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APPARATUS FOR CONTROLLING RAILWAY SWITCHES

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2 Sheets-Sheet 1

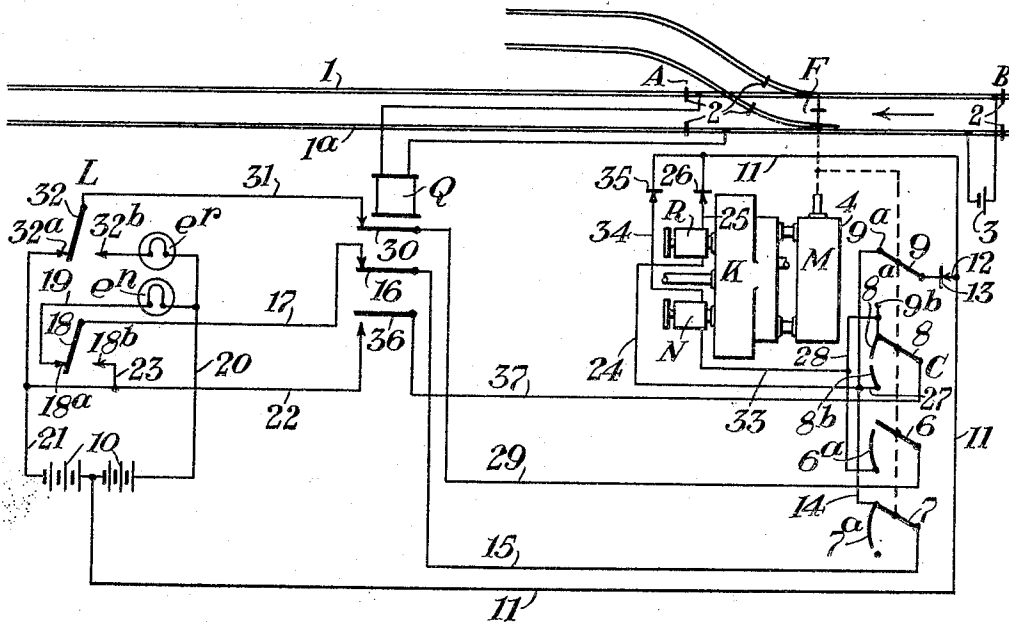


Fig. 1.

