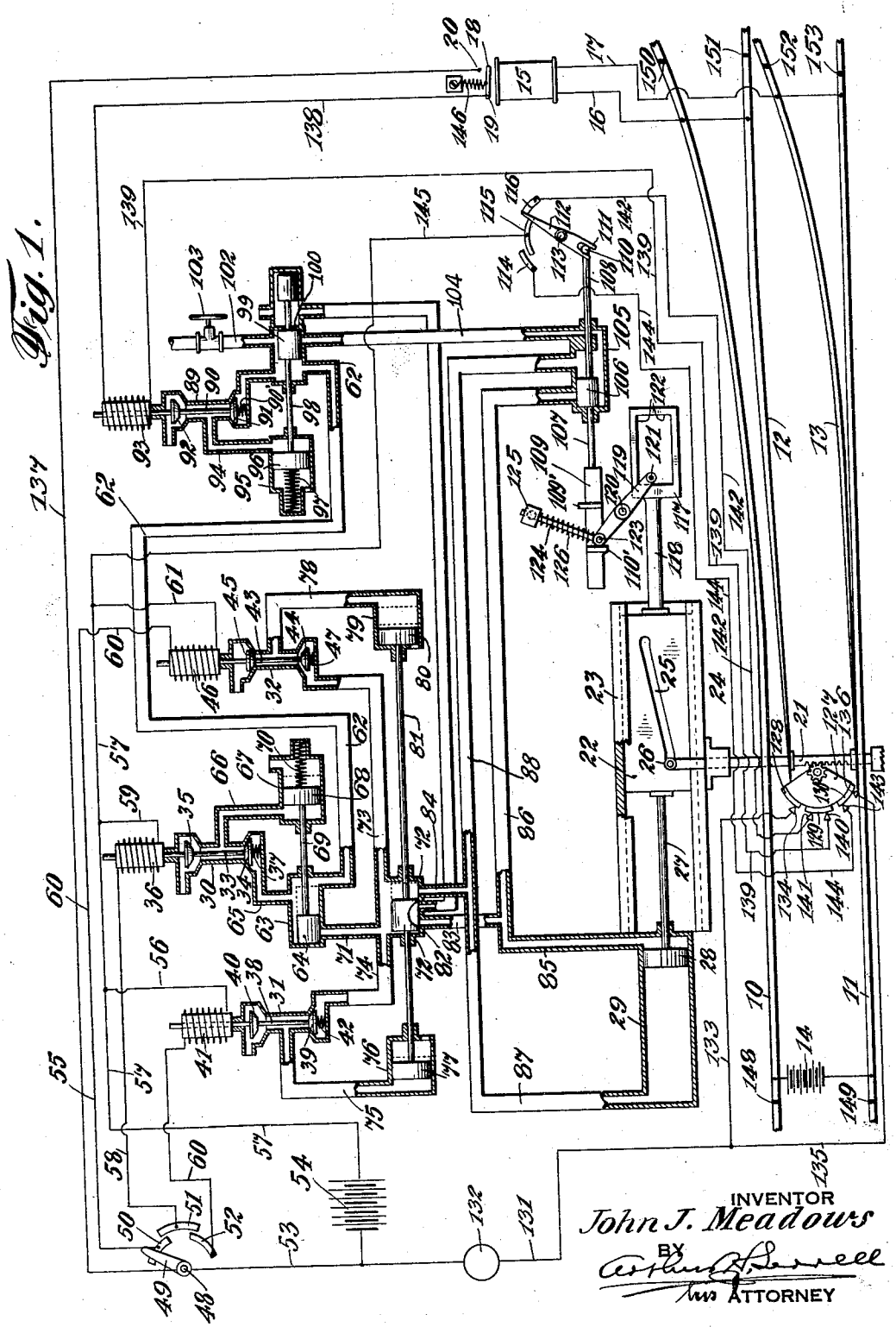
Jan. 13, 1931. J. J. MEADOWS 1,789,108

RAILWAY SWITCH CONTROL APPARATUS

Filed May 1, 1929 2 Sheets-Sheet 1

Fig. 1.



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RAILWAY SWITCH CONTROL APPARATUS

