

Nov. 1, 1927.

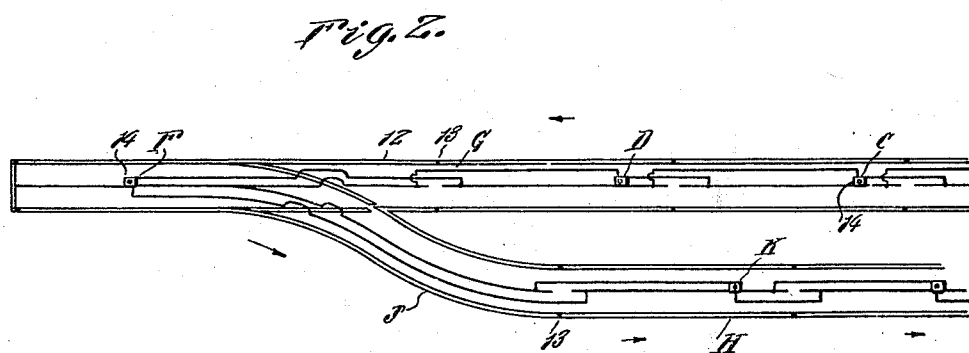
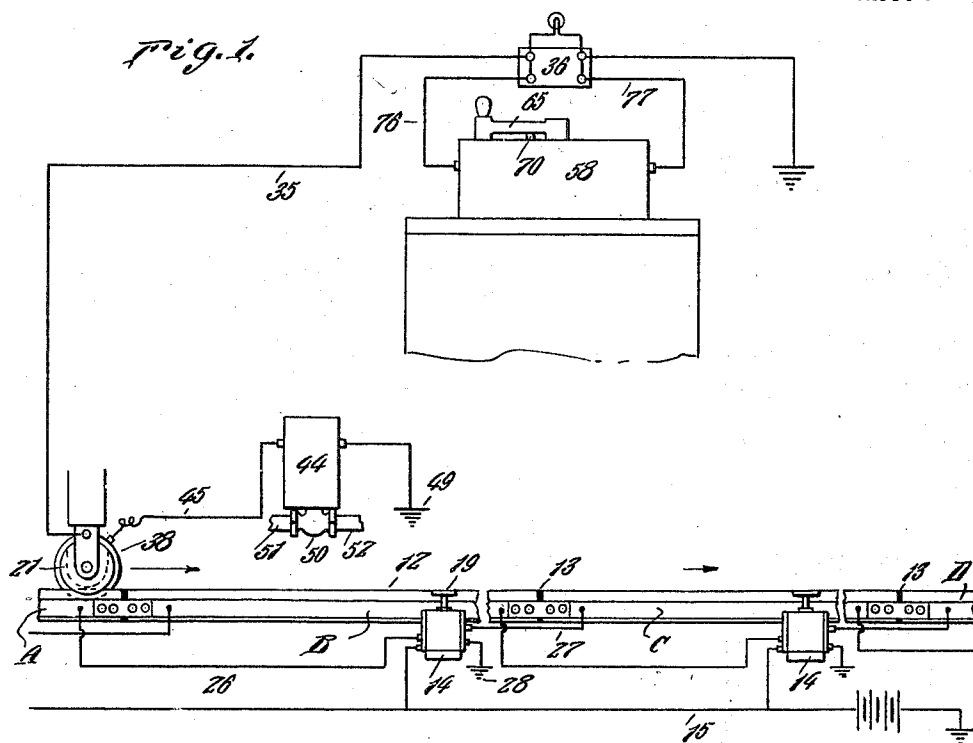
1,647,954

C. BRUNA

AUTOMATIC TRAIN CONTROL

Filed April 21, 1926

4 Sheets-Sheet 1



Quadrant
WITNESS:

Charles Bruna
INVENTOR
BY Victor J. Evans
ATTORNEY

Nov. 1, 1927.

