Dec. 28, 1943. H. L. BONE ET AL 2,337,636

RAILWAY SWITCH OPERATING APPARATUS

Filed Jan. 20, 1942 3 Sheets-Sheet 1

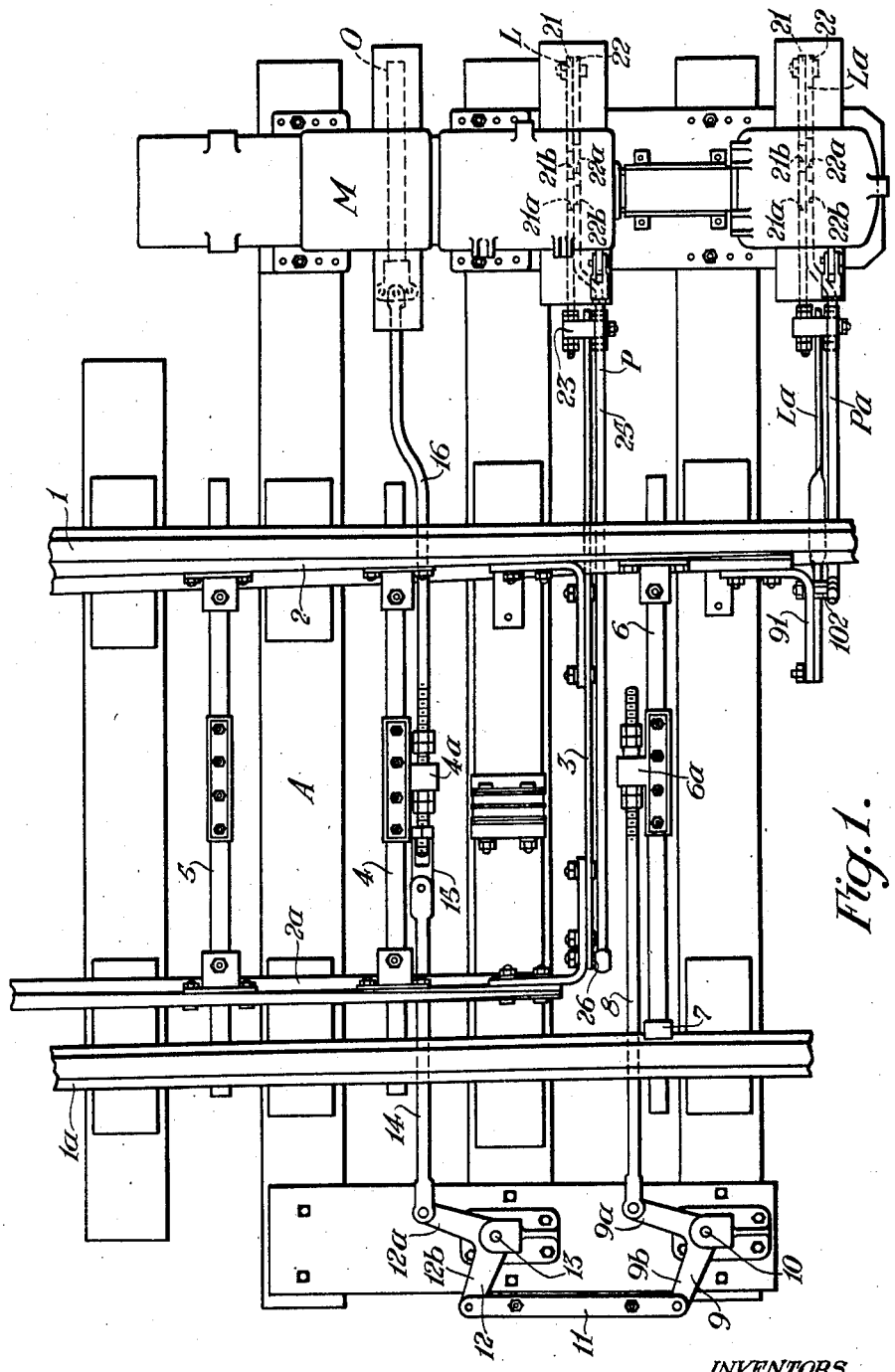


Fig. 1.

