Sept. 6, 1932. J. P. COLEMAN 1,875,853

RAILWAY TRAFFIC CONTROLLING APPARATUS

Original Filed April 25, 1930 4 Sheets-Sheet 1

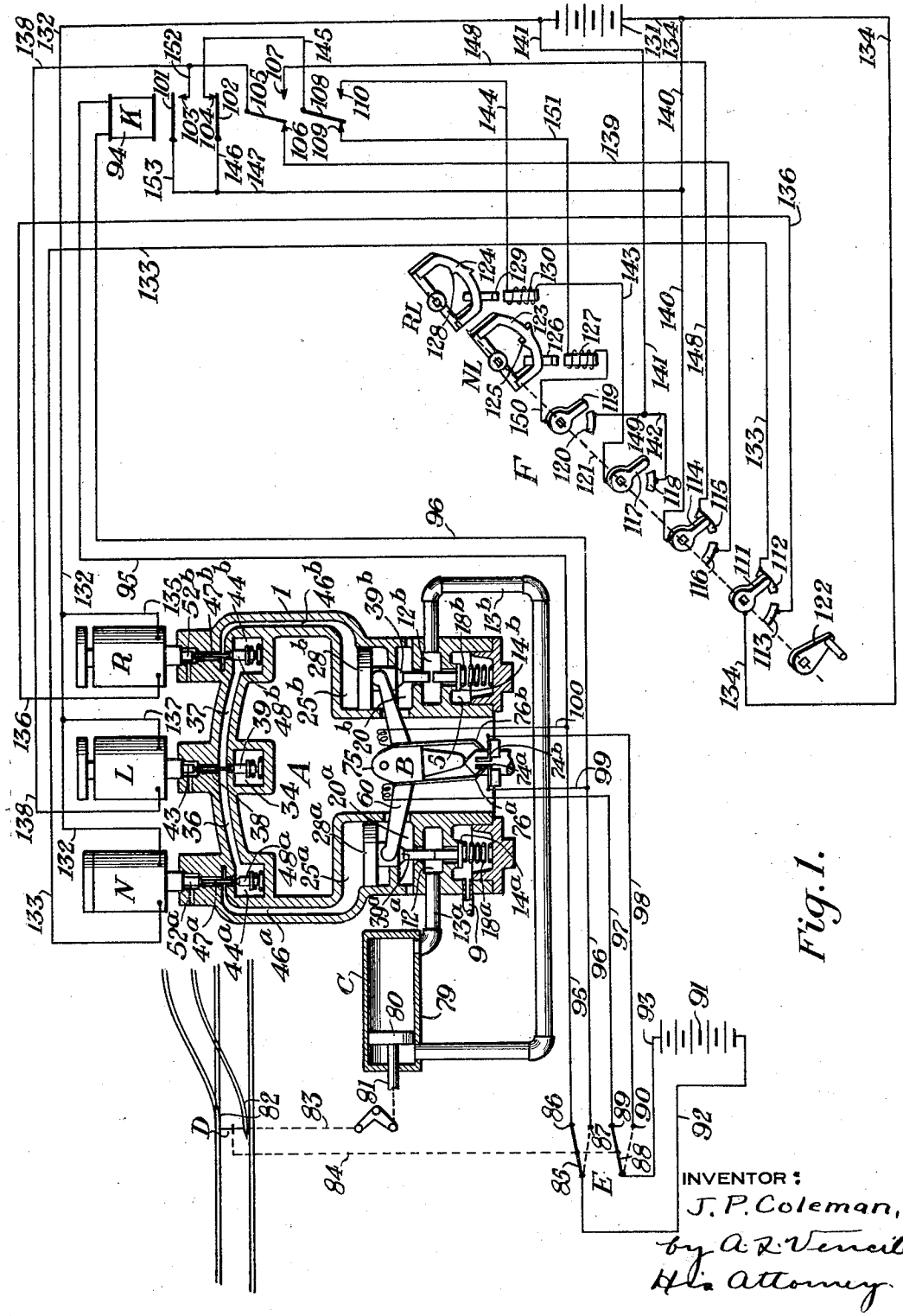

Fig. 1.

INVENTOR:
J. P. Coleman,
by A. R. Vencill
His attorney

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RAILWAY TRAFFIC CONTROLLING APPARATUS

Original Filed April 25, 1930 4 Sheets-Sheet 2

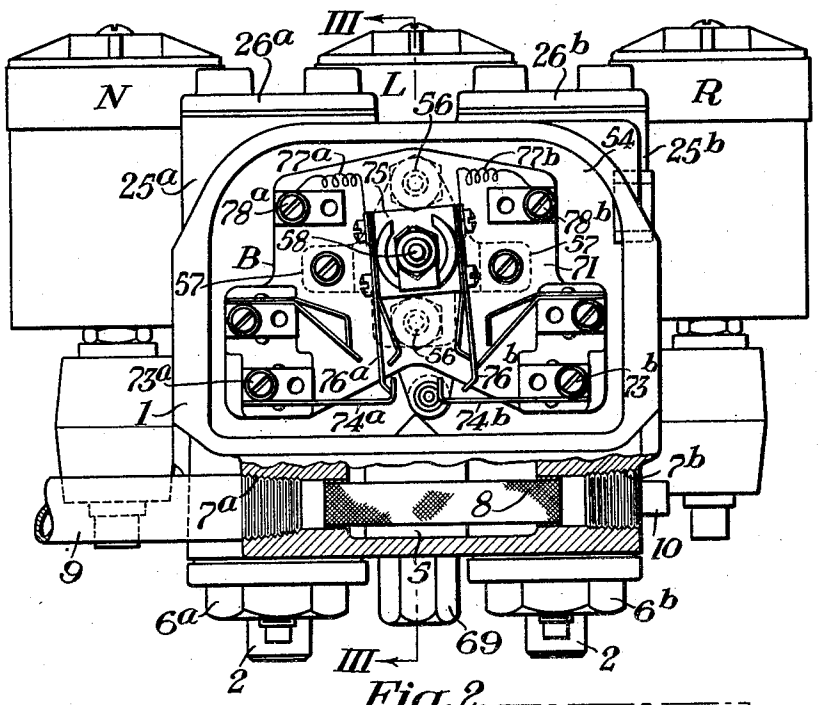

Fig. 2.

