Jan. 20, 1931. J. P. COLEMAN 1,789,894

RAILWAY SWITCH OPERATING APPARATUS

Filed July 23, 1929 2 Sheets-Sheet 1

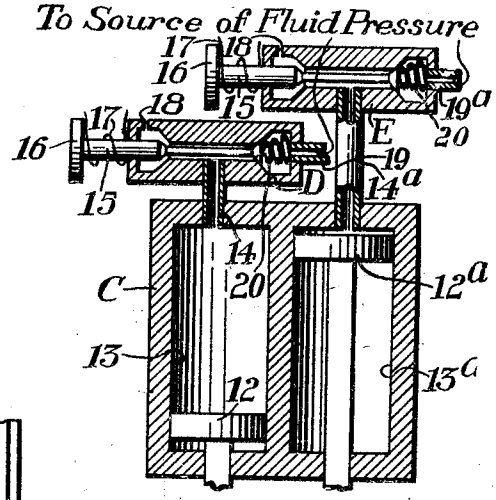


Fig. 1.

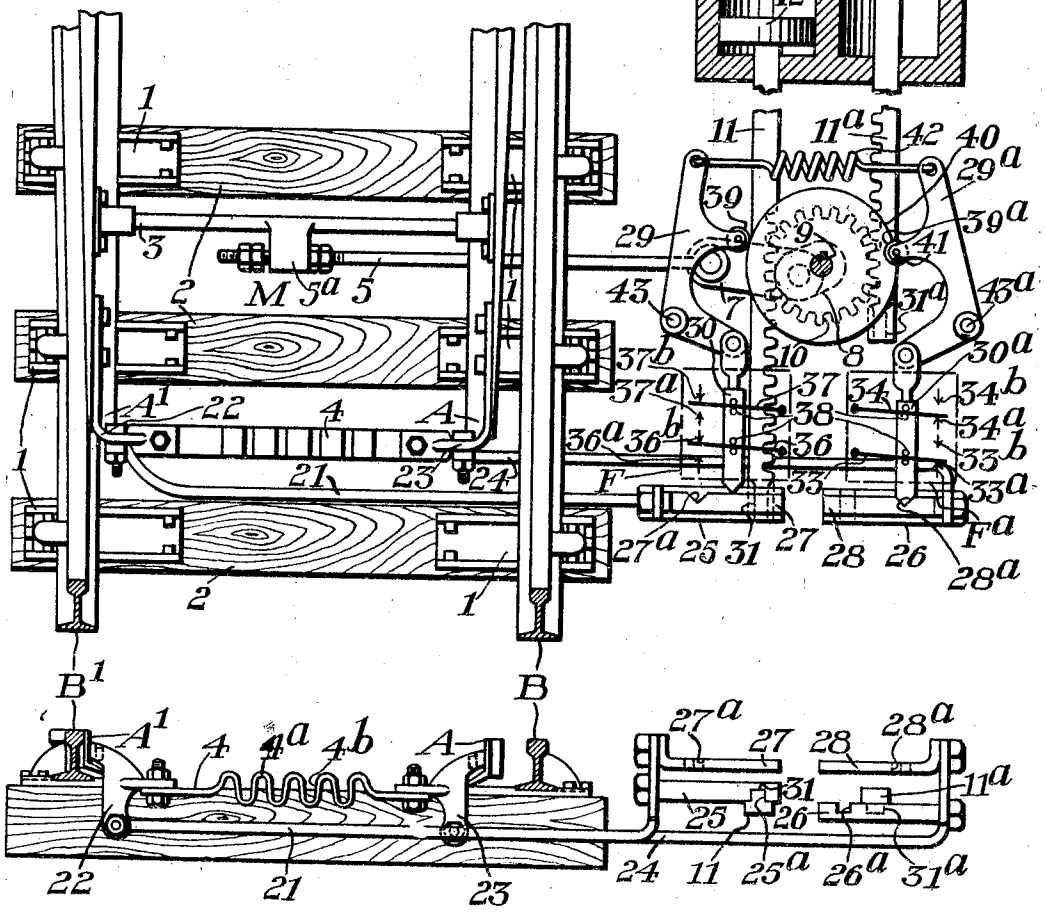


Fig. 2.