Filed May 1, 1929 2 Sheets-Sheet 2

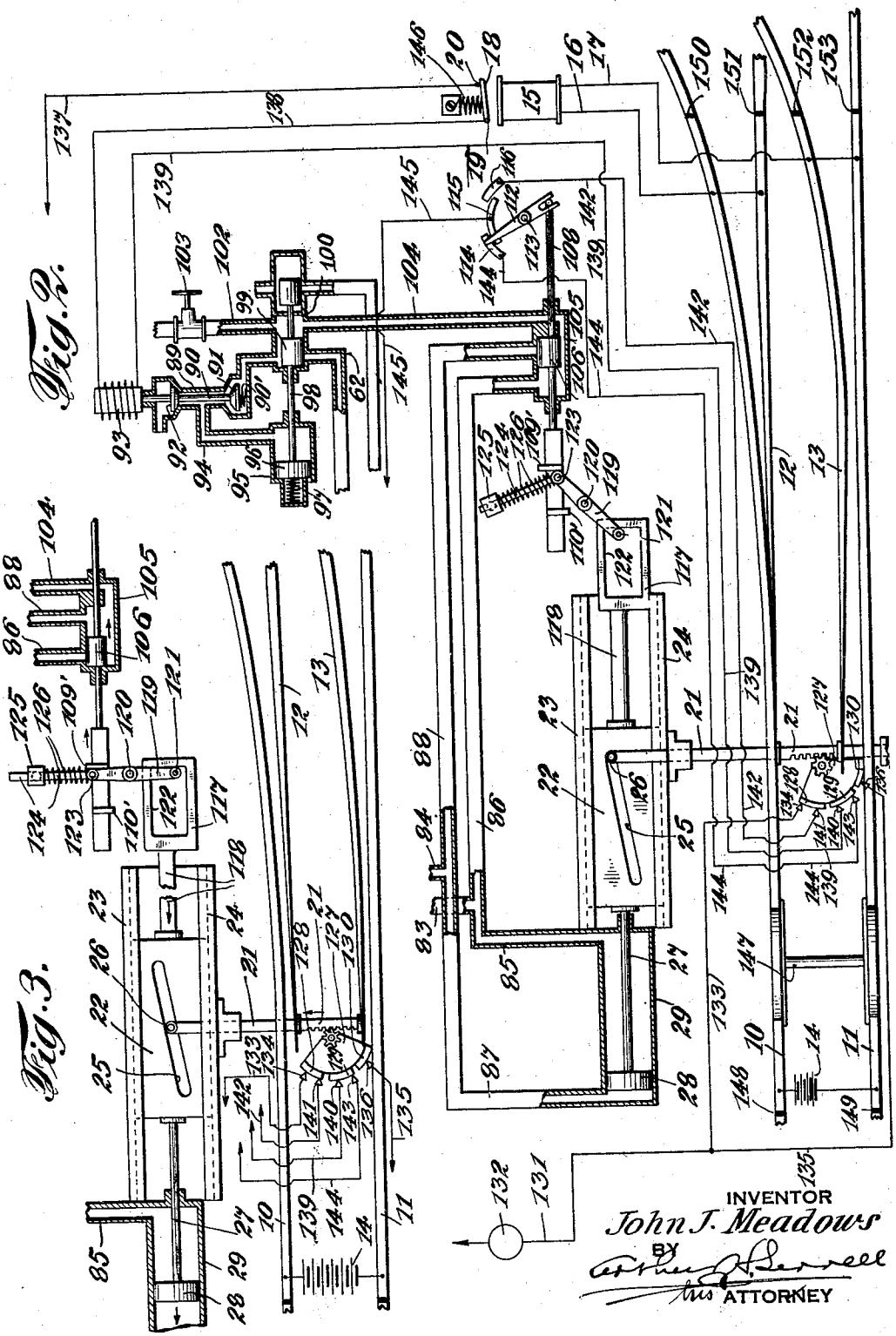


Fig. 2.

Fig. 3.

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1,789,108

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RAILWAY-SWITCH-CONTROL APPARATUS

Application filed May 1, 1929. Serial No. 359,453.

This invention relates to an apparatus for operating and controlling railroad and other switches. Heretofore railway switches have been operated and controlled in various manners. In some instances the operation has been effected electrically, while in other instances, for example, it has been effected electro-pneumatically. In all cases, so far as I am aware, the operation of these various devices is indirectly a manual one. Obviously it is of primary importance that a railway switch should not be movable in either direction while a train is passing over the same. In order to operate and normally maintain a railroad switch in either its normal or reverse position it is customary to employ a switch lever located in a tower or other place for controlling the power employed to operate the switch and to lock it in position. It is also customary to employ indicating devices for showing the position of the switch as well as signal devices for indicating the condition of the track. These indicating and signal devices are usually interlocked with the switch operating devices. The arrangement of these parts may be such that the switch lever is locked when a train is in the section of the track containing the switch and cannot be unlocked to operate the switch while the train is in the track section containing the switch. The indicating devices are constructed to operate when the switch has been thrown to one position or the other to indicate when the switch has completed a desired movement. The signal device, moreover, is so interlocked with the switch operating device that the switch must be thrown to one position or the other in order to give a clear signal for a train to proceed to the track section containing the switch. Consequently under normal conditions such switch operating mechanism fulfills the ordinary requirements of operation provided the parts operate as designed and the train is moved in accordance with the signals.

Railroads, however, must maintain service in order to meet competition, or at least they must maintain schedules. At times these requirements conflict with safety and sometimes safety is sacrificed. In the event of a switch failing to function properly a train may be flagged past a danger signal. If a towerman fails to lock the switch before so signalling a train and the train enters the unlocked switch a serious accident is likely to result.

The object of my present invention is to provide a switch control apparatus in the use of which it is impossible to throw the switch after a train has entered the track section in which the switch is located. In carrying out the invention irrespective of the nature of the power employed, the normal switch operating apparatus whether controlled from a tower or other place is entirely cut off when a train enters the track section in which the switch is contained, and moreover the final position of the switch is then determined by the position in which it happened to be when the train entered the switch track section, the switch being then closed and positively locked and caused to remain so as long as the train is in the track section containing the switch.