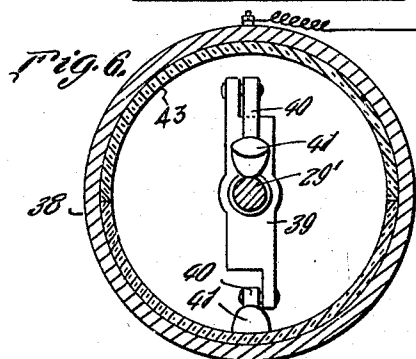
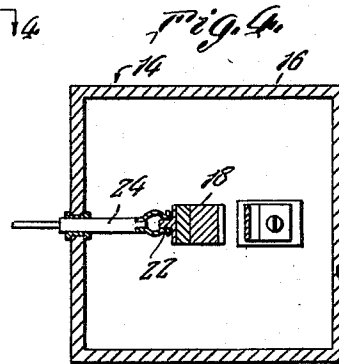
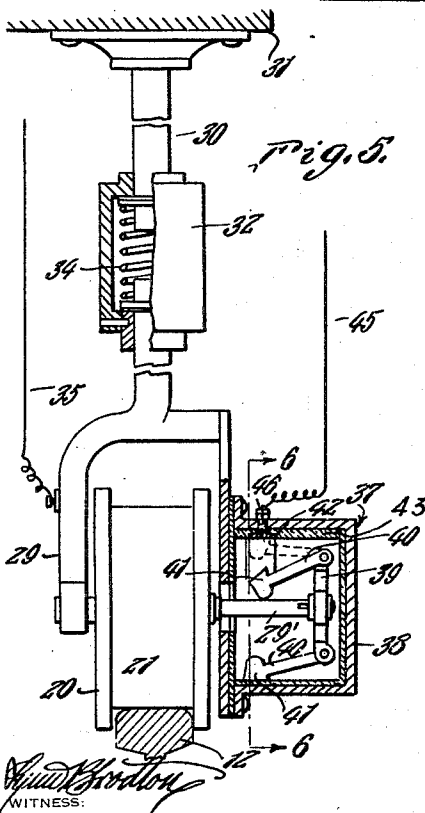
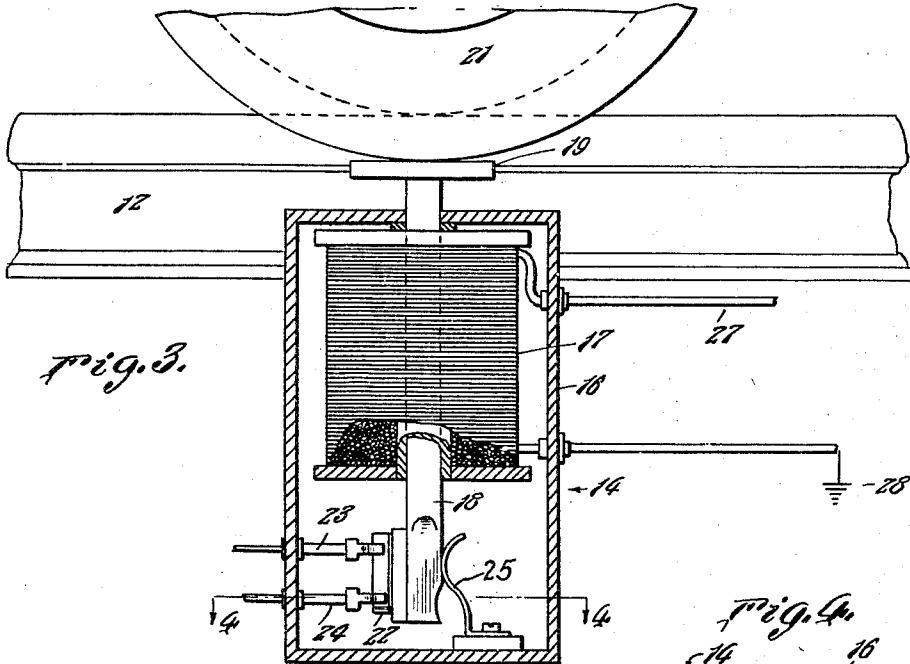
C. BRUNA

1,647,954

AUTOMATIC TRAIN CONTROL

Filed April 21, 1926

4 Sheets-Sheet 2



Charles Bruna
INVENTOR

BY Victor J. Evans
ATTORNEY

Nov. 1, 1927.

1,647,954

C. BRUNA

AUTOMATIC TRAIN CONTROL

Filed April 21, 1926

4 Sheets-Sheet 3

Fig. 7.

