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AUTOMATIC ELECTRIC BLOCK SIGNALING APPARATUS FOR RAILROADS.

APPLICATION FILED DEC. 9, 1908.

1,190,613.

Patented July 11, 1916.

2 SHEETS—SHEET 1.

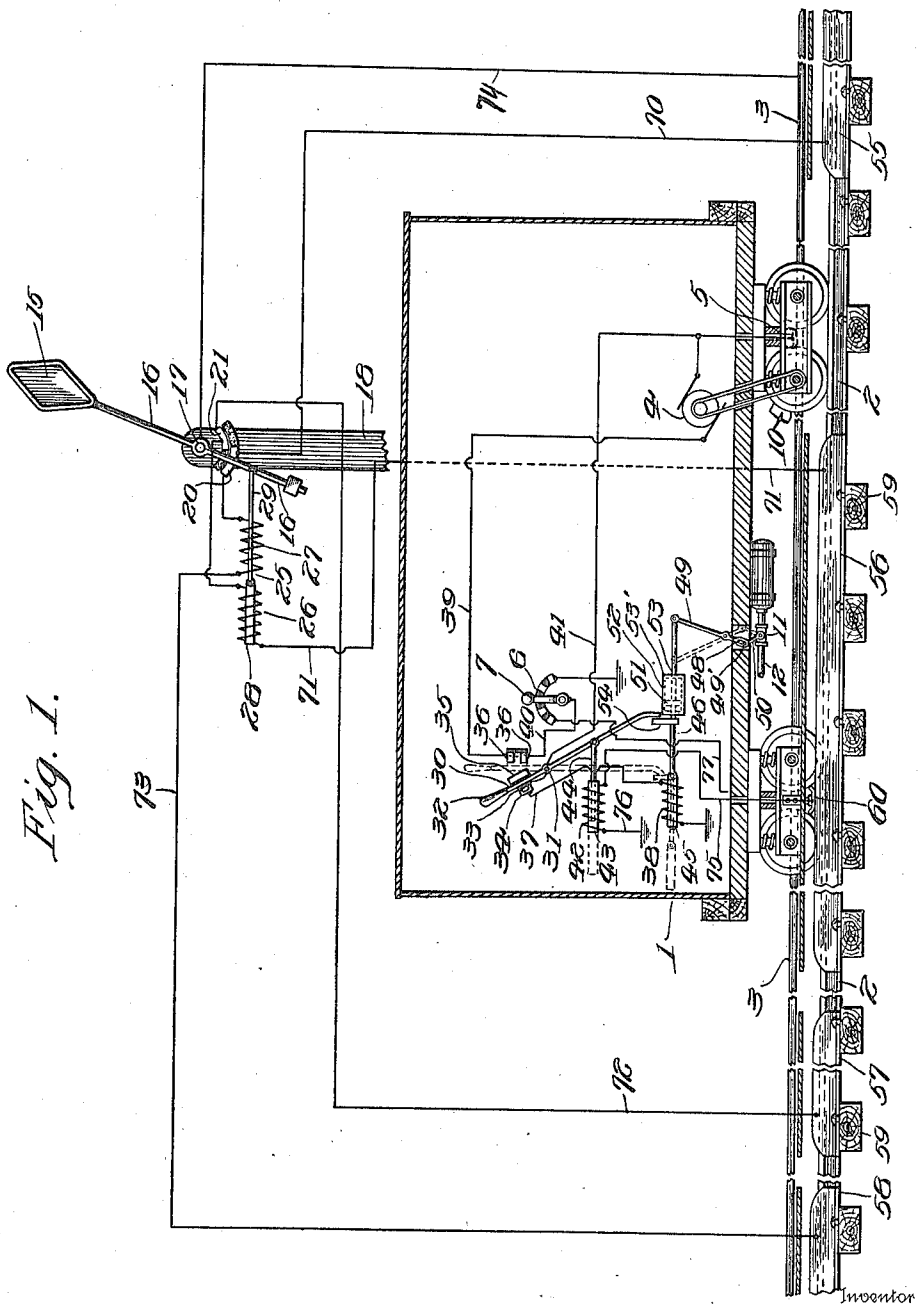

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

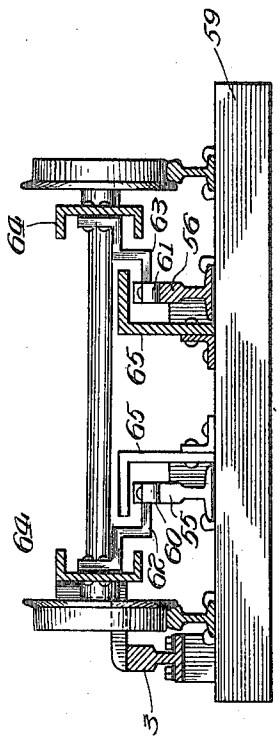
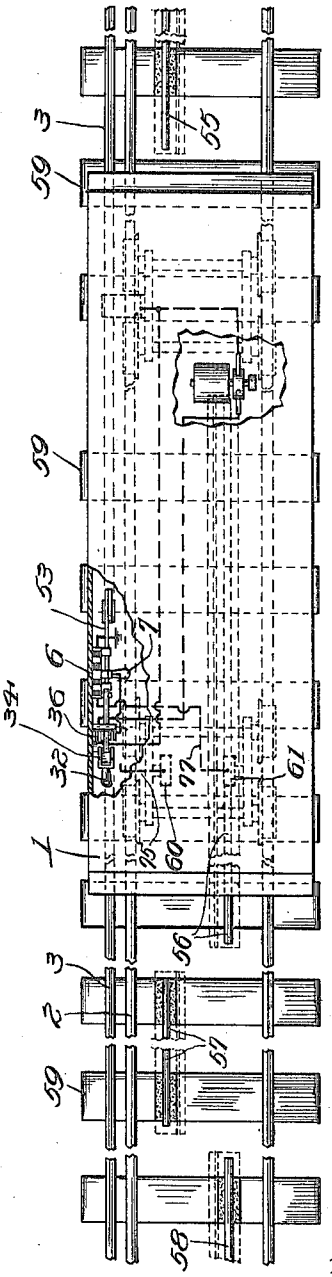


Fig. 2.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC ELECTRIC BLOCK-SIGNALING APPARATUS FOR RAILROADS.

1,190,613. Specification of Letters Patent. Patented July 11, 1916.

Application filed December 9, 1908. Serial No. 466,581.

To all whom it may concern:

Be it known that I, FRANK C. WILLIAMS, a citizen of the United States, and a resident of the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Electric Block-Signal Apparatus for Railroads, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The main objects of this invention are to provide an improved signal system particularly adapted for use on electric railroads, and in which the signal will be set automatically by the passing of a car; to provide an automatic signal system in which accidents will be prevented by the automatic stopping of a car; to provide a signal system which will operate upon a small expenditure of electrical energy; to provide a signal system which may be used upon any electric railroad without disturbing the usual equipment thereof; and to provide other improvements as will appear hereinafter.

The accompanying drawings, Figure 1 is a side elevation of an electric railroad and car equipped with my improved signal apparatus, the signal apparatus being shown diagrammatically and in the plane of the drawing for clearness; Fig. 2 a fragmentary top plan view of the same; and Fig. 3 is an enlarged transverse vertical section through the tracks and truck.

Referring to the drawings, the car 1 represents diagrammatically, any ordinary electric car carried upon the usual rails 2 and actuated electrically from a third-rail 3. The car is driven as usual, by a motor 4 receiving its current from the third-rail 3 through a yielding shoe 5 carried by the car. The circuit through the motor is completed as usual through a controller 6, actuated by the rotary handle 7. The car is provided with the usual air brakes comprising the brake shoe 10 controlled by means of a valve 11 in an air pipe 12 leading to the actuating mechanism of the brake.

A movable signal 15 is located upon one side of the railway at the entrance to each block of the system. This signal is mounted upon the usual metallic lever 16 pivoted intermediate its ends at 17 upon a fixed support 18. The lower end of the signal lever 16 slides over two segmental fixed contact plates 20 and 21 one plate being local to one portion of the path of oscillation of the lower end of the lever, and the other plate being local to the other portion of the path, the two plates overlapping in the center of the path. For convenience, one plate 20 may be called the danger plate and the other plate 21 the normal plate. The danger plate contacts with the signal lever when the signal is set at danger and the normal plate contacts with the signal lever when the signal is set at safety. The two plates both contact with the lever only for a short distance when the lever is in the center of its movement.

