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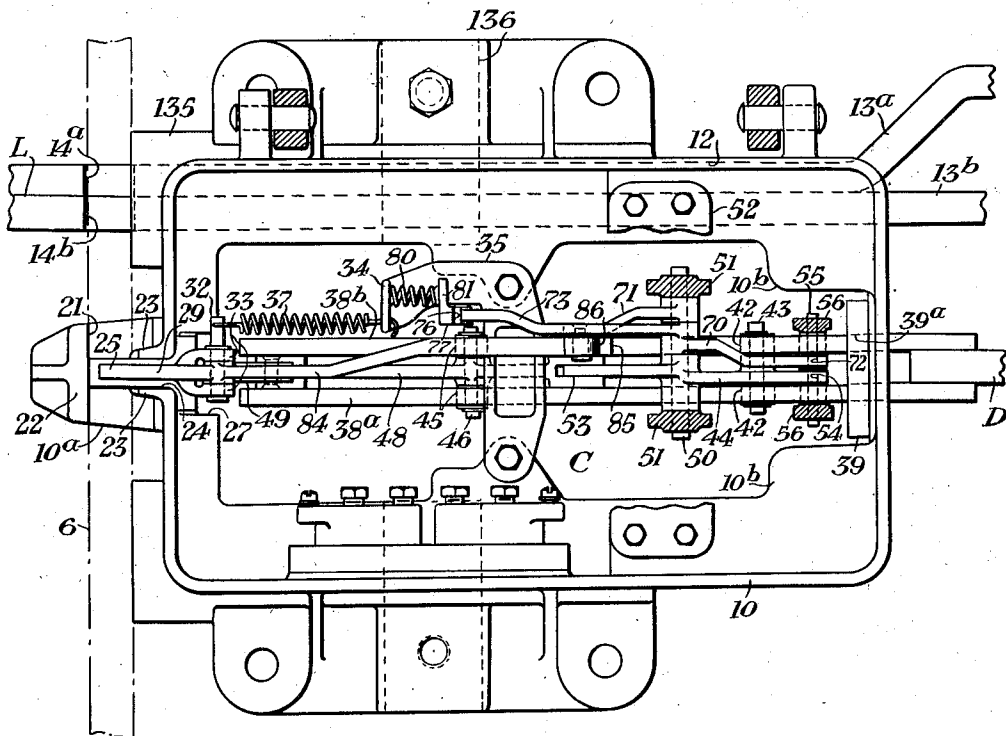
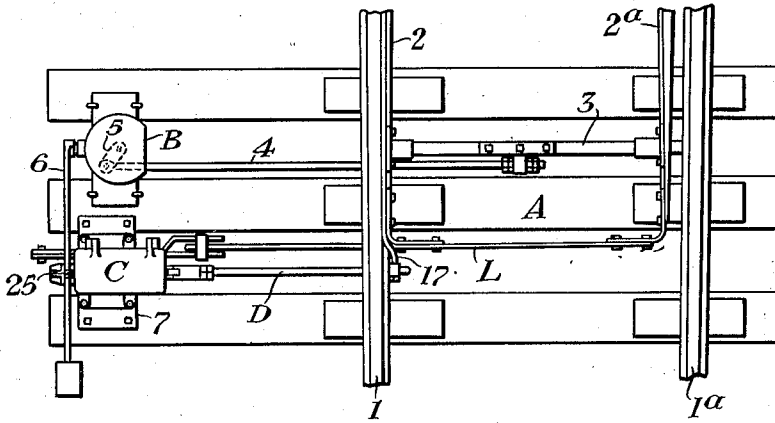
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2,022,359

CONTROL APPARATUS FOR RAILWAY SWITCHES

Filed May 1, 1934

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

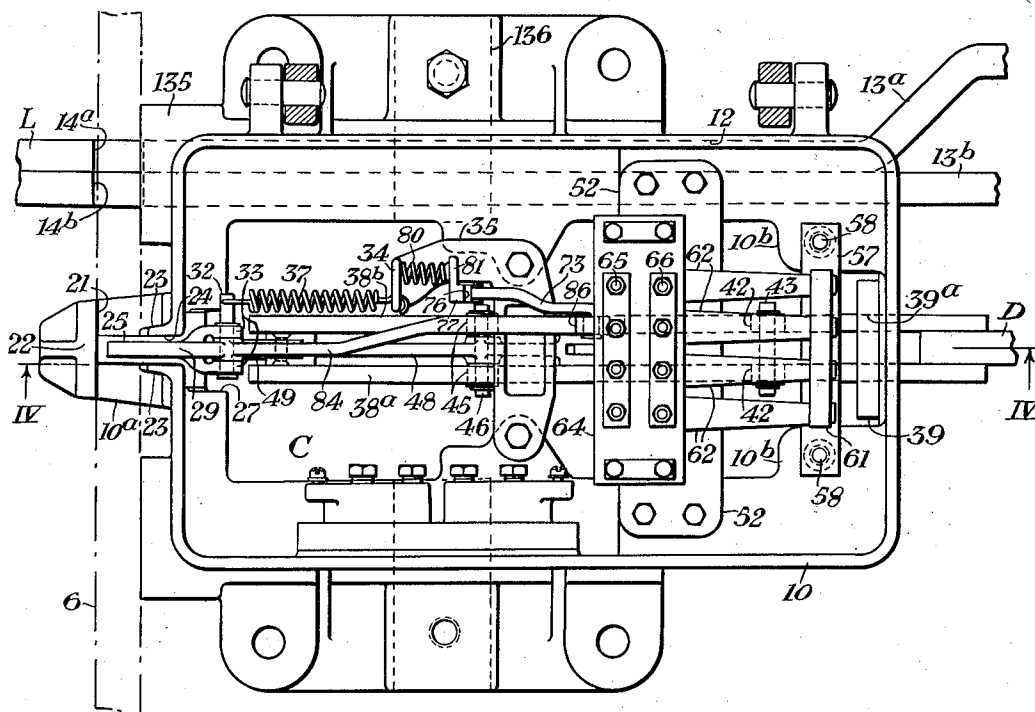


Fig. 2.

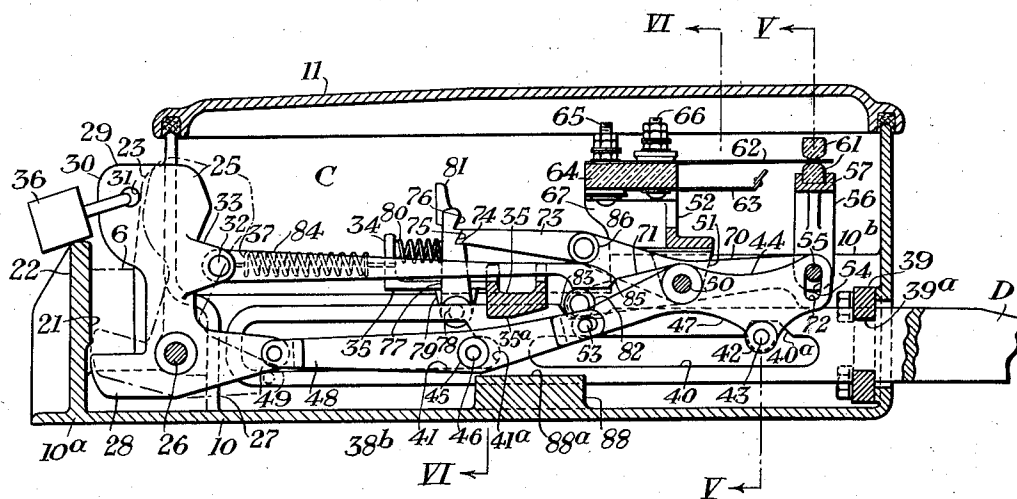


Fig. 4.

