

Oct. 29, 1935.

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2,019,189

RAILWAY SWITCH OPERATING APPARATUS

Filed June 13, 1933

3 Sheets-Sheet 1

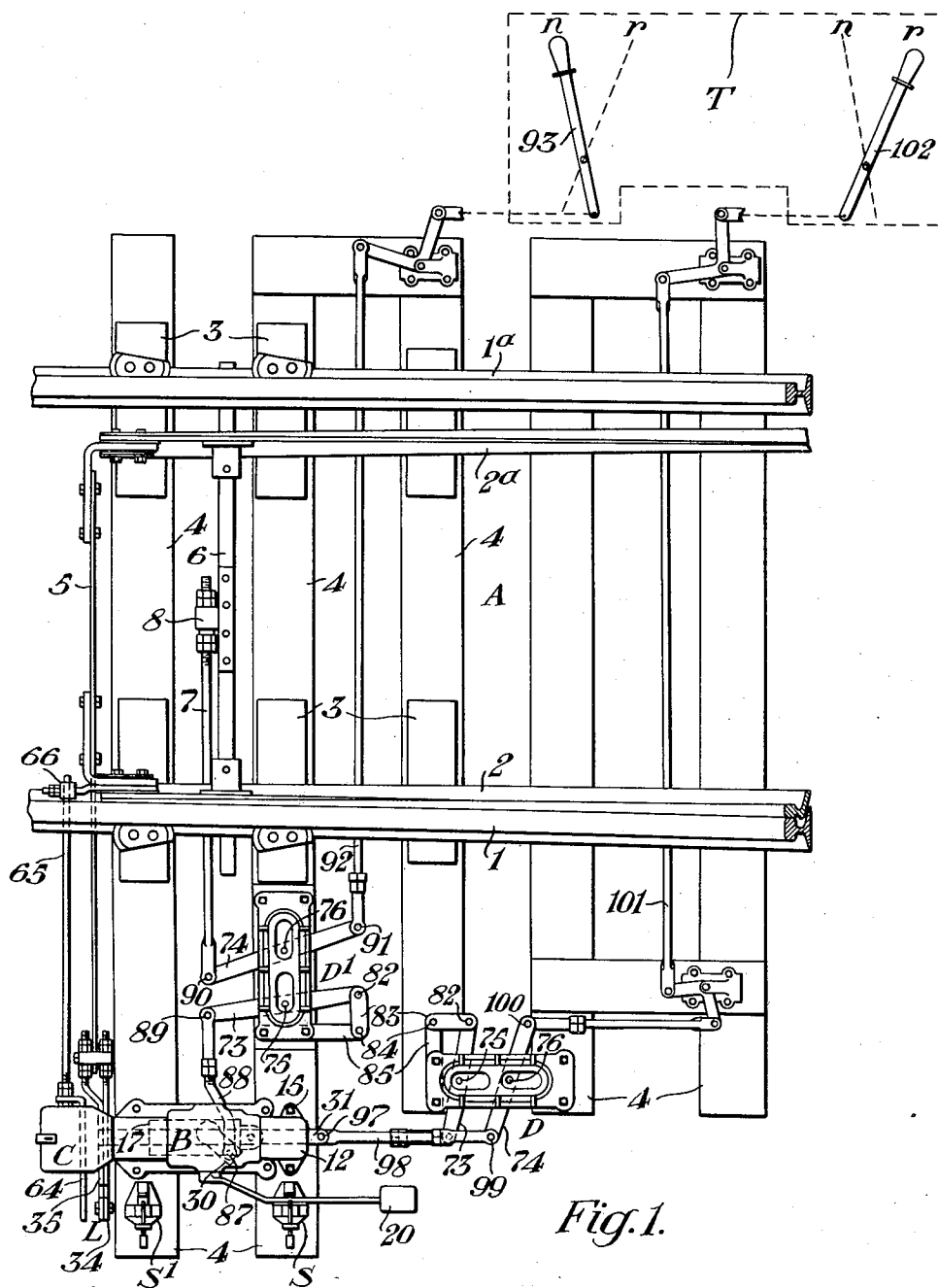


Fig. 1.

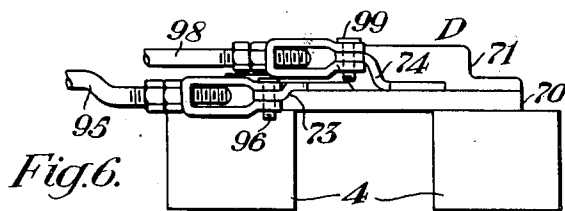


Fig. 6.