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RAILWAY SWITCH OPERATING APPARATUS

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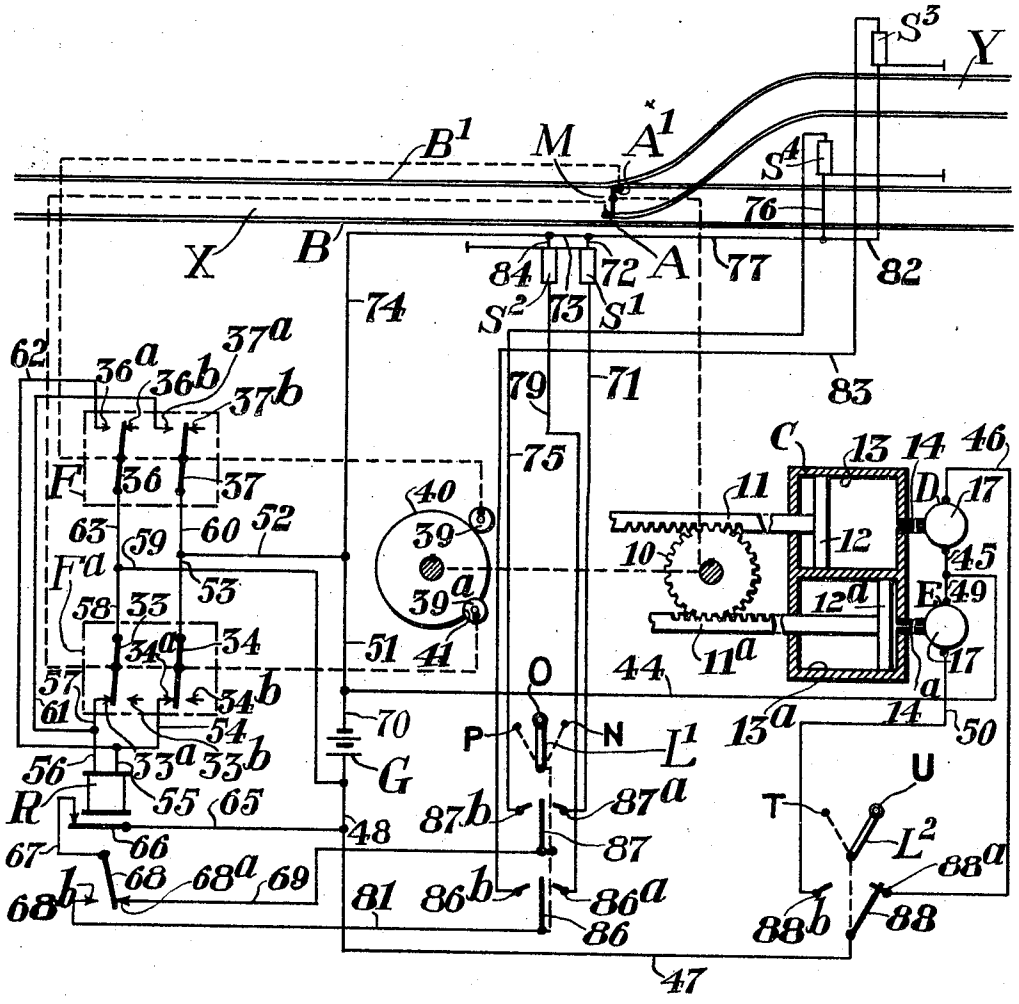


Fig. 3.

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Patented Jan. 20, 1931 1,789,894

UNITED STATES PATENT OFFICE

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RAILWAY-SWITCH-OPERATING APPARATUS

Application filed July 23, 1929. Serial No. 380,289.

My invention relates to railway switch operating apparatus.

One feature of my invention is the provision of means for locking one switch point when the switch occupies its normal position and for locking the other switch point when the switch occupies its reverse position, by means of independent connections to each switch point, and further means for operating the usual switch circuit controller if the unlocked point becomes displaced.