The signal lever is moved either in one direction to a position indicating safety or in the opposite direction to a position indicating danger by means of a solenoid 25 which is provided with two separate windings 26 and 27 which may be called the danger winding and the safety winding respectively. The solenoid is provided with a longitudinally slidable core 28 which is connected by a suitable link 29 with the lower end of the signal lever 16. The electrical connections for actuating the solenoid will be described hereinafter.

For automatically stopping the car electrically a lever 30 is pivoted intermediate of its ends at 31, to any convenient support in the car. The lever 30 is provided with a handle 32 at its upper end for convenience of operation and carries the movable member of a double acting automatic knife switch insulated therefrom and comprising the blade 33 arranged to contact with the terminal 34, and the blade 35 arranged to bridge the terminals 36. The terminal 34, is electrically connected by a lead 37 through a brake solenoid 38 carried by the car, to the ground, the connection to the ground being made, as usual through the wheels of the car. One of the pair of terminals 36 is connected by a lead 39 to one brush of the motor 4 and the other terminal 36 is connected by a lead 40 to the movable part 7 of the controller 6, through which it may be grounded through various resistances in the controller in a well-known manner. It is thus evident that when the lever 30 is in contact with the terminals 36 upon one side of the lever that the circuit is closed be-

tween the motor 4 and its controller 6. The knife 33 of the switch lever 30 is connected by a lead 41 to the third rail 3 which supplies the current to drive the car and when the knife is in contact with the terminal 34 the current is conducted from the third rail through lead 41, through lead 37 and brake solenoid 38 to the ground.

The lever 30 of the automatic knife switch is actuated by a solenoid 42, having a longitudinally slidable core 43 connected by a link 44 to the lower portion of the lever. When the switch solenoid 42, is energized as hereinafter described the lower portion of the lever 30 is moved away from the solenoid to the position indicated in full lines in Fig. 1, thereby breaking the circuit between the motor 4 and its controller 6 and closing the circuit between the third rail and the ground through the lead 37 and the brake solenoid 38.

The brake solenoid 38 has a slidable core 45 which is connected by means of a piston rod 46 to one end of a pivoted lever 49, the other end of which is provided with a longitudinal slot 48, in which slidably rests the crank pin 49′, of the crank arm 50, which controls the valve 11 in the air pipe 12 controlling the air brakes of the car. When the brake solenoid 38 is energized, its core is moved thereby, to the position indicated in full lines in Fig. 1, and, through the piston rod 46 and crank arm 50 opens the valve 11 thus applying the air brakes.

To prevent the too sudden application of the brakes the piston rod 46 is provided with a piston 51, fixed thereon which reciprocates in a cylinder 52, one end of which 53 is closed but provided with a comparatively small aperture 53′ for the passage of air into and from the cylinder thus forming a dash pot to retard the movement of the piston. For releasing the brakes, after having been thus applied, the piston rod 46 is provided with an arm 54 projected rigidly therefrom and adapted to be engaged by the lower end of the switch lever 30, whereby when the lever is moved manually to the position shown in dotted lines to make connection between the contacts 36 preparatory to starting the car, the piston rod will be moved by the lever to close the valve 11, controlling the air brakes thereby releasing the brakes.

For automatically and electrically actuating the signals at the side of the road and stopping mechanism of the car, four plates or fixed contacts 55, 56, 57 and 58 are provided for each block of the system, the plates being mounted rigidly upon the ties 59 of the road bed and insulated therefrom. These four contact plates may be called for convenience the danger plate 55, the danger setting plate 56, the normal plate 57 and the resetting plate 58, and are arranged upon the ties and between the tracks in the order named, the danger plate and normal plate being in a line parallel to the tracks and the danger setting plate and resetting plate being in a line parallel to and at one side of the danger and normal plates.

A pair of yielding shoes or movable contacts 60 and 61, are mounted preferably upon L shaped brackets 62, 63, fixed upon one of the trucks 64 of the car and insulated therefrom and are adapted to engage with the fixed plates, the shoe 60 which may be called the danger shoe, being adapted to engage with the danger plate, and the normal plate, and the shoe 61, which may be called the resetting shoe, being adapted to engage with the danger setting plate 56, and the resetting plate.

