train, and that said resistance 50 might be used on the closed circuit in addition to the resistance 34, which is cut out when the track-circuit is looped into the closed circuit, as above set forth.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent and claim—

1. In an electric safety appliance for railroads, a track mechanism, consisting of an open track-circuit, composed in part of both rails of the track and including a contact-plate, an open line-circuit composed in part of one rail of the track, including a contact-plate and governed and controlled by the track-circuit, and a train mechanism, consisting of a supply of electricity, an open circuit having a brush engaging the contact-plate in the track-circuit and charging the track-circuit, a closed circuit having a brush engaging the contact-plate in the line-circuit, looping in said circuit, a magnet in the closed circuit, and a signal operated by the movement of the armature of said magnet, for the purpose set forth.

2. In an electric safety appliance for railroads, a track mechanism, consisting of, an open track-circuit composed in part of both rails of the track, and an open line-circuit governed or controlled by the track-circuit, and a train mechanism, consisting of a supply of electricity, an open circuit charging the track-circuit, a closed circuit looping in the line-circuit, a magnet in the closed circuit, and a signal governed or controlled by the armature of said magnet, for the purpose set forth.

3. In an electric safety appliance for railroads, a track mechanism, consisting of a track-circuit composed in part of both rails of the track having a contact-plate at one end of the track-circuit, electrical connections between the rails of the track, a magnet in said connections, and a line-circuit having a contact-plate at one end thereof, the armature of said magnet included therein governing said circuit, and a train mechanism, consisting of a supply of electricity, an open circuit, a brush therein engaging the contact-plate and charging the track-circuit, a closed circuit, a brush thereon engaging the contact-plate in and looping in the line-circuit, a magnet in the closed circuit, and a signal operated by the armature of said magnet in the train mechanism, for the purpose set forth.

4. In an electric safety appliance for railroads, a track mechanism, composed of two circuits, combined with a train mechanism, consisting of a supply of electricity, an open circuit charging one of the circuits on the track, a closed circuit looping in and charging the other circuit on the track, and a signal operated by the breaking of the closed circuit, either by the breaking of any of the members constituting said closed circuit or the breaking of the circuit on the track at the time or during the time that it is looped into said closed circuit, for the purpose set forth.

5. In an electric safety appliance for railroads, a track mechanism, composed of two open circuits, a contact-plate in each circuit, combined with a train mechanism, composed of an open circuit, a brush in said circuit engaging the contact-plate in and charging one of the circuits on the track, a closed circuit, a brush in said circuit engaging the contact-plate in and looping in the other circuit on the track, a signal governed by the closed circuit, and a resistance in the closed circuit cut out by the looping-in of the track-circuit, whereby the potential of the electricity in the closed circuit is substantially constant at all times, for the purpose set forth.

6. In an electric safety appliance for railroads, a track mechanism, consisting of two

open circuits one governed or controlled by the other, and a contact-plate in each circuit, combined with a train mechanism, consisting of a supply of electricity, and open circuit having a brush engaging the contact-plate in and charging one of the circuits in the track mechanism, a closed circuit having a magnet and a brush engaging the contact-plate in and looping in the other circuit in the track mechanism, a secondary circuit including and governed or controlled by the armature of the last-named magnet, for the purpose set forth.

7. In an electric appliance for railroads, a track mechanism, consisting of two open circuits having a contact-plate in each, one circuit governing or controlling the other, combined with a train mechanism, consisting of a supply of electricity, an open circuit having a brush engaging the contact-plate in and charging one of the circuits in the track mechanism, a closed circuit having a brush engaging the contact-plate in and looping in the other circuit on the track, and a magnet therein, a plurality of secondary circuits including and governed or controlled by the armature of the magnet in the closed circuit, a magnet in each of the secondary circuits, and a signal for each secondary circuit operated by the armature of its respective magnet, for the purpose set forth.

8. In an electric safety appliance for railroads, a track mechanism containing an open circuit, combined with a train mechanism containing a closed circuit looping in the open circuit on the track, and a resistance in the closed circuit on the train cut out by the looping in of the track-circuit, for the purpose set forth.

9. In an electric safety appliance for railroads, a circuit on the track, combined with a closed circuit on the train looping in the track-circuit, two resistances in said closed circuit, one cut out by the looping of said track-circuit equalizing the potential of the current of electricity in the circuit, and the other resistance preventing the overflushing of electricity from the train-circuit into the track-circuit, for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 4th day of February, A. D. 1897.

EDWARD L. ORCUTT.

Witnesses:

HENRY CHADBOURN,

HARRY N. SQUIRES.