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

In the accompanying drawings, Fig. 1 is a top plan view, partly cross-sectioned, showing a railway switch provided with one form of switch operating apparatus embodying my invention. Fig. 2 is an end view of a portion of the apparatus shown in Fig. 1. Fig. 3 is a wiring diagram showing one arrangement of circuits for the switch operating apparatus illustrated in Figs. 1 and 2, and also embodying my invention.

Similar reference characters, refer to similar parts in all three views.

Referring first to Figs. 1 and 2, the reference character M designates a railway switch comprising, as usual, two fixed rails B and B^1 and two movable switch points A and A^1. The fixed rails B and B^1 are laid upon tie plates 1 and are secured to cross ties 2 in the usual manner. The switch points A and A^1 are fastened together by a bridle rod 3 and a tie rod 4, and may be moved into a normal or a reverse position by operating mechanism connected with the bridle rod. When the switch occupies its normal position, in which position it is illustrated in Fig. 1, the switch point A^1 engages the fixed rail B^1 and the rail A is spaced a slight distance from the rail B. When the switch is reversed, however, the switch point A then engages the fixed rail B and the switch point A^1 is spaced from the rail B^1.

The operating mechanism for the switch, in the form here shown, comprises a crank 8, keyed to a rockshaft 9, and connected with the bridle rod 3 through a link 7, an adjustable operating rod 5 and the usual lost motion connection 5^a. The rockshaft 9 is journaled in suitable bearings, not shown in the drawing, and carries a pinion 10 which meshes with two racks formed on plungers 11 and 11^a. The plungers 11 and 11^a are opearted by two pistons 12 and 12^a respectively, which pistons are located in cylinders 13 and 13^a formed in a casting C. Fluid pressure may at times be admitted to the cylinder 13 through a pipe 14 and to the cylinder 13^a through a pipe 14^a. If the parts are in the positions shown in Fig. 1 and fluid pressure is admitted to cylinder 13^a from pipe 14^a, plunger 11^a is operated to rotate pinion 10 in a clockwise direction, thereby rotating the shaft 9, and hence crank 8, in the same direction, so that the resulting motion imparted to the switch points through the link 7, operating crank 5, and bridle rod 3 moves the switch points to their reverse positions. This clockwise rotation of pinion 10 also moves plunger 11, and hence piston 12, in a direction opposite to the direction of motion of plunger 11^a and piston 12^a. The parts can be returned to their original positions, in which they are illustrated in Fig. 1, by admitting fluid pressure to cylinder 13 from pipe 14, as will readily be apparent from an inspection of Fig. 1.

The supply of fluid pressure to the cylinders 13 and 13^a is controlled by two magnet valves D and E, respectively. In the form here shown, each of these valves comprises a valve stem 15 provided with an armature 16 and a winding 17. When winding 17 of valve D is de-energized, the cylinder 13 is connected with atmosphere through pipe 14, and port 18 of valve D; but when winding 17

of valve D is energized, valve stem 15 is moved against the bias of a spring 20, to a position in which cylinder 13 is disconnected from atmosphere and is connected with a source of fluid pressure through pipes 14 and 19. In similar manner, when winding 17 of valve E is de-energized, cylinder 13^a is connected with atmosphere through a pipe 14^a, and port 18 of valve E, but when winding 17 of valve E is energized, cylinder 13^a is disconnected from atmosphere and is connected with a source of fluid pressure through pipes 14^a and 19^a. The supply of energy to the windings 17 may be controlled in any suitable manner.

