Nov. 12, 1929. J. E. SPEER 1,735,019

APPARATUS FOR CONTROLLING RAILWAY SWITCHES

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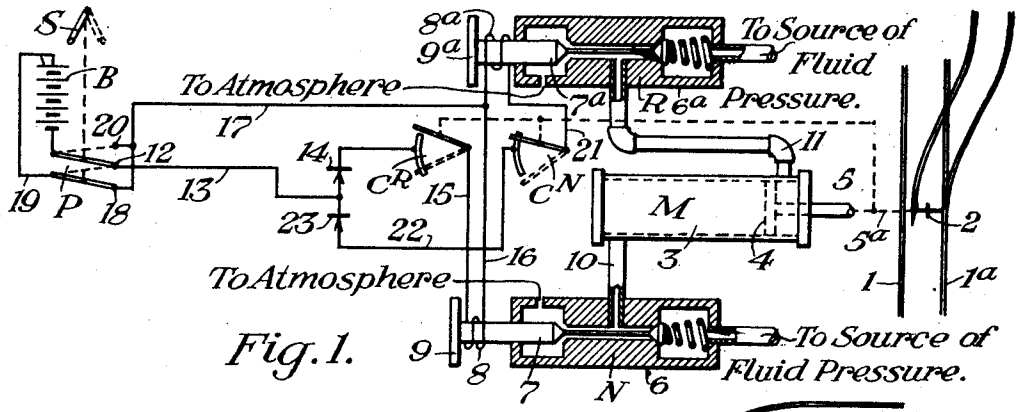


Fig. 1.

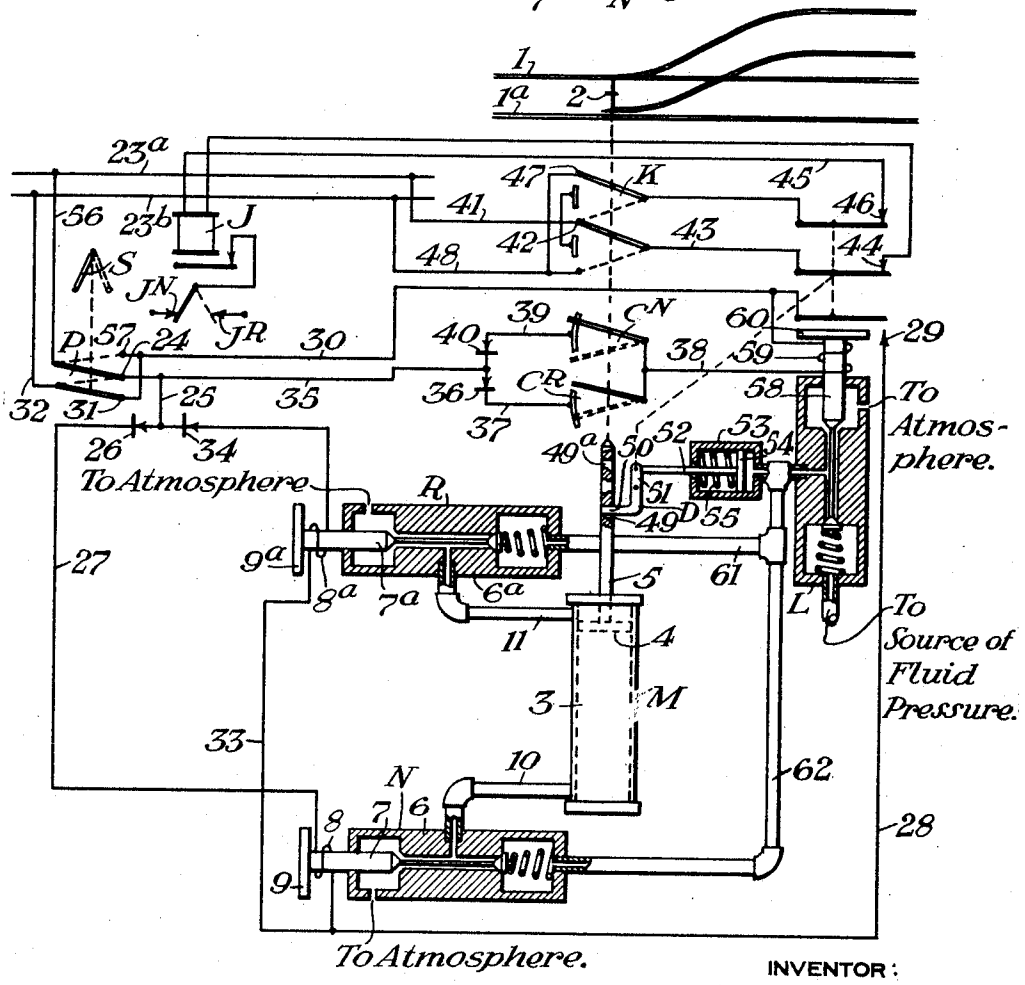


Fig. 2.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR CONTROLLING RAILWAY SWITCHES

Application filed August 31, 1927. Serial No. 216,570.