INVENTORS
Herbert L. Bone and
Edwin G. Little.
BY
THEIR ATTORNEY

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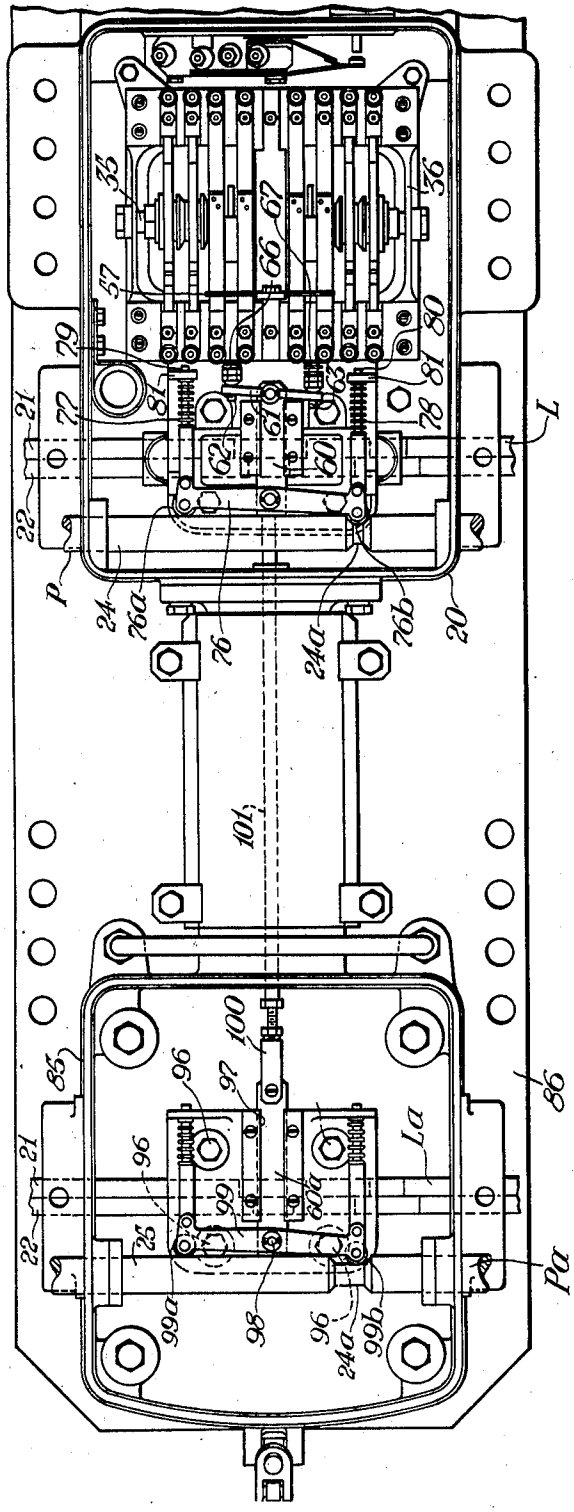


Fig. 2.

INVENTORS
Herbert L. Bone and
Edwin G. Little.
BY
THEIR ATTORNEY

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Filed Jan. 20, 1942 3 Sheets-Sheet 3