Means are provided for separately locking the switch points in such manner that only the switch point which engages a fixed rail is positively locked in position in either position of the switch. As here shown, the switch points are locked by means of two lock rods 21 and 24, as best seen in Fig. 2. One end of lock rod 21 is connected to the downwardly projecting extension of a bracket 22 fastened to the tip of the switch point A^1, while the other end of the lock rod is bent upwardly and carries a locking bar 25. In similar manner, one end of lock rod 24 is connected to the downwardly projecting extension of a bracket 23, similar to the bracket 22, and fastened to the tip of the switch point A, while the other end of the lock rod 24 is also bent upwardly and carries a locking bar 26. The locking bar 25 is provided with a notch 25^a, and the locking bar 26 is provided with a similar notch 26^a. The locking bars 25 and 26 cooperate with two dogs 31 and 31^a, respectively, which dogs are formed on the ends of the plungers 11 and 11^a, respectively. The parts are so proportioned that when the switch occupies its normal position, in which position it is illustrated in Fig. 1, the dog 31 on the end of the plunger 11 enters the notch 25^a in locking bar 25, while the dog 31^a on the end of the plunger 11^a is then withdrawn from engagement with the locking bar 26, so that, under these conditions, the switch point A^1 is rigidly locked in place, but the switch point A is unlocked except in so far as it is locked by reason of its connection with the switch point A^1 through the bridle rod 3 and tie rod 4. When the switch is reversed, however, the dog 31 is withdrawn from engagement with the locking bar 25, while the dog 31^a enters the notch 26^a in bar 26, so that switch point A is locked rigidly in place, but switch point A^1 is unlocked except in so far as it is locked by reason of its connection with the switch point A through the bridle rod 3 and tie rod 4.

The reference characters F and F^a designate two similar circuit controllers which are controlled by the switch operating mechanism and by the switch points A^1 and A, respectively. The circuit controller F comprises a plurality of contact fingers, here shown as two in number, and designated 36 and 37, and the circuit controller F^a comprises two similar contact fingers 33 and 34. Each contact finger of each circuit controller is pivotally supported at one end and cooperates, at the other end, with two fixed contacts. For example, contact finger 33 of circuit controller F^a coacts with fixed contacts 33^a and 33^b. The contact fingers of circuit controller F are operated by an insulating tappet 30 having upright pins 38, one of which is located on each side of each contact finger, and the contact fingers of circuit controller F^a are operated by a similar tappet 30^a also having upright pins 38 located one on each side of each contact finger. The tappet 30 is pivotally attached at one end to a lever 29, which, in turn, is pivoted on a pin 43. The tappet 30^a is similarly attached at one end to a lever 29^a pivoted on a pin 43^a. A cam follower 39 carried by the lever 29 is adapted to engage the periphery of a cam 40 keyed to the rockshaft 9, and at times to enter a notch 41 in the periphery of the cam 40; while a similar cam follower 39^a carried by the lever 29^a is likewise adapted to engage the periphery of the cam 40 and to at times enter the notch 41 in the periphery of the cam 40. The levers are constantly urged toward positions in which the cam followers engage the cam 40 by means of a spring 42 stretched between projections on the levers. The location of the notch 41 in the cam 40 is such that when the switch occupies its extreme reverse position, the notch 41 is in alignment with the cam follower 39, but that when the switch occupies its extreme normal position, the notch 41 is in alignment with the cam follower 39^a, as illustrated in the drawing.

The tappets are also controlled in accordance with the positions of the switch points in the following manner. A slide bar 27 is attached to the bent up end of the lock rod 21, and a similar slide bar 28 is attached to the bent up end of the lock rod 24. (See Fig. 2). The slide bar 27 is provided with a notch 27^a adapted to receive the end of the tappet 30 when and only when the switch is in its extreme reverse position, and the slide bar 28 is provided with a similar notch 28^a adapted to receive the end of the tappet 30^a when and only when the switch is in its extreme normal position. It will thus be seen that when the switch is normal, the notch 41 in the cam 40 is in alignment with the cam follower 39^a, and the notch 28^a in the slide bar 28 is in alignment with the end of the tappet 30^a, so that the action of the spring 42 on the lever 29^a forces the tappet 30 to a position in which contacts 33—33^a and 34—34^a of circuit controller F^a are closed. Furthermore, when the switch is in its normal position, the notch 41 in the cam 40 is out of alignment with the cam follower 39^a,

and the notch 27^a in the slide bar 27 is out of alignment with the end of the tappet 30, so that the tappet 30 is held, by both the slide bar 27 and the cam 40, in a position in which contacts 36—36^b and 37—37^b of circuit controller F are closed. When the switch is reversed, however, the notch 28^a in slide bar 28 is then out of alignment with the tappet 30^a and the notch 41 in the cam 40 is out of alignment with the cam follower 39^a, so that tappet 30^a occupies a position in which contacts 33—33^b and 34—34^b of circuit controller F^a are closed. Furthermore, in this latter position of the switch, notch 27^a in slide bar 27 is in alignment with tappet 30 and notch 41 in cam 40 is in alignment with cam follower 39, so that the action of spring 42 on lever 29 moves tappet 30 to a position in which contacts 36—36^a and 37—37^a of circuit controller F are closed.