In carrying out the invention any suitable apparatus may be employed whether entirely mechanical or entirely electrical, or electro-pneumatic, or otherwise. Irrespective of the particular type of apparatus and the power employed to operate it I provide means whereby the entrance of a train into the track section containing the switch automatically cuts off the power from the devices for normally operating the switch and the power is then utilized to positively shift the switch to one position or the other if it is not then in either its normal or its reversed position, and when moved to either of these positions to lock the same therein until the train has left the track section containing the switch. Associated with these auxiliary switch operating devices I also employ indicating circuits with indicating devices therein which cooperate with the auxiliary switch operating devices to give a signal both when the switch is improperly placed and when the auxiliary means for applying the power does not perform its intended function. These circuits are also ar-

ranged so as to prevent a false operation of the mechanism. In carrying out the invention these auxiliary devices for operating the switch are preferably controlled by the operation of a relay in the track section in which the switch is located so that when a train enters this track section the relay is short circuited, deenergized and its armature moved to close a circuit controlling the operation of the auxiliary switch actuating devices and the circuit controller apparatus associated therewith, as will be hereinafter more particularly described.

In the drawing Figure 1 is a diagrammatic illustration of an apparatus embodying my invention and showing the switch in its reverse position,

Fig. 2 is a similar view showing the switch in its normal position, and

Fig. 3 is also a diagrammatic illustration showing the switch and actuating parts in an intermediate position.

The invention as illustrated is shown as applied to an electro-pneumatic operating device for throwing the switch but, as will be understood, the invention may be applied to various other types of operating mechanism without departing from the nature and spirit thereof. In the drawing one of the stock rails of a track is indicated at 10 and the other at 11. One of the switch rails is indicated at 12 and the other switch rail at 13. Connected across these rails there is a battery 14 or other source of electric energy. A relay 15 is also connected across the rails by means of leads 16 and 17 and suitable connections. The armature of the relay is designated at 18 and as illustrated is pivotally mounted at one end, as at 19, and when deenergized this armature is adapted to bear against a contact 20 to close a circuit, as hereinafter described.

The switch rails are operated by means of a switch rod 21 of the usual type. This switch rod is operated by an actuating and locking plate 22 slidably mounted in guideways 23 and 24, or otherwise. In the plate 22 there is a slot 25 operating in which is a roller 26 connected at one end of the switch rod 21. The plate 22 is actuated by means of a rod 27 connected thereto and to a piston 28 operated in a cylinder 29 by means of compressed air or otherwise.

The parts of the apparatus as hereinbefore described are actuated through the intervention of a lock valve, a normal position valve and a reverse position valve controlled from a station tower, or other operating point, and suitable connections. The lock valve is indicated at 30, the normal position valve at 31 and the reverse position valve at 32. These valves are similarly constructed. The lock valve includes a cylinder in which there is a valve rod 33 carrying valves 34 and 35 adapted to bear against seats provided therefor. This valve rod and the valves carried thereby are operated by means of an electro-magnet or solenoid 36 through which the valve rod passes. The valve rod is normally maintained in position by a spring 37 or otherwise and in its normal position the valve 34 is seated and the valve 35 is unseated.

Similarly the normal position valve 31 includes a cylinder in which there is a valve rod 38 carrying the valves 39 and 40 which are adapted to bear against seats provided therefor in the cylinder. The valve rod and valves are actuated by an electro-magnet 41 and are normally maintained in their inoperative positions in which the valve 39 is seated and the valve 40 is unseated by means of a spring 42 or otherwise.

In like manner the reverse position valve 32 includes a cylinder in which there is a valve rod 43 carrying the valves 44 and 45. The valve rod 43 passes through and is actuated by an electro-magnet 46. By means of a spring 47 or otherwise the valve rod 43 and the valves 44 and 45 carried thereby are normally maintained in that position in which the valve 44 is seated and the valve 45 is unseated.

Circuits to the electro-magnets 36, 41 and 46 are controlled by a suitable switch lever located in a signal tower, or other position. The switch lever operates a shaft 48 to control the various switch and signal operating devices. To this end the shaft 48 carries a contact arm 49 adapted to bear against contacts 50, 51 and 52. A lead wire 53 from one terminal of a battery 54, or other source of electric energy, is connected to the contact arm 49. A lead wire 55 extends from the contact 50 to the electro-magnet 46 and a lead wire 61 extends from the electro-magnet 46 to a return line 57 and thence to the opposite terminal of the battery 54. A lead wire 58 connects the contact 51 to one terminal of the electro-magnet 36 while the other terminal of the electro-magnet 36 is connected by a lead wire 59 to the return line 57. In a like manner a lead wire 60 connects the contact 52 to one terminal of the electro-magnet 41 while the other terminal of this electro-magnet is connected by a lead 56 to the return line 57.

A pipe line 62 for conveying compressed air, or other motive fluid, leads from a suitable source of supply to a valve box 63 in which there is a slide valve 64. Leading from the valve box 63 there is a pipe 65 connecting with the cylinder of the lock valve 30 and leading to a chamber therein directly beneath the valve 34. Leading from the cylinder of the lock valve 30 there is a pipe 66 communicating with one end of a cylinder 67 in which there is a piston 68. The piston 68 is connected by a rod 69 to the slide valve 64 and these parts are normally

maintained in the position shown in Fig. 1 by means of a spring 70 operating against the cylinder 68, or otherwise.