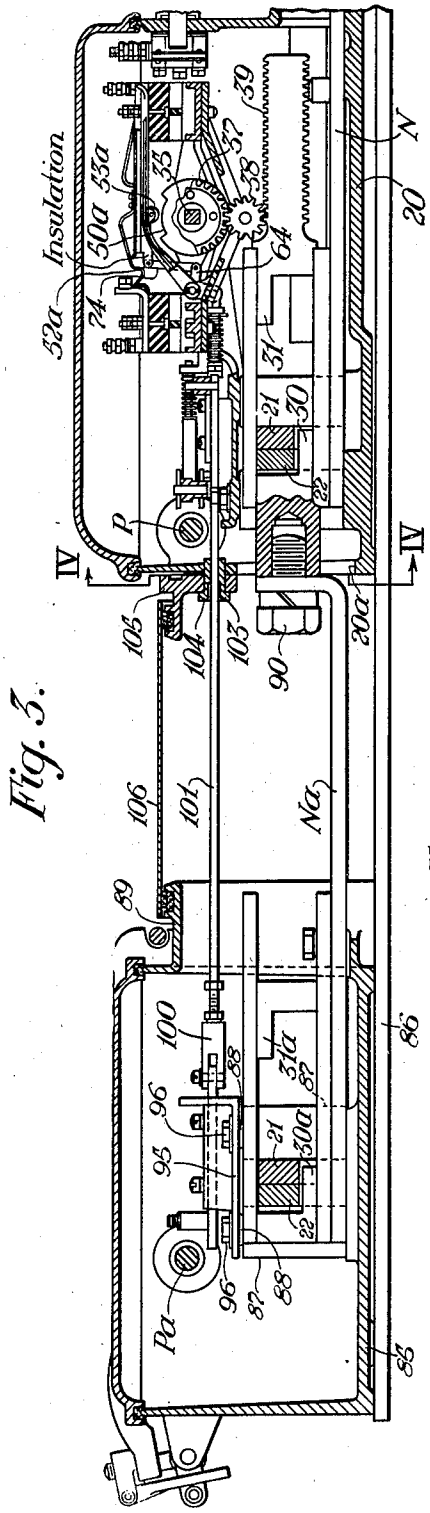


Fig. 3.

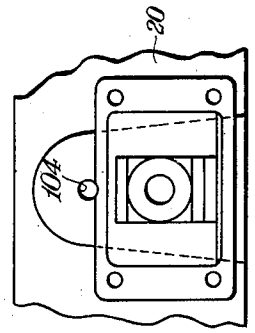


Fig. 4.

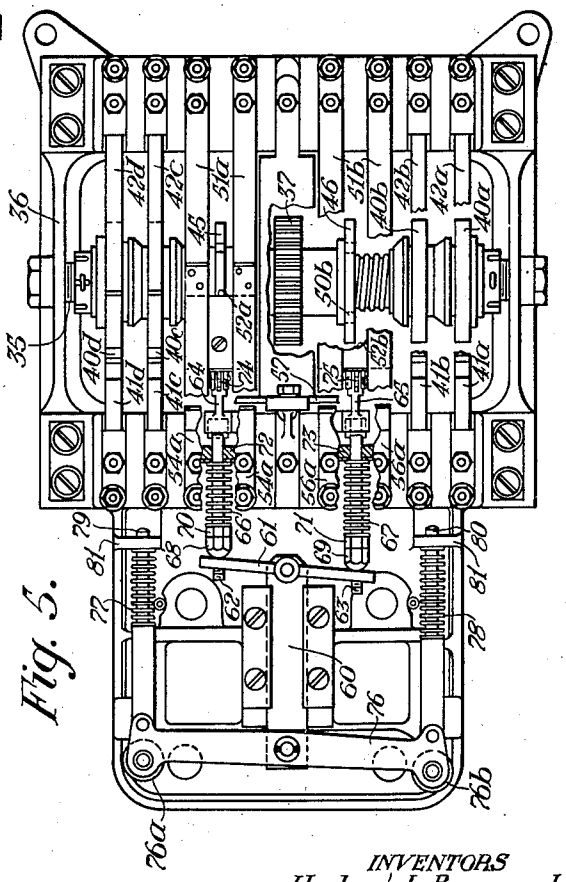


Fig. 5.