With the mechanism constructed in this manner it will be noted that when the switch occupies either extreme position, the switch point which engages the fixed rail is locked in place. If, under these conditions, the unlocked point of the switch is displaced, as when a train trails through the switch, the resultant movement of the unlocked point will actuate the slide bar connected with the point, and through the motion of the slide bar, will move the associated tappet out of the notch in the slide bar, thus operating the corresponding circuit controller. For example, I will assume that the switch occupies its normal position in which switch point A^1 is rigidly locked in place and switch point A is unlocked, as illustrated in Fig. 1. If, now, a train trails through the switch, switch point A^1 will not be moved appreciably because of the rigidity with which it is locked in place, but the force exerted on switch point A by the wheels of the train will displace the point A, so that the point A will no longer occupy its ordinary position with respect to the point A^1. This displacement of the switch point A is transmitted to the slide bar 28 through the lock rod 24, and the end of tappet 30^a is therefore moved out of notch 28^a. As a result, circuit controller F^a is actuated to open contacts 33—33^a and 34—34^a. The circuit controllers may be utilized to control any suitable apparatus, and it will thus be apparent that I have provided switch operating apparatus which will safely control traffic passing over the switch and which will indicate damage to the switch due to trains trailing through the switch or to other causes.

Referring now to Fig. 3, in which is illustrated a wiring diagram showing one arrangement of circuits for the switch operating apparatus described above, the reference character Y designates a siding which is connected with a main stretch X of railway track by means of the switch M.

Westbound traffic, that is, traffic passing from right to left over the switch, is governed by two signals S^3 and S^4. Traffic in the opposite direction is governed by two similar signals S^1 and S^2 which, in the form here shown, are mounted on the same mast.

The signals S^1, S^2, S^3 and S^4 are controlled by a signal lever L^1, and by a polarized relay R, which relay, in turn, is controlled by the circuit controllers F and F^a. The signal lever L^1 comprises two contact arms 86 and 87, and is capable of assuming three positions, indicated by the dotted lines in the drawing, and designated N, O, and P. When the signal lever occupies its N position, the contact arm 87 engages a fixed contact 87^a and the contact arm 86 engages a fixed contact 86^a. When the signal lever occupies its P position, the contact arm 87 then engages a fixed contact 87^b and the contact arm 86 engages a fixed contact 86^b. When the lever occupies its O position all contacts are open. The switch mechanism is controlled by a switch lever L^2, having two positions U and T. The switch lever L^2 controls a contact arm 88 arranged to engage a fixed contact 88^a or 88^b according as the lever occupies its U or T position.

As shown in Fig. 3, the switch lever L^2 occupies its U position so that contact 88—88^a is closed. Current is therefore supplied to winding 17 of magnet valve D over a circuit which passes from a battery G through wires 70, 44 and 45, winding 17 of valve D, wire 46, contact 88—88^a of lever L^2, and wires 47 and 48 back to battery G. Valve D is therefore energized, and admits fluid pressure to cylinder 13, so that switch M occupies its normal position. Since switch M occupies its normal position contacts 33—33^a and 34—34^a of circuit controller F are closed. Current of normal polarity is therefore supplied to relay R from battery G through wires 70, 51, 52 and 53, contact 34—34^a of circuit controller F^a, wires 54 and 55, winding of relay R, wires 56 and 57, contact 33—33^a of circuit controller F^a, and wires 58 and 59 back to battery G. Relay R is therefore energized in its normal direction so that its front contact 66 and its normal contact 68—68^a are closed. Switch level L^1 occupies its O position in which all contacts controlled thereby are open, and all signals indicate stop.

I will now assume that with the switch in its normal position the operator wishes to permit an eastbound train to proceed along the main track X past the switch M. To do this he moves lever L^1 to its N position. Current then flows from battery G through wires 70, 51, 74, 73 and 72, operating mechanism of signal S^1, wire 71, contact 87—87^a of lever L^1, wire 69, polar contact 68—68^a of relay R, wire 67, neutral contact 66 of relay

R, and wires 65 and 48 back to battery G. Signal S^1 therefore indicates proceed.