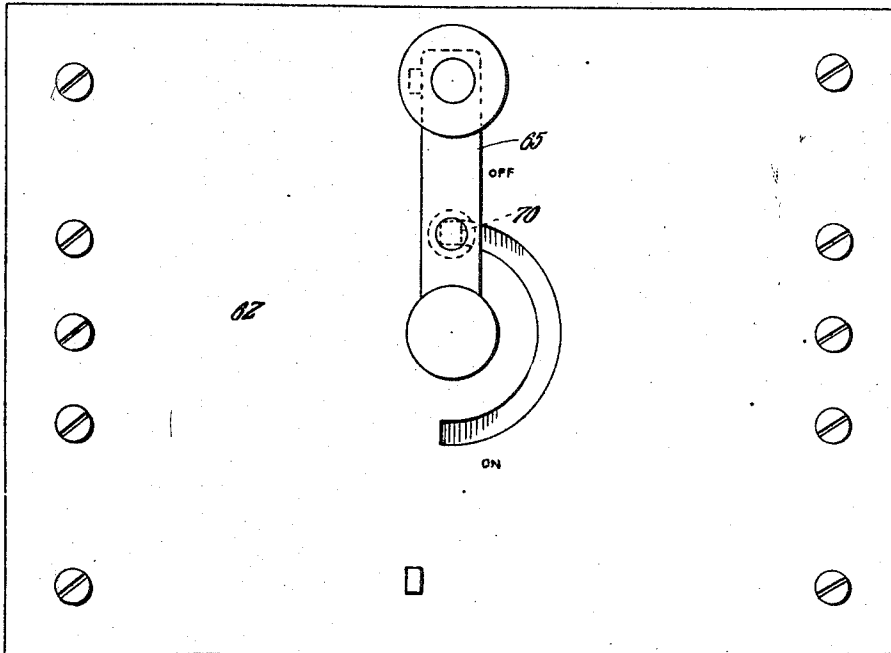


Fig. 8.

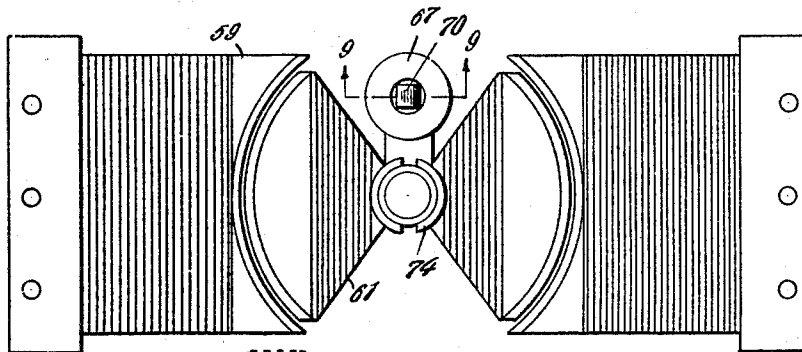
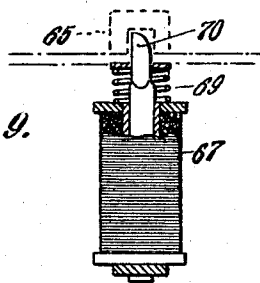


Fig. 9.



W. J. Evans
WITNESS:

Charles Bruna
INVENTOR
BY *Victor J. Evans*
ATTORNEY

Nov. 1, 1927.

1,647,954

C. BRUNA

AUTOMATIC TRAIN CONTROL

Filed April 21, 1926

4 Sheets-Sheet 4

Fig. 10.