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4 Sheets-Sheet 3

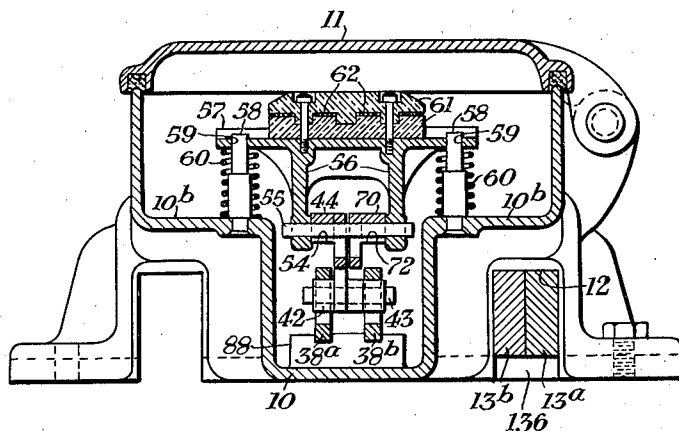


Fig. 5.

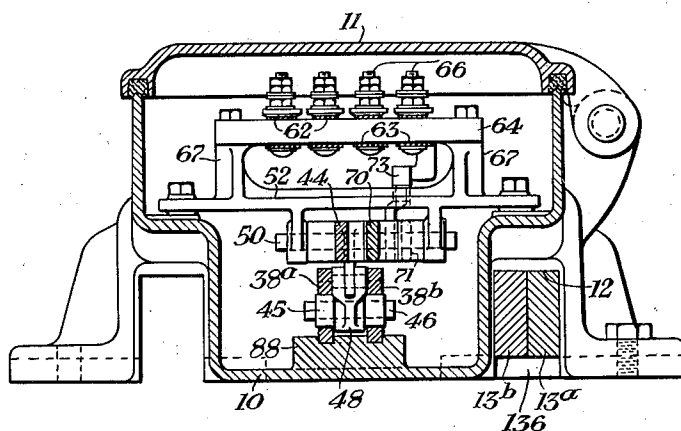


Fig. 6.

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CONTROL APPARATUS FOR RAILWAY SWITCHES

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20 Claims. (Cl. 246—158)

My invention relates to control apparatus for railway switches, and has for an object the provision of a combined switch lock and circuit controller mechanism which is adapted for use in connection with any of the well-known forms of manually operable switch throwing devices, and which when so used will insure the safety of trains or vehicles moving over the switch controlled by the associated switch throwing device.

I will describe two forms of 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 showing a railway switch A provided with a combined switch lock and circuit controller mechanism C embodying my invention. Fig. 2 is a top plan view showing, on an enlarged scale, the mechanism C illustrated in Fig. 1, the cover for the mechanism being removed to better illustrate the construction. Fig. 3 is a view similar to Fig. 2, but with certain of the parts shown in Fig. 2 broken away or removed to illustrate the construction of certain other parts which are not visible in Fig. 2. Fig. 4 is a sectional view taken on the line IV—IV of Fig. 2. Figs. 5 and 6 are sectional views taken on the lines V—V and VI—VI, respectively, of Fig. 4. Fig. 7 is a top plan view showing another form of combined switch lock and circuit controller mechanism embodying my invention, the cover for the mechanism being removed to better illustrate the construction. Fig. 8 is a sectional view taken on the line VIII—VIII of Fig. 7. Fig. 9 is a sectional view taken on the line IX—IX of Fig. 8.

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

Referring first to Fig. 1, the reference character A designates a railway switch comprising, as usual, two fixed rails 1 and 1^a and two movable switch points 2 and 2^a, the switch points being connected together for simultaneous movement by means of a head rod 3 and the usual lock rod L.

Associated with the switch A is a switch operating device B comprising, in the well known form here shown, a switch operating crank 5 actuated by a manually operable hand-throw lever 6 through the medium of suitable mechanism not shown. The crank 5 is connected with the head rod 3 by means of an operating rod 4, the parts being so proportioned that the switch will be moved to its normal position in which it is illustrated in the drawings, or to its reverse position, according as the hand lever occupies the position shown, or is rotated through an angle of substantially 180° from the position shown.

Also associated with the switch A is a combined switch lock and circuit controller mechanism C embodying my present invention, which mechanism I will now describe. Referring now also to Figs. 2 to 5, inclusive, the mechanism C in the form here shown comprises a suitable casing 10 closed at its upper end by a hinged cover 11. The casing 10 is secured to a base plate 7 which, in turn, is secured to a pair of the adjacent crossties upon which the switch A is mounted, and formed in the lower part of the casing adjacent the right-hand side thereof, as viewed in Figs. 5 and 6, is a rectangular guideway 12 which slidably receives the free end of the previously referred to lock rod L. The lock rod L is of the usual and well-known construction, and comprises two longitudinally adjustable bars 13^a and 13^b provided with aligned notches 14^a and 14^b. The lock rod L extends completely through the casing 10, as shown in Figs. 1, 2 and 3, and the bars 13^a and 13^b are so adjusted that when the switch is moved to its normal position by means of the hand-throw lever 6 of the device B, the hand-throw lever will enter the notches 14^a and 14^b and will thus lock the switch in its normal position. The lock rod is supported in the guideway 12 by a short bar 136 which is bolted to the casing within a recess which receives the one end of the bar.

Located at the left-hand end of the casing 10, as viewed in Figs. 2 and 4, between a vertical standard 22 which is formed on a tail-like extension 10^a of the casing 10, and two spaced vertical ribs 23 which are cast on the sidewall of the casing opposite to the standards 22, is a recess 21. This recess is so disposed that when the hand lever 6 enters it, the lever will slightly later enter the notches 14^a and 14^b in the lock rod L. The recess is provided with reasonable working clearance, and a boss 135, which serves as a guide for the lock rod, is arranged to engage one side of the hand lever adjacent the notches in the lock rod when the hand lever is in the recess, and it will be seen, therefore, that any strain which is transmitted to the hand lever by the lock rod will be resisted by the boss and will not be transmitted to the vertical ribs 23 or to the switch operating device B, thus insuring that the switch will be securely locked in its normal position by the lock rod.

A vertical slot 24 is provided in the end wall of the casing 10 between the vertical ribs 23, and pivotally supported within this slot by means of a pivot pin 26 mounted in lugs 27 formed integrally with the casing, is a lever latch 25. This lever latch is provided at its lower end with an

integral toe portion 28 and an integral heel portion 49, and at its upper end with an enlarged head 29 and with two integral lugs 33. The toe portion 28 projects into the recess 21 and co-
 5 operates with the hand-throw lever 6 in such manner that the hand-throw lever can not be rotated to its full normal position to lock the switch in its normal position without engaging the lever latch at the toe portion and rotating the
 10 lever latch to its normal position in which it is shown in full lines in Fig. 4. The head 29 of the lever latch is formed with an integral nose portion 30 and with a hole 31. The nose portion 30 is rounded as shown, and is so disposed that
 15 when the lever latch is rotated to its normal position by the hand-throw lever, this nose portion will extend into the recess 21 and will overlie the hand-throw lever directly above this lever in such manner that this lever can not be raised
 20 from its normal position to reverse the switch A without automatically rotating the lever latch from its normal position to the position in which it is shown in dot and dash lines in Fig. 4. The hole 31 in the nose portion 30 of the lever latch
 25 is adapted to receive a padlock 36 to prevent unauthorized operation of the switch, and is so disposed that when the padlock is in place in this hole, the lever latch can not be rotated away from its normal position. It follows, therefore,
 30 that when the padlock 36 is placed in the hole 31, the switch is securely locked in its normal position.