If, when the switch occupies its normal position, the operator wishes to permit a westbound train instead of an eastbound train to proceed along the main track past the switch, he moves lever L^1 into its P position. Under these conditions current flows from battery G through wires 70, 51, 74, 73, 77 and 76, operating mechanism of signal S^4, wires 75, contact 87—87^b of lever L^1, wire 69, polar contact 68—68^a of relay R, wire 67, neutral contact 66 of relay R, and wires 65 and 48 back to battery G. Signal S^4, therefore, indicates proceed.

I will next assume that when the parts occupy the positions shown the operator wishes to permit an eastbound train to enter the siding Y. To do this, he first moves switch lever L^2 from its U to its T position. The circuit previously traced for winding 17 of valve D is then opened and a circuit for winding 17 of valve E is closed, this latter circuit passing from battery G through wires 70, 44 and 49, winding 17 of valve E, wire 50, contact 88—88^b of lever L^2, and wires 47 and 48 back to battery G. Valve E therefore becomes energized and admits fluid pressure to cylinder 13^a. Since valve D is de-energized cylinder 13 is vented to atmosphere, and the fluid pressure admitted to cylinder 13^a drives switch 17 to its reverse position. When switch 17 is reversed, circuit controllers F and F^a are both operated, so that the circuit previously traced for relay R is opened at contacts 33—33^a and 34—34^a of circuit controller F^a, and another circuit for relay R is closed at contacts 36—36^a and 36—36^b of circuit controller F. This latter circuit passes from battery G through wires 70, 51, 52 and 60, contact 37—37^a of circuit controller F, wires 61 and 56, winding of relay R, wires 55 and 62, contact 36—36^a of circuit controller F, and wires 63 and 59 back to battery G. The current supplied to relay R over this latter circuit is of opposite polarity to that supplied to the relay over the former circuit so that relay R now becomes energized in the reverse direction and closes its front contact 66 and reverse contact 68—68^b. The operator next moves lever L^1 into its N position. Current then flows from battery G through wires 70, 51, 74 and 84, operating mechanism of signal S^2, wire 79, contact 86—86^a of lever L^1, wire 81, polar contact 68—68^b of relay R, wire 67, neutral contact 66 of relay R, and wires 65 and 48 back to battery G. Signal S^2 then indicates proceed.

If the operator wishes to permit a train in the siding Y to enter the stretch X, he moves the lever L^1 to its P position. Current then flows from battery G through wires 70, 51, 74, 73, 77 and 82, operating mechanism of signal S^3, wire 83, contact 86—86^b of lever L^1, wire 81, polar contact 68—68^b of relay R, wire 67, neutral contact 66 of relay R, and wires 65 and 48 back to battery G. Signal S^3 then indicates proceed.

It will be noted from an inspection of the drawing that, when the switch is normal, it is impossible for the operator to clear the signal which permits traffic to proceed from the main track into the siding or the signal which permits traffic from the siding to enter the main track, because the circuits for these signals are then open at polar contact 68—68^b of relay R. Similarly, when the switch is reversed, it is impossible to clear the signals which permit traffic to proceed along the main track over the switch because the circuits for these signals are then open at polar contact 68—68^a of relay R.

It will also be noted that if a train trails through the switch when the switch occupies either extreme position, and thereby displaces the unlocked point of the switch from its normal relative position with respect to the locked point, relay R will become de-energized because the circuit for relay R will then be opened at the circuit controller which is controlled by the unlocked point. As a result, all signal circuits will then be opened at front contact 66 of the relay, so that all signals will display stop indications, thereby indicating that the switch point is damaged and enabling the detection of the damaged point.