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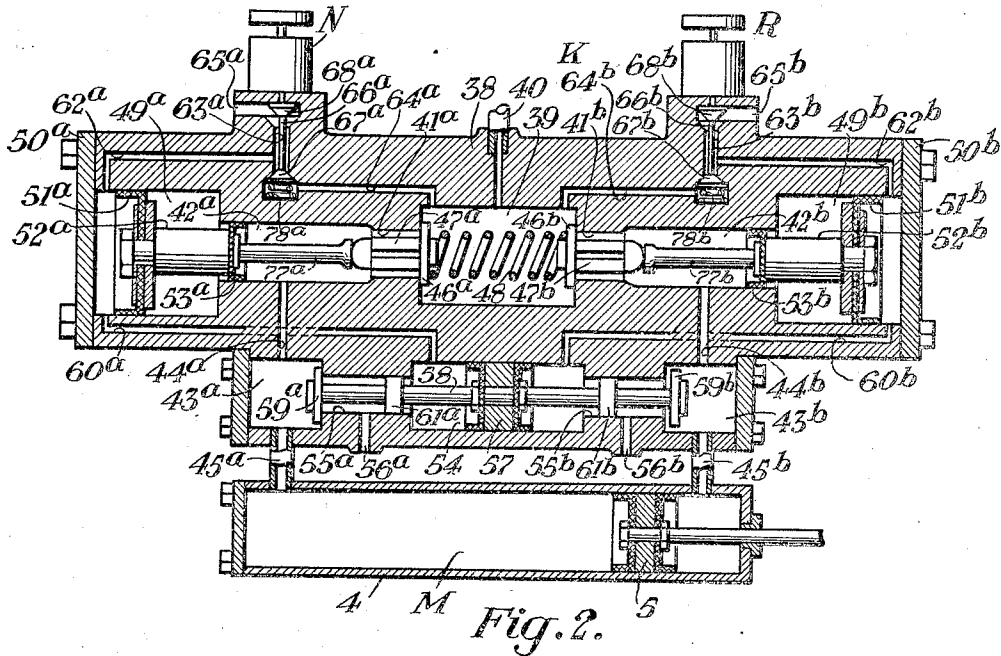
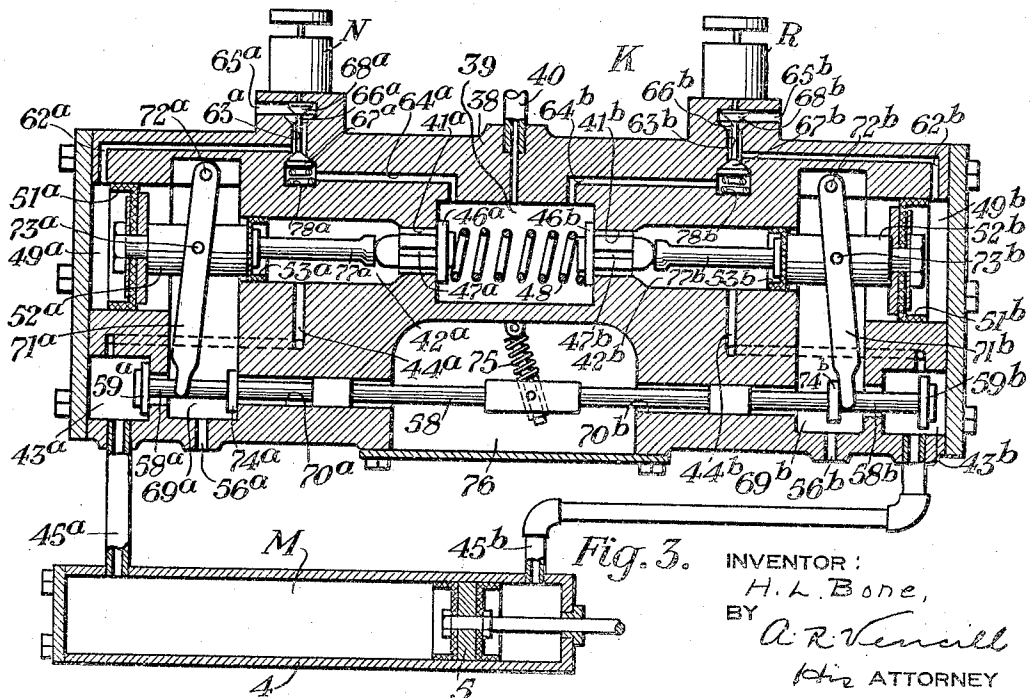
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APPARATUS FOR CONTROLLING RAILWAY SWITCHES

Application filed January 2, 1931. Serial No. 506,061.

My invention relates to apparatus for controlling railway switches, and particularly to apparatus for normally controlling a switch from a distant point, but for at times modifying such control in accordance with traffic conditions adjacent the switch.

I will describe two forms of apparatus embodying my invention, and will then point out the novel features thereof in claim.

10 In the accompanying drawings, Fig. 1 is a diagrammatic view showing one form of apparatus embodying my invention. Fig. 2 is a vertical longitudinal sectional view through one form of switch valve for the apparatus of Fig. 1. Fig. 3 is a similar view showing another form of switch valve for the apparatus of Fig. 1.

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

20 Referring to Fig. 1 of the drawings, the reference characters 1 and 1^a designate the track rails of a stretch of railway track over which traffic normally moves in the direction indicated by the arrow. Rails 1 and 1^a are divided by insulated joints 2 to form a section A—B. A track battery 3 is connected across the rails 1 and 1^a adjacent one end of the section A—B, and a track relay Q is connected across the rails adjacent the other end of section A—B.