The fixed contact plates 55 and 58 are each preferably protected from rain, snow or sleet by a shield 65, which is spaced above its plate just sufficient to permit of the movement of one of the yielding shoes over the plate, a space being allowed upon one side of each contact plate between the plate and its shields for the passage of the support of the shoe.

The danger plate 55 is preferably arranged about one hundred yards in front of the entrance to the block, the danger setting plate 56 adjacent the entrance to the block, the normal plate 57 about two hundred yards within the block from the danger setting plate 56, and the resetting plate 58 a short distance within the succeeding block. The danger plate 55 is connected by lead 70 to the danger segment 20 of the signal, and the danger setting plate 56 is connected by lead 71 to the winding 26 of the solenoid 25 then to the safety segment 21 of the signal. The normal plate 57 is connected by lead 72 to the safety segment 21 of the signal thence through the winding 27 of the solenoid 25 through lead 73 to the white or resetting plate 58. The signal lever 16, is directly connected to the third rail 3, by the lead 74.

Each separate car, or one car of each train, is provided with a pair of the yielding shoes 60 and 61. The danger shoe 60, is connected by a lead 75, to the switch solenoid 42 and through the solenoid and a lead 76 to the ground. The resetting shoe 61, is connected by a lead 77 to the controller of the car and through all the resistance of the controller to the ground.

It is evident from the above description that when the car passes over the danger plate 55 if the signal is set at danger the circuit will be closed from the third rail through the signal lever 16 to the danger plate 55 and from the danger plate through the danger shoe 60, lead 75, and switch solenoid 42 to the ground whereupon the pivoted lever 30 of the automatic switch in the car will be moved, from the position shown in

dotted lines which is the normal running position into the position shown in full lines in Fig. 1 thus breaking the connection between the motor and its controller, and stopping the flow of current through the motor. This automatic movement of the switch arm will also connect the third rail 3, to the ground through the brake solenoid 38 thus turning the valve 11 and applying the brakes to stop the car. When the signal is set at safety, and the car passes the danger plate, no effect will be had upon the signal, nor the car, as no circuit will be closed by the plate.

When the car passes the plate 56, if the signal is set at safety, the circuit will be closed from the third rail through the signal 16, and through the winding 26 of the solenoid 25 to the plate 56, through the shoe 61 to the ground, whereby the signal will be moved from the safety position to the danger position.

When the car passes the normal plate and the shoe 60 engages with the normal plate, if the signal is set at safety, the circuit will be closed from the third rail through the signal through the normal segment 21 the lead 72, the normal plate, the shoe 60, the lead 75 and the switch solenoid 42 to the ground, thus opening the motor circuit and closing the brake circuit to stop the car. If the signal is set at danger when the car passes the normal plate, no circuit will be closed thereby, and therefore no effect will be had on the signal or car.

When the car passes the resetting plate 58, if the signal is set at danger the circuit will be closed from the third rail through the signal through the winding 27 of the signal solenoid 25 through the lead 73, the resetting plate 58, and the resetting shoe 61 to the ground, thus energizing the winding 27 of the solenoid and resetting the signal to the safety position.

In any instance, when the car has been automatically stopped as above described, it cannot be started again until the motor circuit is closed by moving the handle 32 to move the lever 30 releasing the brakes through the movement of the piston rod 46 and connecting the contacts 36, whereupon the controller 6 may be utilized to start the car.

Although only the preferred form of this invention has been illustrated, it is obvious that many changes might be made in the construction set forth without departing from the spirit of the invention or the scope of the appended claims.

Having thus fully described my invention I claim and desire to protect by Letters Patent of the United States:

1. In a signal and stopping system, the combination with a signal, of a car, an electric circuit for actuating said car, means whereby said signal is controlled by the movement of said car and means controlled by said signal to stop said car upon failure to actuate said signal.