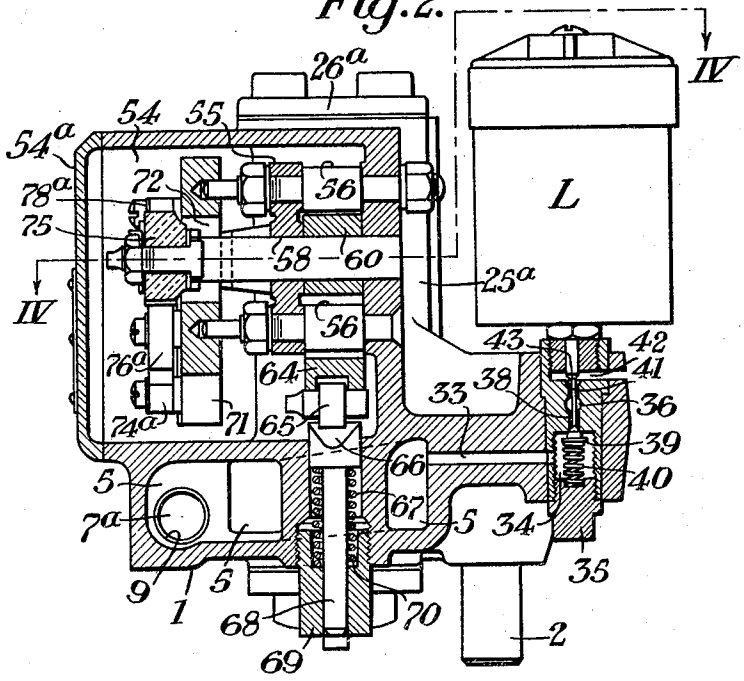

Fig. 3.

INVENTOR;
J. P. Coleman,
by A. L. Vencill
His attorney

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RAILWAY TRAFFIC CONTROLLING APPARATUS

Original Filed April 25, 1930 4 Sheets-Sheet 3

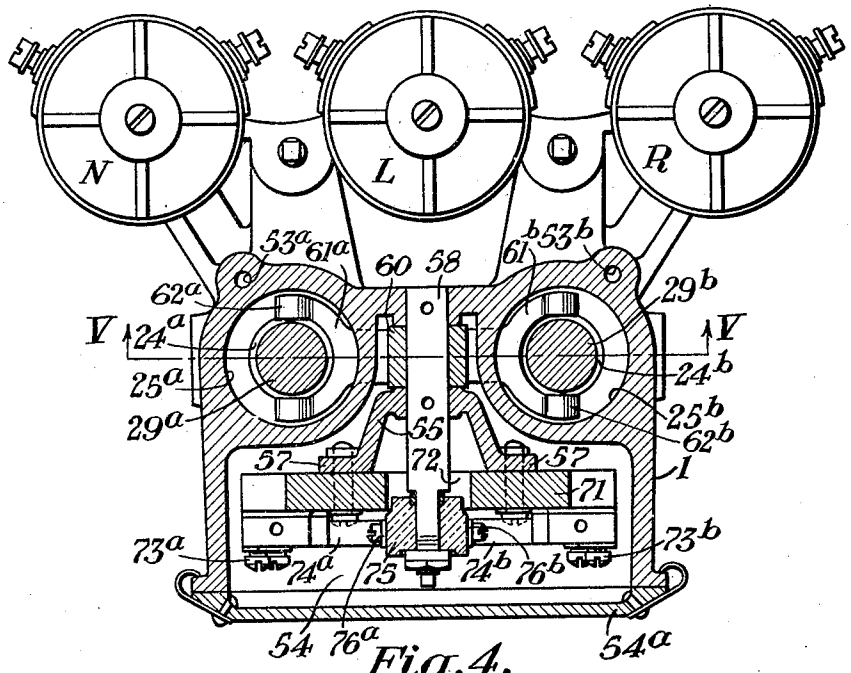

Fig. 4.

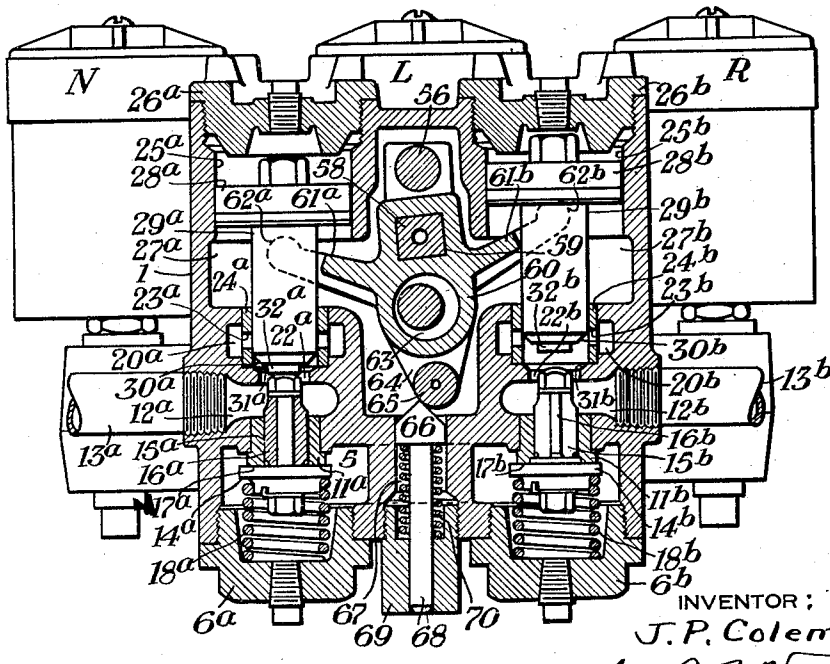

Fig. 5.

INVENTOR;
J. P. Coleman,
by A. L. Vencill
His Attorney

Sept. 6, 1932. J. P. COLEMAN 1,875,853

RAILWAY TRAFFIC CONTROLLING APPARATUS

Original Filed April 25, 1930 4 Sheets-Sheet 4

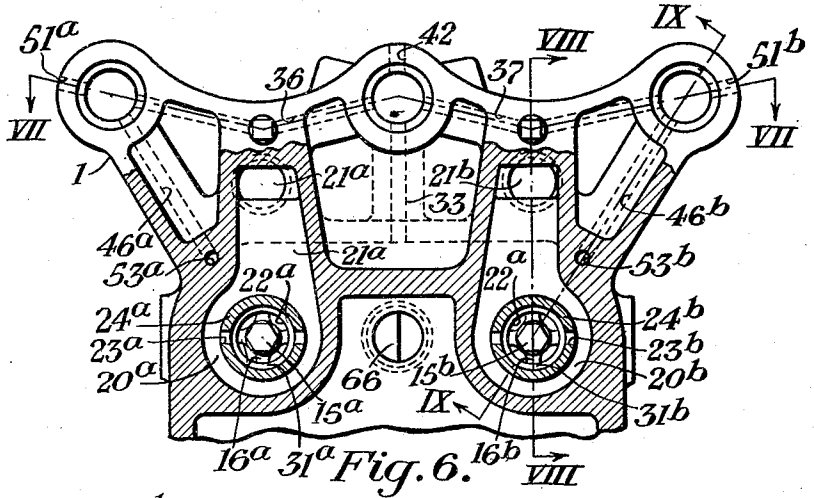

Fig. 6.