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3 Sheets-Sheet 2

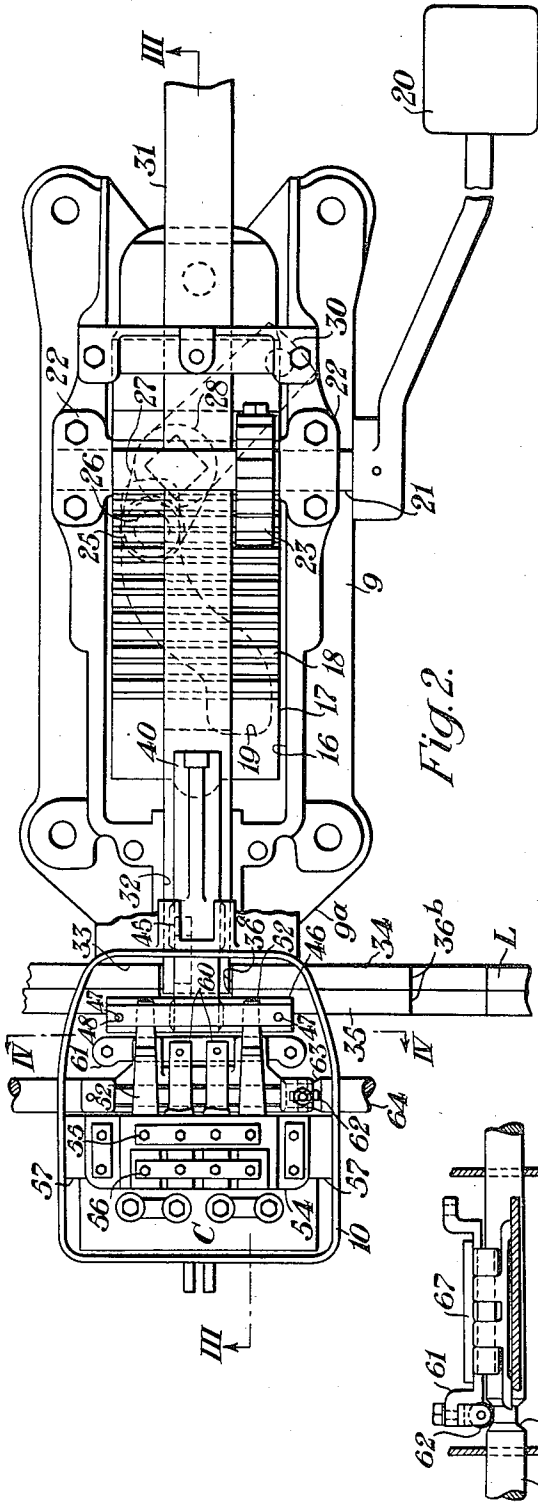


Fig. 2.

Fig. 4.

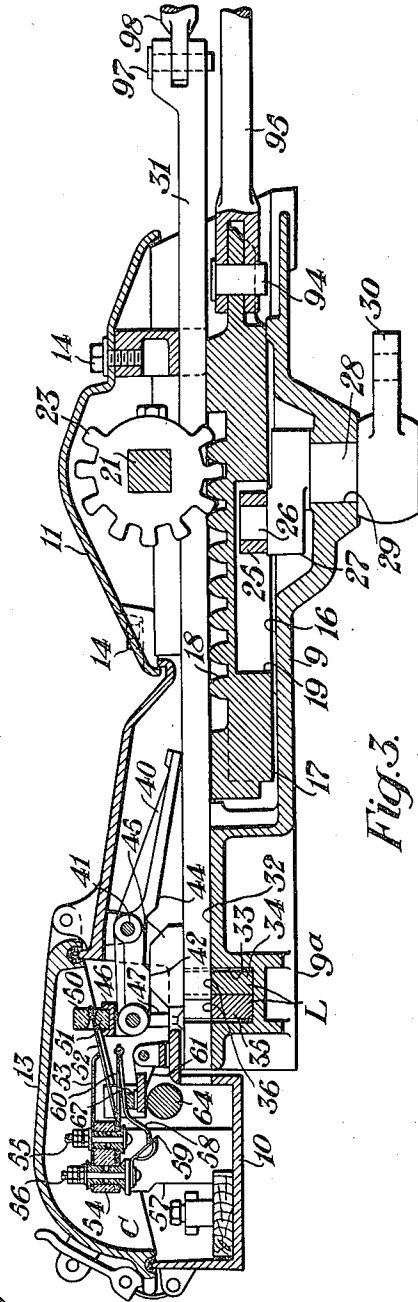


Fig. 3.