My invention relates to apparatus for controlling railway switches, and particularly to apparatus suitable for control of a switch from a distant point with a minimum number of line wires between such point and the switch.

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

In the accompanying drawing, Fig. 1 is a diagrammatic view showing one form of apparatus embodying my invention. Fig. 2 is a diagrammatic view showing a modified form of apparatus also embodying my invention.

Similar reference characters refer to similar parts in each view.

Referring first to Fig. 1, the reference characters 1 and 1ª designate the rails of a stretch of railway track which is provided with a switch 2 of the usual and well known form. This switch is operated by a fluid pressure motor M comprising a cylinder 3 containing a reciprocable piston 4. Attached to the piston 4 is a plunger 5 which is operatively connected with the movable points of the switch 2 through suitable mechanism which is indicated by the dotted line 5ª.

The motor M is controlled by means of two valves N and R. The valve N contains a valve stem 7 which is controlled by a "normal" magnet 8 having an armature 9 associated therewith. When the magnet 8 is energized the valve stem 7 is moved to the right so as to connect a source of fluid pressure to the left-hand end of cylinder 3 by means of a pipe 10. When the magnet 8 is de-energized, the valve stem 7 occupies its left-hand position in which the left-hand end of cylinder 3 is connected with atmosphere. In similar manner, the valve R contains a valve stem 7ª controlled by a "reverse" magnet 8ª having an armature 9ª associated therewith. When the reverse magnet 8ª is energized, the valve stem 7ª is moved to its right-hand position, connecting the source of fluid pressure to the right-hand end of cylinder 3 by means of pipe 11, and when de-energized the valve stem 7ª occupies its left-hand position in which the cylinder 3 is connected with atmosphere. When the piston 4 is moved to the right-hand position by supplying fluid pressure to the left-hand end of cylinder 3, the switch 2 is moved to the normal position as shown in the drawing, and when fluid pressure is supplied to the right-hand end of cylinder 3, the piston 4 is moved to the left carrying the switch 2 to the reverse position.

The normal magnet 8 and the reverse magnet 8ª are controlled by a manually operable switch lever S. This lever may be located at a point distant from the switch and may, for example, be one of a plurality of such levers located in an interlocking machine in an interlocking cabin. The switch lever S has the usual normal and reverse positions, corresponding to the normal and reverse positions of the switch, and as shown in the drawing the lever is in its normal position.

The normal magnet 8 is provided with a circuit which may be traced from the lower terminal of a suitable source of energy such as a battery B, through contact 12 of a pole-changer P, wire 13, asymmetric unit 14, contact C^R, wire 15, normal magnet 8, wires 16 and 17, contact 18 of pole-changer P and wire 19 back to battery B. The reverse magnet 8ª has a circuit which may be traced from the lower terminal of battery B, through contact 20 of pole changer P, wire 17, reverse magnet 8ª, wire 21, contact C^N, wire 22, asymmetric unit 23, wire 13, contact 12 of pole changer P, and wire 19 back to battery B.

The contacts C^N and C^R are operatively connected with the movable points of the switch 2, and are controlled in such manner that contact C^N is open when the switch occupies its extreme reverse position but is closed at all other times, and contact C^R is open when the switch occupies its extreme normal position but is closed at all other times. It will be clear from the foregoing that the circuits for magnets 8 and 8ª are opened by the contacts C^R and C^N respectively when the switch occupies its normal and its reverse position respectively.

The operation of the apparatus is as follows: As shown in the drawing, the lever S occupies its normal position, and both of the magnets 8 and 8ª are de-energized with