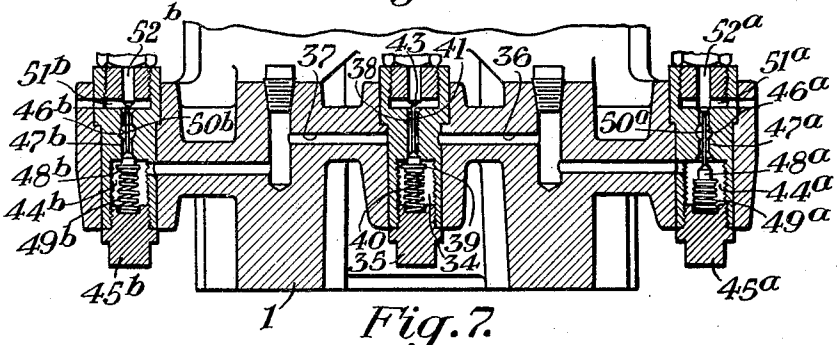

Fig. 7.

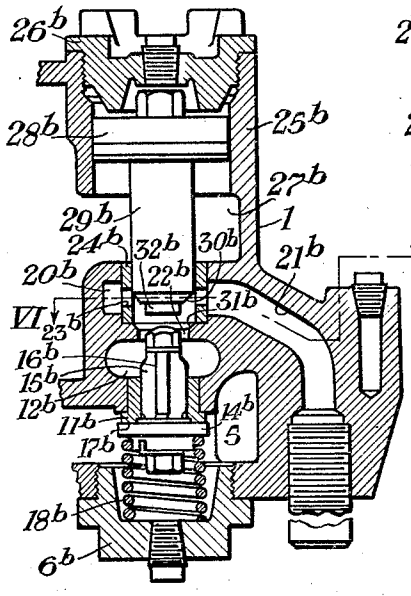

Fig. 8.

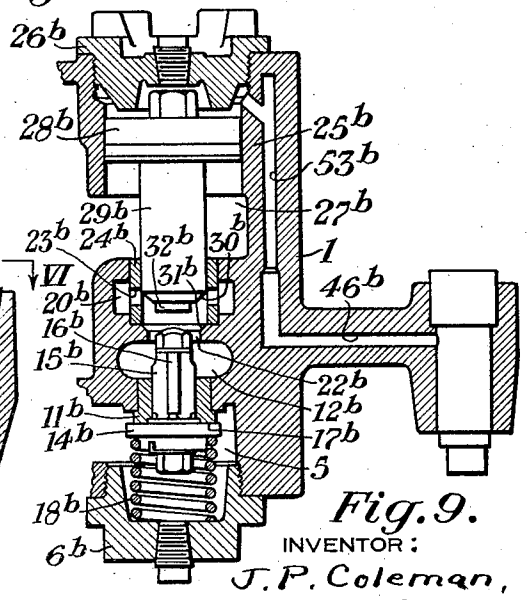

Fig. 9.

INVENTOR:
J. P. Coleman,
by A. L. Vincell
His Attorney

Patented Sept. 6, 1932 1,875,853

UNITED STATES PATENT OFFICE

JOHN P. COLEMAN, OF EDGEWOOD, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

RAILWAY TRAFFIC CONTROLLING APPARATUS

Application filed April 25, 1930, Serial No. 447,155. Renewed February 16, 1932.

My invention relates to railway traffic controlling apparatus and has particular relation to apparatus of the type in which a railway switch is moved between normal and reverse positions by a manually operable lever through the medium of a valve controlled fluid pressure motor.

One of the features of my invention is the provision, in apparatus of the type described, of means for limiting the movement of the lever unless both the valve and the switch occupy predetermined positions relative to each other.

Another feature of my invention is the provision of a contact device operated by the valve mechanism for controlling the energization of an indication relay jointly with the switch operated circuit controller, thereby eliminating the necessity of the "quick switch" usually employed for controlling the operation of the lever mechanism.

I will describe one form of railway traffic controlling apparatus embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a diagrammatic view, illustrating one form of railway traffic controlling apparatus embodying my invention. Fig. 2 is a front elevational view with part broken away of the valve mechanism and contact device shown in Fig. 1. Fig. 3 is a vertical sectional view taken on line III—III of Fig. 2. Fig. 4 is a horizontal sectional view taken on line IV—IV of Fig. 3. Fig. 5 is a vertical sectional view taken on line V—V of Fig. 4. Fig. 6 is a horizontal sectional view taken on line VI—VI of Fig. 8. Fig. 7 is a fragmentary vertical sectional view taken on line VII—VII of Fig. 6. Fig. 8 is a vertical sectional view taken on line VIII—VIII of Fig. 6. Fig. 9 is a vertical sectional view taken on line IX—IX of Fig. 6.

Similar reference characters indicate similar parts in each of the several views.

Referring first to Fig. 1, my invention is diagrammatically shown as embodied in railway traffic controlling apparatus which, briefly, comprises a valve mechanism A; a contact device B directly associated with and operated by the valve mechanism for controlling the position of the valve according to the position of other elements of the apparatus; a fluid pressure motor C controlled by the valve mechanism; a track switch D, movable between normal and reverse positions by the fluid pressure motor; a pole-changing device E, actuated by the movement of the switch; and a lever mechanism F for controlling the operation of the valve mechanism. The construction and operation of the above mentioned instrumentalities, together with the manner in which they cooperate to obtain the end in view, will now be described in the order indicated.