30 A track switch F is located in the section A—B, and is operated between normal and reverse positions by a motor M which, in the form shown in detail in Figs. 2 and 3, comprises a cylinder 4 containing a reciprocable piston 5 operatively connected with the switch F. Fluid under pressure, usually compressed air, is at times supplied to one end or the other of the cylinder 4 from a suitable source not shown in the drawings, and the supply of such fluid pressure is controlled by a switch valve designated in general by the reference character K, the construction and operation of which will hereinafter be described in detail. For clear-
45 ness, the valve K is shown in Fig. 1 as being disposed upon its side at a right angle to its preferred operating position and embodies in its construction a normal magnet N and a reverse magnet R which, when energized, se-

lectively permit fluid under pressure to enter one end of the cylinder 4 to move the switch F to its normal position or to enter the other end of the cylinder to move the switch to its reverse position, respectively. The operation of the valve K is controlled by a switch control device L located at a remote point, such for example as a car retarder control tower, and by a circuit controller C operated by the switch. The circuit controller C comprises a first contact 6—6^a, which is closed in all positions of the switch except when the switch occupies its extreme normal position; a second contact 7—7^a, which is closed in all positions of the switch except when the switch occupies its extreme reverse position; a third contact 8—8^a, which is closed in all positions of the switch from the normal position to an intermediate position thereof; a fourth contact 8—8^b, which is closed in all positions of the switch from the reverse position to an intermediate position thereof; a fifth contact 9—9^a, which is closed when and only when the switch occupies its extreme normal position; and a sixth contact 9—9^b, which is closed when and only when the switch occupies its extreme reverse position. The apparatus also includes normal and reverse indicating lamps eⁿ and e^r respectively, one or the other of which is illuminated according to the positions occupied by the switch F and device L.

50 With the apparatus in the normal condition shown in Fig. 1, in which the switch F occupies its normal position, and the section A—B is unoccupied, the normal and reverse magnets N and R are both deenergized, and the lamp eⁿ is illuminated by virtue of a circuit passing from a mid-terminal of a battery 10, through wires 11 and 12, an asymmetric unit 13, contact 9—9^a of circuit controller C, wire 14, contact 7—7^a of circuit controller C, wire 15, front contact 16 of track relay Q, wire 17, normal contact 18—18^a of contact device L, wire 19, normal indication lamp eⁿ, and wire 20 to an outer terminal of battery 10.

If the despatcher now desires to move the switch F to its reverse position, he operates the contact device L to open normal contact 18—18^a and to close reverse contact 18—18^b.

This interrupts the circuit for lamp e^n just traced through normal contact 18—18^a but establishes a circuit for reverse magnet R of the switch valve K passing from the left-hand terminal of battery 10, through wires 21, 22 and 23, reverse contact 18—18^b of contact device L, wire 17, front contact 16 of track relay Q, wire 15, contact 7—7^a of circuit controller C, wires 14 and 24, winding of reverse magnet R, wire 25, an asymmetric unit 26, and wire 11 to the mid-terminal of battery 10. The energization of the reverse magnet R controls the switch valve K to admit fluid pressure into the upper portion of the cylinder 4, as viewed in Fig. 1, and to establish communication between the lower half of the cylinder and the outer atmosphere, thus causing the movement of the switch F to its reverse position. Near the end of the stroke of the reverse movement of the switch F, contact 7—7^a of circuit controller C opens and thus interrupts the circuit for reverse magnet R, and contacts 6—6^a and 9—9^b close. The closing of contact 9—9^b establishes a circuit for reverse indication lamp e^r passing from the mid-terminal of battery 10, through wires 11 and 12, asymmetric unit 13, contact 9—9^b of circuit controller C, wire 27 and 28, contact 6—6^a of circuit controller C, wire 29, front contact 30 of track relay Q, wire 31, reverse contact 32—32^b of contact device L, reverse indication lamp e^r , and wire 20 to the right-hand terminal of battery 10.