For reasons which will be made clear herein-
 35 after, it is desirable when the lever latch has been rotated to its dot and dash line position by means of the hand-throw lever to subsequently retain the lever latch in the dot and dash line position until the hand-throw lever is restored to its normal position, and for this purpose a spring 37 is
 40 stretched between a pin 32 mounted in the lugs 33, and a lug 34 formed in a bracket 35 which extends transversely of the casing 10.

A point detector rod D is secured at one end to the point 2 of the switch A by means of a
 45 point bracket 17, and attached to the free end of this point detector rod are two spaced parallel detector bars 38^a and 38^b. The detector bars 38^a and 38^b extend into the casing 10 and are maintained in parallel spaced relation within the
 50 casing by means of guides 39^a formed on a guide bracket 39 secured to the right-hand side wall of the casing, guides 39^b formed on a boss 38 cast integrally with the bottom wall of the casing, and
 55 guides 35^a formed on the previously referred to bracket 35. Located in the bars 38^a and 38^b directly opposite each other adjacent the right-hand ends of the bars, as viewed in Fig. 4, are
 60 two similar cam slots 40, and located in the bars 38^a and 38^b directly opposite each other adjacent the left-hand ends of the bars are two similar cam slots 41. Each cam slot 40 is of uniform width throughout its length except for a
 65 portion 40^a adjacent the right-hand end of the slot where the slot is widened at its upper edge to provide an offset portion as shown. Each cam slot 41 is likewise of uniform width throughout its length except for a portion 41^a at the right-hand end of this slot where the width of the slot is reduced.

Cooperating with the cam slots 41 in the detector bars 38 are two rollers 45 mounted on a
 70 pin 46 secured to a lever 48 intermediate the ends of the lever, and cooperating with the cam slots 40 are two rollers 42 mounted on a pin 43
 75 secured to a depending lug 47 formed on a lever

44 adjacent one end of the lever. The lever 48 is disposed between the two bars 38^a and 38^b of the point detector rod D, and is pivotally connected with the heel portion 49 of the lever latch
 25. The lever 44 is pivotally mounted intermediate its ends on a rod 50 supported in depend-
 5 ing lugs 51 formed on a bracket 52, and is connected at its left-hand end with the free end of the lever 48 by means of a pin and slot connection 53.

The detector rod D is so adjusted and the parts are so proportioned that the rollers 42 carried by the lever 44 will enter the wide portions 40^a of the cam slots 40, and the rollers 45 carried by the lever 48 will enter the narrow portions 41^a of the cam slots 41, when and only when the
 15 switch A occupies its full normal position and the switch point 2 is tightly closed against the associated fixed rail 1, and that the rollers 45 carried by the lever 48 will move into or out of 20 the narrow portions 41^a of the cam slots 41 at substantially the same time that the rollers 42 move into or out of the wide portions 40^a of the cam slots 40. The parts are further so proportioned that when the rollers 45 occupy the nar-
 25 row portions 41^a of the cam slots 41, if the lever latch 25 then occupies its normal position, as shown in full lines in Fig. 4, the lever 48 will be rotated to an extreme position in a clockwise direction and the lever 44 to an extreme position
 30 in a counter-clockwise direction, but that, if the lever latch occupies the dotted line position shown in Fig. 4, when the rollers 45 occupy the narrow portions 41^a of the cam slots 41, the lever 48 will
 35 then be rotated to an extreme position in a counter-clockwise direction and the lever 44 to an extreme position in a clockwise direction. The parts are still further so proportioned that if the switch point 2 is moved away from the position in which it tightly engages the fixed rail 1
 40 while the lever latch occupies its normal position, due for example, to a train trailing the switch, the resultant simultaneous movement of the rollers 42 out of the wide portions 40^a of the cam slots 40 in the detector rod D and the
 45 rollers 45 out of the narrow portions 41^a of the cam slots 41, will cause the lever 44 to rotate from its counter-clockwise extreme position as viewed in Fig. 4 to its clockwise extreme position.

The right-hand end of the lever 44, as viewed
 50 in Fig. 4, is provided with a vertical slot 54, and extending through this slot with some clearance is a rod 55 mounted in depending lugs 56 formed on a contact operating member 57. As best seen in Fig. 5, the contact operating member 57 is
 55 guided to move vertically by means of studs 58 which are secured at their lower ends to horizontal shelf-like portions 10^b of the casing 10. The studs 58 pass freely through holes 59 formed in the contact operating member, and surround-
 60 ing each stud between the associated shelf-like portion 10^b of the casing and the underside of the contact operating member is a coil spring 60, which coil springs constantly bias the contact operating member to an upper position on the
 65 studs.

Secured to the upper side of the contact operating member 57 are two superposed insulating blocks 61 between which are clamped the free
 70 ends of a plurality of flexible contact fingers 62, here shown as four in number. Each flexible contact finger 62 cooperates with an associated fixed contact finger 63 to form a contact 62-63. Each contact finger 62 and the associated contact
 75 finger 63 are clamped to the opposite sides of an

insulating block 64 by means of terminal posts 65 and 66 and the insulating block 64, in turn, is bolted to the upper ends of two spaced uprights 67 formed on the bracket 52. Each terminal post 65 is electrically connected with the associated contact finger 62 but is insulated from the associated contact finger 63, as will be apparent from an inspection of the drawings, while each terminal post 66 is insulated from the associated contact finger 62 but is electrically connected with the associated contact finger 63.

The parts are so proportioned that when the lever 44 occupies its counter-clockwise extreme position, the contact operating member 57, in so far as its control by the lever 44 is concerned, is free to move between an upper extreme position, in which the contacts 62—63 are open and a lower extreme position in which the contacts 62—63 are closed but that, when the lever 44 is rotated to its clockwise extreme position, the operating member 57 will then be moved downwardly by the lever 44, in opposition to the bias of the spring 60, to its lower extreme position in which the contacts 62—63 are closed.

Pivotaly mounted on the rod 50 at one side of the lever 44 are two other levers 70 and 71 (see Figs. 3, 4 and 6). The lever 70 is provided at one end with a slot 72 which is similar to the slot 54 in the lever 44, and which slidably receives the rod 55 carried by the operating member 57 in the same manner that the slot 54 slidably receives the rod 55. The other end of the lever 70 is formed with an integral latching finger 73, the tip 74 of which is bevelled as shown, to cooperate with two inclined notches 75 and 76 formed in the upper part of a vertically disposed latch catch 77. The latch catch 77 is pivoted at its lower end on a pin 78 mounted in a lug 79 formed on the bracket 35, and is constantly biased by means of a spring 80 interposed between the lug 34 on the bracket 35 and the latch catch, to the position in which the tip 74 of the latching finger 73 enters one or the other of the notches 75 or 76. The spacing between the notches 75 and 76 is such, and the parts are so proportioned, that when the tip 74 of the latching finger is in the notch 75, the lever 70 will be rotated to a counter-clockwise extreme position in which it is shown in the drawings, and in which the contact operating member 57 is free to move between its upper and lower extreme positions due to the pin and slot connection between the lever 70 and the operating member, but that, when the tip 74 is in the notch 76, the lever 70 will then be rotated to a clockwise extreme position in which the contact operating member will then be held in its lower position in which the contacts 62—63 are closed.