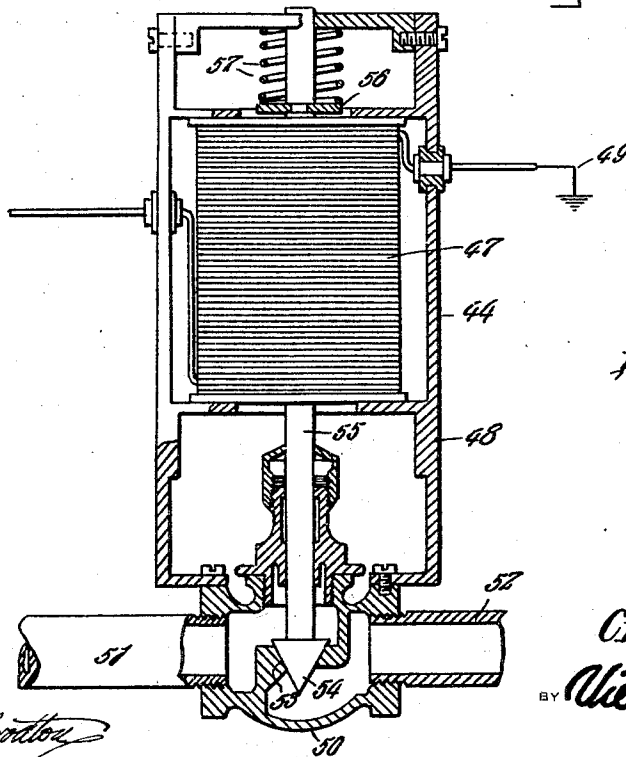
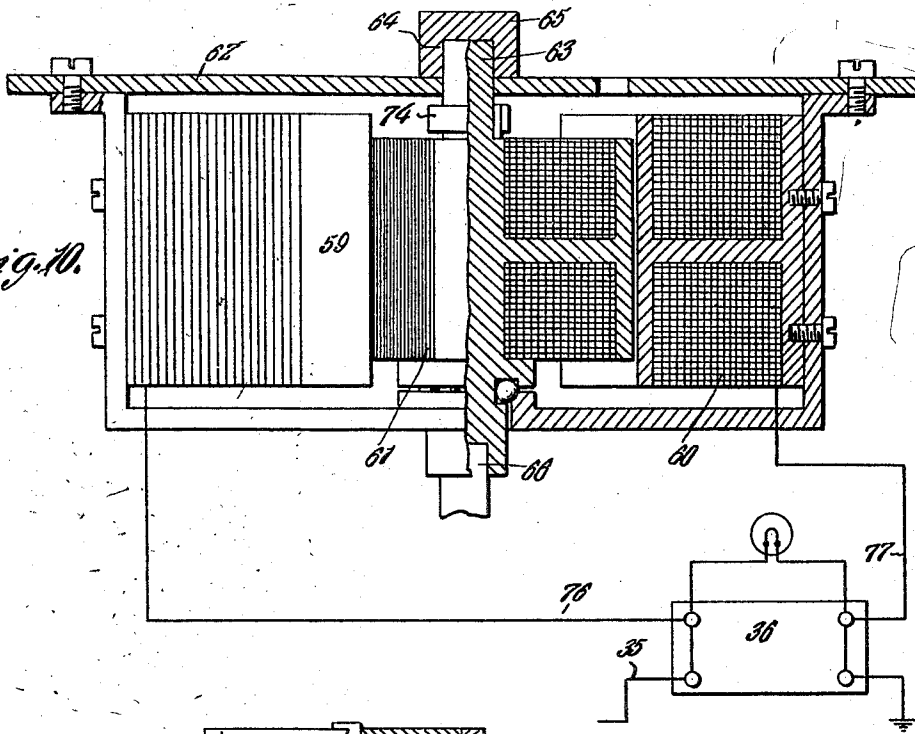


Fig. 11.

Charles Bruna
WITNESS:

Charles Bruna
INVENTOR
BY *Victor J. Evans*
ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES BRUNA, OF NEW YORK, N. Y.

AUTOMATIC TRAIN CONTROL.

Application filed April 21, 1926. Serial No. 103,591.

This invention relates to improvements in automatic train controls.

The principal object of the invention resides in an automatic train control operable on the "block principle", wherein the track over which a train is adapted to pass is divided into blocks to prevent a train in the rear from approaching too near the train ahead in the event that the motorman or engineer of the rear train should fail to heed the stop signal set against him and which signals are usually provided along the railroad and subway tracks for warning purposes.

Another object of the invention is to provide an automatic train stop in which the train ahead automatically charges or energizes a rail or cable in a block to the rear of the same, to automatically set the block for operating suitable control means on an approaching train which may enter the charged block, whereby the rear train may be brought to a stop to prevent a rear end collision of the same with the train ahead and which forward train automatically deenergizes the rear block as the same enters another block ahead. Briefly, a block or section of the track is placed in condition behind each train to bring an approaching rear train to a complete stop.

A further object is to provide a means for automatically shutting off the power of a train and for applying the brakes when a train approaches too near a train ahead providing the approaching train is moving at a high rate of speed, but which only operates to shut-off the power of the approaching train when entering a charged block at a relatively slow rate of speed whereby the train may be permitted to drift or coast by reason of its momentum until the same comes to a stop. The blocks are sufficient distance apart as to prevent a coasting train from reaching the train ahead.