With the parts in their reverse positions as above described, I will now assume that the despatcher desires to restore the switch to its normal position. He consequently moves the contact device L to its left-hand or normal position, thus opening reverse contacts 18—18^b and 32—32^b and closing normal contacts 18—18^a and 32—32^a. This causes the energization of the normal magnet by virtue of a circuit passing from the left-hand terminal of battery 10, through wire 21, normal contact 32—32^a of contact device L, wire 31, front contact 30 of track relay Q, wire 29, contact 6—6^a of circuit controller C, which is closed when the switch occupies its reverse position, wire 33, winding of normal magnet N, wire 34, an asymmetric unit 35, and wire 11 to the mid-terminal of battery 10. The energization of normal magnet N controls the valve mechanism K to admit fluid pressure into the lower portion of cylinder 4, as viewed in Fig. 1, and to vent the upper portion thereof to atmosphere, thereby causing the piston 5 to move the switch F to its normal position. Near the end of the stroke of the movement of the switch F to its normal position, contact 6—6^a of circuit controller C opens, thereby interrupting the circuit just traced through this contact for the normal magnet N. At this point however, contact 9—9^a closes and establishes the circuit for

the normal indication lamp e^n previously traced through this contact.

I will now assume that with the switch F in its normal position, a car enters section A—B. This will shunt the track relay Q and establish a normal restoring circuit for the normal magnet N passing from the left-hand terminal of battery 10, through wires 21 and 22, back contact 36 of track relay Q, wire 37, contact 8—8^a of circuit controller C, wires 27, 28 and 33, winding of normal magnet N, wire 34, asymmetric unit 35, and wire 11 back to battery 10. This causes the energization of magnet N and the admission of fluid pressure into the lower portion of the cylinder 4, thereby positively holding the switch F in its normal position as long as the section A—B is occupied.

Conversely, if the switch F occupies its reverse position and a car enters section A—B, the track relay Q will become deenergized and establish a reverse restoring circuit for switch F passing from the left-hand terminal of battery 10, through wires 21 and 22, back contact 36 of track relay Q, wire 37, contact 8—8^b of circuit controller C, wires 27 and 24, winding of reverse magnet R, wire 25, asymmetric unit 26, and wire 11 to the mid-terminal of battery 10. This causes the energization of reverse magnet R and the consequent admission of fluid pressure to the upper portion of cylinder 4, thereby positively holding the switch F in its reverse position as long as the section A—B is occupied.

I will now assume a condition in which the switch F occupies its reverse position, the section A—B is unoccupied, and the pressure of the air trapped in cylinder 4 diminishes, through leakage, to a point where it no longer positively holds the switch in its reverse position. Under such a condition, if the switch points, by reason of their inherent spring action, move from their reverse position a distance greater than an allowable maximum distance, usually one quarter of an inch, fluid under pressure is immediately readmitted to cylinder 4 in the following manner. The movement of the switch points, as above described, opens contact 9—9^b of the circuit controller C and so interrupts the circuit previously traced through this contact for the lamp e^r . This movement of the switch points also causes the contact 7—7^a of the circuit controller C to close the circuit previously traced through this contact for the reverse magnet R. The energization of this magnet operates the switch valve K so as to readmit pressure to the cylinder 4 which returns the switch points to their extreme reverse position. This return movement of the switch points opens the contact 7—7^a, thereby interrupting the circuit for the reverse magnet, and also again closes the contact

9—9^b, thereby reestablishing the circuit for the lamp *e*^r.

It will be apparent from the foregoing that the flow of both electric current and the supply of air under pressure to the switch operating mechanism is interrupted except when the switch operating mechanism is operated either to move the switch to normal or reverse positions or to restore the switch points to their proper position if unintentionally displaced.

In Fig. 2, I have shown in detail, in vertical section, one form of fluid pressure device K constructed according to my invention for controlling the supply of fluid pressure to the switch operating cylinder M. The device in this embodiment comprises a casting 38 formed with a centrally located fluid pressure supply chamber 39 which communicates through a pipe 40 with a suitable source of fluid under pressure, and through openings 41^a—41^b in its opposite walls, with a pair of valve chambers 42^a—42^b. A pair of outlet chambers 43^a—43^b communicate with the valve chambers 42^a—42^b, respectively, through passageways 44^a—44^b, and also with the switch operating cylinder 4 at each end thereof through pipes 45^a—45^b. Communication between the pressure supply chamber 39 and the valve chambers 42^a—42^b and consequently with the outlet chambers 43^a—43^b, respectively, is controlled by inlet valves 46^a—46^b which are provided with ribbed stems 47^a—47^b slidably mounted in the openings 41^a—41^b and which are biased toward closed positions by a coiled spring 48 interposed between the valves 46^a—46^b within the supply chamber 39.