A finger piece 81 is formed on the upper end of the latch catch 77, and this finger piece serves as a means for gripping the latch catch to enable the latch catch to at times be rotated manually to the position in which the latch catch is out of engagement with the latching finger, as will be explained more fully hereinafter.

A roller 82 (see Fig. 4) is secured to the free end of the lever 71, and this roller cooperates with a notch 83 formed in the upper edge of the detector bar 38^b in such manner that the roller 82 will enter the notch 83 when and only when the switch A occupies its full normal position and the switch point 2 is tightly closed against the associated fixed rail 1. A selector lever 84 is pivoted at one end on the pin 32 carried by the lever latch 25, and the free end of this selector

lever is provided with an enlarged head 85 which cooperates with the roller 82, and with a roller 86 which is secured to the lever 70 directly above the roller 82. The parts are so proportioned that when the lever latch 25 occupies its normal position, the head 85 of the selector lever will be disposed between the rollers 82 and 86, but that, when the lever latch occupies its dot and dash line position, the head 85 of the selector lever will then be moved to a position beyond the rollers. The parts are further so proportioned that if the roller 82 is forced out of the notch 83 in the bar 38^b of the detector rod D when the tip 74 of the lever 70 is in the notch 75 in the latch catch 77 and the head 85 is between the rollers 82 and 86, the roller 82 will act through the medium of the head 85 and the roller 86 to rotate the lever 70 to the position in which the tip 74 of the latching finger 73 enters the notch 76 in the latch catch 77 but that, if the roller 82 is forced out of the notch 83 in the bar 38^b of detector rod D when the tip 74 of the latching finger 73 is in the notch 75 in the latch catch 77 and the head 85 of the selector lever is moved beyond the rollers 82 and 86, the lever 70 will then remain in the position 25 in which it is shown in Fig. 4.

As shown in the drawings, all parts are in their normal positions. That is to say, the hand lever 6 is rotated to its clockwise extreme position as viewed from the left in Fig. 1, and is locked in this extreme position by means of the lever latch 25 and padlock 36, the switch occupies its full normal position in which the switch point 2 is tightly closed against the associated fixed rail 1, the rollers 42 occupy the wide portions 40^a of the cam slots 40, the rollers 45 occupy the narrow portions 41^a of the cam slots 41, the roller 82 occupies the notch 83 in the bar 38^b of detector rod D, the enlarged head 85 of the selector lever 84 is disposed between the rollers 82 and 86, the tip 74 of the latching finger 73 occupies the notch 75 in the latch catch 77, the contact operating member 57 occupies its upper position, and the contacts 62—63 controlled by the contact operating member 57 are all open.

I will now assume that with the parts in the positions just described, it is desired to reverse the switch A. To do this, the padlock 36 is first removed from the hole 31 in the lever latch 25, and the hand lever 6 is then rotated from the position shown through an angle of 180° in a counterclockwise direction as viewed from the left in Fig. 1 to its opposite extreme position. The initial movement of the hand lever, that is to say, the movement which takes place before any movement of the switch points 2 and 2^a occurs, rotates lever latch 25 in a clockwise direction as viewed in Fig. 4 from its full line position to its dotted line position, and withdraws the hand lever from engagement with the notches 14^a and 14^b in the lock rod L. The movement of the lever latch to its dotted line position acts through the levers 42 and 48 to move the contact operating member 57 downwardly to the position in which the contacts 62—63 controlled thereby are closed, while the withdrawal of the hand lever from engagement with the notches 14^a and 14^b in the lock rod unlocks the switch, the parts being so proportioned that the switch will not become fully unlocked until after the contacts 62—63 have become closed. The movement of the lever latch to its dotted line position also moves the selector lever 84 inwardly to the position in which its enlarged head 85 is past the rollers 82 and 86 for a purpose presently to be made clear. After

the hand lever latch has been moved to its dotted line position in the manner just described, the spring 37 temporarily holds the lever latch in its dotted line position, and it will be seen, therefore, that the contacts 62—63 will remain closed after the hand lever has moved completely past the lever latch. As soon as the switch points start to move in response to the movement of the hand lever to its reverse position, the resultant movement of the point detector rod D, toward the right simultaneously forces the rollers 42 out of the wide portions 40^a of the cam slots 40 and into the narrow portions of these cam slots, and the rollers 45 out of the narrow portions 41^a of the cam slots 41 and into the wide portions of these cam slots, thus causing the levers 42 and 48 to be moved to, and held in, the relative positions in which the contacts 62—63 are positively held closed, and hence insuring that the contacts 62—63 will remain closed at all times except when the switch points occupy their full normal positions. The movement of the point detector rod D due to the movement of the switch points also causes roller 82 to be forced out of the notch 83 in the detector bar 38^b of the detector rod D, but since the head 85 of the selector lever 84 is then moved past the rollers 82 and 86, the movement of the roller 82 out of the notch 83 has no effect on the latching mechanism. It should be noted that when the contact operating member 57 is moved to its lowermost position by means of the lever 44 no force is then exerted on the lever 70 by the biasing springs 60 acting through the contact operating member 57, to hold the lever 70 in the position in which the tip 74 of the latching finger 73 engages the notch 75. The lever, however, is prevented from rotating away from the position in which the tip 74 engages the notch 75 under these condition by the cooperation between the bevel of the tip 74 and the inclined surface of the notch 75.

When the switch has been moved to its reverse position in the manner just described, and it is desired to restore the switch to its normal position, the hand lever is restored to its normal position. Under these conditions, the switch points will be moved to their full normal positions before the hand lever starts to enter the recess 21, so that when the lever does start to enter the recess 21, the notches 14^a and 14^b in the lock rod L will be restored to positions to receive the lever. Furthermore, as soon as the switch points reach their full normal positions, the rollers 42 will enter the wide portions 40^a of the cam slots 40 and the rollers 45 will enter the narrow portions 41^a of the cam slots 41. The contacts 62—63, however, remain closed under these conditions due to the bias of spring 37 on lever latch 25, until after the hand-throw lever has partly entered the notches 14^a and 14^b. When this happens, the hand-throw lever will engage the toe portion of the lever latch and as a result during the balance of the stroke of the hand lever, the lever latch will be rotated in response to the rotation of the hand lever, thus restoring the lever latch to its normal position. When the lever latch has been restored to its normal position, the contacts 62—63 will become open and the selector lever 84 will be restored to its normal position in which the enlarged head 85 is disposed between the rollers 82 and 86. The padlock may now be reinserted into the hole 31 in the lever latch, and when this is done all parts will then be restored to their normal positions in which they are shown in the drawings.