As a further means of insuring that a switch point which has been damaged by a train trailing through the switch will be detected, it may be desirable, under some conditions, to make the tie rod 4 deformable. For this purpose, the tie rod 4, in the form here shown, is provided with a plurality of ridges 4^a and parallel grooves 4^b, as best seen in Fig. 2, and the parts are so proportioned that for all ordinary conditions of operation of the switch, the tie rod will hold the switch points in the proper relative positions with the necessary rigidity. With the tie rod constructed in this manner, if a train trails through the switch the unusual force applied to the switch points moves the unlocked point with respect to the locked point, and the tie rod is subjected to great tension, and is, hence, permanently deformed so that the unlocked point is held in its altered position continuously thereafter. As a result, the slide bar connected with the unlocked point is moved to the position where the associated tappet is forced out of the notch in the slide bar, and the slide bar is held in this position until the switch is repaired. When the tappet is forced out of the notch, the associated circuit controller is operated, and as will be apparent from the previous description and from an inspection of Fig. 3, relay R becomes de-energized under these conditions, so that all signals become de-energized.

When the signals become de-energized the operator is informed of the damaged point, so that the damaged point will be immediately detected.

It should be pointed out that while I have shown the circuit controllers F and F^a arranged to control the relay R, the circuit controllers may be used to control any suitable indicating or governing apparatus in any suitable manner.

Although I have herein shown and described only one form of railway switch operating 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 double point railway switch having normal and reverse positions, means for driving said switch to either of said positions, means for locking one point of said switch when the switch occupies its normal position, means for locking the other point of said switch when the switch occupies its reverse position, and two circuit controllers separately controlled in accordance with the positions of said two switch points respectively.

2. In combination, a double point railway switch having normal and reverse positions, means for driving said switch to either of said positions, means for locking one point of said switch when the switch occupies its normal position, means for locking the other point of said switch when the switch occupies its reverse position, two circuit controllers separately controlled in accordance with the positions of said two switch points respectively, and governing means controlled by said two circuit controllers.

3. In combination, a double point railway switch having normal and reverse positions, means for driving said switch to either of said positions, means for locking one point of said switch when the switch occupies its normal position, means for locking the other point of said switch when the switch occupies its reverse position, two tappets, one controlled by each point of said switch, and two circuit controllers one operated by each said tappet.

4. In combination, a railway switch comprising two movable points and two fixed rails adjacent said movable points respectively, means effective when either one of said movable points is in engagement with the associated fixed rail to lock such one point but not the other, and two circuit controllers separately controlled in accordance with the position of said two movable switch points respectively.

5. In combination, a railway switch comprising two movable points and two fixed rails adjacent said movable points respectively, operating mechanism for driving said movable points to either of two extreme positions in which a movable point engages the associated fixed rail, means effective when the switch it in either extreme position for locking the movable point which engages a fixed rail but not the other movable point, a first circuit controller controlled by one said point and by said operating mechanism, and a second circuit controller controlled by the other said point and by said operating mechanism.

6. In combination, a double point railway switch, operating mechanism connected with both said points for driving said switch to its normal or its reverse position, means effective when the switch is in either of said positions to lock the movable point which engages a fixed rail but not the other movable point, two tappets one connected with each said movable point, and governing means controlled jointly by said tappets.

7. In combination, a double point railway switch, operating mechanism connected with both said points for driving said switch to its normal or its reverse position, means effective when the switch is in either of said positions to lock the movable point which engages a fixed rail but not the other movable point, two tappets one connected with each said movable point and with said operating mechanism, and governing means responsive to the positions of said tappets.

8. In combination, a railway switch comprising two movable points, means for locking one said point in engagement with a fixed rail while permitting slight relative motion of the free point, and governing means responsive to the position of said free point.

9. In combination, a railway switch comprising two movable points connected near their tips by a deformable tie rod, means for locking one of said points when the switch occupies one position, means for locking the other point when the switch occupies another position, and governing means controlled at times in accordance with the relative position of said movable points.

10. In combination with a railway switch comprising two movable points, means for at times locking one such point in engagement with a fixed rail, a deformable tie rod having its end connected with the tips of said movable points, respectively, and a circuit controller responsive to the position of the unlocked point of said switch and arranged to be permanently affected due to deformation of said tie rod if a train trails through said switch while said one point is locked.

11. In combination, a railway switch comprising two movable points and two fixed rails adjacent said movable points respectively, means effective when either one of said

movable points is in engagement with the associated fixed rail to lock such one point but not the other, a relay controlled by said two switch points respectively and responsive to the relative position of the unlocked point with respect to the locked point of the switch when one said point is locked, and governing means controlled by said relay.