A pair of fluid pressure cylinders 49^a—49^b are arranged in axial alignment with each other adjacent each end of the device K, the outer ends of which are closed by cylinder heads 50^a—50^b. Pistons 51^a—51^b are mounted for reciprocation within the cylinders 49^a—49^b, respectively, and are provided with plungers 52^a—52^b having portions 77^a—77^b which extend inwardly through the valve chambers 42^a—42^b for engagement with rounded outer ends of the valve stems 47^a—47^b of the inlet valves 46^a—46^b. Communication between the inner ends of the cylinders 49^a—49^b and the valve chambers 42^a—42^b is prevented by relatively small pistons 53^a—53^b carried by the plungers 52^a—52^b for reciprocation within the valve chambers between the cylinders 49^a—49^b and the outlet passageways 44^a—44^b.

A fluid pressure cylinder 54 is formed in the casting 38 between the outlet chambers 43^a—43^b, with its longitudinal axis spaced from and parallel to the axis of the cylinders 49^a—49^b and is provided with openings 55^a—55^b in its end walls which extend to the outlet chambers 43^a—43^b. Communication is, at times, established between the outlet cham-

bers 43^a—43^b and the outer atmosphere, through exhaust ports 56^a—56^b which communicate with the openings 55^a—55^b. A piston 57 is mounted for reciprocation within the cylinder 54 and carries a rod 58 which extends in opposite directions through the openings 55^a—55^b and into the outlet chambers 43^a—43^b and carries, at its outer ends, outlet valve members 59^a—59^b which control communication between the outlet chambers 43^a—43^b and the exhaust ports 56^a—56^b. Passageways 60^a—60^b establish communication between opposite ends of the fluid pressure cylinder 54 and the pressure side of the cylinders 49^a—49^b but communication between the cylinder 54 and the exhaust ports 56^a—56^b is prevented by relatively small pistons 61^a—61^b carried by the rod 58 for reciprocation within the openings 55^a—55^b between the cylinder 54 and the exhaust ports 56^a—56^b.

The pistons 51^a—51^b are forced inwardly to open the inlet valves 46^a—46^b, respectively, against the action of the spring 48 by fluid pressure admitted into the cylinders 49^a—49^b through passageways 62^a—62^b which extend inwardly and communicate with vertically extending passageways 63^a—63^b. The passageways 63^a—63^b communicate at their lower ends with the pressure supply chamber 39 through passageways 64^a—64^b and at their upper ends with the outer atmosphere through exhaust ports 65^a—65^b. Valve stems 66^a—66^b extend vertically through the passageways 63^a—63^b and are provided at their lower ends with normally closed lower valves 67^a—67^b which control communication between the passageways 64^a—64^b and the vertical passageways 63^a—63^b. The valve stems 66^a—66^b are also provided at their upper ends with normally open upper valves 68^a—68^b which control communication between the vertical passageways 63^a—63^b and the exhaust ports 65^a—65^b. The valves 67^a—67^b are urged toward a closed position and the valves 68^a—68^b are biased toward an open position by springs 78^a—78^b. The valve stems 66^a—66^b are operated by the normal and reverse magnets N and R respectively which are suitably mounted on the top of the casting 38.

With the parts in the positions shown in the drawings, the piston 5 has been shifted to the right in order to move the switch F to its normal position, and the normal and reverse magnets N and R are both deenergized, thereby permitting the lower valves 67^a—67^b to close and the upper valves 68^a—68^b to open. This interrupts communication between the pressure supply chamber 39 and both of the cylinders 49^a—49^b but establishes communication between these cylinders and the outer atmosphere, thus permitting the spring 48 to close the inlet valves 46^a—46^b and to yieldably hold the valve oper-

ating pistons 51^a—51^b in their outer positions. Also, it will be noted that, with the switch F in its normal position, the piston 57 occupies a position to the right of the center so as to close the outlet valve 59^a and open the outlet valve 59^b.