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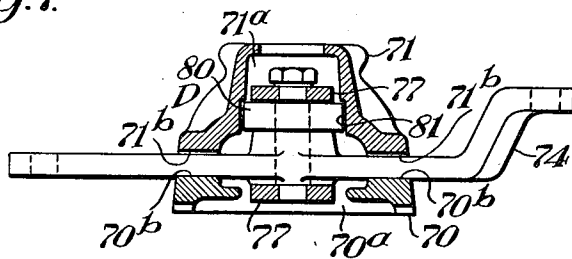
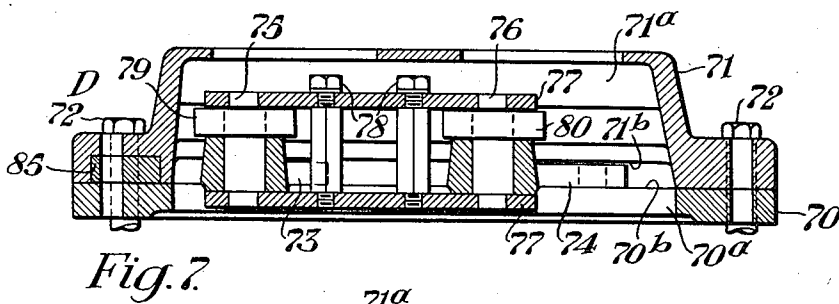
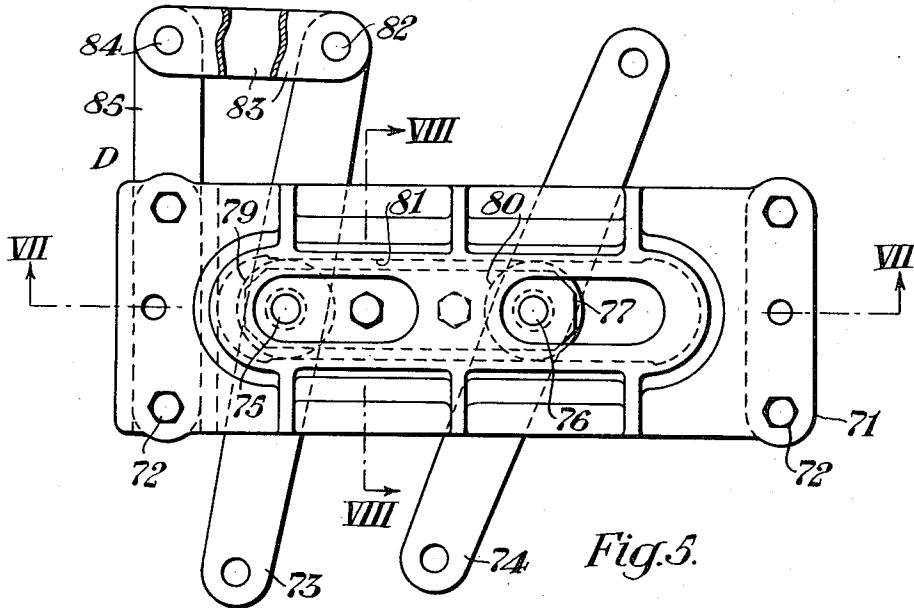
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RAILWAY SWITCH OPERATING APPARATUS

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3 Sheets-Sheet 3



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2,019,189

RAILWAY SWITCH OPERATING APPARATUS

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Application June 13, 1933, Serial No. 675,590

10 Claims. (Cl. 246—159)

Our invention relates to railway switch operating apparatus.

In certain mechanical interlockings in which railway switches are operated by means of mechanical levers located in an interlocking tower, and connected with the switches by means of pipe lines, the traffic during certain periods of the day is so light, or of such a nature, that the necessity for having an operator in the tower during these periods can be eliminated if means are provided whereby when the towerman is off duty, the switch can be left locked in its normal position for main line traffic over the switch, but if it becomes necessary to reverse the switch to permit a siding move, a trainman can, by means of a manually operable switch throwing device located at the switch, unlock the switch and reverse it until the siding move is completed, and then restore the switch to its normal position and relock it in this position, in such a way that when the towerman again comes on duty, he can control the switch from the tower in the usual manner. One object of our invention is to provide novel means for accomplishing this desirable result.

We will describe one form of railway switch operating apparatus embodying our 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 provided with one form of switch operating apparatus embodying our invention. Fig. 2 is an enlarged top plan view of the switch throwing and locking device B forming part of the apparatus illustrated in Fig. 1, the several covers of the device being removed to better illustrate the construction of its mechanism. Fig. 3 is a longitudinal sectional view of the device shown in Fig. 2 taken substantially on the line III—III of Fig. 2. Fig. 4 is a detail view taken on the line IV—IV of Fig. 2. Fig. 5 is an enlarged top plan view of the lever stand D forming part of the apparatus illustrated in Fig. 1, and embodying our invention. Fig. 6 is a side view of the stand D shown in Fig. 5. Figs. 7 and 8 are sectional views taken on the lines VII—VII, and VIII—VIII, respectively, of Fig. 5.

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 rails 2 and 2^a. The fixed rails 1 and 1^a are laid on tie plates 3 and are secured to crossties 4 in

the usual manner. The movable rails 2 and 2^a are fastened together by a front rod 5 and a head rod 6, and may be moved into a normal or a reverse position by means of a throw rod 7 which is connected with the head rod 6 through the medium of the usual switch basket 8. When the switch occupies its normal position, in which position, it is shown in the drawings, the movable rail 2 engages the fixed rail 1, and the movable rail 2^a is spaced a slight distance from the fixed rail 1^a. When the switch is reversed, however, the movable rail 2^a then engages the fixed rail 1^a, and the movable rail 2 is spaced from the fixed rail 1.

Associated with the switch A is a switch throwing and locking device B. This device may be of any suitable type but, in the form here shown, this device comprises a main casing 9 (see Figs. 2 and 3) which is bolted to an adjacent pair of the crossties 4, and an auxiliary casing 10 which is bolted to a tail-like projection 9^a of the main casing 9. The upper end of the main casing 9 is closed by a cover 11 and a guard 12, while the upper end of the auxiliary casing 10 is closed by a hinged cover 13. The cover 11 is secured to the main casing 9 by means of bolts 14 while the guard 12 is secured to one of the ties 4 by means of lag screws or bolts 15.