A pipe 71 leads from the valve box 63 to a valve box 72 which has branches 73 and 74, the former leading to a chamber beneath the valve 44 in the cylinder of the reverse position valve 32 and the latter to a chamber beneath the valve 39 in the normal position valve 31. Extending from the cylinder of the normal position valve 31 there is a pipe 75 leading to one end of a cylinder 76 in which there is a piston 77. Similarly leading from the cylinder of the reverse position valve there is a pipe 78 making communication with a cylinder 79 in which there is a piston 80. A rod 81 connects the pistons 77 and 79 and also a slide valve 82 in the valve box 72. Leading from the valve box 72 there is a pipe 83 having branches 85 and 86, the former of which leads to one end of the cylinder 29 and the latter to one end of the valve box, which will be hereinafter described. Leading from the valve box 72 there is also a pipe 84 having branches 87 and 88. The branch pipe 87 leads to the opposite end of the cylinder 29 and the branch pipe 88 to a valve box, which will be hereinafter described.

The devices for operating a track switch and the apparatus for controlling the operation thereof as hereinbefore described are not new and in and by themselves form no part of my invention. In the operation of these devices, however, it will be understood that the compressed air or other motive fluid is supplied from a suitable source to the pipe 62 and that when the lock valve is closed the compressed air cannot be admitted to either one or the other of the positioning valves for controlling the switch rod operating mechanism. In the position of these parts as shown in Fig. 1 the switch has been thrown from its normal to its reverse position. In so moving the switch the switch lever shaft is turned in a counter-clockwise direction to first bring the contact arm 49 to bear on the contact 51 and then upon the contact 50. When the contact arm 49 bears against the contact 51 a circuit is closed through the line 58 to the electro-magnet 36 of the lock valve 30 whereby the rod 33 is depressed or moved downwardly, the valve 34 opened and the valve 35 closed. This condition maintains, of course, as long as the circuit through the electro-magnet 36 is closed. In this counter-clockwise movement of the lever arm 49 it is brought to bear on the contact 50 before it leaves the contact 51. When in contact with the contact 50 the circuit is also closed through the line 55 to the electro-magnet 46 of the reverse position valve 32 whereby the rod 43 is depressed and the valve 44 opened and the valve 45 closed. This condition maintains while the lever arm 49 is in contact with both the contacts 51 and 50. When the valve 34 is open the compressed air passes by way of the pipe 65 to the cylinder of the lock valve 30 and to and through the pipe 66 to move the piston 68 from left to right, as viewed in Fig. 1, against the action of the spring 70, thereby also moving the slide valve 64 from the full line position to the dotted line position, as shown in Fig. 1. When the slide valve 64 is in the dotted line position the port to the pipe 71 is uncovered and consequently the compressed air through the pipe 62 passes through the pipe 71 to the valve box 72 and thence through either of its branches 73 and 74 depending upon the position of the valves in the cylinders of the normal position and reverse position valves 31 and 32. Inasmuch as the valve 44 in the cylinder 32 has been opened, as hereinbefore described, compressed air passes by way of the pipe 73, to and through the reverse position valve 32, and thence through the pipe 78 to the cylinder 79, shifting the piston 80 from right to left and to the position shown in Fig. 1, thereby also shifting the slide valve 82 to uncover the port leading to the pipe 84 and to cover the port leading to the pipe 83. By this, as will be understood, compressed air passing through the pipe 71 also passes to the pipe 84 and thence through the pipe 87 to the cylinder 29 to move the piston 28 from left to right, as viewed in Fig. 1, and to substantially the position therein illustrated. This movement of the piston 28 correspondingly moves the actuating and locking plate 22 through the rod 27, and this movement of the plate 22 causes the switch rod 21 to be thrown and to thereby move the switch rails from their normal to their reverse positions. Obviously the reverse conditions maintain in throwing the switch from its reverse position to its normal position. In other words, when the switch lever is moved in the opposite or clockwise position the normal position valve 31 and the lock valve 30 are actuated by closing the circuits to their operating magnets and the compressed air or other motive fluid flows through the normal position valve 31 through the pipe 75 to the cylinder 76 thereby shifting the piston 77 from left to right, as viewed in Fig. 1, correspondingly moving the slide valve 82 to close the port to the pipe 84 and to open the port to the pipe 83 in order that the compressed air flowing through the pipe 71 may pass to the pipe 85, thence to the opposite end of the cylinder 29 to return the piston 28 to its normal position, thereby moving the plate 22 in like manner to shift the switch rod 21 to its initial position and thereby return the switch rails to their normal positions.

Together with the apparatus as hereinbefore described in practice there have been employed various devices for making the actuating mechanism inoperative when and after a train has entered the block in which the switch is situated. This type of apparatus operates satisfactorily when it is in perfect working order, but in directly locking or otherwise making the switch actuating devices inoperative no provision has heretofore been made, so far as I am aware, for shutting off the power to the actuating devices and applying the power to the operating devices when a train has entered the block in which the switch is located. Consequently it is quite possible for the switch to remain in an intermediate position or to actually be operated after a train has entered the switch block provided, of course, the operating mechanism has been released and the switch partially operated after the train has passed a signal which if obeyed would cause the driver to stop the train and not to run the same into the switch block. In either event, or in other similar and possible emergencies, a serious accident is likely to occur. Now the object of this invention is to prevent such accident and to employ with the type of apparatus hereinbefore described, or equivalent apparatus, means whereby when a train enters the switch block the actuating devices for moving the switch shift mechanism are made entirely inoperative by shutting off the power therefrom while the power is maintained to operate the switch shifting mechanism irrespective of the position it may be in when the train enters the switch block, whereby when the switch movement has been completed the shifting mechanism will be maintained in the shifted position, whereas if the shifting of the switch has not been then completed it will be completed in either one direction or the other and when completed will be so maintained while the train is in the switch block. Together with this auxiliary apparatus for so controlling the switch movement, I also employ indicating devices whereby an operator is informed of the condition of the apparatus when either the auxiliary apparatus or the switch throwing devices are not in proper or perfect working condition and fail to move to an intended position.