With these and other objects in view, the invention resides in certain novel construction and combination and arrangement of parts, the essential features of which are hereinafter fully described, are particularly pointed out in the appended claims, and are illustrated in the accompanying drawing, in which:—

Figure 1 is a diagrammatic view of my invention showing the same applied to a portion of a straight track.

Figure 2 is a diagrammatic view showing

the manner in which the principle may be utilized for protecting switches.

Figure 3 is a sectional elevational view of the make and break device for charging a rear block.

Figure 4 is a horizontal sectional view on the line 4—4 of Figure 3.

Figure 5 is a sectional elevational view of the trolley.

Figure 6 is a vertical transverse sectional view on the line 6—6 of Figure 5.

Figure 7 is a top plan view of the motorman's power control box.

Figure 8 is a top plan view of the automatic power control device.

Figure 9 is a detail sectional view on the line 9—9 of Figure 8.

Figure 10 is a vertical sectional view on the line 10—10 of Figure 9.

Figure 11 is a vertical sectional view of the automatic air valve.

Referring more particularly to the drawings, the reference numeral 10 designates a railroad track and primarily a subway track for electric trains wherein the power for operating a train thereon is obtained by the use of a "third rail". Extending parallel opposite the track 10 is a rail 11 which we shall term a "fourth rail" which is constructed of a plurality of lengths of joined rail sections 12, certain of which are insulated from each other as at 13 to provided blocks A, B, C and D.

Adjacent the entrance to each block and disposed opposite the rail 12, I provide a make and break device 14, while a charged cable 15 extends parallel to the rail 12, which cable receives its energy from a suitable power station. Each make and break device 14 comprises a cylindrical casing 16 for housing a solenoid 17. The outer end of the sliding core 18 of the solenoid 17 extends through the top of the casing and is provided with a head 19 which is disposed within the path of the outer flange 20 of a trolley wheel 21 and which trolley wheel will be more fully described herein after. The lower end of the core 18 carries a plate 22 which is insulated therefrom and is slidable into engagement with a pair of spaced contacts 23 and 24 extending inwardly from one wall of the casing. When the solenoid 17 is energized, the core is held in a raised position by means of a flat spring 25 which seats in a notch 26 provided in the core but which spring allows the core to drop to bridge the

contacts when engaged by the trolley wheel, as the pressure of the wheel is capable of overcoming the tension of the spring.

The contact 24 of each make and break device is connected with the power cable 15 by a wire 25, while the contact 23 is connected to the rail 12 in the next rear block by a wire 27. One end of the winding on the solenoid 17 is electrically connected with the track 12 of the block by a wire 27, while the other end of the winding is grounded as at 28.

The trolley wheel or roller 21 is keyed to a shaft 29' which is journaled for rotation in a bracket 29 suspended from the front end of a train by means of an arm 30. The upper end of the arm 30 carries a disk adapted to be bolted to the under portion 31 of the car of a train, while the lower end of the same extends into one end of a cylinder 32. The free end of the bracket 29 extends into the opposite end of the cylinder and both the ends of the arm and bracket are provided with disks 33, between which a helical expansion spring 34 is interposed for yieldingly holding the trolley in engagement with the track 12 so that the same may easily ride over any irregularities in the rail 12 without disengaging the trolley wheel therefrom. The bracket 29 is of a conducting material and has one end of a wire 35 connected thereto, while the other end of said wire leads to a terminal on a panel board 36 adapted to be positioned in the motorman's compartment of the train.

Mounted upon the bracket 29 is an automatic circuit make and break device 37 which comprises a casing 38 within which one end of the shaft 29' extends. The shaft carries a cross arm 39 which is keyed thereto and to the ends of which, brush carriers 40 are respectively pivoted. The free end of the brush carriers are provided with brushes 41 for wiping engagement with the collector ring segment 42 which is counter-sunk within an insulating ring 43 which encircles the inner walls of the casing 38. The purpose of the make and break device 37 is to collect current when the approaching train is moving at a high rate of speed for transmitting the current to an electrically controlled automatic air brake valve 44 which is arranged in the air brake line of the train for causing the air brakes of the train to be automatically applied. The circuit make and break device 37 is electrically connected to the automatic brake valve 44 by a wire 45, one end of which is connected to a terminal 46 extending from the collecting ring 42 beyond the exterior of the casing 38, while the other end of the wire connects with the winding of a solenoid 47 mounted within a housing 48. The other end of the winding of the solenoid is grounded as at 49.