Formed in the main casing 9 is an axially extending rectangular guideway 16 which slidably receives a motion plate 17. The motion plate 17 is provided on its upper face with rack teeth 18, and on its lower face with a cam slot 19, and is adapted to be reciprocated between two extreme positions by means of a hand throw lever 20 fixed to a shaft 21. The shaft 21 is journaled in suitable bearings 22 secured to the casing 9, and has fixed thereto a segment gear 23 which meshes with the rack teeth 18. As best seen in Fig. 2, the cam slot 19 is formed with a portion at each end which is parallel to the direction of movement of the motion plate, and with an intermediate connecting portion which is disposed at an acute angle to the direction of movement of the motion plate. Extending into the cam slot 19 and cooperating therewith is a roller 25 which is mounted on a pin 26 secured to an arm 27 forming part of a crank 28. The crank 28 is journaled in a vertical bearing 29 formed in the bottom of the casing 9, and has fixed thereto on the underside of the casing, a removable switch operating arm 30.

Extending longitudinally of the casing 9 between the upper side of the motion plate 17 and the shaft 21 is a lock bar 31 which is adapted to

be reciprocated between a locking and an unlocking position in a manner which we will describe hereinafter. The lefthand end of this lock bar is slidably mounted in a rectangular guideway 32 provided in the tail-like projection 9^a in the casing 9, and is adapted to cooperate with a lock rod L which is slidably mounted in a transverse guideway 33 formed in the tail-like projection 9^a at right angles to the guideway 32. The lock rod L, in the form here shown, is of standard construction, and comprises two longitudinally adjustable bars 34 and 35 attached at one end to the front rod 5 of the switch A, the bar 34 being provided with two notches 36^a and 36^b which register with similar notches 36^a and 36^b in the bar 35. The notches 36^a are so disposed that these notches will align with the lock bar when and only when the switch A occupies its normal position in which it is shown in the drawings, and the notches 36^b are so disposed that these notches will align with the lock bar when and only when the switch occupies its reverse position. The parts are so proportioned that when the lock bar is moved to its locking position, it will enter the notches 36^a or 36^b according as the switch then occupies its normal position or its reverse position, but that, when the lock bar is moved to its unlocking position, it will be withdrawn from both sets of notches. It will be apparent, therefore, that the switch will be locked in one extreme position or the other, or unlocked, according as the lock bar occupies its locking or its unlocking position.

Cooperating with the hand lever 20 for the purpose of permitting this lever to be locked in either extreme position are two lever latch stands S and S'. These stands may be of any of the well-known types, and need not, therefore, be described in detail here.

The device B further comprises a circuit controller C which is located wholly within the auxiliary casing 10. This circuit controller may be of any suitable type, but as here shown, this circuit controller comprises a rocker arm 40 which is pivoted intermediate its ends on a pin 41 secured to the casing 10. The rocker arm 40 is formed with two cam surfaces 42 and 44 which cooperate with a cam 45 secured to the upper face of the lock bar. When the lock bar occupies its locking position, the cam 45 engages the cam surface 42, and under these conditions the rocker arm 40 is rotated to its normal position in which it is shown in Fig. 3. When, however, the lock bar is moved to its unlocking position in order to unlock the switch, the cam 45 moves out of engagement with the cam surface 42 and into engagement with the cam surface 44, thereby rotating the rocker arm 40 from its normal extreme position to its other extreme position in a manner which will be obvious from an inspection of the drawings.

Pivotally attached to the lefthand end of the rocker arm 40 is a contact operating member 46 which is guided to move vertically by means of studs 47 which pass freely through holes 48 in the operating member. Secured to the upper side of the operating member 46 are two superposed insulating blocks 50 and 51 between which are clamped the free ends of a plurality of flexible contact fingers 52, here shown as four in number. Each contact finger 52 cooperates with an associated fixed contact member 53 to form a plunger lock contact 52—53. Each contact finger 52 and the associated fixed contact member 53 are clamped to the opposite

sides of an insulating block 54 by means of terminal posts 55 and 56, and the insulating block 54, in turn, is supported on lugs 57 projecting inwardly from the sides of the casing 10. Each terminal post 55 is electrically connected with the associated contact member 53 but is insulated from the associated contact finger 52, as will be apparent from an inspection of the drawings, while each terminal post 56 is insulated from both the associated contact finger 52 and contact member 53. The parts are so proportioned that when the rocker arm 40 occupies its normal extreme position, each plunger lock contact 52—53 will be closed, but that, when the rocker arm is rotated to its other extreme position, each contact 52—53 will then become opened. It will be apparent, therefore, that the plunger lock contacts will be closed when and only when the lock bar 31 occupies its locking position.