I will now assume that the parts are in the positions in which they are shown in the drawings, and that a train trails the switch. Under these conditions, the excessive forces which are exerted by the wheels of the train on the switch points causes the switch point 2 to move away from the associated fixed rail 1 a small amount even though the lock rod is then securely locked in the normal position by means of the hand lever 6, and this movement of the switch point 2 causes a corresponding movement of point detector rod D toward the right, as viewed in Figs. 1 and 4. The movement of the point detector rod D, in turn, forces rollers 42 out of the wide portions 40^a of the cam slots 40 into the narrow portions of these cam slots and also forces rollers 45 out of the narrow portions 41^a of the cam slots 41 and into the wide portions of these cam slots, thereby causing lever 44 to rotate in a clockwise direction and move the contact operating member 57 downwardly to the position in which the contacts 62—63 become closed. The movement of the point detector rod D also forces roller 82 out of the notch 83 in the detector bar 38^a, and since the enlarged head 85 of the selector lever 84 is then located between the rollers 82 and 86, the movement of the roller 82 out of the notch 83 acts through the selector lever and through roller 86 to rotate the lever 70 to the position in which the tip 74 of the latching finger 73 enters the notch 76 in the latch catch 77. After the lever 70 has once been rotated to the position in which the tip 74 of the latching finger enters the notch 76, it is subsequently held in this position by the latch catch, and as was previously pointed out, when the lever occupies this position, the contact operating member 57 is held in its lowermost position. As a result, if, after the train has trailed completely through the switch, the switch points spring back to their normal positions and restore the point detector rod D to the position in which the rollers 42 enter the wide portions 40^a of the cam slots 40, the rollers 45 enter the narrow portions 41^a of the cam slots 41, and the roller 82 enters the notch 83, the contact 62—63 will subsequently remain closed until the lever 70 is released. In order to release the lever 70, it is necessary for an authorized person to manually operate the latch catch 77. When this has been done, the lever 70 is free to return to its normal position, and the springs 60 will therefore move the contact operating member 57 upwardly to its upper position, thereby causing the contacts 62—63 to open and the lever 70 to return to its normal position. It is assumed that the authorized person who manually operates the latch catch will inspect the switch points, and, if damaged, repair them before operating the latch catch to restore the contacts to their closed positions.

It should be particularly pointed out that, after the switch has been improperly trailed and the latch mechanism has become effective to hold the contacts 62—63 in their closed positions in the manner just described, operation of the hand lever from its normal position, and the consequent rotation of the lever latch 25 in a clockwise direction, has no effect on the latch mechanism except to move the enlarged head 85 of the selector lever idly between the rollers 82 and 86 to the position in which it is beyond the rollers. The operation of the hand lever from its normal position under these conditions, however, operates the switch in the same manner as if no

switch lock and circuit controller mechanism were provided.

As is well known, a combined switch lock and circuit controller mechanism of the type which I have just described is normally used in connection with a track circuit which extends in either direction from the associated switch, and the contacts of the mechanism are usually connected with the track circuit in such manner that when these contacts are closed, the rails of the track circuit will be short-circuited through these contacts to produce the same effect on the signals which control traffic over the switch as is produced when the rails of the track circuit are shunted by the wheels of a train. Normally, the electromotive force of the source of potential which is connected across the rails of the associated track circuit is small, and the currents due to this electromotive force are all that the contacts of the circuit controller are required to carry, with the result that low voltage contacts of the type previously described are entirely adequate under these conditions. However, it is at times desirable to use a combined lock and circuit controller mechanism of the type described on electrified roads on which the rails of the track circuit form the return path for the propulsion current, and it is obvious that under these conditions when the contacts of the mechanism become closed and short-circuit the track circuit, if there is any difference in the rail resistance of the two rails of the track circuit, relatively large currents are likely to flow through the contacts of the mechanism, necessitating the use of what are commonly terminated "heavy duty" circuit controller contacts. When this is the case, the mechanism may be constructed in the manner shown in Figs. 7 to 9, inclusive, this latter mechanism being designated in its entirety by the reference character C¹ for convenience in distinguishing it from the mechanism C.

Referring now to Figs. 7-9, inclusive, all parts of the mechanism C¹ which cooperate with the lever 6 of the switch stand B to lock the switch in its normal position are similar to the corresponding parts of the mechanism C shown in the preceding views, and these parts need not, therefore, be re-described here. Furthermore, the point detector rod D is also the same as was previously described with the exception that the bar 33^b thereof is not provided with a notch 33 in its upper edge. However, the casing in which the mechanism is mounted, which casing I have here designated 90 has been changed somewhat, and pivotally supported in the right-hand end of this casing by means of trunnion screws 91 carried by a bracket 92 secured to the bottom wall 90^a and the end wall 90^b of the casing 90, is a contact operating member 93 comprising two spaced side members 93^a and 93^b (see Fig. 9) connected together at their upper and lower ends, respectively, by webs 93^c and 93^d. A horizontally disposed insulating block 94 is secured intermediate its ends to the forward side of the web 93^c of the contact operating member 93, and attached to this block adjacent its opposite ends are two U-shaped switch elements 95 and 96. The legs 95^a and 95^b of the switch elements 95 act as switch blades and cooperate, respectively, with slotted switch jaws 97^a and 97^b of the usual type, these jaws being secured to, but insulated from, the end wall 99^b of the casing 90. The legs 96^a and 96^b of the switch element 96 likewise act as switch blades and cooperate, respectively, with slotted switch jaws 98^a and 98^b similar to the

switch jaws 97^a and 97^b, and secured to, but insulated from, the end wall 90^a of the casing 90 in the same manner that the switch jaws 97^a and 97^b are secured to, but insulated from, the end wall of the casing 90. The switch jaws 97^a and 98^a are connected by means of bolts 99 to a bus bar 100, and the switch jaws 97^b and 98^b are connected by means of bolts 101 to a bus bar 102. Both bus bars 100 and 102 and the associated bolts are, of course, adequately insulated from the casing 90 in accordance with standard practice. The contact operating member 93 is movable between an open position in which the switch blades are out of engagement with the switch jaws as shown in the drawings, 15 and a closed position in which the switch blades are in engagement with the switch jaws, and it will be apparent that when the contact operating member occupies its open position, the bus bars 100 and 102 are disconnected from each other, 20 but that, when the contact operating member 93 occupies its closed position, the bus bars are connected together through the switch jaws 97^a and 97^b and the associated switch element 95, and also through the switch jaws 98^a and 98^b 25 and the associated switch element 96.

The contact operating member 93 is arranged to be moved between its open and closed positions through the medium of a lever 103 and a spring 104. The lever 103 is pivotally supported 30 intermediate its ends between the side members 93^a and 93^b of the contact operating member 93 by means of a pivot pin 134 mounted in two up-standing lugs 92^a formed on the bracket 92, and is provided at one end with a depending leg 103^a 35 having a rounded toe 103^b, and at the other end with an upstanding lug 103^c. The spring 104 is stretched between a pin 105 mounted in the lug 103^c, and a pin 106 mounted in the side members 93^a and 93^b of the contact operating member, and 40 this spring constantly biases the lever and contact operating member to the relative positions in which the rounded toe 103^b of the lever 103 engages the web 93^b of the contact operating member with sufficient force so that under normal con- 45 ditions any rotation in a clockwise direction of the lever 103 will cause corresponding rotation of the contact operating member 93.