The valve mechanism A (Fig. 2) comprises a main casting 1 which is formed with a plurality of feet or pedestals 2 for connection with a suitable support (not shown). The casting 1 is formed with a constant pressure chamber 5 (Fig. 5) in the lower portion thereof into which access may be obtained through spaced openings in the bottom of the casting which openings are normally closed by screw caps or plugs 6^a—6^b. A pair of axially arranged screw threaded openings 7^a—7^b (Fig. 2) communicate with the chamber 5 through a tubular air screen 8 connecting these openings within the chamber, and a pipe 9 may be connected with either of these openings in order to establish communication between the chamber 5 and a source of constant air pressure according to the position of the device relative to the track. The opening not so employed is closed by means of a screw plug 10. The chamber 5 communicates through sleeves 11^a—11^b (Fig. 5) with a pair of spaced outlet chambers 12^a—12^b which are formed in the casting 1 directly above the chamber 5 and which communicate, through pipes 13^a—13^b, with the switch operating device C, presently to be described. The passage of air through the sleeves 11^a—11^b is controlled by means of valve members 14^a—14^b which are secured to the lower extremities of valve stems 15^a—15^b. These valve stems are slidably mounted in the sleeves 11^a—11^b and are provided with a plurality of longitudinally extending spaced ribs or guides 16^a—16^b between which air

passes from the chamber 5 into the outlet chambers 12^a—12^b when the valve members 14^a—14^b occupy their lower, or open, positions. The valves 14^a—14^b are urged toward closed positions in which they engage valve seats 17^a—17^b formed on the lower ends of the sleeves 11^a—11^b, by means of coiled springs 18^a—18^b interposed between the valves and the caps 6^a—6^b. A pair of spaced exhaust chambers 20^a—20^b are formed in the casting 1 above the outlet chambers 12^a—12^b and communicate with the outer atmosphere through passageways 21^a—21^b (Figs. 6 and 8), ports 23^a—23^b provided in sleeves 24^a—24^b which extend through the exhaust chambers 20^a—20^b in axial alignment with the valve stems 15^a—15^b, and with the outlet chambers 12^a—12^b through openings 22^a—22^b formed in the casting. The valves 14^a—14^b are alternately opened against the action of the springs 18^a—18^b in order to admit air under pressure into one side or the other of the switch operating device C by means of the following described mechanism.

A pair of laterally spaced fluid pressure cylinders 25^a—25^b are formed in the upper portion of the casting 1 in axial alignment with the valves 14^a—14^b. These cylinders are closed at their upper ends by cylinder heads 26^a—26^b but open at their lower ends into lever chambers 27^a—27^b, as best shown in Fig. 5. Pistons 28^a—28^b are mounted for vertical reciprocation within the cylinders 25^a—25^b and carry depending plungers or valve stems 29^a—29^b which extend downwardly through the lever chambers 27^a—27^b, and are slidably mounted adjacent their lower ends in the sleeves 24^a—24^b.

The lower extremities of the valve stems 29^a—29^b are beveled to form valve elements 30^a—30^b for engagement with valve seats 31^a—31^b which surround the openings 22^a—22^b. The valve stems 29^a—29^b are also formed at the lower ends with reduced portions 32^a—32^b which are adapted to project through the openings 22^a—22^b in spaced relation with the walls thereof for engagement with the upper ends of the valve stems 15^a—15^b. It will be noted by referring to Fig. 5 of the drawings that when the valves 14^a—14^b occupy closed positions and the pistons 28^a—28^b are elevated, communication between the constant pressure chamber 5 and the outlet chambers 12^a—12^b is interrupted and communication is established between the outlet chambers and the outer atmosphere through the openings 22^a—22^b, ports 23^a—23^b in the sleeves 24^a—24^b, and the passageways 21^a—21^b. Conversely, when the valves 14^a—14^b are opened against the action of their springs 18^a—18^b by the downward movement of the plungers 29^a—29^b under the influence of fluid pressure admitted to the cylinders 25^a—25^b above the pistons 28^a—28^b, communication is established between the constant pressure chamber 5 and the pipes 13^a—13^b leading to the switch operating motor, between the ribs 16^a—16^b of the valve stems 15^a—15^b and the outlet chambers 12^a—12^b. Also, the engagement of the valve elements 30^a—30^b on the plungers 29^a—29^b with the valve seats 31^a—31^b interrupts communication between the chambers 12^a—12^b and exhaust chambers 20^a—20^b.

The pistons 28^a—28^b are urged downwardly by fluid pressure admitted above the pistons from the constant pressure chamber 5 in the following manner. A rearwardly extending passageway 33 (Figs. 3 and 6) establishes communication between the constant pressure chamber 5 and a valve chamber 34 provided in the rear portion of the casting 1 and to the interior of which access may be obtained by a removable plug 35 closing its lower end (see also Fig. 7). This chamber communicates with transversely extending passageways 36 and 37 (Figs. 6 and 7) through a vertically extending passageway 38, the lower end of which may be closed, by means of a valve member 39 to prevent the flow of air upwardly therethrough. This valve is urged upwardly to a position in which it seats within the lower end of the passageway 38 by a coil spring 40 disposed in the chamber 34 between the lower end of the valve and the plug 35, valve member 39 being carried by stem 41 which extends upwardly through the passageway 38 and is operatively connected, at its upper end, with the armature of an electromagnet L, hereinafter termed the lock magnet (Fig. 3). The lock magnet L is suitably mounted on the casting 1 and is controlled to open and close the valve 39, by an electric circuit presently to be described. The upper end of the passageway 38 communicates with an exhaust port 42 (Fig. 3) leading to the outer atmosphere and through which the escape of air is controlled by a valve member 43 carried by the stem 41 for seating engagement with the upper end of the passageway 38. When the valve 39 is elevated by the spring 40 in order to interrupt communication between the chamber 34 and the passageways 36 and 37 upon the deenergization of the locking magnet L, the valve 43 is opened thus venting passageways 36 and 37 to atmosphere through the exhaust port 42.

The passageways 36 and 37, in turn, communicate with valve chambers 44^a—44^b (Fig. 7) which are also provided in the rear portion of the casting 1 on each side of the chamber 34 and to which access may also be obtained through openings in their lower portions closed by removable screw plugs 45^a—45^b. These chambers communicate with forwardly extending passageways 46^a—46^b (Fig. 6) through vertically extending passageways 47^a—47^b which may also be closed to prevent the flow of air under pressure from the passageways 36—37 to the passageways

46ª—46ᵇ, by means of valve members 48ª—48ᵇ. These valve members are urged upwardly towards seating engagement with the lower ends of the passageways 47ª—47ᵇ, by coil springs 49ª—49ᵇ disposed within the chambers 44ª—44ᵇ, between the lower ends of the valve members and the plugs 45ª—45ᵇ, and are carried by valve stems 50ª—50ᵇ. The valve stems 50ª—50ᵇ extend upwardly through the passageways 47ª—47ᵇ and are operatively connected at their upper ends with the armatures of electromagnets N and R, hereinafter termed the "normal" and "reverse" magnets, respectively. These magnets are also suitably mounted on the casting 1 on each side of the lock magnet L and are energized and deenergized in properly timed relation with respect to each other and to the lock magnet L, through electric circuits hereinafter to be described.