Associated with each plunger lock contact is a point detector contact comprising a flexible contact finger 58 which cooperates with a fixed contact member 59. Each contact finger 58 is fastened at one end to one end of a conducting strip 60, the other end of which strip is clamped against the fixed end of the associated finger 52 to make electrical contact therewith; while each contact member 59 is secured to and electrically connected with the associated terminal post 56. Pivotally mounted below the contact fingers 58 is a second contact operating member 61 (see Fig. 4) carrying a roller 62 which at times enters a notch 63 in a point detector rod 64. The point detector rod 64 is slidably mounted in the casing 10, and is attached by means of a link 65 and a bolt member 66 with the movable rail 2 of the switch A in the usual and well-known manner. The operating member 61 also carries an insulating strip 67 which cooperates with the contact fingers 58 in such manner that when the roller 62 is within the notch 63, the insulating strip 67 will be clear of the fingers 58, thus permitting the contacts 58—59 to become closed. When, however, the roller 62 is forced out of the notch 63, this strip will engage the undersides of the fingers 58 and raise them to the position in which they are out of engagement with the associated fixed contact members 59, thus opening the contacts 58—59. The notch 63 in the point detector rod 64 is so disposed, and the parts are so proportioned, that the roller 62 will enter the notch 63 when and only when the movable rails 2 and 2^a of the switch A occupy their normal positions and the rail 2 is in proper engagement with the fixed rail 1.

It will be noted from an inspection of the drawings that each plunger lock contact 52—53 and the associated point detector contact 58—59 are connected in series between the associated terminal posts 55 and 56, so that in order to complete an electrical circuit which is connected with the associated terminal posts 55 and 56, it is necessary for the lock bar 31 to occupy its normal locking position, and for the movable rail 2 to be properly closed against the fixed rail 1.

The switch operating apparatus further comprises two floating lever stands D and D¹ embodying our invention. These stands are similar and a description of one will therefore suffice for both. Referring particularly to the stand D shown in detail in Figs. 5 to 8, inclusive, this stand comprises a base casting 70 and a top casting 71 secured together adjacent their ends by means of suitable bolts 72, which bolts also serve to se-

cure the device to an adjacent pair of the ties 4 or to any other suitable support. The base casting 70 is formed with a hollow central portion 70^a and is provided at its opposite sides with guide surfaces 70^b. The top casting 71 is likewise formed with a hollow central portion 71^a, and is provided at its opposite sides with guide surfaces 71^b disposed in parallel spaced relation with respect to the guide surfaces 70^b. Slidably supported on the guide surfaces 70^b, and held in place vertically by the guide surfaces 71^b, are two levers 73 and 74. These levers are pivoted at or near their centers on pins 75 and 76 mounted in spaced straps 77 secured together by studs 78, and are guided laterally by means of rollers 79 and 80 which are journaled on the pins 75 and 76 directly above the levers, and which ride in a guideway 81 formed in the top casting 71. One end of lever 73 is connected, by means of a pin 82, with a pair of links 83, and the links 83, in turn, are connected by means of a pivot pin 84 with a bar 85 which is secured between the top and base castings 70 and 71 in a manner which will be apparent from an inspection of the drawings.

With the lever stand D constructed in the manner just described, it will be apparent that the motion of the upper end of the lever 73 is restricted so that it may be considered as rotating about a fixed point. The lengths of the two levers 73 and 74 are equal, and since the pivot pins 75 and 76 are located at or near the centers of these levers, it will be obvious that rotation of the lever 73 about the pivot pin 82 will cause the pivot pins 75 and 76 to move along the axis of the stand D through approximately one-half the distance that the free end of the lever 73 is moved. It follows that if the upper end of lever 74 is constrained to rotate about a fixed point while the lever 73 is being rotated, the lower end of lever 74 will be rotated in the same direction and through the same angular distance that the lower or free end of lever 73 is rotated. Likewise, it will be obvious that if lever 73 is held stationary, the pivot pin 76 will be held stationary, and lever 74 will then be constrained to rotate about the pivot pin 76 as a fixed point, so that if the upper end of lever 74 is then rotated through any angular distance, the lower end of this lever will be rotated through the same angular distance.

Referring now again to Fig. 1, the operating arm 39 of the switch throwing and locking device B is operatively connected with the free end of the floating lever 73 of the lever stand D¹ by means of a pivot pin 87, an adjustable connecting rod 88 and a pivot pin 89; and the throw rod 7 of switch A is operatively connected with one end of lever 74 of stand D¹ by means of a pivot pin 90. The other end of lever 74 of stand D¹ is pivotally connected by means of a pivot pin 91 with a pipe line 92 of the usual and well-known type operated from an interlocking tower T by means of a lever 93. The motion plate 17 of device D (see Figs. 3 and 6) is operatively connected with the free end of lever 73 of stand D by means of a pivot pin 94, an adjustable connecting rod 95, and a pivot pin 96, and the righthand end of lock bar 31 of device B is operatively connected with one end of lever 74 of stand D by means of a pivot pin 97, a connecting rod 98 and a pivot pin 99. The remaining end of lever 74 of stand D is operatively connected by means of a pivot pin 100 with a pipe line 101 operated by lever 102 located in the tower T. The two levers 93 and 102 are each movable between a normal po-

sition *n* and a reverse position *r*, and will usually be interlocked in accordance with the customary practice in such manner that lever 93 can not be moved from either position to the other position unless lever 102 then occupies its *n* position.

As shown in the drawings, the hand lever 29 of the switch throwing and locking device B and the lever 93 in the tower T both occupy their normal position, but the lever 102 occupies its reverse position. Under these conditions, the switch occupies its normal position and the lock bar 31 occupies its locking position, so that the switch is securely locked in its normal position. Furthermore, since the switch occupies its normal position, the point detector contacts 53—59 of circuit controller C are closed, and since the lock bar occupies its locking position, the plunger lock contacts 52—53 of circuit controller C are also closed.