Therefore, in addition to the apparatus heretofore described I employ the mechanism as hereinafter described. Among these additional devices there is a safety lock valve indicated at 89. This safety lock valve is similar in construction in all respects to the lock valve and the normal and reverse position valves, as hereinbefore described. This safety lock valve 89, therefore, includes a cylindrical body in which there is a valve rod 90 mounted on which are valves 91 and 92. The valve rod 90 passes through an electro-magnet or solenoid 93 by which the same and the valves are operated. The valve rod 90 and its valve are normally maintained in an initial position by a spring 90′. Leading from the safety lock valve 89 there is a pipe 94. This pipe 94 communicates with a cylinder 95 in which there is a piston 96 normally maintained in a normal position by a spring 97 or otherwise. The piston 96 is connected by a rod 98 to a slide valve 99 in a valve box 100. A pipe 101 connects the slide valve 100 with a chamber immediately beneath the valve 91 in the safety lock valve 89. A pipe 102 fitted with a valve 103 extends from and is connected to a suitable source of compressed air or other motive fluid. This pipe 102, therefore, is the power supply pipe for the apparatus. The pipe 62, as hereinbefore described, in this structure leads from one end of the valve box 100 as clearly shown in the drawings. Leading from the other end of this valve box 100 there is a pipe 104. The slide valve 99 is adapted to cover and uncover the ports leading to the pipes 62 and 104. When in its normal position, as shown in Fig. 1, the slide valve 99 covers the port to the pipe 104 and uncovers the port leading to the pipe 62 whereby the compressed air may flow from the pipe 102 over the slide valve 99 to the pipe 62 to be employed in operating the parts as hereinbefore described. The opposite end of the pipe 104 communicates with one end of a valve box 105 in which there is a slide valve 106. Extending from the opposite end of the slide valve and through suitable stuffing boxes at the ends of the valve box there are rods 107 and 108. The rod 107 is connected to a valve actuating slide bar 109. This slide bar 109 is adapted to move in suitable guideways provided therefor and is fitted with spaced lugs 109′ and 110′. At the free end of the rod 108 there is a pin 110 adapted to fit within the bifurcated end 111 of a lever 112. The lever 112 is pivotally mounted at 113 and the opposite end thereof is adapted to bear against a series of circularly arranged contacts 114, 115 and 116, or to operate a similar electrical controller.

Associated with the slide bar 109 there is a trip plate 117. This trip plate 117 is connected to the plate 22 by a rod 118 or otherwise and the trip plate is also adapted to slide in suitable guideways which are not indicated in the drawing. The trip plate 117 operates a lever 119. The lever 119 is pivotally mounted at 120 approximately midway of its length and at one end is fitted with a roller 121 operating in a slot or opening 122 in the said trip plate 117. The opposite end of the trip lever 119 is pivotally connected, as indicated at 123, to

a bar 124. The opposite end of this bar 124 is journaled so as to slide in a rocker bearing 125 and extending between the rocker bearing 125 and the pivotal point 123 and surrounding the rod 124 there is a spring 126. The relationship between these parts is such that in the operation of the plate 22 the movement thereof is imparted to the trip plate 117. As will be obvious the initial movement of the trip plate 117 has no effect on the trip lever 119. When, however, the trip lever has moved a predetermined distance the trip plate is brought into contact with the roller 121 and the continued movement of the trip plate causes the lever 119 to swing, and after the trip lever has passed a vertical or dead center position the spring 126 is brought into play causing the lever to assume a quick or snap action, thereby forcing the pivotal point against either one of the lugs 109′ and 110′ to move the slide bar 109 with a corresponding motion and to thereby shift the slide valve 106.

Associated with the switch rod 21, or otherwise, I employ a circuit controller 127 fitted with spaced and circularly arranged contact plates 128, 129 and 130. This controller may be actuated by means of a suitable pinion operating in a rack connected with or moved by the switch rod or otherwise. A lead wire 131 in which there is an indicator lamp or other signal device 132 extends from one terminal of the battery 54 and is provided with a shunt wire 133 terminating in a contact point 134 and also with a shunt wire 135 terminating in a contact point 136. A lead wire 137 extends from the positive terminal of the battery 54 and is connected to the contact 20 on which the armature 18 of the relay 15 is adapted to bear. A lead wire 138 extends from the pivotal point 19 of the armature 18 to one terminal of the magnet 93. The other terminal of the magnet 93 is connected by a lead wire 139 to a contact point 140.