The upper ends of the passageways 47ª—47ᵇ also communicate with exhaust ports 51ª—51ᵇ leading to the outer atmosphere and through which the escape of air is controlled by valve members 52ª—52ᵇ carried by the valve stems 50ª—50ᵇ for seating engagement with the upper ends of the passageways 47ª—47ᵇ. As in the case of the valve 43, when the valve stems 50ª—50ᵇ are elevated by the springs 49ª—49ᵇ in order to interrupt communication between the chambers 44ª—44ᵇ and the passageways 46ª—46ᵇ upon the deenergization of the normal and reverse magnets N and R, the valves 52ª—52ᵇ are opened, thus venting passageways 46ª—46ᵇ to the atmosphere through the exhaust ports 51ª—51ᵇ. The passageways 46ª—46ᵇ in turn communicate at their forward ends with vertically extending passageways 53ª—53ᵇ (Figs. 6 and 9) which respectively communicate at their upper extremities with the interior of the cylinders 25ª—25ᵇ at a point above the pistons 28ª—28ᵇ mounted therein.

Under normal operating conditions, for reasons which will appear hereinafter, it is not possible to energize the normal and reverse magnets N and R simultaneously and thereby to open valves 14ª—14ᵇ and admit fluid pressure to opposite sides of the switch actuating device at the same time. However, I provide against the possibility of such an abnormal condition in the following manner:

The casting 1 is also formed with a chamber 54 (Figs. 2, 3 and 4) which houses the contact device B presently to be described and to which access may be had through a removable cover 54ª. This chamber opens at each side into the lever chambers 27ª—27ᵇ beneath the cylinders 25ª—25ᵇ. A bracket 55 is mounted on the rear wall of this chamber and in spaced relation thereto by means of upper and lower spacing bolts 56, and is formed with a pair of laterally extending arms 57. A forwardly extending shaft 58 having a squared portion 59 (Fig. 5) is rotatably mounted in the rear wall of the chamber 54 and in the bracket 55 and carries a walking beam 60 which is fixed to the squared portion 59 thereof intermediate the rear wall and the bracket 55. This beam is provided with a pair of oppositely extending bifurcated arms 61ª—61ᵇ which extend into the lever chambers 27ª—27ᵇ and which are formed with rounded extremities 62ª—62ᵇ for sliding contact with the lower sides of the pistons 28ª—28ᵇ on each side of the plungers 29ª—29ᵇ. The walking beam 60 is formed with a centrally disposed opening 63 through which the lower spacing bolt 56 extends and which, although being of a size sufficient to permit of the necessary degree of angular movement of the beam under normal operating conditions, prevents abnormal swinging movement thereof in assembling the device or in the replacement of parts. The beam 60 is also formed with a centrally disposed downwardly extending bifurcated arm 64 in which a roller 65 is mounted for engagement with a detent 66. This detent is mounted for vertical sliding movement in a bore 67 in the casting 1 and is provided with a stem 68 which is slidably mounted in a removable bearing 69 threaded into the lower end of the bore 67. The detent 66 is urged upwardly into yielding engagement with the roller 65 by a coil spring 70 which surrounds the stem 68 between the detent 66 and the bearing 69.

From the foregoing, it will be obvious that by means of this construction, when either of the pistons 28ª—28ᵇ is depressed, the walking beam 60 will be rocked about its axis and will lift the other piston if it does not already occupy its upper position. Also, it will be noted that if fluid pressure is applied above both pistons simultaneously from the chamber 5 the pistons, being of equal area, will be in a state of equilibrium by virtue of their connection through beam 60, and consequently will not move or disturb the position of the valves 14ª—14ᵇ actuated thereby. Moreover, the detent 66 will prevent any undesired shifting in the position of the pistons and the parts actuated thereby when there is no pressure in the cylinders 25ª—25ᵇ and will effectively maintain them in the positions to which they were moved when the device was last operated.

The valve mechanism above described also incorporates in its construction a contact device B for controlling the operation of the indication relay K jointly with the switch operated pole-changing device E, both of which will hereafter be described. This contact device comprises a block 71 of insulating material (Figs. 2, 3 and 4) which is mounted on the arms 57 of the bracket 55 and which is formed with a central opening 72 through which the forward end of the shaft 58 pro-

jects. This block carries a pair of binding posts 73^a—73^b to which contact members 74^a—74^b are respectively secured. A block 75 of insulating material is fixed to the extreme forward end of the shaft 58 and carries a pair of contact fingers 76^a—76^b for engagement with the contact members 74^a—74^b (Fig. 2). The fingers 76^a—76^b are electrically connected by means of flexible wires 77^a—77^b with the binding posts 78^a—78^b which are also mounted on the block 71. When the piston 28^a is depressed to open the valve 14^a, the walking beam 60 is rocked in a counter-clockwise direction, as viewed in Fig. 5, thereby swinging the arm 64 to the right. This movement of the arm 64 carries the finger 76^a into engagement with the contact 74^a and breaks the circuit through the finger 76^b and contact 74^b. Upon movement of the walking beam in an opposite direction the finger 76^a moves out of engagement with its contact 74^a, thereby breaking the circuit therethrough, and the finger 76^b is carried into engagement with its associated contact 74^b. When the contact device is actuated as above described, the detent 66 effectively maintains the contact fingers 76^a—76^b in the position to which they were last moved until the valve mechanism is again operated.

The contact device above described is connected in the circuit including the pole-changing device E and the polarized indication relay K and acts jointly with the pole-changing device E in opening and closing the circuit to energize and deenergize the indication relay in the event that the position of the valve mechanism A does not correspond to that of the lever mechanism, track switch, and circuit controller or any one of these elements as will be presently described.

The pipes 13^a—13^b lead to the fluid pressure device C, herein shown as comprising a fluid pressure cylinder 79 provided with a piston 80 and piston rod 81 which is connected in a manner well known in the art with the movable rails 82 of the track switch D, as is diagrammatically illustrated by the dotted line 83 in Fig. 1.

With particular reference to Fig. 1, it will be noted that the pipe 13^a which communicates at one end with the chamber 12^a and to which the supply of fluid pressure is controlled by the normal magnet N, communicates at its other end with the cylinder 79 at the right of the piston 80, so that when fluid pressure is admitted to the cylinder through this pipe, the switch D will be moved to its normal position. Also, it will be noted that the pipe 13^b which communicates at one end with the chamber 12^b to which the supply of fluid pressure is controlled by the reverse magnet R, communicates at its other end with the cylinder 79 at the left of the piston 80, so that when fluid pressure is admitted to the cylinder through this pipe, the switch D will be moved to its reverse position.