In explaining the operation of the apparatus as a whole, we will first assume that the parts are in the positions in which they are shown in the drawings, and that it is desired to reverse the switch, and lock it in its reverse position, from the tower. To do this, the operator in the tower first moves lever 102 from its reverse position *r* to its normal position *n*. During this movement of lever 102, lever 73 of lever stand D is held fixed so that the lever 74 of lever stand D is constrained to rotate about the pivot pin 76 as a fixed pivot, and the parts are so proportioned that this rotation of lever 74 under these conditions will move lock bar 31 from its locking position to its unlocking position, thereby unlocking the switch and at the same time opening the plunger lock contacts 52—53 of circuit controller C. The switch now being unlocked, the operator next rotates lever 93 from its normal position to its reverse position. During this rotation of lever 93, lever 73 of lever stand D¹ is also held in a fixed position, so that lever 74 of stand D¹ is constrained to rotate about the pin 76 of lever stand D¹ as a fixed pivot, and the parts are so proportioned that the rotation of lever 74 of stand D¹ moves the movable rails of the switch from their normal positions to their reverse positions. As soon as the switch is moved away from its normal position, the resultant movement of point detector rod 54 actuates the operating member 61 of circuit controller C to open the point detector contacts 53—59. After the switch has been moved to its reverse position, the operator restores lever 102 to its reverse position *r*. When he does this, the notches 36^b in lock rod L are then in alignment with the lock bar 31, and the lock bar enters these notches, thus locking the switch in its reverse position.

To restore the switch to its normal position and lock it in its normal position after the switch has been reversed in the manner just described, the operator first moves lever 102 from its *r* position to its *n* position, then moves lever 93 from its *r* position to its *n* position, and finally restores lever 102 to its *r* position. The operation of the apparatus, under these conditions, will be apparent from the foregoing and from an inspection of the drawings without further description.

We will now assume that the parts are in the positions in which they are shown in the drawings, and that it is desired to reverse the switch by means of the switch throwing and locking device B. To do this, the operator rotates the hand lever 29 from the position shown in Fig. 1 through an angle of approximately 180° in a

counter-clockwise direction to its opposite extreme position. This rotation of lever 20 causes the motion plate 17 to move from its extreme left-hand position, as viewed in Figs. 2 and 3, to

5 its extreme right-hand position, which movement in turn, acts through the pivot pin 94, connecting rod 95 and pivot pin 96 to rotate the lever 73 of the lever stand D about the pivot pin 82 in a counter-clockwise direction, as viewed in Fig. 10 1. During this rotation of lever 73, pin 100 is held fixed by the pipe line 101, and as a result, this rotation of lever 73 causes lever 74 to rotate about the pivot pin 100 in the same direction and through the same angular distance that lever 73 15 is rotated, thereby withdrawing lock bar 31 from engagement with the notches 36 in the lock rod L and hence unlocking the switch. The movement of the motion plate toward the right also causes roller 25 on crank 28 to move along cam 20 slot 19, and the parts are so proportioned that while the lock bar 31 is being withdrawn from the notches 36 in the lock rod L, the cam slot 25 will continue to engage the roller 25 at that 25 portion of the slot at its right-hand end which is parallel to the direction of movement of the motion plate so that the crank 28 will remain stationary under these conditions. It follows, therefore, that during that portion of the movement of the motion plate which is necessary to unlock 30 the movable rails of the switch, no force is exerted on these rails tending to reverse them. As soon, however, as this first part of the movement of the motion plate is completed, the roller 25 is then engaged by the curved portion of the cam slot 19, and the crank 28 is then rotated in a counter-clockwise direction as viewed in Fig. 1. This counter-clockwise rotation of the crank is transmitted to the lever 73 of stand D¹ through the pivot pin 87, connecting rod 88 and pivot 40 pin 89, thereby causing lever 73 to be rotated in a clockwise direction about the pivot pin 82. As a result, pin 91 now being held fixed by the pipe line 92, lever 74 is rotated about the pivot pin 91 in the same direction, and through the same angular distance as lever 73 is rotated, which rotation moves the switch to its reverse position. As soon as the lock bar 31 is moved away from its locking position, the plunger lock contacts 52—53 of circuit controller C become opened in the same 50 manner as when the switch is unlocked from the tower, and as soon as the switch points start to move away from their normal positions, the point detector contacts 53—59 of circuit controller C become opened.

55 In order to restore the switch to its normal position by the switch operating device B after the switch has been reversed as just described, the lever 20 is restored to the position shown in the drawings. The subsequent movements of the parts under these conditions are just the reverse of those which take place during movement of the switch to its reverse position by the device B, and it is believed, therefore, that the operation of the apparatus under these conditions 60 will be readily understood from an inspection of the drawings without further description.

65 It should be pointed out that before operation of the switch can be effected from the tower, it is necessary that the lever 20 of switch operating device B should occupy its normal position in which it is shown in the drawings, and that before operation of the switch can be effected by means of the switch operating device B, it is necessary that the levers 93 and 102 should oc- 70 75

cupy the positions in which they are shown in the drawings.