INVENTORS
Herbert L. Bone and
Edwin G. Little
BY
THEIR ATTORNEY

Patented Dec. 28, 1943

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UNITED STATES PATENT OFFICE

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RAILWAY SWITCH OPERATING APPARATUS

Herbert L Bone, Forest Hills, and Edwin G. Little, Penn Township, Allegheny County, Pa., assignors to The Union Switch & Signal Company, Swissvale, Pa., a corporation of Pennsylvania

Application January 20, 1942, Serial No. 427,448

1 Claim. (Cl. 246—253)

Our invention relates to railway switch operating apparatus, and particularly to apparatus for operating staggered point switches, that is, switches in which one of the points is placed in advance of the other.

One object of our invention is the provision of novel means whereby a staggered point switch may be operated by the same type of electric switch and lock movement which is commonly employed to operate conventional switches.

Another object of our invention is the provision of means for separately locking both points of a staggered point switch when the switch is operated by a switch and lock movement of the above referred to type.

A further object of our invention is the provision of means to enable the circuit controller of a switch and lock movement of the above referred to type to be separately controlled by the long and short points of a staggered point switch.

According to our invention, we provide auxiliary locking and point detector mechanism for connection with the long switch point. This mechanism is housed in an auxiliary housing which is secured to a plate bolted to the housing of the switch and lock movement, and is constructed to enable it to cooperate with the locking and point detector mechanism of the switch and lock movement in such manner that operation of the switch and lock movement causes both sets of mechanisms to function jointly in locking the switch points and in detecting their positions when locked.

Other objects and characteristic features of our invention will become apparent as the description proceeds.

We shall describe one form of apparatus embodying our invention, and shall then point out the novel features thereof in the claim.

In the accompanying drawings, Fig. 1 is a top plan view showing a staggered point railway switch having applied thereto one form of operating and locking mechanism embodying our invention. Fig. 2 is a plan view on an enlarged scale of a portion of the switch operating and locking mechanism shown in Fig. 1 with the covers to the casings removed. Fig. 3 is a vertical longitudinal sectional view of the mechanism shown in Fig. 2. Fig. 4 is a detail sectional view taken on the line IV—IV of Fig. 3. Fig. 5 is an enlarged top plan view of a portion of the circuit controller forming part of the switch and lock movement shown in Figs. 1, 2 and 3 with certain of the parts removed to better illustrate the construction of the remaining parts.

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 the usual stock rails 1 and 1*a* and movable switch points 2 and 2*a* connected for simultaneous movement by a front rod 3, a head rod 4 and a tie rod 5. The movable switch points 2 and 2*a* are staggered longitudinally with respect to the track, that is to say, the switch point 2 extends some distance, preferably from 26 to 36 inches, in advance of the switch point 2*a*.

Attached to the long switch point 2 adjacent its free end is a second head rod 6. This head rod is guided at the end opposite the point 2 by a bracket 7 secured to the stock rail 1*a*, and is operatively connected intermediate its ends by means of a lost motion connection 6*a* with one end of a throw rod 8, the other end of which is pivotally connected to one arm 9*a* of a bell crank lever 9. The bell crank lever 9 is pivotally supported in the trackway at 10, and the other arm 9*b* thereof is connected by means of a connecting link 11 with the corresponding arm 12*b* of a similar bell crank lever 12 which is pivotally supported in the trackway at 13. The remaining arm 12*a* of the bell crank lever 12 is connected by means of a connecting rod 14 and a screw jaw 15, with a throw rod 16 which, in turn, is connected with the head rod 4 by means of a lost motion connection 4*a* similar to the lost motion connection 6*a*. The throw rod 16 extends underneath the stock rail 1 and the switch point 2, and is connected at its free end with the longitudinally movable operating rod O of a switch and lock movement M. It will be apparent, therefore, from an inspection of the drawings, that when the operating rod O is actuated by the switch and lock movement M, separate forces will be simultaneously applied to both switch points to reverse them.

The switch and lock movement M is preferably of the type shown and described in Letters Patent of the United States No. 1,293,290, granted to William Zabel on February 4, 1919, for Railway traffic controlling apparatus, and only those parts which are thought to be essential for a clear understanding of our present invention have therefore been shown in detail in the drawings and will be described herein.