The switch D is operatively connected, as diagrammatically indicated by the dotted line 84 in Fig. 1, with the pole-changing device E, which comprises an arm 85 movable between contacts 86 and 87 and an arm 88 movable between contacts 89 and 90. The arm 85 is connected with the positive terminal of a suitable source of power, such as battery 91, by means of a wire 92 and the arm 88 is connected with the negative terminal of this battery by means of a wire 93. The contact 86 is connected with one terminal of the winding 94 of a polarized indication relay K by a wire 95. The other terminal of the winding 94 is connected with the contact 87 by means of a wire 96. The contact 89 is connected with the finger 76^a of the contact device B by a wire 97 and the contact 90 of the controller is connected with the contact 74^b of the contact device, by a wire 98. A wire 99 connects the contact 74^a of the contact device with the wire 96 and a wire 100 connects the finger 76^b of the contact device with the wire 95. It will be apparent that with the parts occupying the positions shown in Fig. 1, the polarized relay K is energized by current flowing from the positive terminal of the battery 91, wire 92, arm 85, contact 86 of the pole-changing device E, wire 95, winding of polarized relay K, wires 96 and 99, contact 74^a and finger 76^a of the contact device B, wire 97, contact 89 and arm 88 of the pole-changing device, and wire 93 to the negative terminal of the battery 91. Relay K is then energized to close its front contact 102—104 and its normal contacts 105—106 and 108—109. If, however, the pole-changing device E is actuated so as to move the arms 85 and 88 into engagement with the contacts 87 and 90 respectively, as shown in dotted lines in Fig. 1, and the contact device B is actuated to open the contacts 76^a—74^a and to close the contacts 76^b—74^b, the relay K will be energized by current of a reverse polarity. Under such conditions the circuit will be from the positive terminal of battery 91, wire 92, arm 85, contact 87, wire 96, winding 94 of relay K, wires 95 and 100, finger 76^b, contact 74^b, wire 98, contact 90 and arm 88 of pole-changing device E and wire 93 to the negative terminal of battery 91. Relay K is then operated to close its front contact 102—104 and its reverse contacts 105—107 and 108—110. If relay K becomes deenergized, its front contact opens and its back contact 101—103 closes.

The lever mechanism F comprises an arm 111, movable into engagement with normal and reverse contacts 112 and 113; an arm 114, movable into engagement with normal and reverse arcuate contacts 115 and 116; an arm 117 movable into and out of engage-

ment with a single arcuate contact 118; and an arm 119, movable into and out of engagement with a single arcuate contact 120. These arms are all mounted on a rockshaft, indicated by a broken line 121 in Fig. 1, and are controlled by means of a manually operable lever 122. The lever mechanism F also includes a normal locking segment 123 and a reverse locking segment 124. The segment 123 is provided with a shoulder 125 for engagement with a latch 126 which is actuated by an electromagnet 127. The reverse locking segment 124 is also formed with a shoulder 128 for engagement with a latch 129 actuated by an electromagnet 130. These segments are also mounted on the shaft 121 and prevent the movement thereof under certain operating conditions.

Considering the parts in the positions shown in Fig. 1, the normal valve actuating magnet N is energized over a circuit which may be traced from a suitable source, such as battery 131, through wire 132, winding of the normal magnet N, wire 133, contact 112, arm 111, and wire 134 back to battery 131. The energization of the normal magnet N maintains the valve 48^a in an open position, thereby establishing communication between the passageway 36 and the passageway 46^a, but inasmuch as the valve 39 is now closed by reason of the deenergization of the locking magnet L, no air pressure exists in the passageways 36 and 37 and consequently no pressure is admitted to the cylinder 79 of the switch actuating device C by the operation of this valve alone.

If the towerman should now desire to move the switch D from its normal to a reverse position, he swings the lever 122 in a clockwise direction until its movement is arrested in an intermediate position to the left of the vertical center line by the shoulder 128 of the locking segment 124 engaging the latch 129. This movement of the lever 122 opens the circuit above traced through the arm 111 and contact 112, and deenergizes the normal magnet N. When the lever 122 is thus actuated, the arms 111, 114 and 117 are moved into engagement with their reverse contacts 113, 116 and 118, respectively, and the arm 119 into engagement with its contact 120. This establishes a circuit from battery 131, through wires 132 and 135, winding of the reverse magnet R, wire 136, contact 113, arm 111 and wire 134 back to battery 131, and another circuit from battery 131, wires 132 and 137, winding of the lock magnet L, wire 138, polar armature 105, contact 106, wire 139, contact 116, arm 114, wires 140 and 134, back to battery 131. These two circuits energize the reverse and locking magnets R and L respectively, and open the valves 39 and 48^b of the valve mechanism, thereby admitting fluid pressure from the constant pressure chamber 5 into the passageway 37 and thence through the valve 48^b into the passageways 46^b and 53^b. From the passageway 53^b the air under pressure enters the cylinder 25^b and forces the piston 28^b downwardly and the plunger 29^b, carried thereby, into engagement with the valve stem 15^b, thus opening the valve 14^b against the action of the spring 18^b. The opening of the valve 14^b establishes communication between the constant pressure chamber 5 and the outlet chamber 12^b. As the plunger 29^b reaches the limit of its downward travel, the valve portion 30^b thereof engages the seat 31^b and interrupts communication between the outlet chamber 12^b and the exhaust port 21^b. From the outlet chamber 12^b air under pressure flows through the pipe 13^b to the left-hand end of the cylinder 79 and forces the piston 80 and piston rod 81 to the left as viewed in Fig. 1. This movement of the piston shifts the switch 83, through the operative connection 82, from a normal to a reverse position.

The downward movement of the piston 28^b rocks the walking beam 60 in a clockwise direction and not only positively lifts the piston 28^a in the event that it has not previously been returned to its upper position for some other reason, such as by a failure of the spring 18^a, but also opens the circuit through the contact 74^a—76^a and closes the contact 74^b—76^b. This breaks the circuit through the winding 94 of the indication relay K, causing its deenergization and the release of the neutral armatures 101 and 102. Although the contact device, as has been stated, acts jointly with the circuit controller in establishing or interrupting the circuit through the indication relay, it functions to interrupt this circuit before the valve 14^a or 14^b is opened. This is a feature designed to deenergize the indication relay prior to any action of the valve that (intended or otherwise) will cause it to assume a position out of harmony with the position of the switch and until that harmony is again restored and both coincide with the lever in the latter's original position or in its reverse position.

