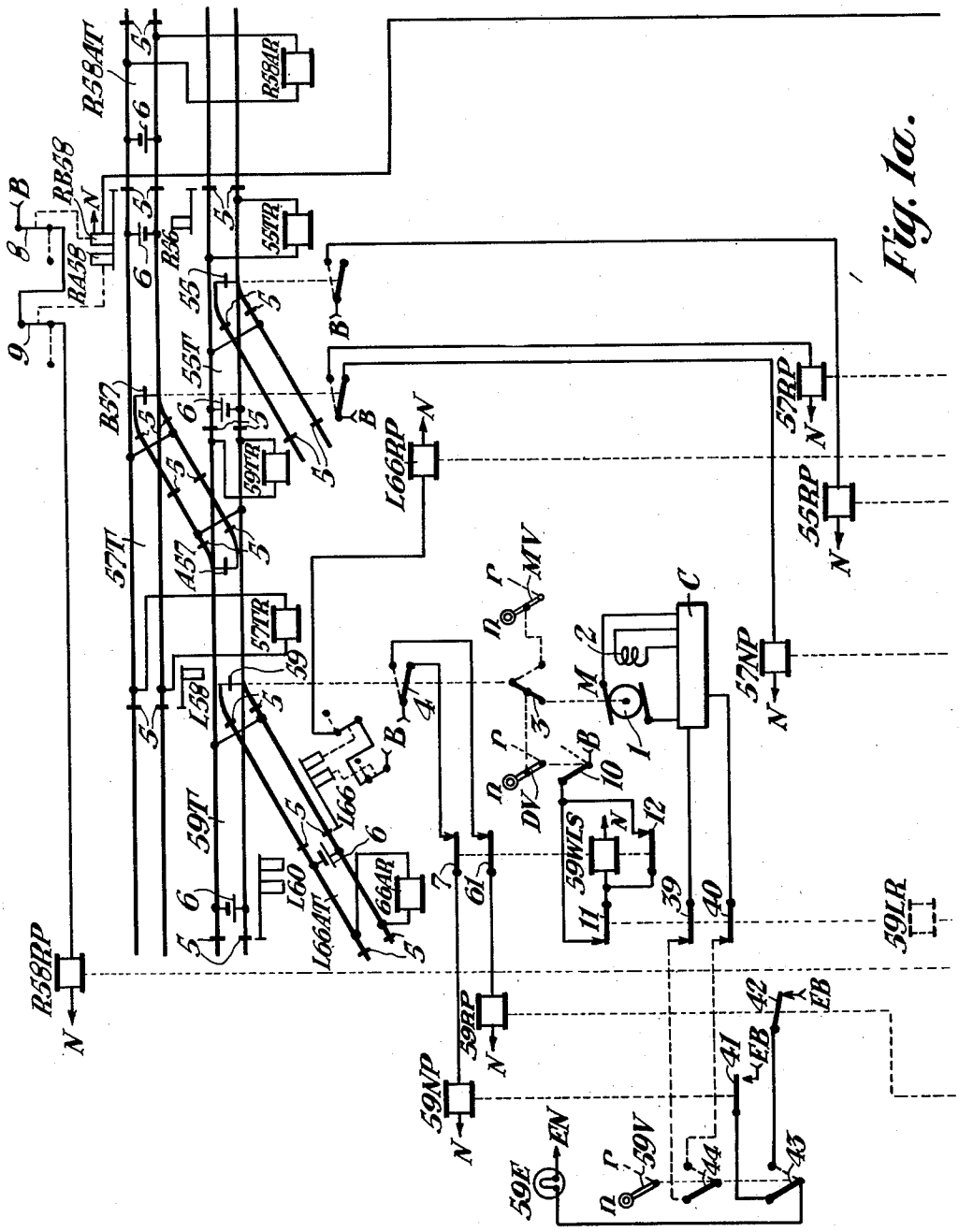
June 13, 1950 E. M. ALLEN 2,511,760

RAILWAY TRACK SWITCH CONTROLLING APPARATUS

Filed Jan. 17, 1947 2 Sheets-Sheet 1

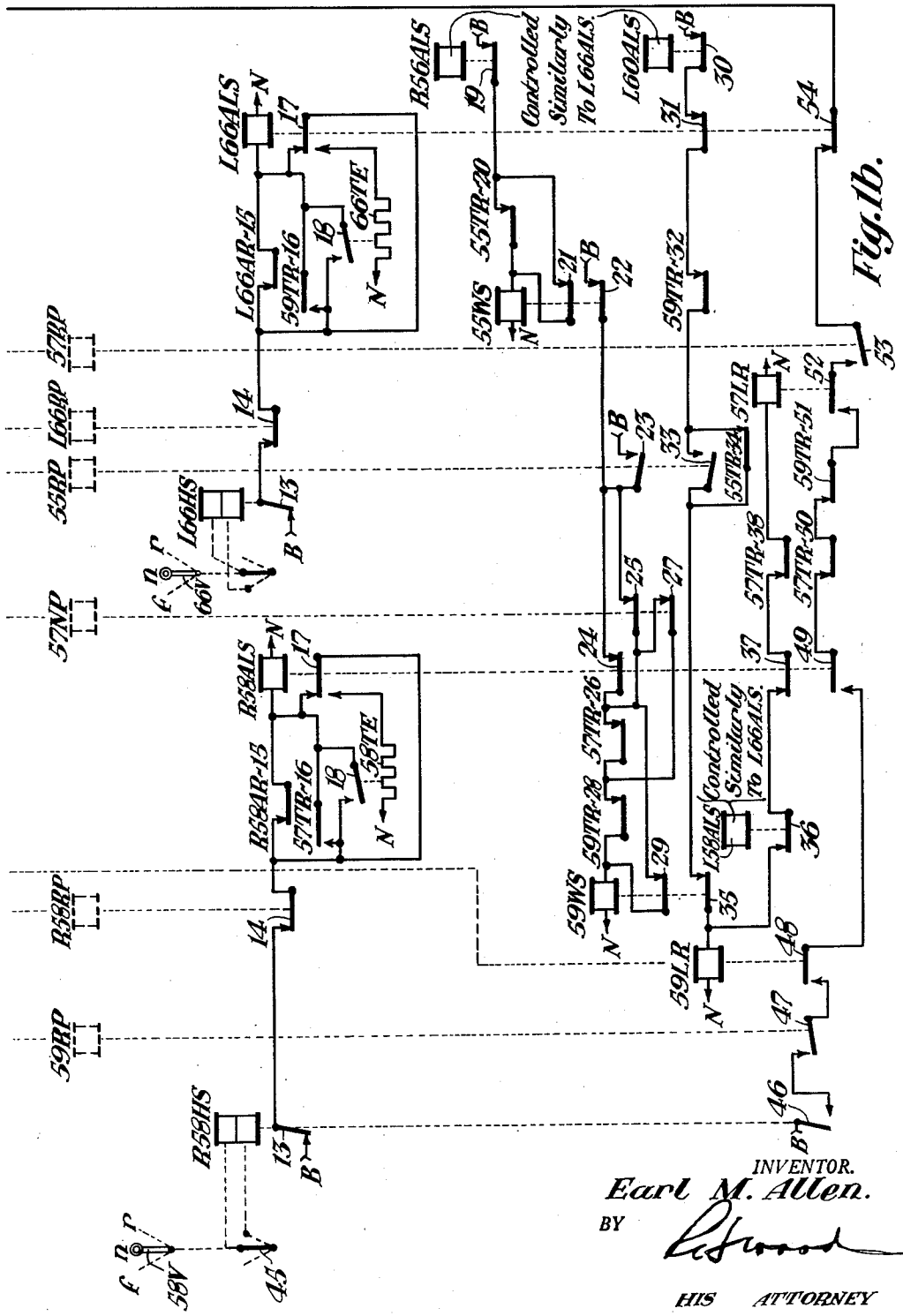


INVENTOR.
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RAILWAY TRACK SWITCH CONTROLLING APPARATUS

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RAILWAY TRACK SWITCH CONTROLLING APPARATUS

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8 Claims. (Cl. 246—160)

1

My invention relates to railway track switch controlling apparatus, and particularly to apparatus for at times effecting operation of a switch by power apparatus manually controlled from a remote point and for at other times effecting operation of a switch by manually operable apparatus adjacent the switch.