A valve casing 50 is suspended from the

underside of the housing 48 and to which the ends of a pair of air pipes 51 and 52 are respectively connected. A bevelled valve seat 53 is provided within the valve casing intermediate the inlet and outlet side thereof for co-action by a valve head 54 provided on the lower end of the sliding core 55 of the solenoid 47. The upper end of the core 55 carries a disk 56 adjacent the upper end thereof and which end projects beyond the top of the casing, and interposed between the top of the casing 48 and the disk 56 is an expansible spring 57 which normally acts to keep the valve head 54 seated. However, upon the energizing of the solenoid 47 by reason of the circuit make and break device 37, the core 55 will be caused to raise and unseat the valve head to allow the air in the air line to pass through the valve for the purpose of applying the brakes on the train as will be readily appreciated.

The reference numeral 58 designates the motorman's control box within which is mounted a pair of spaced fixed poles 59 and 60 between which an armature 61 is turnably mounted. The box 58 has a removable cover 62 through which the upper end of the armature shaft 63 extends for the reception in a socket 64 provided in a control handle 65. The handle is not keyed to the shaft but is free to turn thereon. The lower end of the armature shaft is provided with a square socket or recess 66 for engagement with the shaft of the control box now used on trains, so that when the armature shaft turns, the same will transmit a turning movement to the control mechanism of the train. Mounted on the armature 61 parallel to the armature shaft is a solenoid 67, the core 68 of which is normally held in an extended position by a spring 69. The upper end of the core is provided with a rounded nose 70 which extends through an arcuate shaped slot 71 in the top cover plate 62 when the solenoid is in a deenergized condition. The nose 70 extends into a recess 72 provided in the handle and which acts as a key for permitting the handle to impart a turning movement to the armature 61 and shaft 63 when it is desired to turn on the current of the train. However, when the poles 59 and 60 and solenoid 67 are energized, the nose 70 is retracted from the socket or recess 72, whereupon the poles tend to swing the armature to a position shown in the drawing, leaving the handle in the "on" position. It will be seen that if the handle is now manually moved to an "off" position, the same will have no effect on the train as the current has already been automatically shut off by the return of the armature. When the solenoid and poles are deenergized, the spring 69 will force the nose of the core into the recess whereupon the handle may be manually moved to again put on the power.

The nose 70 allows the core to automatically seat in the recess in the event that the handle is moved to an "off" position after deenergizing the solenoid 68. A collecting ring 74 surrounds the armature shaft 63 and which is insulated therefrom as at 75.

A wire 76 leads from the winding of the pole 59 to a terminal on the panel board 36, and which terminal is bridged by a wire 10 with the terminal to which the wire 35 is connected. The other pole 60 is connected to a terminal on the panel board by a wire 77, and which latter terminal connects with a terminal to which a ground wire 78 is connected. 15 An electric lamp 79 is arranged in shunt with the poles 59 and 60 and is adapted to light when the poles are energized to visibly indicate to the motorman that the train has entered a charged block, and which 20 light will automatically disappear when the block is deenergized thereby indicating that the motorman may apply the power to again put the train in motion.

In operation, we shall presume that a 25 train is travelling in the block C, whereupon the trolley wheel carried by the train has pressed down upon the core 18 of the make and break device 14, causing the rail section 12 of the block B to be charged or energized 30 by reason of the bridging of the contacts 23 and 24 by the plate 22 carried by the core. Current will then pass from the power cable 15 through the contacts 23 and 24 of the make and break device above mentioned and 35 through the wire 26 to the rail 12 of the block B. It will be appreciated that the train in the block C has just passed over the make and break device arranged in the block B whereupon to charge block A, and 40 in travelling in the direction indicated by an arrow in Figure 1 of the drawings. As the make and break device 14 in the block C is operated to charge block B, block B becoming charged will energize the solenoid 17 45 of the make and break device 14 in block A, thus causing the core 18 of the said make and break device to raise whereupon the connection between the contacts 23 and 24 of the make and break device in block A is broken, 50 thereby resetting the same for engagement by another train which may attempt to approach the train in block C from the rear.