At the commencement of the reverse movement of the switch the arms 85 and 88 of the circuit controller are moved out of engagement with the contacts 86 and 89, thereby causing an additional break in the indication relay circuit. As soon as the reverse movement has been completed and the switch is locked in its reverse position, the arms 85 and 88 of the circuit controller are moved into engagement with the contacts 87 and 90. This reverses the polarity of the current energizing the winding 94 of the indication relay K through the circuit hereinbefore traced. It will be noted, however, that when the relay K is thus reenergized by a current of reverse polarity, the neutral armature 101 moves out

of engagement with its back contact 103 and the neutral armature 102 moves into engagement with its front contact 104 and also that the polar armatures 105 and 108 swing out of engagement with the contacts 106 and 109 and into engagement with their contacts 107 and 110. The movement of the several armatures in the manner described opens the circuit through the armature 105 and contact 106 thereby deenergizing the lock magnet L and shutting-off the supply of air pressure to the cylinder 25^b. As a result, valve 14^b closes, and discontinues the supply of air pressure to cylinder 79. This movement of the armature 108 also establishes a circuit from battery 131, through wires 132, 141 and 142, contact 118, arm 117, wire 143, locking magnet 130, wire 144, contact 110, polar armature 108, wire 145, front contact 102—104 of relay K, and wires 146, 147, 140 and 134, back to battery 131. The current through the circuit above traced energizes the locking magnet 130 and releases the latch 129 from engagement with the shoulder 128 of the locking segment 124, thus indicating to the leverman that the switch D has been fully reversed and locked, and permitting him to move the lever 122 through the remainder of its stroke towards its reverse position. This final movement of the lever 122 carries the contact arms 117 and 119 out of engagement with their contacts 118 and 120 and opens the circuit through the lock magnet 130.

When the leverman desires to return the switch to its normal position he swings the lever 122 in a counter-clockwise direction back to an intermediate position to the right of the vertical center line where its movement is arrested through the engagement of the shoulder 125 of the normal locking segment 123 with the latch 126. In this position, the arms 111 and 114 reengage their contacts 112 and 115 respectively, thereby completing a circuit from battery 131, wire 132, normal magnet N, wire 133, contact 112, arm 111 and wire 134 back to the battery 131 and, also a circuit from battery 131, wires 132 and 137, lock magnet L, wire 138, polar armature 105, contact 107, wire 148, contact 115, arm 114, and wires 140 and 134 back to battery 131. The current in these two circuits energizes the normal and reverse magnets N and R, and opens the valves 39 and 48^a to admit pressure above the piston 28^a in the cylinder 25^a and cause the downward movement thereof. During the first part of the downward travel of the piston 28^a, the walking beam 60 is rocked about its axis sufficiently to open the circuit through the contacts 74^b and 76^b and close the circuit through the contacts 74^a and 76^a. The continued downward travel of the piston 28^a interrupts communication between the cylinder 79 and the outer atmosphere through the ports 22^a, 23^a and 21^a and opens the valve 14^a against the action of the spring 18^a, thus establishing communication between the constant pressure chamber 5 and the interior of the cylinder 79 to the right of the piston 80, through the outlet chamber 12^a and pipe 13^a. The downward movement of the piston 28^a, through the medium of the walking beam 60, also elevates the piston 28^b simultaneously therewith and raises the plunger 29^b sufficiently to permit the valve 14^b to close under the action of the spring 18^b and to establish communication between the left-hand end of the cylinder 79 and the outer atmosphere through the pipe 13^b, chamber 12^b and ports 30^b, 23^b and 21^b. The admission of fluid pressure to the right-hand end of the cylinder 79 through the pipe 13^a causes the piston 80 and piston rod 81 to move to the left and shift the switch rails 83 back to their normal position, shown in full lines in Fig. 1.

As soon as a switch has completed this return movement and is locked in its normal position, the operative connection 84 swings the arms 85 and 88 of the pole-changing device E out of engagement with the contacts 87 and 90 back to their initial positions in engagement with the contacts 86 and 89. This not only completes a circuit through the contacts 74^a—76^a and reenergizes the magnet 94 of the indication relay K, but effects such energization by a current again reversed in polarity. This causes the neutral armatures 101 and 102 to be lifted, and the polar armatures 105 and 108 to swing back to their initial position shown in Fig. 1. The movement of the armatures 101, 102, 105 and 108, in this manner breaks the circuit through the armature 105 and contact 107, thereby deenergizing the lock magnet L and permitting the valve 39 to close under the action of its spring 40 to shut off the supply of air under pressure above the piston 28^a. This permits the valve 14^a to close and interrupt communication between the constant pressure chamber 5 and the cylinder 79.

The upward movement of the neutral armature 102 carries it into engagement with the contact 104, thereby establishing a circuit from the battery 131, wires 132, 141 and 149, contact 120, arm 119, wire 150, lock magnet 127, wire 151, contact 109, polar armature 108, wire 145, contact 104, neutral armature 102, wires 146, 147, 140 and 134 back to battery 131. This causes the energization of the lock magnet 127 and lifts the latch 126 out of engagement with the shoulder 125 of the locking segment 123, thereby indicating to the leverman that the switch has been returned to normal and locked and permitting him to move the lever 122 the remainder of its stroke toward its normal position. This final movement of the lever 122 again carries the contact arms 117 and 119 out of engagement with their contacts 118 and 120 and

opens the circuit through the lock magnet 127.

Under certain abnormal conditions the relative positions of the valve mechanism, circuit controller and lever mechanism might be disturbed. For example, it might happen that a repairman depresses piston 28[b] to open valve 14[b] manually while making certain adjustments or repairs to the valve mechanism when the lever mechanism F is normal as shown in Fig. 1. In such event, the walking beam 60 would be rocked about its pivot sufficiently to open the circuit through the contacts 74[a]—76[a] thereby deenergizing the winding 94 of the indication relay K. This will cause the neutral armature 101 to drop and engage its back contact 103, thereby establishing a circuit from battery 131 through wires 132 and 137, winding of the lock magnet L, wires 138 and 152, contact 103, neutral armature 101, wires 153, 147, 140 and 134 back to battery 131. The current in the circuit thus established again energizes the lock magnet L and supplies air pressure to the passageways 36 and 37. By reason of the fact that the normal valve magnet N is energized when the lever mechanism F occupies its normal position, the valve 48[a] controlled thereby is open, and consequently pressure will immediately be transmitted to the cylinder 25[a] and force the piston 28[a] downwardly. This will rock the walking beam 60 about its pivot in the opposite direction and elevate the piston 28[b] to its initial position, thus permitting the valve 14[b] to close. The supply of air under pressure to the cylinder 79 will thus be discontinued immediately and before it has had sufficient time to actuate the piston 80 of the fluid pressure motor C to reverse the switch.

This return movement of the walking beam 60 again closes contact 74[a]—76[a] and reestablishes the circuit through the indication relay K. The reenergization of this magnet again lifts the neutral armature 101 out of engagement with its back contact 103 and breaks the circuit through the lock magnet L. This permits the valve 39 to close and shut off the supply of air to the cylinder 25[a].