One feature of my invention in railway track switch controlling apparatus of this type, in which a manually operable lever, known as a dual control lever, is employed for at times transferring operation of a track switch from power apparatus to manually operable apparatus, is the provision of a pick-up circuit for a locking stick relay controlled by a switch locking relay in conjunction with the dual control lever. The switch locking relay is normally energized, and is arranged to become deenergized when a signal for any route which includes the switch is cleared, and to then remain deenergized while a train occupies the route between the signal and the switch.

A further feature of my invention in conjunction with the locking stick relay is the provision of a normal polar contact of a polar stick relay in the pick-up and stick circuits for an approach locking relay associated with a signal which is controlled in part by a reverse polar contact of the same polar stick relay. With this arrangement, if the dual control lever for a switch is placed in the position for manual operation of the switch, thereby causing an associated signal to change its indication from proceed to stop, and if the dual control lever is later restored to the position for power operation of the switch, the leverman at the remote control point must return the signal control lever to the normal position to energize the approach locking relay before the signal can again be cleared.

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

The accompanying drawings, Figs. 1*a* and 1*b*, when placed side by side, with the upper edge of Fig. 1*b* adjacent the lower edge of Fig. 1*a*, constitute a diagrammatic view showing one form of apparatus embodying my invention, in which a layout of switches and signals in an interlocking plant is shown, together with control and indication circuits for a switch which is provided with a dual control lever, control and indication circuits for a signal which governs traffic movements over the switch, a locking stick relay controlled by a switch locking relay in conjunction with a dual control lever; and control

2

circuits for approach locking relays, route locking relays, and switch locking relays.

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

In the drawings, contacts operated by the various relays or other devices are identified by numbers, such numbers having distinguishing prefixes from which they are separated by a dash when the contacts of track relays are shown apart from the relay by which they are operated. The prefix for each of these contact numbers comprises the reference character for the relay by which the associated contact is operated. For example, contact R58AR–15, shown in a pick-up circuit for relay R58ALS in Fig. 1*b*, is identified by the number 15 separated by a dash from the prefix R58AR which is the reference character for relay R58AR by which this contact is operated.

Referring first to Fig. 1*a*, two parallel tracks are shown interconnected by a crossover including track switches designated by the reference characters A57 and B57. Two single switches, designated by the reference characters 55 and 59, are also shown in one of the tracks.

The tracks are divided by insulated joints 5 to form switch sections, designated by the reference characters 55T, 57T and 59T, and approach sections, designated by the reference characters R58AT and L66AT, associated with signals R58 and L66, respectively. Each of these track sections is provided with a track circuit including a suitable source of current, such, for example, as a battery 6 connected across the rails adjacent one end of the section, and a track relay, designated by a reference character which is the same as the reference character for its track section except that it includes the letter R instead of, or in addition to, the letter T, connected across the rails adjacent the opposite end of the section.

Traffic movements toward the left, as shown in the drawing, which I shall assume is the westbound direction, are governed by signals R56, RA58 and RB58. Traffic movements in the opposite or eastbound direction are governed by signals L58, L60 and L66. The signals may be of any suitable design such, for example, as the semaphore or the searchlight type.