It should also be pointed out that when a tower-man is on duty in the tower, lever 102 will normally be left standing in its normal position in which the switch is unlocked in accordance with standard interlocking practice, instead of in its reverse position as shown. When the lever 102 occupies its normal position, a signal lever (not shown) is held, by the usual interlocking mechanism, in its normal position, and under these conditions when it is desired to clear the signal governing traffic over the switch to permit a train to pass over the switch it is necessary to first place the switch lever 93 in the desired position 15 for the route which is to be set up, and then operate the lock lever 102 to its reverse position to lock the switch in the position corresponding to the position of the lever 102, which releases the interlocking and thereby permits the signal lever 20 to be reversed and the signal cleared.

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

Having thus described our invention, what we claim is:

1. In combination, a railway switch, a lever stand comprising two floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but which are free to move together along a fixed path, the one end of one lever being pivoted for rotation about a relatively fixed point, a manually operable switch throwing device located adjacent said switch and operatively connected with the free end of said one lever, means for operatively connecting one end of the other lever with said switch, a manually operable device located at a remote point, and means for operatively connecting said manually operable device with the other end of said other lever. 30 35 40 45

2. In combination, a railway switch, a lever stand comprising first and second floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but are free to move together along a fixed path, the one end of said first lever being pivoted for rotation about a relatively fixed point, a switch throwing device located adjacent the switch and including a switch operating member rotatable between two extreme positions, means for operatively connecting said switch operating member with the free end of said first lever, means for operatively connecting one end of said second lever with said switch, a manually operable lever having normal and reverse positions, and means for operatively connecting said manually operable lever with the free end of said second lever, the parts being so proportioned that when said switch operating arm occupies its one extreme position, movement of said manually operable lever between its normal and reverse positions will move said switch between its normal and reverse positions and that when said manually operable lever occupies its normal position, rotation of said switch operating arm between its one extreme position and its other extreme position will move said switch between its normal and reverse positions. 50 55 60 65 70

3. In combination with a railway switch, a switch operating and locking device comprising 75

a casing, a motion plate reciprocable in said casing between a first and a second extreme position, means in said casing for reciprocating said motion plate between its two extreme positions, a lock bar in said casing movable between a locking and an unlocking position, means effective when and only when said lock bar occupies its locking position for locking the switch in its normal extreme position, a first and a second manually operable lever each having normal and reverse positions, means including a first floating lever stand for operatively connecting said lock bar with said motion plate and with said first manually operable lever in such manner that when said motion plate occupies its first extreme position and said first manually operable lever occupies its reverse position said lock bar will occupy its locking position but that if said motion plate is moved to its second extreme position when said first manually operable lever occupies its reverse position, or if said first manually operable lever is moved to its normal position when said motion plate occupies its first extreme position, said lock bar will be moved to its unlocking position, and means including a second floating lever stand for operatively connecting the movable rails of said switch with said motion plate and with said second manually operable lever in such manner that when said motion plate occupies its first extreme position and said second manually operable lever occupies its normal position, said switch will occupy its normal position, but that if said motion plate is moved to its second extreme position when said second manually operable lever occupies its normal position, or if said second manually operable lever is moved to its reverse position when said motion plate occupies its first extreme position said switch will be moved to its reverse position.

4. In combination with a railway switch, a switch operating and locking device comprising a casing, a motion plate reciprocable in said casing between a first and a second extreme position, means in said casing for reciprocating said motion plate between its two extreme positions, a lock bar in said casing movable between a locking and an unlocking position, means effective when and only when said lock bar occupies its locking position for locking the switch in its normal extreme position, a first and a second manually operable lever each having normal and reverse positions, means including a first floating lever stand for operatively connecting said lock bar with said motion plate and with said first manually operable lever in such manner that when said motion plate occupies its first extreme position and said first manually operable lever occupies its reverse position said lock bar will occupy its locking position but that if said motion plate is moved to its second extreme position when said first manually operable lever occupies its reverse position, or if said first manually operable lever is moved to its normal position when said motion plate occupies its first extreme position, said lock bar will then be moved to its unlocking position, means including a second floating lever stand for operatively connecting the movable rails of said switch with said motion plate and with said second manually operable lever in such manner that when said motion plate occupies its first extreme position and said second manually operable lever occupies its normal position said switch will occupy its normal position, but that if said motion plate is moved to its second extreme position when

said second manually operable lever occupies its normal position, or if said second manually operable lever is moved to its reverse position when said motion plate occupies its first extreme position said switch will then be moved to its reverse position, and a circuit controller controlled in accordance with the position of said lock bar.