I will now assume that the operator, desiring to move the switch F to its reverse position, causes the energization of the reverse magnet R in the manner hereinbefore described. This closes the upper valve 68^b, which interrupts communication between the cylinder 49^b and the outer atmosphere, and opens the lower valve 67^b, which establishes communication between the pressure supply chamber 39 and the cylinder 49^b through the passageways 62^b, 63^b and 64^b. Fluid pressure, thus admitted to the cylinder 49^b, forces the piston 51^b to the left, as viewed in the drawings, and opens the inlet valve 46^b against the action of the spring 48, thereby establishing communication between the supply chamber 39 and the right-hand end of the switch operating cylinder 4. During these operations fluid under pressure in the cylinder 49^b has been admitted to the right-hand portion of the cylinder 54 and shifts the piston 57 to the left, thereby closing the outlet valve 59^b and opening the outlet valve 59^a. This establishes communication between the left-hand portion of the switch operating cylinder 4 and the outer atmosphere through the pipe 45^a, outlet chamber 43^a, opening 55^a, and exhaust port 56^a. The piston 5 is thus forced to the left and moves the switch F to its reverse position. When the reverse movement of the switch is completed the reverse magnet R becomes deenergized, in the manner previously described, and closes the lower valve 67^b and opens the upper valve 68^b. This interrupts communication between the pressure supply chamber and the cylinders 49^b and 54, and vents both of these cylinders to atmosphere through the exhaust port 65^b. The spring 48 is thus permitted to return the inlet valve 46^b to its normally closed position, thereby interrupting communication between the pressure supply chamber 39 and the switch operating cylinder 4.

It will be noted, however, that the outlet valve 59^b remains in the closed position to which it was moved and is held in such position by the fluid under pressure which is trapped in the switch operating cylinder 4 and the outlet chamber 43^b. Also, it will be noted that the fluid under pressure thus trapped in the cylinder 4 positively tends to maintain the switch in the position to which it was last moved and that any leakage of fluid pressure by the inlet valve 46^b will be into the pressure side of the cylinder 4. This tends to replace the fluid under pressure that may leak from the cylinder 4, moreover, in the present device fluid under pressure is cut off from the switch operating cylinder 4

except when the switch is being moved between its normal and reverse positions when the switch is being restored to its intended position if it accidentally moves away from such position, and when the section A—B is occupied by a car. This results in a material saving of air.

The operation of the device in moving the switch F back to its normal position is the same as that above described but in a reverse order and will be understood without further description.

In Fig. 3, I have shown another embodiment of my invention in which I employ lever mechanism instead of fluid pressure means for operating the outlet valves 59^a—59^b. In this particular construction, the valve chambers 42^a—42^b and the inner ends of the cylinders 49^a—49^b open into lever chambers 69^a—69^b interposed therebetween and through which the inlet valve operating plungers 52^a—52^b extend. Also, in this form of the device, the rod 58 is slidably mounted in guideways 70^a—70^b formed in the lower portion of the casting and extends through the lower portions of the lever chambers 69^a—69^b, through the openings 58^a—58^b and into the outlet chambers 43^a—43^b. Communication between the outlet chambers 43^a—43^b and the outer atmosphere is obtained through the openings 58^a—58^b and through the exhaust ports 56^a—56^b which in this case communicate with the lower portions of the lever chambers 69^a—69^b.