The lever 103 is operatively connected with the point detector rod D by means of two rollers 107 50 which are secured to the lever at the upper end of the depending leg 103^a, and which cooperate with the cam slots 40 in the point detector rod. The point detector rod D is so adjusted that the rollers 107 will enter the wide portions 40^a 55 of the cam slots 40 when and only when the switch point 2 is tightly closed against the associated fixed rail 1, and the parts are so proportioned that when these rollers occupy the wide portions 40^a of the cam slots 40, the lever 103 is free to rotate to an extreme position corresponding to the open position of the contact operating member 93, in which extreme position the rollers 107 engage the cam slots 40 at their upper edges, and an extreme position corresponding 60 to the closed position of the contact operating member 93 in which latter position the rollers 107 engage the cam slots 40 at their lower edges. The parts are further so proportioned that when the rollers 107 are forced out 70 of the wide portions 40^a of the cam slots 40 and into the narrow portions of these cam slots, the lever 103 will be rotated to the position corresponding to the closed position of the contact operating member. 75

The lever 103 is also pivotally attached at point 108 to one end of a lever 109, the opposite end of which is connected by means of a pin and slot connection 110 with the heel portion 49 of the lever latch 25. Two rollers 111 are secured to the lever 109 intermediate the ends of this lever, and these rollers are disposed in, and cooperate with, the cam slots 41 of the point detector rod D in such manner that these rollers will enter the narrow portions 41^a of the cam slots 41 when and only when the switch point 2 is tightly closed against the associated fixed rail 1, and that, the movement of the rollers into and out of the narrow portions of the associated cam slots will occur substantially simultaneously with the movement of the rollers 107 into and out of the wide portions 40^a of the cam slots 40. The parts are so proportioned that when the rollers 111 occupy the narrow portions 41^a of the cam slots 41, the lever 103 will be rotated to the position corresponding to the open position of the contact operating member 93 or to the position corresponding to the closed position of the contact operating member according as the lever latch then occupies the position in which it is shown in full lines in Fig. 8 or the position in which it is shown in dot and dash lines in Fig. 8.

The web 93^c of the contact operating member 93 is provided with an integral rearwardly extending projection 113 having a rounded upper surface 113^a and having formed therein at the rear of the rounded surface 113^a a notch 113^b. A latch arm 114, one end of which is bifurcated as shown in Fig. 7, is pivotally supported at its bifurcated end by means of trunnion screws 115 adjustably mounted in the side walls of the casing 90, and this latch arm extends toward the contact operating member 93 and cooperates at its free end with the rounded surface 113^a of the projection 113 and with the notch 113^b, in such manner that when the contact operating member occupies its open position, the latch arm will rest on the rounded surface but that, when the contact operating member is moved to its closed position, the arm will drop into the notch 113^b by gravity and will hold the contact operating member in its closed position, unless the arm is prevented from dropping by means controlled by the lever latch 25, which means I will now describe.

As here shown, these means comprise a member 116 provided at its rear end with a centrally located hole 116^a which slidably receives one end of a rod 117, the other end of which is attached to the upper end of the lever latch 25 by means of a screw jaw 118 and a pivot pin 118^a. The distance that the member 116 can slide on the rod 117 is limited by a pin 119 which is secured intermediate its ends to the rod, and the ends of which project into aligned elongated slots 120 provided in the member 116. The pin 119 also acts to prevent the member from turning on the rod. A compressed coil spring 121 is mounted on the rod 117 between the member 116 and two adjusting nuts 122, and this spring constantly biases the member to the position in which the pin 119 engages the slots 120 at their left-hand ends as viewed in Fig. 8. The member 116 is disposed between the bifurcations of the latch arm 114 and carries at its forward end a pair of spaced rollers 123. These rollers ride on a guide 124 formed on a bracket 125 and cooperate with cam surfaces 126 provided on the underside of the latch arm 114 adjacent the point where the bifurcations of the latch arm

join the body of the latch arm. The parts are so proportioned that when the lever latch 25 occupies its normal position, the rollers 123 will clear the left-hand end of the cam surfaces 126, but that, when the latch arm is moved away from its normal position, the rollers 123 will then move into engagement with the cam surfaces. The parts are further so proportioned that when the rollers 123 are clear of the left-hand end of the cam surfaces 126, the latch arm 114 is free to drop to the position in which it enters the notch 113^b in the projection 113 of the contact operating member, but that, when the rollers are in engagement with the cam surfaces 126, the latch arm will be raised to a position where it is just clear of the rounded surface 113^a of the projection 113. The nuts 122 are so adjusted that the spring 121 will be just stiff enough to raise the latch arm against its own weight.

A stud 127 projects from the side of the latch arm 114 a little to the right of the cam surfaces 126, and this stud cooperates with a hook 128 which is pivotally supported at its lower end on a pin 129 mounted in the bracket 125. The hook 128 is biased in a counter-clockwise direction by means of a spring 130, and the parts are so proportioned that when the latch arm is out of engagement with the notch 113^b in the projection 113 on the contact operating member 93, the end of the hook, which end it will be noted has a vertical surface, will engage the stud 127 at its right-hand side as viewed in Fig. 7, but that, when the latch arm moves to the position in which it enters the notch 113^b, the hook will move over the stud and securely hold the latch arm in engagement with the notch 113^b.

As shown in the drawings, the switch A is locked in its normal position and the lever latch 25 and point detector rod D both occupy their normal positions. Under these conditions, due to the previously described proportioning of the parts, the contact operating member 93 is held in its open position, and the latch arm 114 rests on the rounded surface 113^a of the projection 113.

In explaining the operation of the apparatus as a whole, I will first assume that the switch A is moved from its normal position to its reverse position by means of the hand lever 6. Under these conditions, the initial movement of the hand lever, that is to say, the movement which takes place before the switch points start to move, rotates lever latch 25 in a clockwise direction from its full line position to its dotted line position, and this rotation of the lever latch, in turn, acts through the levers 109 and 103 to rotate the contact operating member 93 from its open position to its closed position. This rotation of the lever latch 25 also causes the rollers 123 to move into engagement with the cam surfaces 126 on the latch arm 114, so that when the contact operating member reaches its closed position, the latch arm will be prevented from dropping to the position in which it enters the notch 113^b in the projection 113, which latter position I will term the latching position of the latch arm. As soon as the initial movement of the hand lever 6 has been completed, and the switch points have started to move in response to further movement of the hand lever, the resultant movement of point detector rod D causes rollers 107 carried by lever 103 to move out of the wide portions of the cam slots 40 and into the narrow portions of these cam slots, and also causes rollers 111 carried by lever 109 to simultaneously move out of the narrow portions of the

cam slots 41 and into the wide portions of these cam slots, thereby causing the contact operating member to be positively held in its closed position and the lever latch to be held in its dotted line position during the balance of the movement of the switch.

If, after the switch has been moved to its reverse position, the hand lever is restored to its normal position, the parts will be restored to their normal positions. The movement of the parts under these conditions is the reverse of that just described, and will be understood without further description.

I will now assume that the parts are in their normal positions in which they are shown in the drawings and that a train trails the switch. Under these conditions, the extreme forces which are exerted on the switch points will cause the point detector rod D to be moved toward the right a certain amount in spite of the fact that the lock rod is then securely locked by means of the hand lever, and this movement of the point detector rod will force the rollers 107 at least part way out of the wide portions 40^a of the cam slots 40, and the rollers 111 at least part way out of the narrow portions of the cam slots 41, thereby causing the lever 103 to be rotated in a clockwise direction and rotate the contact operating member 93 from its open to its closed position. When the contact operating member is moved to its closed position under these conditions, the rollers 123 are out of engagement with the cam surfaces 126 since the lever latch 25 then occupies its normal position, and the latch arm 114 therefore now drops by gravity to its latching position in which it enters the notch 113^b. After the latch arm has once been rotated to its latching position, the hook 128, due to the bias of the spring 130, moves to the position in which its upper end overlies the stud 127, thus securely locking the latch arm in its latching position. As was previously pointed out, when the latch arm occupies its latching position, the contact operating member 93 is held in its closed position, and as a result, if after the train has completely trailed the switch, the switch points spring back to their normal positions, and thereby restore the point detector rod D to the position in which the rollers 107 enter the wide portions 40^a of the cam slots 40 and the rollers 111 enter the narrow portions 41^a of the cam slots 41, the contact operating member will remain in its closed position until the latch arm 114 is restored to its normal position. To do this, it is necessary for an authorized person to move the hook 128 to the position in which it is out of engagement with the stud 127, and then manually raise the latch arm; and it is assumed that the authorized person who does this will inspect the switch points, and, if they are damaged, repair them before he raises the latch arm. It should be noted that if the point detector rod D returns to its normal position, after the train has trailed the switch in the manner just described, the spring 104 will yield and will allow the levers 109 and 103 to move in response to the movement of the point detector rod without causing the operating member 93 to move. When the latch arm 114 is restored to its normal position, the spring 104 restores the contact operating member 93 to its open position, and all parts are then restored to their normal positions in which they are shown in the drawings.