Referring to Figs. 2 and 3, this switch and lock movement comprises a casing 20 provided with suitable guides to receive the operating rod O, a lock rod L and a point detector rod P. The lock rod L is of standard construction, and comprises

two longitudinally adjustable bars 21 and 22 secured at one end to the front rod 3 of the switch A by means of an adjustable connection 23. The bar 21 is provided in its lower edge with a long notch 21*a* which aligns with a short notch 22*b* provided in the lower edge of the bar 22, and in its upper edge with a short notch 21*b* which aligns with a long notch 22*a* provided in the upper edge of the bar 22.

The point detector rod P is also of standard construction, and comprises a circular bar 24 connected by means of a connecting rod 25 and a point lug 26 with the switch point 2*a*. The bar 24 is formed with an annular recess 24*a* the function of which will appear presently.

Slidably mounted within the casing 20 directly above the operating rod O and directly below the lock rod L, and intersecting the operating rod O and the lock rod L at right angles is a slide bar N (see Fig. 3) the left-hand end of which is provided with two vertically and longitudinally spaced locking dogs 30 and 31. When the movable rails of the switch occupy their normal positions in which they are shown in Fig. 1, the slide bar N occupies the extreme position in which it is shown in Fig. 3, and under these conditions the locking dog 30 enters the aligned notches 21*a* and 22*b*. When, however, the switch and lock movement is operated to move the movable rails of the switch to their reverse positions, the slide bar N is moved toward the left, as viewed in Fig. 3, prior to the movement of the operating rod O which reverses the movable rails, to an intermediate position in which the locking dog 30 is withdrawn from the aligned notches 21*a* and 22*b* in the lock rod L, and when the movement of the movable rails to their full reverse positions by the operating rod O has been completed, the slide bar N is then moved in the same direction as before to another extreme position in which the dog 31 enters the aligned notches 21*b* and 22*a* in the lock rod L. When the switch and lock movement is next operated to restore the switch to its normal position, the subsequent movements of the slide bar and operating rod above described are maintained, but the directions of the movements are reversed.

The switch and lock movement M also includes a suitable circuit controller which is here shown as comprising a cam shaft 35 journaled in supporting framework 36. The cam shaft 35 is adapted to be oscillated or rotated in response to the longitudinal movements of the slide bar N, and for this purpose the shaft has fixed thereto a gear wheel 37 which meshes with an intermediate idler gear 38 driven by a rack bar 39 secured to the slide bar N. Mounted on and insulated from the cam shaft 35 are four contact segments two of which 40*a* and 40*b* are disposed on one side of the gear wheel 37, and the remaining two of which 40*c* and 40*d* are disposed on the other side of the gear wheel 37. Each cam segment 40 cooperates at its periphery with two contact fingers designated by the reference characters 41 and 42, respectively, with the same distinguishing suffix as the suffix of the reference character for the associated cam segment. For example, the cam segment 40*a* cooperates with the contact fingers 41*a* and 42*a* to at times close a contact 41*a*—40*a*—42*a*. The periphery of each cam segment may have any desired length, and the cam segments are secured to the cam shaft by well-known means which permit them to be readily turned to any desired position relative to the cam shaft. As here illustrated, the contact segments are of such length and are so positioned relative to the cam shaft that the contacts 41*a*—40*a*—42*a* and 41*b*—40*b*—42*b* will be closed at all times except when the slide bar N is in the extreme position in which it locks the switch points in the positions in which they are shown in Fig. 1, and that the contacts 41*c*—40*c*—42*c* and 41*d*—40*d*—42*d* will be closed at all times except when the slide bar N is in the extreme position in which it locks the switch points in the positions reverse to that in which they are shown in Fig. 1. The contacts 41*a*—40*a*—42*a*, 41*b*—40*b*—42*b*, 41*c*—40*c*—42*c* and 41*d*—40*d*—42*d* may be used in a well-known manner to control the circuit for the switch and lock movement, or for any other desired purpose.