2. A signal and stopping system for railways, comprising a car, an electric circuit for actuating said car, a movable signal, fixed contact plates, a shoe carried by said car for engaging said contact plates, a solenoid having two windings respectively operative to actuate a common core in opposite directions, means connecting said core and signal, separate circuits including the respective windings of said solenoid and terminating in said fixed contact plates respectively arranged to be closed by contact of said shoe for energizing the respective solenoid windings to move said signal into its opposite positions, and a circuit and means coöperating therewith to stop said car upon failure of said signal to properly shift to the danger position to protect said car.

3. A signal and stopping system for railways comprising a car, an electric circuit for actuating said car, a switch for breaking said circuit, a movable signal, a pair of fixed contact plates arranged in alinement, a shoe carried by said car for engaging said plates consecutively, a circuit adapted to be closed by the contact of said shoe and one of said plates, and including means for breaking said first mentioned circuit and stopping the car when said signal is in one predetermined position, and a circuit adapted to be closed by the contact of said shoe with the other of said plates and including means for breaking said first mentioned circuit, and stopping said car, when said signal is in a second predetermined position, a third fixed contact plate between, but out of alinement with said first mentioned plates, a shoe carried by said car and adapted to engage said third plate, a circuit adapted to be closed by the contact of said shoe and said third plate and including means for moving said signal into said predetermined position, a fourth plate in alinement with said third plate and adapted to be engaged by said second mentioned shoe and a circuit adapted to be closed by the contact of said second mentioned shoe and said fourth plate to move said signal away from said first predetermined position into said second mentioned predetermined position.

4. A signal and stopping system comprising, an electric line conductor, a car comprising stopping mechanism, means to propel said car including a circuit connected with said line conductor, means controlled by the movement of said car to stop a second car, means coöperating with said stopping mechanism to assure the operator of said first mentioned car that said stopping means is actuated to stop said second car, and means controlled by the movement of the

first mentioned car arranged to actuate said stopping means to permit the unchecked movement of said second car.

5. A signal and stopping system comprising an electric line conductor, a car, a signal station having a movable signal, a circuit connected with said line conductor, and carried by said car, and including a motor to propel said car, a second circuit formed through said signal arranged to be closed by the movement of said car, means actuated by said second circuit to break said motor circuit when said signal is "danger" set, and to be unaffected when said signal is "safety" set, a solenoid, a third circuit formed through said signal and including said solenoid when "safety" set, means to close said third circuit controlled by the movement of said car, to shift said signal to "danger" position, a fourth circuit formed through said signal, means to close said fourth circuit controlled by the movement of said car, and including means to stop the latter upon failure to actuate said signal to "danger" position, and to remain open when said signal is properly set by the movement of said car, to "danger" position, a second solenoid, and a fifth circuit formed through said signal and including said second solenoid arranged to be closed by the movement of said car, to shift said signal from "danger" to "safety" position.

6. A signal and stopping system for railways, comprising an electric line conductor, a car, a motor carried by said car and arranged to be electrically connected to said line conductor to propel said car, means operative to stop a second car while permitting said first mentioned car to proceed, said means including an electric conductor arranged to be alternately electrically connected to and disconnected from said line conductor as a result of the movement of said first mentioned car, and means controlled by the movement of said first mentioned car to disconnect said motor from said line conductor upon the failure of said first mentioned car to cause said first mentioned means to assume an operative position to stop said second car.

7. A signal stopping system comprising an electric line conductor, a car, a track, a signal station having a movable signal, a circuit connected with said line conductor and including a motor to propel said car, a second circuit formed through said signal when set to "danger" position and through said car, at a predetermined position along the track, means actuated by said second circuit when so closed to break said motor circuit, and inoperative when said signal is "safety" set, means to shift said signal, a third circuit formed through said signal and through said car at a predetermined point along the track and including said means to shift said signal when "safety" set, means to close said third circuit controlled by said car, to shift said signal to "danger" position, a fourth circuit formed through said signal, means to close said fourth circuit controlled by said car, and including means to stop the latter upon failure to actuate said signal to "danger" position, and inoperative when said signal is properly set at "danger" position, and a fifth circuit formed through said signal and said car and including means closed by said car at a predetermined point along said track to shift said signal from "danger" to "safety" position.

In witness whereof, I have hereunto set my hand this seventh day of December, A. D. 1908.

FRANK C. WILLIAMS.

Witnesses:
ALSTON B. MOULTON,
ALEXANDER PARK.