5. In combination with a railway switch, a switch operating and locking device comprising a casing, a motion plate reciprocable in said casing between a first and a second extreme position, means in said casing for reciprocating said motion plate between its two extreme positions, a lock bar in said casing movable between a locking and an unlocking position, means effective when and only when said lock bar occupies its locking position for locking the switch in its normal extreme position, a first and a second manually operable lever each having normal and reverse positions, means including a first floating lever stand for operatively connecting said lock bar with said motion plate and with said first manually operable lever in such manner that when said motion plate occupies its first extreme position and said first manually operable lever occupies its reverse position said lock bar will occupy its locking position but that if said motion plate is moved to its second extreme position when said first manually operable lever occupies its reverse position, or if said first manually operable lever is moved to its normal position when said motion plate occupies its first extreme position, said lock bar will then be moved to its unlocking position, and means including a second floating lever stand for operatively connecting the movable rails of said switch with said motion plate and with said second manually operable lever in such manner that when said motion plate occupies its first extreme position and said second manually operable lever occupies its normal position said switch will occupy its normal position, but that if said motion plate is moved to its second extreme position when said second manually operable lever occupies its normal position, or if said second manually operable lever is moved to its reverse position when said motion plate occupies its first extreme position said switch will then be moved to its reverse position, and a circuit controller controlled in accordance with the position of said lock bar and said switch.

6. In combination, a railway switch movable between normal and reverse positions, a first floating lever stand comprising first and second floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but which are free to move together along a fixed path, said first floating lever also having one end pivoted for rotation about a relatively fixed pivot, a second floating lever stand comprising third and fourth floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but which are free to move together along a fixed path, said third floating lever also having one end pivoted for rotation about a relatively fixed pivot, means for operatively connecting one end of said second floating lever with the movable rails of said switch, a first manually operable lever movable between a normal and reverse position, means for operatively connecting said first manually operable lever with the other end of said second floating lever, a switch operating and locking device comprising a casing, a motion plate in said casing movable between a first and

a second extreme position, means in said casing for reciprocating said motion plate between its two extreme positions, means for operatively connecting said motion plate with the free end of said first floating lever, a lock bar mounted in said casing and movable between a locking and an unlocking position, means effective when and only when said switch occupies its normal position and said lock bar occupies its locking position for locking the switch in its normal position, means for operatively connecting said motion plate with the free end of said third floating lever, means for operatively connecting said lock bar with one end of said fourth floating lever, a second manually operable lever movable between a normal and reverse position, and means for operatively connecting said second manually operable lever with the free end of said fourth floating lever, the parts being so proportioned that when said first manually operable lever occupies its normal position and said second manually operable lever occupies its reverse position, movement of said motion plate from its first extreme position to its second extreme position will first operate the levers of said second lever stand in such manner that said locking plunger is moved from its locking position to its unlocking position and will then operate the levers of said first lever stand in such manner that said switch is moved from its normal to its reverse position, and vice versa, and that when said motion plate occupies its first extreme position, movement of said second manually operable lever between its normal and reverse positions will rotate said fourth lever about its pivotal axis in such manner that said lock bar is moved between its unlocking and locking positions while rotation of said first manually operable lever between its normal and reverse positions will rotate said second lever about its pivotal axis in such manner that the switch is moved between its normal and reverse positions.

7. In combination, a railway switch, a lever stand comprising two floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but which are free to move together along a fixed path, the one end of the one lever being pivoted for rotation about a relatively fixed point, means for operatively connecting one end of the other lever with said switch, and two separate switch operating instrumentalities one operatively connected with the free end of each of said levers.

8. In combination, a railway switch provided with a lock bar movable between a locking and an unlocking position, said lock bar being effective when moved to its locking position to lock said switch in one or the other of its extreme positions, a lever stand comprising two floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but which are free to move together along a fixed path, the one end of the one lever being pivoted for rotation about a relatively fixed point, two separate operating means each movable between two extreme positions, the one said oper-

ating means being connected with the free end of said one lever and the other said operating means being connected with one end of the other lever, and means for connecting the free end of said other lever with said lock bar, the parts being so proportioned that when said one operating means occupies its one extreme position movement of said other operating means between its two extreme positions will move said lock bar between its locking and unlocking positions and vice versa.

9. In combination, a railway switch, means for operating said switch between its two extreme positions, a lock bar movable between a locking and an unlocking position, means effective when said switch occupies either of its two extreme positions and said lock bar occupies its locking position for locking said switch in the extreme position which it then occupies, a lever stand comprising two floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but which are free to move together along a fixed path, the one end of the one lever being pivoted for rotation about a relatively fixed point, means for operatively connecting the other end of said one lever with said switch operating means, means for operatively connecting one end of said other lever with said lock bar, and operating means connected with the free end of said other lever.

10. In combination, a railway switch, a first operating means for moving said switch between its two extreme positions, a lock bar movable between a locking and an unlocking position, means effective when said switch occupies either of its two extreme positions and said lock bar occupies its locking position for locking said switch in the extreme position which it then occupies, a lever stand comprising two floating levers pivoted intermediate their ends for rotation about axes which are fixed relative to each other but which are free to move together along a fixed path, the one end of the one lever being pivoted for rotation about a relatively fixed point, means for operatively connecting the other end of said one lever with said first operating means, means for operatively connecting the one end of said other lever with said lock bar, a second operating means having normal and reverse positions, and means for operatively connecting said second operating means with the free end of said other lever, the parts being so proportioned that when said switch is moved to its normal position by said first operating means and said second operating means occupies its reverse position said lock bar will be moved to its locking position but that if said switch is moved to its reverse position by said first operating means when said second operating means occupies its reverse position or if said second operating means is moved to its normal position when said switch is moved to its normal position by said first operating means, said lock bar will then be moved to its unlocking position.

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