Also mounted on the cam shaft 35 on opposite sides of the gear wheel 37 are two cams 45 and 46 which are operatively connected with the cam shaft in such manner that they can be readily turned through an angle of 180° relative to the cam shaft to enable the switch machine to be used in either a right-hand or a left-hand installation. The means for securing these cams to the cam shaft forms no part of our present invention, and it is deemed unnecessary therefore to describe them herein. The cam 45 is provided in its periphery with an arcuate notch 50*a*, and is adapted, when rotated, to actuate a pair of contact fingers 51*a* which are connected together for simultaneous movement by an insulating bridge 52*a*. The cam 46 is likewise provided in its periphery with an arcuate notch 50*b*, and is adapted, when rotated, to actuate a pair of contact fingers 51*b* which are connected together by an insulating bridge 52*b*. The insulating bridges 52*a* and 52*b* are provided with rollers 53*a* which coact with the corresponding cams and serve as an actuating means for the contact fingers when the cams are rotated. The fingers 51*a* and 51*b*, when the notches 50*a* and 50*b* in the cams 45 and 46 are opposite the rollers 53*a*, at times assume inclined positions in which they engage four stationary contact fingers 54*a*, 54*a*, and 56*a*, 56*a* as will be described more fully hereinafter, but when the notches 50*a* and 50*b* are not opposite the rollers 53*a* and 53*b* these fingers are lifted to cause the fingers of each pair to engage an upper stationary contact 57. The cams 45 and 46 are so arranged and the notches are of such length that all of the contact fingers 51 will be lifted when the slide bar N is in transit, but that one pair of fingers will normally be permitted to assume their lower positions when the slide bar N is in one extreme end of its movement, and the other pair of fingers will normally be permitted to assume their lower positions when the slide bar N is in the other extreme end of its movement, as will be described more fully hereinafter.

The switch and lock movement M also includes point detector mechanism for controlling the contact fingers 51 independently of the positions of the slide bar N. As here shown, this mechanism includes a short bar 60 mounted for longitudinal sliding movement toward and away from the circuit controller at the left-hand end of the circuit controller. An equalizing lever 61 is pivotally attached to the inner end of the bar 60, and is provided at its opposite ends with through holes which receive the outer ends of two threaded rods 62 and 63 with some clearance. The rods 62 and 63 are pivotally connected at their inner ends to bell crank levers 64 and 65, respectively, and are biased by means of springs

66 and 67 to positions in which nuts 68 and 69 adjustably screwed onto the rods engage the inner face of the equalizing lever 61. The springs 66 and 67 are disposed on the rods 62 and 63 between jam nuts 70 and 71 which lock the nuts 68 and 69 in their adjusted positions, and slotted guideways 72 and 73 through which the rods pass with clearance. The bell crank levers 64 and 65 are pivotally mounted in the framework 36, and have their free arms operatively connected with the insulating bridges 52*a* and 52*b* by means of links 74 and 75.

A rocker arm 76 provided at its opposite ends with rollers 76*a* and 76*b* which cooperate with the previously described recess 24*a* in the point detector rod P is pivotally attached to the outer end of the bar 60, and is constantly biased, to the position in which either roller will enter the recess 24*a* if the recess is then in alignment with the roller, by means of springs 77 and 78 disposed on the rounded ends of spring rods 79 and 80. The spring rods 79 and 80 are pivotally attached at one end to the opposite ends of the lever 76 and are slidably supported at the other end in lugs 81 formed on the framework 36. The springs 77 and 78 are disposed on the rods between the lugs 81 and shoulders formed on the rods intermediate their ends.