It will thus be seen that the circuit through the back contact 101—103 controls the energization of the lock magnet L under abnormal operating conditions, and that for this purpose the relay K is controlled by the contact device B. Inasmuch as the contact device B is actuated by the valve mechanism, it follows that the position of the valves will at all times occupy their proper relative positions to the pole-changing device E and the lever mechanism F. In this particular my invention eliminates the necessity of what is termed a "quick switch" for obtaining the desired cooperation between the several elements of the system, thereby not only simplifying the construction and operation of the system but materially increasing the factor of safety.

Although I have herein shown and described only one form of railway traffic controlling apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, railway traffic governing means, fluid pressure means for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure means and comprising a pair of fluid pressure cylinders, a piston in each of said cylinders, means for selectively controlling the admission of fluid pressure to said cylinders, a valve operable by one of said pistons for controlling the operation of said traffic governing means toward its normal position, a valve operable by the other of said pistons for controlling the operation of said traffic governing means toward its reverse position, means operatively connecting said valves for insuring that one of said valves is closed when the other of said valves is opened, and a contact device operated by said connecting means.

2. In combination, railway traffic governing means, fluid pressure means for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure means and comprising a pair of fluid pressure cylinders, a piston in each of said cylinders, means for selectively controlling the admission of fluid pressure to said cylinders, a valve operable by one of said pistons for controlling the operation of said traffic governing means toward its normal position, a valve operable by the other of said pistons for controlling the operation of said traffic governing means toward its reverse position, means operatively connecting said valves for insuring that one of said valves is closed when the other of said valves is opened, indication means for indicating the position of said traffic governing means, and a contact device operable by said connecting means for controlling the operation of said indication means.

3. In combination, railway traffic governing means, fluid pressure means for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure means and comprising a pair of fluid pressure cylinders, a piston in each of said cylinders, means for selectively controlling the admission of fluid pressure to said cylinders, a valve operable by one of

said pistons for controlling the operation of said traffic governing means toward its normal position, a valve operable by the other of said pistons for controlling the operation of said traffic governing means toward its reverse position, a lever operatively connecting said valves for insuring that one of said valves is closed when the other of said valves is open, and a contact device operable by said lever.

4. In combination, railway traffic governing means, fluid pressure means for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure means and comprising a pair of fluid pressure cylinders, a piston in each of said cylinders, means for selectively controlling the admission of fluid pressure to said cylinders, a valve operable by one of said pistons for controlling the operation of said traffic governing means toward its normal position, a valve operable by the other of said pistons for controlling the operation of said traffic governing means toward its reverse position, means for indicating the position of said traffic governing means, a contact device for controlling the operation of said indication means, and means operable by said pistons for controlling the operation of said contact device in accordance with the position of said valves.

5. In combination, railway traffic governing means, a fluid pressure device for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure device and comprising a constant pressure chamber, a pair of outlet chambers each communicably connected with said fluid pressure device and with said constant pressure chamber, a first valve for controlling communication between said constant pressure chamber and one of said outlet chambers for movement of said traffic governing device toward a normal position, a second valve for controlling communication between said constant pressure chamber and the other of said outlet chambers for movement of said traffic governing means toward a reverse position, two fluid pressure cylinders, a piston in one of said cylinders for operating said first valve, a piston in the other of said cylinders for operating said second valve, a passageway, a control valve for controlling communication between said passageway and said constant pressure chamber, control valves for controlling communication between said passageway and said cylinders, means for operating said control valves to selectively actuate said pistons and said first and second valves, means for indicating the position of said traffic governing means, and a contact device operable by said pistons for controlling the operation of said indicating means in accordance with the positions of said first and second valves relative to that of said traffic governing means.

6. In combination, railway traffic governing means, a fluid pressure device for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure device and comprising a constant pressure chamber, a pair of outlet chambers each communicably connected with said fluid pressure device and with said constant pressure chamber, a first valve for establishing communication between said constant pressure chamber and one of said outlet chambers to move said traffic governing device toward a normal position, a second valve for establishing communication between said constant pressure chamber and the other of said outlet chambers to move said traffic governing means toward a reverse position, two fluid pressure cylinders, a piston in one of said cylinders for operating said first valve, a piston in the other of said cylinders for operating said second valve, a passageway, a control valve for controlling communication between said passageway and said constant pressure chamber, control valves for controlling communication between said passageway and said cylinders, means for operating said control valves to selectively actuate said pistons and said first and second valves, means for indicating the position of said traffic governing means, means operatively connecting said first and second valves for insuring that when one is opened the other is closed, and a contact device operable by said connecting means for controlling the operation of said indicating means in accordance with the positions of said first and second valves relative to that of said traffic governing means.

7. In combination, railway traffic governing means, a fluid pressure device for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure device and comprising a constant pressure chamber, a pair of outlet chambers each communicably connected with said fluid pressure device and with said constant pressure chamber, a first valve for establishing communication between said constant pressure chamber and one of said outlet chambers to move said traffic governing device toward a normal position, a second valve for establishing communication between said constant pressure chamber and the other of said outlet chambers to move said traffic governing means toward a reverse position, two fluid pressure cylinders, a piston in one of said cylinders for operating said first valve, a piston in the other of said cylinders for operating said second valve, a passageway, a con-

trol valve for controlling communication between said passageway and said constant pressure chamber, control valves for controlling communication between said passageway and said cylinders, means for operating said control valves to selectively actuate said pistons and said first and second valves, means for indicating the position of said traffic governing means, lever mechanism operatively connecting said pistons for insuring that when one of said first and second valves is open the other is closed, and a contact device operable by said lever mechanism for controlling the operation of said indicating means in accordance with the positions of said first and second valves relative to that of said traffic governing means.

8. In combination, railway traffic governing means, a fluid pressure device for operating said traffic governing means between normal and reverse positions, valve mechanism for controlling the operation of said fluid pressure device and comprising a constant pressure chamber, a pair of outlet chambers each communicably connected with said fluid pressure device and with said constant pressure chamber, a first valve for establishing communication between said constant pressure chamber and one of said outlet chambers to move said traffic governing device toward a normal position, a second valve for establishing communication between said constant pressure chamber and the other of said outlet chambers to move said traffic governing means toward a reverse position, two fluid pressure cylinders, a piston in one of said cylinders for operating said first valve, a piston in the other of said cylinders for operating said second valve, a passageway, a control valve for controlling communication between said passageway and said constant pressure chamber, control valves for controlling communication between said passageway and said cylinders, electromagnetic means for operating said control valves to actuate said pistons and said first and second valves, means for selectively energizing said electromagnetic means, means for indicating the position of said traffic governing means, a walking beam operatively connecting said first and second valves for insuring that when one is open the other is closed, and a contact device operable by said walking beam for controlling the operation of said indicating means in accordance with the positions of said first and second valves relative to that of said traffic governing means.

In testimony whereof I affix my signature.

JOHN P. COLEMAN.