the switch 2 in its normal position. If the operator wishes to move the switch 2 to its reverse position, he moves the lever S to its reverse position, thereby reversing the pole changer P and completing the circuit for the reverse magnet 8^a, so that fluid pressure is supplied to the right-hand end of cylinder 3, moving piston 4 to its left-hand position, reversing the switch 2 and moving the contact C^N to its dotted line position to open the circuit for the reverse magnet 8^a. If, after the switch reaches its full reverse position, an object should strike the switch so as to move it away from its reverse position, the contact C^N would be closed to again complete the circuit for the reverse magnet 8^a and thus to supply fluid pressure to the motor M to restore the switch to its full reverse position. If the operator wishes to restore the switch to its normal position, he moves the lever S to the full line position, thereby reversing the position of pole changer P and completing the circuit for the normal magnet 8 through the asymmetric unit 14 and contact C^R. As soon as this circuit is completed, fluid pressure is supplied to the left-hand end of cylinder 3 and piston 4 is moved to the right, carrying the switch to its normal position, and at the completion of this operation, contact C^R opens the circuit for the normal magnet. It will be clear that if the switch 2 should then be inadvertently moved away from its normal position, contact C^R would be closed to complete the circuit for the normal magnet 8 so as to again supply fluid pressure to the left-hand end of cylinder 3 and to restore the switch to its full normal position.

It will be clear that the asymmetric units 14 and 23 are so arranged that when the switch 2 occupies its full reverse position the circuit for the reverse magnet can not be completed, and in like manner that when the switch occupies its full normal position the normal magnet cannot be energized.

Each of the asymmetric units 14 and 23 may for example, be of the type disclosed and claimed in an application for Letters Patent of the United States, Serial No. 1111, filed Jan. 7, 1925, by Lars O. Grondahl, for unidirectional current carrying devices, although I do not wish to be limited to any specific type of unit.

By the use of the asymmetric units 14 and 23 in combination with the contacts C^N and C^R the normal and reverse magnets of the switch valves may be controlled from a distant point over a single pair of conductors, and by maintaining the magnets normally de-energized, economy in the use of air for operating the switch is possible, since air is supplied to the switch operating motor only at times when an actual movement of the switch is desired.

Another arrangement of circuits and apparatus for controlling the magnets of a switch operating motor is shown in Fig. 2. In this view the switch operating motor M and the controlling valves therefor are similar to those illustrated in Fig. 1, but these elements are additionally controlled by a locking valve L. This valve comprises a valve stem having an armature 60 which is controlled by a locking magnet 59. The valve L controls the supply of fluid pressure to valves N and R, through pipes 62 and 61 respectively, in such manner that these valves are supplied with pressure when magnet 59 is energized, but not when the magnet is de-energized.

The locking valve L also controls a switch locking device designated as a whole by the reference character D. When the magnet 59 is energized, fluid pressure is supplied to a cylinder 53 containing a piston 54 connected by means of an operating rod 52 and a lever 51 with a locking detent 50 which co-operates with an opening 49 in the piston rod 5. When fluid pressure is supplied to the cylinder 53, the piston 54 is moved to the left, and the locking detent 50 is moved from the opening 49 to unlock the switch, but when the magnet 59 is de-energized so as to connect the cylinder 53 with atmosphere, the piston 54 is moved to its right-hand position by means of a spring 55 and detent 50 is pushed into the opening 49 to lock the switch. In addition to controlling the locking detent for the switch, the lever 51 also controls the position of three contacts 29, 44 and 46. When the switch is locked by detent 50, contact 29 is open and contacts 44 and 46 are closed, but when the switch is unlocked, contact 29 is closed and contacts 44 and 46 are open. The contact 29 is included in the circuit of each of the magnets 8 and 8^a so that neither of these magnets can be energized unless the contact 29 is closed. The circuit for normal magnet 8 may be traced from line wire 23^a, over wire 56, contact 24 of pole changer P, wire 25, asymmetric unit 26, wire 27, normal magnet 8, wire 28, contacts 29, wire 30, contact 31 of pole changer P and wire 32 to line wire 23^b. This circuit can be closed only when the pole changer P occupies its normal position and locking magnet 59 is energized to close the contact 29. The circuit for reverse magnet 8^a may be traced from wire 23^a, over wire 56, contact 57 of pole changer P, wire 30, contact 29, wires 28 and 33, reverse magnet 8^a, asymmetric unit 34, wire 25, contact 24 of pole changer P and wire 32 back to line wire 23^b. This circuit may be closed only when the pole change P occupies its reverse position and locking magnet 59 is energized to close the contact 29. The locking magnet 59 has two circuits, one of which is controlled by contact C^N and the other of which is controlled by the contact C^R. One circuit for locking magnet 50 may be traced

from wire 23^a, over wire 56, contact 57 of pole changer P, wire 30, locking magnet 59, wire 38, normal contact C^N, wire 39, asymmetric unit 40, wire 35, contact 24 of pole changer P and wire 32 to line wire 23^b. This circuit may be closed only when the pole changer P occupies its reverse position and the contact C^N is closed. Another circuit for the locking magnet 59 may be traced from wire 23^a, over wire 56, contact 24 of pole changer P, wire 35, asymmetric unit 36, wire 37, contact C^R, wire 38, locking magnet 59, wire 30, contact 31 of pole changer P, and wire 32 to line wire 23^b; this circuit may be closed only when the pole changer P occupies its normal position and the contact C^R is closed.