It should be pointed out that when the switch has been trailed and the latch arm has latched

the contact operating member in its closed position in the manner just described, operation of the switch will not unlatch the contact operating member for the reason that when the rollers 123 move against the inclined face of the cam surfaces 126 under these conditions, the hook 128 will hold the latch arm in its latching position. As a result the member 117 will move toward the right in the jaw 116 and compress the spring 121, but this movement will have no effect on the remainder of the apparatus.

Although I have herein shown and described only two forms of control apparatus for railway switches 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, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, means including a lever latch for locking said lever in its normal extreme position, a contact, means controlled by said lever latch for operating said contact when said lever is moved away from its normal position, other means controlled by the switch points for at times operating said contact in response to movement of the switch points away from their normal positions, and means controlled by said lever latch for latching said contact in its operated position if the switch points are moved away from their normal positions when the lever occupies its normal position.

2. In combination, a railway switch, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, means including a lever latch for locking said lever in its normal extreme position, a contact, means controlled by said lever latch for operating said contact when said lever is moved away from its normal position, other means controlled by the switch points for holding said contact in its operated position until the lever is restored to its normal position when the switch points are moved away from their normal positions by said lever, and means effective if the switch points are moved away from their normal positions by a trailing train for moving said contact to its operated position and for subsequently latching said contact in its operated position until said last mentioned means is operated to unlatch said contact.

3. In combination, a railway switch, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, means including a lever latch for locking said lever in its normal position, a point detector rod secured to one of said switch points to move therewith, a contact, means controlled jointly by said lever latch and said point detector rod for operating said contact prior to the movement of the switch points when the switch points are moved away from their normal positions by said lever latch and for subsequently maintaining said contact in its operated position until the switch points and the lever are both restored to their normal positions, and means controlled by said lever latch and said point detector rod for moving said contact to its operated position and for subsequently latching it in its operated position when the switch

points are moved away from their normal positions by a train trailing the switch.

4. In combination, a railway switch, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, means including a lever latch for locking said lever in its normal position, a point detector rod secured to one of said switch points to move therewith, a contact, means controlled jointly by said lever latch and said point detector rod for operating said contact prior to the movement of the switch points when the switch points are moved away from their normal positions by said lever latch and for subsequently maintaining said contact in its operated position until the switch points and the lever are both restored to their normal positions, means controlled by said point detector rod for moving said contact to its operated position when a train trails the switch, and means controlled by said point detector rod and said lever latch for latching said contact in its operated position when it is moved to its operated position by a train trailing the switch.

5. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever for moving the switch between its two extreme positions arranged to engage said lock rod when said switch occupies one extreme position to lock said switch in said one extreme position, a lever latch for locking said lever in the extreme position corresponding to said one extreme position of the switch, a point detector rod secured to the movable rails of the switch to move therewith, a contact, means controlled by said lever latch and said point detector rod for operating said contact whenever said switch is moved away from said one extreme position, and means controlled by said lever latch and said point detector rod for latching said contact in its operated position if and only if the switch is moved away from its one extreme position by a train trailing the switch.

6. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever for moving the switch between its two extreme positions arranged to engage said lock rod when said switch occupies one extreme position to lock said switch in said one extreme position, a lever latch for locking said lever in the extreme position corresponding to said one extreme position of the switch, a point detector rod secured to the movable rails of the switch to move therewith, a contact, means controlled by said lever latch and said point detector rod for operating said contact whenever said switch is moved away from said one extreme position, and means controlled by said lever latch and said point detector rod for latching said contact in its operated position until said last-mentioned means is manually operated to restore said contact to its normal position if and only if the switch is moved away from its one extreme position by a train trailing the switch.

7. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving said switch between its normal and reverse positions and arranged to engage said lock rod when said switch and said lever both occupy their normal positions to lock the switch in its normal position, a lever latch for latching said

lever in its normal position arranged to be moved to a first or a second position according as said lever occupies its normal position or is moved away from its normal position, a point detector rod secured to one of the switch points for movement therewith, a contact, means controlled by said lever latch for operating said contact when said lever latch is moved from its first position to its second position, means controlled by said point detector rod for operating said contact when said one switch point is moved away from the position which it occupies when the switch occupies its normal position, and latch mechanism effective if said one switch point is moved while said lever latch occupies its first position for latching said contact in its operated position.

8. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever for moving said switch between its two extreme positions so arranged that when said switch occupies one extreme position said lever will engage said lock rod and lock said switch in said one extreme position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first position when said lever is moved to the position corresponding to said one extreme position of the switch and to a second position when said lever is moved away from the position corresponding to said one extreme position, a point detector rod secured to the switch point which is closed in said one extreme position of the switch for movement therewith, a contact biased to an open position, means controlled by said lever latch for closing said contact when said lever latch is moved from its first position to its second position, means controlled by said point detector rod for closing said contact when said point detector rod is moved away from the position which it normally occupies when said switch occupies said one extreme position, and means for latching said contact in its closed position if said point detector rod is moved away from the position which it occupies when said switch occupies said one extreme position while said lever latch occupies its first position.

9. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a point detector rod secured to the switch points to move therewith and provided with cam slots, a contact, means controlled by said lever latch and the cam slots in said detector rod for closing said contact when the switch points occupy their full normal positions and said lever latch is moved to its second position or when said lever latch occupies its first position and the switch points are moved away from their normal positions, and means for latching said contact in its closed position if said contact is moved to its closed position while the lever latch occupies its first position.

10. In combination, a railway switch, a lock rod secured to the movable rails of said switch to

move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a point detector rod secured to the switch points to move therewith and provided with cam slots, a contact, means controlled by said lever latch and the cam slots in said detector rod for closing said contact when the switch points occupy their full normal positions and said lever latch is moved to its second position or when said lever latch occupies its first position and the switch points are moved away from their normal positions and for holding said contact in its closed position when the lever latch occupies its second position and the switch points are moved away from their full normal positions, and means for latching said contact in its closed position if it is moved to its closed position while the lever latch occupies its first position.

11. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a point detector rod secured to the switch points to move therewith and provided with cam slots and with a notch, a contact, means controlled by said lever latch and the cam slots in said detector rod for closing said contact when the switch points occupy their full normal positions and said lever latch is moved to its second position or when said lever latch occupies its first position and the switch points are moved away from their normal positions, and means controlled by said notch and said lever latch for latching said contact in its closed position if said contact is moved to its closed position while the lever latch occupies its first position.

12. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a contact operating member biased to an upper position and movable to a lower position, contacts controlled by said contact operating member and arranged to be open or closed according as said contact member occupies its upper or its lower position, a point detector rod secured to the switch points to move therewith and provided with two sets of cam slots and with a notch, a first lever pivotally

supported intermediate its ends and connected at one end by means of a pin and slot connection with said contact operating member, a second lever pivotally connected at one end to said lever latch and at the other end to the free end of said first lever, rollers secured to said first lever between its pivotal support and the end which is connected with said contact operating member and arranged to cooperate with the one set of cam slots in said point detector rod, other rollers secured to said second lever intermediate its ends and arranged to cooperate with the other set of cam slots in said point detector rod, the parts being so proportioned that when said lever latch occupies its first position and said switch points occupy their full normal position said levers will be rotated to positions in which said contact operating member is free to move to its upper position under the action of its bias, but that, when the switch points are moved away from their full normal positions while said lever latch occupies its normal position, or when said lever latch is moved to its second position while the switch points occupy their full normal positions, said levers will be rotated to positions in which said contact operating member is moved to its lower position, and means controlled by said notch and said lever latch for latching said contact operating member in its lower position if said switch points are moved away from their normal positions while said lever latch occupies its normal position.

13. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a contact operating member biased to an upper position and movable to a lower position, contacts controlled by said contact operating members and arranged to be open or closed according as said contact member occupies its upper or its lower position, a point detector rod secured to the switch points to move therewith and provided with cam slots, means controlled by said lever latch and the cam slots in said detector rod for moving said contact operating member to its lower position if the lever latch is moved to its second position while the switch points occupy their full normal positions or if the switch points are moved away from their normal positions while the lever latch occupies its first position and for subsequently holding said contact operating member in its lower position as long as the switch points remain away from their normal positions, or the lever latch remains in its second position or both, and means for latching said contact operating member in its lower position if it is moved to its lower position while the lever latch occupies its first position.

14. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal posi-

tion to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a contact operating member biased to an upper position and movable to a lower position, contacts controlled by said contact operating member and arranged to be open or closed according as said contact member occupies its upper or its lower position, a point detector rod secured to the switch points to move therewith and provided with cam slots and with a notch, means controlled by said lever latch and the cam slots in said detector rod for moving said contact operating member to its lower position if the lever latch is moved to its second position while the switch points occupy their full normal position or if the switch points are moved away from their normal positions while the lever latch occupies its first position and for subsequently holding said contact operating member in its lower position as long as the switch points remain away from their normal positions or the lever latch remains in its second position or both, and means controlled by said lever latch and the notch in said point detector rod for latching said contact operating member in its lower position if it is moved to its lower position while the lever latch occupies its first position.

15. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a contact operating member biased to an upper position and movable to a lower position, contacts controlled by said contact operating members and arranged to be open or closed according as said contact member occupies its upper or its lower position, a point detector rod secured to the switch points to move therewith and provided with cam slots and with a notch, means controlled by said lever latch and the cam slots in said detector rod for moving said contact operating member to its lower position if the lever latch is moved to its second position while the switch points occupy their full normal positions or if the switch points are moved away from their normal positions while the lever latch occupies its first position and for subsequently holding said contact operating member in its lower position as long as the switch points remain away from their normal positions or the lever latch remains in its second position or both, a first lever pivotally supported intermediate its ends and connected at one end with said contact operating member by means of a pin and slot connection, a latching finger formed on the other end of said first lever, a latch catch provided with a first and a second notch adapted to selectively receive the free end of said latching finger, means for biasing said latch catch to a position to which one or the other of the notches in said latch catch will receive the free end of said latching finger; the parts being so proportioned that when the free end of the latching finger is in the first notch in said latch catch, said contact operating

member will be free to move between its upper and lower positions, but that, when the free end of said latching finger is in the second notch in said latch catch, said contact operating member will be held in its lower position, a second lever pivoted at one end and provided at the other end with a roller which will enter the notch in said lock rod when and only when the switch points occupy their full normal positions, a roller secured to said first lever between said latching finger and the pivotal support for said first lever directly above the roller secured to said second lever, and a selector lever secured to said lever latch and provided with an enlarged head which is disposed between said two rollers when and only when said lever latch occupies its first position, the parts being so proportioned that if the roller secured to said second lever is forced out of the notch in said detector rod when said enlarged head is disposed between said two rollers said first lever will be rotated to the position in which the latching finger enters the second notch in the latch catch but that if the roller secured to said second lever is forced out of the notch in said detector rod when said enlarged head is not disposed between said rollers the movement of such roller out of the notch will have no effect on said first lever.

16. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a pivoted contact operating member movable between open and closed positions, contacts controlled by said contact operating member arranged to be open or closed according as said contact operating member occupies its open or closed position, a point detector rod, means controlled jointly by said lever latch and said point detector rod for biasing said contact operating member to its normal position when said lever latch occupies its first position and the switch points occupy their full normal positions and for moving said contact operating member to its closed positions when the lever latch is moved to its second position or when the switch points are moved away from their normal positions, latching means biased to a latching position and effective when in its latching position for latching said contact operating member in its closed position, and means controlled by said lever latch for preventing said latching means from moving to its latching position except when said lever latch occupies its first position.

17. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from

its normal position, a pivoted contact operating member movable between open and closed positions, a contact controlled by said contact operating member arranged to be open or closed according as said contact operating member occupies its open or closed position, a point detector rod, means controlled jointly by said lever latch and said point detector rod for biasing said contact operating member to its open position when said lever latch occupies its first position and the switch points occupy their full normal positions and for moving said contact operating member to its closed position when the lever latch is moved to its second position or when the switch points are moved away from their normal positions, a latching projection secured to said contact operating member and provided with a notch, a latch arm adapted to enter said notch when said contact operating member occupies its closed position to latch said contact operating member in its closed position, said latch arm being biased to its latching position, and means controlled by said lever latch for preventing said latch arm from moving to its latching position except when said lever latch occupies its first position.

18. In combination, a railway switch, a lock rod secured to the movable rails of said switch to move therewith, a manually operable lever movable between normal and reverse positions for moving the switch between its normal and reverse positions, said lever being arranged to engage said lock rod when said lever occupies its normal position to lock the switch in its normal position, a lever latch cooperating with said lever in such manner that said lever latch will be moved by said lever to a first or a second position according as said lever is moved to or away from its normal position, a pivoted contact operating member movable between open and closed positions, a contact controlled by said contact operating member arranged to be open or closed according as said contact operating member occupies its open or closed position, a latching projection secured to said contact operating member and provided with a notch, a latch arm adapted

to enter said notch when said contact operating member occupies its closed position to latch said contact operating member in its closed position, said latch arm being biased to its latching position, means effective when said latch arm is moved to its latching position for securely retaining it in its latching position until it is manually moved away from its latching position, and means controlled by said lever latch for preventing said latch arm from moving to its latching position except when said lever latch occupies its first position.

19. In combination, a railway switch, a manually operable lever movable between normal and reverse positions for moving said switch between its normal and reverse positions, means including a lever latch for locking said lever in its normal extreme position, a contact, means controlled by said lever latch for operating said contact when said lever is moved away from its normal position, other means controlled by the switch points for at times operating said contact in response to movement of the switch points away from their normal positions, and means for latching said contact in its operated position if the switch points are moved away from their normal positions when the lever occupies its normal position.

20. In combination, a railway switch, a manually operable lever movable between normal and reverse positions for moving said switch between its normal and reverse positions, means including a lever latch for locking said lever in its normal extreme position, a contact, means controlled by said lever latch for operating said contact when said lever is moved away from its normal position, other means controlled by the switch points for at times operating said contact in response to movement of the switch points away from their normal positions, and means effective upon the movement of the switch points away from their normal positions while the lever occupies its normal position for latching said contact.

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