Another contact point 141 is connected by a lead wire 142 to the contact plate 116. A contact point 143 is connected by a lead line 144 to the contact plate 114. As diagrammatically illustrated in the drawing the contact points 134, 136, 140, 141 and 143 are adapted to bear against the contact plates 128, 129 and 130 on the circuit controller 127. A lead 145 connects the contact plate 115 with the return lead 57 connected to the opposite or negative terminal of the battery 54. A spring 146 may be employed, if necessary, to move the armature 18 into contact with the contact point 20 when the relay magnet 15 is deenergized which, as will be understood, occurs when a train enters the block in which the switch is located, the relay being short circuited by the trucks of the train one of which trucks is indicated diagrammatically at 147 in Fig. 2 of the drawing. Of course, it will be furthermore understood that this switch block of the track is suitably insulated, as indicated at 148, 149, 150, 151, 152 and 153 of the drawing.

It will be understood that in the normal operation of the switch by the mechanism as hereinbefore described, the safety lock valve 89 is inoperative and that the switch is operated in the usual manner by a switch lever located in a tower, or at any suitable station. In the event, however, of a train entering the block in which the switch is located the track relay 15 is immediately short circuited, becomes deenergized, thereby releasing the armature 18 and permitting the same through the action of the spring 146, as illustrated, or by gravity, or otherwise, to bear against the contact 20 to complete, that is, to close the circuit to the magnet 93 in order to energize the same and thereby actuate the valve rod 90 to unseat the valve 91 and to seat the valve 92. In so doing the compressed air or other motive fluid employed is permitted to pass through the supply pipe 102 to the cylinder of the safety lock valve 99 and through the pipe 94 to the cylinder 95 and to shift the piston 96 therein against the action of the spring 97 to thereby correspondingly shift the slide valve 99 to cover the port leading to the pipe 62 and to uncover the port leading to the pipe 104. By so shifting the slide valve 99, as will be understood, the compressed air is entirely shut off from the section 62 of the supply pipe and consequently the lock valve 30 and the normal and reverse position valves 31 and 32 are rendered inoperative as are also the parts immediately controlled thereby making it immaterial, as will be understood, what position the operating switch lever may be in when this action takes place. It will therefore make no difference whether the switch lever has completed a given movement or whether the switch lever has been moved sufficiently far to be unlocked and this movement uncompleted because in such an event, as hereinbefore stated, these normally actuated devices for controlling the switch throwing mechanism are made entirely inoperative. Moreover, this condition maintains as long as the train is in the block in which the switch is situated.

With the compressed air, or other motive fluid, admitted to the pipe 104 it passes to the valve box 105 and depending upon the position of the slide valve 106 the compressed air may pass by way of the pipe 88 to the pipe 87 to the left hand end of the cylinder 29 as shown in Fig. 1, or the compressed air may pass by way of the pipe 86 through the pipe 85 to the right hand end of the cylinder 29. With the parts in the

position as shown in Fig. 1 when the compressed air passes by way of the pipes 88 and 87 to the left hand end of the cylinder 29 it is thereby applied to the piston 28 therein to maintain the slide plate 22 and consequently the switch rod 21 and the switch in the reverse position into which the switch has been thrown by the normal operation of the apparatus. It will be understood, of course, that in so throwing the switch the trip plate 117 imparted a counterclockwise movement to the lever 119 and that when the switch had been shifted slightly more than half of its movement the lever 119 was moved sufficiently far to swing the pivotal point 123 between the same and the rod 124 past its dead center position, thereby bringing the spring 126 into action, causing the same to complete the movement of the lever 119 and the rod 124 thereby moving the slide bar 109 with a quick snap action and correspondingly moving the slide valve 106 to the position shown in Fig. 1 in which the port to the pipe 88 is uncovered and the port to the pipe 86 is covered. In so moving the slide bar 109 and the slide valve 106 the rod 108 also shifts the contact lever 112 to a position in which it bears against both the contacts 115 and 116. Normally the reverse conditions maintain in throwing the switch from its reverse to its normal position, in which position the various parts of the actuating mechanism are caused to assume the position as shown in Fig. 2 of the drawing.

By the use of this apparatus, as will be understood, not only is the power shut off from the apparatus for normally actuating the switch operating mechanism and applied directly thereto when a train enters the block in which the switch is situated, but the power is then so applied as to make it impossible for the switch to assume an intermediate position, that is, the switch must then move to either its normal or its reverse position. For example, should a train enter the block before the switch movement has been completed and the switch has not completed one half of its throw the slide bar 109 and the slide valve 106 will not have been actuated and the compressed air or other power will be utilized to return the switch to the position from which it started to move, whereas if the switch has completed one half or more of its throw the slide bar 109 and the slide valve 106 will have been actuated and the power applied to complete the intended movement of the switch. In either event, as hereinbefore stated, the power so applied maintains, or moves and maintains, the switch to either its normal or its reverse position as long as the train is in the block in which the switch is situated and the track relay 15 is short circuited. When the train moves out of the block the relay 15 is again energized, attracting its armature 18, thereby breaking the circuit to the magnet 93, and permitting the valve 91 to close, thereby shutting off the supply of compressed air or other motive fluid and permitting the spring 97 to return the piston 96 and the slide bar 99 to their normal or initial positions. This, of course, makes possible the reentrance of the compressed air to the pipe 62 thereby making the normal control devices operative.

The circuit through the magnet 93 includes a lead wire 137 extending from the battery 54 to the contact 20, the armature 18, the lead wire 138 extending to one terminal of the magnet 93, the lead wire 139 extending from the other terminal of the magnet to the contact point 140, the contact 129, the contact point 141, the lead wire 142 to the contact plate 116, the contact lever 112, the contact plate 115, the lead wire 145 to the return line 57 and thence to the negative terminal of the battery.