With the point detector mechanism constructed in the manner described it will be apparent that the lever 76 is operatively connected with both sets of contacts 51*a* and 51*b* through the medium of the bar 60, the equalizing lever 61, nuts 68 and 69, threaded rods 62 and 63, bell crank levers 64 and 65, links 74 and 75 and the insulating bridges 52*a* and 52*b*. The nuts 68 and 69 are so adjusted, and the parts are so proportioned that when the contacts of either set are free to move to their lowermost positions insofar as the control of these contacts by the slide bar N is concerned, the point detector mechanism will act to bias the contacts of such sets to their lowermost positions provided the recess 24*a* in the point detector rod P then aligns with one or the other of the rollers 76*a* or 76*b* so that the lever 76 is free to rotate to the position in which the aligned roller enters the recess. If, however, the recess 24*a* is out of alignment with both rollers 76*a* and 76*b*, the point detector mechanism will act to force the fingers of both sets to their raised positions regardless of the position of the slide bar N.

The point detector rod P is so adjusted that the recess 24*a* will align with the roller 76*a* when and only when the switch points occupy their normal positions in which they are shown in the drawings, and with the roller 76*b* when and only when the points occupy their full reverse positions. It will be seen, therefore, that when the switch occupies its normal position and is properly locked in this position the contacts 51*a*—54*a* will be closed, but that when the switch occupies its reverse position and is properly locked in this position the contact 51*b*—56*a* will be closed. If, however, when the switch occupies either extreme position, the switch points are out of adjustment or are forced away from their properly adjusted positions, as by a train trailing the switch, the resultant displacement of the switch points will move the detector rod P to the position in which the recess 24*a* is out of alignment with both sets of rollers 76*a* and 76*b*, and will thereby raise the set of contacts 51 which would normally be closed in that position of the switch. The contacts 51 may be used to control signal circuits or in any other way to provide a check on the position of the points.

According to our present invention we provide auxiliary locking and point detector mechanism for the long switch point 2, which mechanism is adapted to connect to and work with the locking and point detector mechanism of the switch and lock movement M without necessitating any substantial change in the construction of the switch and lock movement. As here shown, this mechanism is enclosed in an auxiliary casing 85 mounted on a supporting plate 86 secured at one end to the casing 20 of the switch and lock movement M, whereby the auxiliary casing is held in a fixed position relative to the switch and lock movement. Slidably mounted in the bottom of the auxiliary casing 85 between guide rollers 87 mounted on studs 88 is an auxiliary slide bar N*a*, one end of which projects outside of the auxiliary housing through a flanged opening 89 and is secured to one end of the slide bar N by means of a stud 90. The slide bar N*a* is provided at its free end with two vertically and longitudinally spaced locking dogs 30*a* and 31*a* which cooperate with an auxiliary lock rod L*a* slidably mounted in the auxiliary casing 85 at right angles to the slide bar. The auxiliary lock rod L*a* is similar in all respects to the lock rod L, and is operatively connected to the switch point 2 through the medium of a switch foot 91. The locking dogs 30*a* and 31*a* cooperate with lock rod L*a* in the same manner that the locking dogs 30 and 31 cooperate with the lock rod L. That is to say, when the movable rails of the switch are moved by the switch and lock movement M to their normal positions in which they are shown in Fig. 1, the slide bar N*a* is moved by virtue of its connection to the slide bar N to the extreme position in which it is shown in Fig. 3, and under these conditions, the locking dog 30*a* enters the aligned notches 21*a* and 22*b* in the lock rod L*a* to thereby securely lock the switch point 2 in its normal position. When, however, the switch and lock movement is operated to move the movable rails of the switch to their reverse positions, the slide bar N*a* is moved toward the left as viewed in Fig. 3, prior to the movement of the operating rod O which reverses the movable rails, to an intermediate position in which the locking dog 30*a* is withdrawn from the aligned notches 21*a* and 22*b* in the lock rod L*a*, and when the movement of the movable rails to their full reverse position by the operating rod O has been completed, the slide bar N*a* is then moved in the same direction as before, to another extreme position in which the locking dog 31*a* enters the aligned notches 21*b* and 22*a* in the lock rod L*a*. When the switch and lock movement is next operated to restore the switch to its normal position the subsequent movements of the points above described are maintained but the directions of the movements are reversed.