12. In combination, a railway switch comprising two movable points having a normal spaced relation and two fixed rails adjacent said movable points respectively, means effective when either one of said movable points is in engagement with the associated fixed rail to lock such one point but not the other, a relay, means for normally energizing said relay when one of said points is locked unless the switch points are displaced from their normal spaced relation, and governing means controlled by said relay.

13. In combination, a double point railway switch having normal and reverse positions, means for driving said switch to either of said positions, means for locking one point of said switch when the switch occupies its normal position, means for locking the other point of said switch when the switch occupies its reverse position, two circuit controllers separately controlled in accordance with the positions of said two switch points respectively, a relay controlled by said circuit controllers, and governing means controlled by said relay.

14. In combination, a railway switch comprising two movable points and two fixed rails adjacent said movable points respectively, operating mechanism for driving said movable points to either of two extreme positions in which a movable point engages the associated fixed rail, means effective when the switch is in either extreme position for locking the movable point which engages a fixed rail but not the other movable point, a first circuit controller controlled by one said point and by said operating mechanism, a second circuit controller controlled by the other said point and by said operating mechanism, a relay controlled by both said circuit controllers, and governing means controlled by said relay.

15. In combinaiton, a double point railway switch having normal and reverse positions, operating mechanism for driving said switch to either of said positions, means for locking one point of said switch when the switch occupies it normal position, means for locking the other point of said switch when the switch occupies its reverse position; a first circuit controller controlled by said one point and by said operating mechanism, a second circuit controller controlled by said other point and said operating mechanism, a polarized relay, means controlled by said first circuit controller for supplying said relay with current of one relative polarity when and only when said switch is reversed, means controlled by said second circuit controller for supplying said relay with current of the opposite polarity when and only when said switch is normal, and governing means controlled by said relay.

16. In combination, a double point railway switch having normal and reverse positions, operating mechanism for driving said switch to either of said positions, two lock rods one attached to each said switch point, means for locking one lock rod when the switch occupies its normal position, means for locking the other lock rod when the switch occupies its reverse position, two slide bars one attached to each lock rod and each provided with a notch, two tappets one coacting with each side bar and each biased to one position in such a manner that the tappet will enter the notch in the associated slide bar when and only when the switch occupies the extreme position in which the lock rod which controls the slide bar is unlocked, two circuit controllers one controlled by each tappet and each arranged to close one set of contacts when the associated tappet is out of engagement with the notch in the associated slide bar and to close another set of contacts when the associated tappet occupies the notch in the associated slide bar, and governing means controlled by said circuit controller.

17. In combination, a double point railway switch having normal and reverse positions, operating mechanism for driving said switch to either of said positions, two lock rods one attached to each said switch point, means for locking one lock rod when the switch occupies its normal position, means for locking the other lock rod when the switch occupies its reverse position, a first and a second levers each provided with a cam follower, a cam operatively connected with said operating mechanism and co-operating with said cam follower and provided with two notches one of which is in alignment with the cam follower of said first lever when and only when said switch occupies its normal position and the other of which is in alignment with the cam follower of said second lever when and only when the switch occupies its reverse position, a spring connected between the levers for urging the cam followers into the notches, a first tappet pivotally connected with said first lever in such manner that said tappet will be operated when said first lever enters the notch in said cam, a second tappet pivotally connected with said second lever in such manner that said tappet will be operated when said second lever enters the notch in said cam, a first slide bar attached to the lock rod which is unlocked when said switch occupies its normal position and coacting with said first tappet and provided with a notch adapted to receive the free end of said first tappet when

and only when said switch is normal, a second slide bar attached to the other lock rod and coacting with said second tappet and provided with a notch adapted to receive the free end of said second tappet when and only when said switch is reversed, and two circuit controllers one controlled by each said tappet.

18. In combination, a railway switch comprising two movable points, means for locking one said point in engagement with a fixed rail while permitting slight relative motion of the free point, and governing means responsive to the position of said free point but not to the position of said locked point.

In testimony whereof I affix my signature.

JOHN P. COLEMAN.