For the purpose of indicating the position of the switch 2, a pole changer K operated by this switch cooperates with the contacts 44 and 46 controlled by locking magnet 59 to operate a polarized indication relay J. When the pole changer K occupies its normal position indicated by full lines and contacts 44 and 46 are closed, the relay J is energized in normal direction to close its normal contact J^N. When the pole changer P is moved to its reverse position indicated by dotted lines and the contacts 44 and 46 are closed, the relay J is energized in reverse direction to close its reverse contact J^R.

The operation of the apparatus shown in Fig. 2 is as follows: As shown in the drawing, the lever S occupies its normal position and the switch 2 also occupies its normal position. The normal and the reverse magnets 8 and 8^a and the locking magnet 59 are de-energized. If the operator wishes to move the switch to its reverse position, he moves the lever S to the dotted line position, thereby reversing the pole changer P and completing a circuit for the locking magnet 59 over the contact C^N and through asymmetric unit 40. When the locking magnet 59 becomes energized, fluid pressure is supplied to the cylinder 53 and the switch 2 is unlocked. At the same time contact 29 is closed, completing a circuit for the reverse magnet 8^a over the contact 29 and asymmetric unit 34, so that fluid pressure is supplied to the upper end of cylinder 3 through the pipe 11 and the switch 2 is moved to the reverse position. When the switch reaches the reverse position, contact C^N opens, and the pole changer K reverses so that indication relay J is energized in such a direction as to close its contact J^R when contacts 44 and 46 close. The locking magnet 59 is de-energized by the opening of contact C^N so that the supply of fluid pressure to cylinder 53 is discontinued and this cylinder is connected with atmosphere so that the spring 55 moves the piston 54 to the right and locks the switch by forcing the detent 50 into opening 49^a in plunger 5. When the operator wishes to return the switch to normal position he moves the lever S to the normal position shown in full lines, thereby moving the pole changer P to its full line position and completing the circuit for the lock magnet 59 through asymmetric unit 36 and contact C^R. Fluid pressure is therefore supplied to the cylinder 53 and the switch 2 is unlocked. At the same time, contact 29 is closed to complete the circuit of the normal magnet 8 through asymmetric unit 26 and contact 29 so that fluid pressure is supplied through pipe 10 to the lower end of cylinder 3 and piston 4 is therefore moved upwardly to move the switch to normal position and to again move the pole changer K to its normal position. Current is now supplied to the indication relay K in such direction as to close the normal contact J^N of this relay as soon as the contacts 44 and 46 are closed by the de-energization of locking magnet 59 after the switch 2 has reached its full normal position in which the contact C^R is open.

It will be clear from the foregoing that the normal and the reverse magnets are de-energized at all times except when an actual movement of the switch is to be made, and that neither of these magnets can be energized until the locking magnet is energized. It will also be clear that the indication relay J can not be operated until the locking magnet has been de-energized, following a switch movement, and that a switch movement can not occur until this locking magnet has been energized. The apparatus which I provide not only renders it unnecessary to maintain one of the normal or reverse magnets energized, but it also renders unnecessary the building up of air pressure beyond that necessary to actually move the switch, hence economy in the use of air may be practiced.

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 claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination a railway switch, two normally de-energized magnets, one for causing said switch to move to normal position and the other for causing it to move to reverse position, two asymmetric units, a circuit for one magnet including one of such units, and a circuit for the other magnet including the other unit.

2. In combination, a railway switch, a normal, a reverse and a lock magnet for controlling said switch, a plurality of asymmetric units, a circuit for each of said magnets each including one of said units, means controlled by said lock magnet for locking the switch, and other means controlled by said lock magnet for controlling the circuits of both said normal and reverse magnets.

3. In combination, a railway switch, means for moving said switch to either normal or reverse position, means for locking said switch in either position, means for indicating the position of said switch, and means controlled by said moving means and said locking means for completing the circuit for said indicating means when and only when the switch moving means is de-energized and the switch is locked.

4. In combination, a railway switch, a pair of normally de-energized magnets for controlling said switch, a locking magnet for said switch, means for indicating the position of said switch, other means controlled by said switch for controlling the energization of said locking magnet, means controlled by said locking magnet for controlling the indicating means, and other means controlled by said locking magnet for completing the circuits for the switch controlling magnets when and only when said locking magnet is energized and said switch is unlocked.

In testimony whereof I affix my signature.

JAMES E. SPEER.