A point detector supporting plate 95 is secured by means of studs 96 to the upper end of the studs 88 which support the guide rollers 87, and is provided with a longitudinal guideway 97 which slidably receives a bar 60*a* similar to the bar 60. The bar 60*a* is provided at one end with an upstanding pin 98 which pivotally supports a rocker arm 99, and is operatively connected at the other end by means of a screw jaw 100 with one end of a push rod 101. The rocker arm 99 is similar to the rocker arm 76 and is provided at its opposite ends with rollers 99*a* and 99*b* which cooperate with a point detector rod P*a* slidably mounted in

casing 85. The point detector rod P*a* is similar to the point detector rod P, and is operatively connected at one end with the switch point 2 through the medium of a point lug 102 attached to the switch foot 91.

The push rod 101 is slidably supported adjacent its free end in a bushing 103 screwed into an opening 104 formed in a flange 105 bolted to the casing 20 of the switch and lock movement at the outer side of an opening 20*a* through which the auxiliary slide bar N*a* passes, and abuts against the end of the point detector bar 60.

The parts are so proportioned that the recess 24*a* in the point detecting rod P*a* will align with the roller 99*b* when and only when the switch points occupy the normal positions in which they are shown in Fig. 1, and with the roller 99*a* when and only when the switch points occupy their reverse positions. The parts are further so proportioned that when the recess 24*a* aligns with either roller the rocker arm will be rotated by virtue of the engagement of the push rod with the slide bar 60 to the position in which the aligned roller will enter the recess 24*a*, but that, if the point detector rod P*a* becomes displaced for any reason, such, for example, as would be the case if the point 2 becomes damaged, both rollers will be forced out of the recess 24*a* to thereby move the slide bar 60*a* to the right. The movement of the slide bar 60*a*, in turn, acts through the push rod 101 to move the slide bar 60 to the right the same amount that it would be moved to the right when either one of the rollers 76*a* or 76*b* is forced out of the recess 24*a* in the point detector rod P. As was pointed out hereinbefore, when slide bar 60 is moved to the right, both sets of the indication contacts 51 are forced upwardly to their raised positions to indicate that one of the switch points is damaged.

The flanges 89 and 105 provide packing grooves to receive a cover 106 which closes the opening between the main casing 20 and the auxiliary casing 85.

One advantage of apparatus embodying our invention is that it provides operating, locking and point detector functions for both the long and short points of a staggered point switch, without requiring a special switch and lock movement to accomplish this result.

Another advantage of apparatus embodying our invention is that the operating, locking and point detector functions for both points are tied together in such manner that the two points must move together and are secured in position at each end of the switch stroke.

Although we have herein shown and described only one form of railway switch operating apparatus embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claim without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

In combination, a staggered point switch, an electric switch and lock movement designed for operation of a non-staggered point switch operatively connected with the switch and including a slide bar cooperating with a lock rod connected to the short switch point to lock the switch in both extreme positions and an indication circuit controller controlled jointly by said slide bar and a point detector rod secured to the short switch point, the combination with the aforementioned instrumentalities of an auxiliary locking and point detector mechanism for cooperation with the long switch point, said mechanism being housed in a casing separate from said switch and lock movement and secured in a fixed position relative to said switch and lock movement opposite the long switch point and said mechanism comprising an auxiliary slide bar disposed in said casing and secured to the slide bar of the switch and lock movement and cooperating with an auxiliary lock rod in said casing secured to the long switch point to lock the long point in both extreme positions, an auxiliary point detector rod in said casing secured to the long switch point, and auxiliary linkage connecting said circuit controller with said auxiliary point detector rod and effective in the event of the displacement of said long point from its normal locked position to actuate said circuit controller.

HERBERT L. BONE.
EDWIN G. LITTLE.