The rod 58 is shifted longitudinally in order to open and close the outlet valves 59^a—59^b by depending levers 71^a—71^b which are pivotally mounted at their upper ends in the upper end of the chambers 69^a—69^b, as at 72^a—72^b, and which are pivotally connected intermediate of their ends with the plungers 52^a—52^b, as at 73^a—73^b. The lower ends of the levers 71^a—71^b are adapted to engage collars 74^a—74^b carried by the rod 58 so that when the pistons 51^a—51^b are forced inwardly by fluid pressure their motion will be transmitted to and cause a corresponding movement of the rod 58 and the outlet valves 59^a—59^b carried thereby. The rod 58 is yieldably maintained in the position to which it is moved by a suitable toggle device 75 which is disposed within a chamber 76 located between the guideways 70^a—70^b and beneath the pressure supply chamber 39. It will be noted from an inspection of Fig. 3, that the levers 71^a—71^b function to shift the position of the outlet valves 59^a—59^b only when the pistons 51^a—51^b are forced inwardly and that when the pistons are returned to their normal positions under the action of the spring 48, the lower ends of the levers 71^a—71^b move out of engagement with the collars 74^a—74^b without transmitting any motion to the rod 58, which is maintained by

the toggle device 75 in the position to which it was last moved.

The operation of the device above described is substantially the same as that described in connection with the structure disclosed in Fig. 2, and a brief description is therefore deemed sufficient. With the parts in the positions shown in Fig. 3, if the operator desires to move the switch F to its reverse position, he causes the energization of the reverse magnet R as before. This opens the valve 67^b and thus admits fluid under pressure into the cylinder 49^b which forces the piston 51^b inwardly thereby opening the inlet valve 46^b. The inward movement of the piston 51^b swings the lever 71^b about its pivot 72^b in a clockwise direction which in turn shifts the rod 58 longitudinally to the left through its engagement with the collar 74^b. This closes the outlet valve 59^b and opens outlet valve 59^a, thereby venting the left-hand portion of the switch operating cylinder 4 to atmosphere. The opening of the inlet valve 46^b admits fluid under pressure from the supply chamber 39 into the valve chamber 42^b, thence through the passageway 44^b into the outlet chamber 43^b, and thence through the pipe 45^b into the right-hand end of the switch operating cylinder 4, thereby forcing the piston 5 to the left and moving the switch to its reverse position. The operation of the device for a movement of the switch to its normal position is identically the same as that above described but in a reverse order.

From the foregoing, it will be apparent that I have provided an apparatus that is relatively simple in operation and construction and by means of which the loss of fluid under pressure through leakage is reduced to a minimum.

Although I have herein shown and described only two forms of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claim without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

In combination, a section of railway track including a switch, fluid pressure means for moving said switch between normal and reverse positions, a normal magnet for controlling the normal operation of said fluid pressure means, a reverse magnet for controlling the reverse operation of said fluid pressure means, a circuit controller operated by said switch and having a first contact which is closed in all positions of said switch except when said switch occupies its extreme normal position, a second contact which is closed in all positions of said switch except when said switch occupies its extreme reverse position, a third contact which is closed in all positions of said switch from the normal posi-

tion to an intermediate position thereof, a fourth contact which is closed in all positions of said switch from the reverse position to an intermediate position thereof, a fifth contact which is closed when and only when said switch occupies its extreme normal position, and a sixth contact which is closed when and only when said switch occupies its extreme reverse position, a manually operated contact device having a first normal contact, a second normal contact, a first reverse contact and a second reverse contact, a track relay associated with said section and having a first front contact, a second front contact and a back contact, a normal signal for indicating when said switch occupies its extreme normal position, a reverse signal for indicating when said switch occupies its extreme reverse position, an operating circuit for said normal magnet including the first normal contact of said contact device as well as the first front contact of said track relay and the first contact of said circuit controller, an operating circuit for said reverse magnet including the second reverse contact of said contact device as well as the second front contact of said track relay and the second contact of said circuit controller, a normal restoring circuit for said normal magnet including the back contact of said track relay and the third contact of said circuit controller, a reverse restoring circuit for said reverse magnet including the back contact of said track relay and the fourth contact of said circuit controller, a circuit for said normal signal including the second normal contact of said contact device, the second front contact of said track relay, and the second and fifth contacts of said circuit controller, and a circuit for said reverse signal including the first reverse contact of said contact device, the first front contact of said track relay and the first and sixth contacts of said circuit controller.

In testimony whereof I affix my signature.
HERBERT L. BONE.