Having deenergized block A and energized block B, it will be seen that should a 55 train enter the said block B, current will flow through the trolley wheel 21, wire 35 to the panel board 36, thence through the wire 76 to the stationary field or pole 59 through the collecting ring 74, through one-half of the armature 61 to the solenoid 67 60 which is electrically connected therewith, from where it passes to the other half of the armature 61 to the collecting ring and through the other pole of the stationary field 65 60, back to the panel and through the wire

77 and thence to the ground 78. This energizes the solenoid 67 and poles 59 and 60 to cause the nose 70 of the core 68 of the solenoid to be retracted to release the control handle 65 of the approaching train, and automatically cause the armature which may 70 have been in an "on" position to swing to an "off" position, wherein the current for the operation of the approaching train is automatically shut off. 75

In the event that the approaching train enters block B while travelling at a fast rate of speed, the automatic air valve 44 will operate to put on the brakes of the approaching train. The automatic air valve 80 is arranged in parallel with the circuit just described and operates in the following manner. The centrifugal force of the trolley wheel shaft 29 tends to throw the shoes 41 into contact with the collecting ring segment 85 42 which completes the circuit through the rail 12, control wheel 21, shaft 29', shoes 41, wire 45 to the solenoid 47, which is energized to lift the valve head 54 from its seat 53 to permit air in the air line to pass to the 90 air brake mechanism provided on the approaching train for the purpose of automatically applying the brakes thereto. The solenoid 47 is grounded as at 49, thus completing the circuit for energizing the same. 95 When the solenoid 47 is deenergized, the spring 57 automatically seats the valve head to relieve the air pressure to the air brake mechanism, thus allowing the train to proceed. 100

In Figure 2 of the drawings, I have shown the same principle as above mentioned with the exception that the same is shown as applied for protecting the switches. In the drawing, the reference character F designates a make and break device which is similar in construction to the make and break devices 14 hereinbefore mentioned. The device F is provided at the end of a track G 105 while a track H runs parallel to the track G and is connected therewith through a curved length of track J, the object being to cause the train when reaching the end of the track G to operate the make and break device F to prevent an approaching train 110 from entering the end block. A make and break device K is arranged in the track H for actuating the make and break device F after the train has passed through the track G to track H. 115 120

What is claimed as new is:—

1. In an automatic train stop, the combination with the power control mechanism of an electric train, power control, actuating means operatively connected with the power control mechanism, said power control mechanism including an armature operable with said power control mechanism and interposed between a pair of magnetic fields, and a solenoid arranged in series with said mag- 125 130

netic fields and movable with said armature, an energized rail, and means engageable with said rail and adapted to be carried by the train for actuating said power control actuating means for moving said power control mechanism from an "on" position to an "off" position.

2. In an automatic train control, the combination with the power control mechanism of a train, an armature having one end connected therewith, a pair of magnetic fields normally deenergized for permitting said armature to be turned relative thereto, a control handle freely turnable on the other end of said armature, a solenoid mounted on said armature and arranged in an electric circuit with said magnetic fields, the core of said solenoid normally engaging said handle whereby rotation of said handle to an "on" position will cause said armature to turn to actuate said power control mechanism, and upon the energizing of said magnetic fields and solenoids will cause the core to be retracted from engagement with said handle whereupon the magnetic fields will automatically return said armature to move said power control means to an "off" position.

3. In an automatic train control, a pair of rail sections, the ends of which are insulated from each other, a trolley wheel, a make and break device disposed along one of said rail sections, said make and break device including a solenoid having a sliding

core therein, said solenoid and the other of said rail sections being arranged in a normally open electric circuit, means for holding said core in the path of said trolley wheel whereby said trolley wheel engages said core and depresses the same against the action of said means, and switch means operable upon the depression of said core to close said circuit to energize the last mentioned rail section while travelling over said first mentioned rail section.

4. In an automatic train control, a pair of rail sections, the ends of which are insulated from each other, a trolley wheel, a make and break device disposed along one of said rail sections, said make and break device including a solenoid having a sliding core therein, said solenoid and the other of said rail sections being arranged in a normally open electric circuit, means for holding said core in the path of said trolley wheel whereby said trolley wheel engages said core and depresses the same against the action of said means, and switch means operable upon the depression of said core to close said circuit to energize the last mentioned rail section while travelling over said first mentioned rail section, and means for energizing said solenoid to reset said core after the trolley wheel has passed from one rail section onto the next adjacent rail section.

In testimony whereof I have affixed my signature.

CHARLES BRUNA.