It will now be furthermore understood that in the event of the switch failing to reach a position either normal or reverse, or the failure of the slide bar 109 and the slide valve 106 to operate properly, a circuit will be closed to an indicator lamp 132, or a plurality of the same, suitably situated to indicate such a condition to the operator at the same time causing the magnet 93 to be inoperative. For example, with the parts of the apparatus in their proper places as shown in Fig. 1, the circuit to the magnet 93 will be closed, as hereinbefore described, by the armature 18 when the relay 15 becomes deenergized and the circuit to the indicator lamp 132 will be open at either the contact points on the circuit controller 127 or at the contact points 114, 115 and 116. With the parts as shown in Fig. 1 this circuit is open between the contact points 134 and 141 and while closed between the contact points 136 and 143 it is open between the contact points 114 and 115. Similar conditions maintain with the parts of the apparatus as shown in the positions illustrated in Fig. 2. If, however, the slide bar 109 and the slide valve 106 should fail to operate properly in throwing the switch from normal to reverse positions the circuit to the magnet 93 would be opened between the contacts 115 and 116 while the indicator circuit would be closed through the contact points 114 and 115 and the lever 112 and the contact points 136 and 143 thereby lighting the indicator lamp to show this or a similar condition. In like manner should the slide bar 109 and slide valve 106 be properly actuated and the switch rod 21 not be moved sufficiently far to close the switch either in its normal or its reverse position the indicator circuit would be closed through the contact points 141 and 134 and the contact points 115 and 116 and the con-

tact lever 112. Consequently when the auxiliary devices for applying the power are the switch itself is not in either its normal or its reverse position these conditions are indicated by the lighting of the lamp 132. The segments 128 and 139 on the circuit controller 127 are arranged so that the contact points 141 and 143 only break the contact at the completion of the respective switch movements.

It will be understood that while the apparatus to which the present invention more particularly relates has herein been shown and described in conjunction with devices for normally controlling and operating a switch mechanism from a service tower or other place, the apparatus whereby the power employed is cut off from the devices for normally operating the switch mechanism may be employed without these devices for normally operating the switch mechanism and arranged to be controlled automatically by the entrance of a train to the block in which the switch is situated and also while as herein shown and described I have illustrated the invention as applied to an electro-pneumatically operated apparatus as hereinbefore stated it may be applied to apparatus which is operated mechanically, or electrically, or in any other manner by substituting the necessary equivalent controlling devices without departing from the nature and spirit thereof.

I claim as my invention:

1. In a power operated switch system, a track switch, devices for operating the track switch, means for normally controlling the application of power to the devices for operating the track switch, and means operative upon a train entering the block in which the track switch is situated for cutting off the power to the said devices for normally controlling its application to the said devices for operating the track switch and applying the power directly to the said devices for operating the track switch to maintain the same in a closed position until the train leaves the block in which the track switch is situated.

2. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the said devices for operating the track switch, a safety lock device operative when a train enters the block in which the track switch is situated to shut off the power to the said devices for normally controlling the application thereof to devices for normally operating the track switch, and means associated with the safety lock device for then directly applying the power to the devices for operating the track switch to maintain the same in a closed position until the train leaves the block in which the track switch is situated.

3. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the said devices for operating the track switch, a safety lock device operative when a train enters the block in which the track switch is situated to shut off the power to the said devices for normally controlling the application thereof to the devices for operating the track switch, and means operated by the devices for operating the track switch for then applying the power to the track switch operating devices in such a manner as to maintain the track switch in a closed position until the train leaves the block in which the track switch is situated.

4. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the said devices for operating the track switch, a safety lock device, means for actuating the safety lock device when a train enters the block in which the track switch is situated, and means whereby the power is then applied to the devices for operating the track switch to move the same, if then unclosed, to its normal or reverse position and so maintain it until the train leaves the block in which the track switch is situated.

5. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the said devices for operating the track switch, a safety lock device, means for actuating the safety lock device when a train enters the block in which the track switch is situated, and means operated by the devices for operating the track switch for then so applying power to the said track switch operating devices to return the track switch to a position from which it may have been moved in the event of the movement being less than half completed, and for completing the movement of the track switch if its movement has been more than half completed, and then maintaining the track switch in either its normal or its reverse position as long as the train is in the block in which the track switch is situated.

6. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the devices for operating the track switch, means operative when a train enters the block in which the track switch is situated for cutting off the power to the said devices for normally controlling the application thereof to the devices for operating the track switch, means then operative for directing the power to the devices for operating the track switch, and

means then operative to indicate an improper position of the aforesaid means.

7. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the devices for operating the track switch, a safety lock, means operative when a train enters the block in which the track switch is situated for operating the safety lock to shut off the power to the devices for normally controlling the application thereof to the devices for operating the track switch, means for then applying the power directly to the devices for operating the track switch and to maintain the same in a closed position while the train is in the block in which the track switch is situated, and means operative when the train is in the block in which the track switch is situated for indicating that the track switch has not moved to a closed position.

8. In a power operated switch system, a track switch devices for operating the track switch, devices for normally controlling the application of power to the devices for operating the track switch, a safety lock device, means operative for actuating the safety lock device when a train enters the block in which the track switch is situated for shutting off the power to the devices for normally controlling the application thereof to the track switch operating devices, means operative by the track switch operating devices for then directing the application of power to the said track switch operating devices, and means operative to indicate an improper position of the last aforesaid means and also an improper position of the devices for operating the track switch and to prevent the operation of the safety lock devices when an improper position of the devices for normally controlling the application of power to the switch operating devices would cause a false movement of the switch operating devices.

9. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the track switch operating devices, a safety lock, means operative when a train enters the block in which the track switch is situated for actuating the safety lock to shut off the power to the devices for normally controlling the application thereof to the switch operative devices and directing the power to the said track switch operating devices, means operated by the track switch operative devices for so directing the application of the power as to maintain the track switch in a locked position while the train is in the block in which the track switch is situated, and means for indicating the relative positions of the aforesaid means and that of the said track switch.

10. In a power operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the said track switch operating devices, a safety lock device, normally inoperative means for applying power directly to the said track switch operating devices, means operative when a train enters the block in which the said track switch is situated for actuating the safety lock device to shut off the power from the devices for normally controlling the application thereof to the track switch operating devices and applying the power to the said normally inoperative power directing means, and means operative by the track switch operating devices for then directing the application of the power to the said track switch operating devices.

11. In an electro-pneumatically operated switch system, a track switch, devices for operating the track switch, electro-pneumatically controlled devices for applying power to the track switch operating devices, an electro-pneumatically controlled safety lock, a power directing valve, means operative when a train enters the block in which the track switch is situated for closing a circuit to the said safety lock to actuate the same to shut off the power to the devices for normally controlling the application thereof to the switch operating devices, and means actuated by the switch operating devices for actuating the said power directing valve to determine the manner of then applying the power to maintain the said track switch in a closed position while the train is in the block in which the track switch is situated.

12. In an electro-pneumatically operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the track switch operating devices, a safety lock, a safety valve associated therewith, a power directing valve, means operative when a train enters the block in which the track switch is situated for actuating the safety lock to shift the safety valve and thereby shut off the power to the devices for normally controlling the operation of the track switch operating devices and directing the power to the said power directing valve, and means actuated by the track switch operating devices for shifting the said power directing valve to determine the application of power to the said track switch operating devices to maintain the track switch in a closed and safe position while the train is in the block in which the track switch is situated.

13. In an electro-pneumatically operated switch system, a track switch, devices for operating the track switch, devices for nor-

mally controlling the application of power to the track switch operating devices, a safety lock valve, a power directing valve, a safety valve by which power is normally directed to the devices for normally controlling its application to the track switch operating devices and shutting off the power from the said power directing valve, means operative when a train enters the block in which the track switch is situated for actuating the safety lock valve and thereby shifting the safety valve to shut off the power to the devices for normally controlling the application thereof to the track switch operating devices and admitting the power to the said power directing valve, and means actuated by the track switch operating devices for shifting the said power directing valve to determine the manner in which the power is then applied to the said track switch operating devices to maintain the track switch in a locked position while the train is in the block in which the track switch is situated.

14. In an electro-pneumatically operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the track switch operating devices, a safety lock valve, a power directing valve, a safety valve by which power is normally directed to the devices for normally controlling its application to the track switch operating devices and shutting off the power from the said power directing valve, means operative when a train enters the block in which the track switch is situated for actuating the safety lock valve and thereby shifting the safety valve to shut off the power to the devices for normally controlling the application thereof to the track switch operating devices and admitting the power to the said power directing valve, a slide bar connected to the said power directing valve, and means actuated by the said devices for operating the track switch for shifting the said slide bar and power directing valve with a quick snap action immediately after the track switch has been moved more than one half its throw in either direction.

15. In an electro-pneumatically operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the track switch operating devices, a safety lock valve, a power directing valve, a safety valve by which power is normally directed to the devices for normally controlling its application to the track switch operating devices and shutting off the power from the said power directing valve, means operative when a train enters the block in which the track switch is situated for actuating the safety lock valve and thereby shifting the safety valve to shut off the power to the devices for normally controlling the application thereof to the track switch operating devices and admitting the power to the said power directing valve, a slide bar connected to the said power directing valve, a lever, a bar pivotally connected to the lever, a spring associated with the said bar causing the same to engage lugs on the said slide bar, and means actuated by the devices for operating the track switch for throwing the said lever when the track switch has been shifted a predetermined portion of its throw to then operate the said slide bar and power directing valve with a quick snap movement.

16. In an electro-pneumatically operated switch system, a track switch, devices for operating the track switch, devices for normally controlling the application of power to the track switch operating devices, a safety lock valve, a power directing valve, a safety valve by which power is normally directed to the devices for normally controlling its application to the track switch operating devices and shutting off the power from the said power directing valve, means operative when a train enters the block in which the track switch is situated for actuating the safety lock valve and thereby shifting the safety valve to shut off the power to the devices for normally controlling the application thereof to the track switch operating devices and admitting the power to the said power directing valve, a slide bar connected to the said power directing valve, a lever, a bar pivotally connected to the lever, a spring associated with the said bar causing the same to engage lugs on the said slide bar, and a trip plate associated with and moved by the devices for operating the track switch for operating the said lever immediately after the track switch has completed one half of its throw in either direction to then cause the lever and bar through the action of the spring to actuate the slide bar to operate the power directing valve with a quick snap movement.

Signed by me this 12th day of April, 1929.

JOHN J. MEADOWS.