Each of the track switches may be operated from each of its extreme positions to the other by any suitable manually controllable power operated means such, for example, as a motor M having an armature 1 and a field winding 2, as shown for switch 59. Manually operable means such, for example, as a lever MV, is also pro-

vided for at times operating switch 59 manually. A selector device such, for example, as a dual control or selector lever DV having a normal position *n* and a reverse position *r*, is provided with means such, for example, as a link 3 for transferring operation of the switch from motor M to lever MV and from lever MV back to motor M. As shown in the drawing, link 3, which is operable by lever DV, is in its normal position because lever DV is in its *n* position for arranging switch 59 for operation by motor M. When lever DV is moved to its *r* position, link 3 will be moved to its reverse position for adapting switch 59 for operation by manually operable lever MV.

Motor M may be controlled through suitable control apparatus C from a remote point by a manually operable device such, for example, as a switch lever 59V having a normal position *n* and a reverse position *r* for controlling operation of switch 59 to its normal and reverse positions, respectively. The control of apparatus C by lever 59V may be effected in any suitable manner such, for example, as by time code apparatus shown and described in Letters Patent of the United States No. 2,273,383 granted February 17, 1942 to Clarence S. Snavely and Alfred B. Miller for Remote control system.

Operated in conjunction with switch 59 is a circuit controller contact 4 which, when switch 59 is in the normal position, as shown, closes a circuit for a normal switch indication relay 59NP, and which, when switch 59 is in its reverse position, closes a circuit for a reverse switch indication relay 59RP. Switch indication relay 57NP for switch B57 is controlled by a switch circuit controller contact similarly to relay 59NP, and relays 55RP and 57RP are controlled similarly to relay 59RP.

A switch indication lamp 59E is controlled by relays 59NP and 59RP and by lever 59V.

A polar stick control relay R58HS, shown in Fig. 1*b*, for signals R58 is controlled by a manually operable signal lever 58V through any suitable medium such, for example, as the time code apparatus previously referred to. Lever 58V has a normal position *n* and reverse positions *f* and *r*. Polar stick relays for controlling the other signals shown, including relay L66HS for signals L66 may be controlled similarly to relay R58HS.

A signal indication relay R58RP, shown in Fig. 1*a*, is controlled in conjunction with signals R58 so as to be energized only when these signals indicate stop. Signal indication relay L66RP for signals L66 is controlled similarly to relay R58RP.

A locking stick relay 59WLS is controlled by lever DV and by a switch locking relay 59LR so as to be energized only when lever DV is in its normal position *n*.

Referring now to Fig. 1*b*, circuits are here shown including a normal polar contact of polar stick relay R58HS for controlling an approach locking relay R58ALS and an associated time element device 58TE. Similar circuits are also shown for an approach locking relay L66ALS and its associated time element device 66TE. Approach locking relays R56ALS, L58ALS and L60ALS are controlled similarly to relays R58ALS and L66ALS.

Pick-up and stick circuits are shown for controlling route locking relays 55WS and 59WS.

Circuits are shown for controlling switch locking relays 57LR and 59LR.

Having described, in general, the arrangement and control of the apparatus shown by the accompanying drawings, I shall now describe, in detail, its operation.

As shown by the drawings, all parts are in the normal condition, that is, switches 55, A57, B57 and 59 are in their normal positions; all signals are indicating stop; all track sections are unoccupied, and hence the track relays are energized; each of the levers is in its normal position *n*; relays R58RP, L66RP, 57NP, 59NP, 59WLS, R56ALS, R58ALS, L58ALS, L60ALS, L66ALS, 55WS, 59WS, 57LR and 59LR are energized; normal polar contacts of relays R58HS and L66HS are closed; and relays 55RP, 57RP and 59RP, and indication lamp 59E are deenergized.

The circuit by which relay 59NP is energized passes from terminal B of a suitable source of current, through contact 4 of switch 59 in its normal position, contact 7 of relay 59WLS, and the winding of relay 59NP to terminal N of the same source of current.

The circuit by which relay R58RP is energized passes from terminal B, through contact 8 operated by signal RB58, contact 9 operated by signal RA58, and the winding of relay R58RP to terminal N.

Both a pick-up and a stick circuit are closed for energizing relay 59WLS, the pick-up circuit passing from terminal B, through contact 10 of lever DV, contact 11 of relay 59LR, and the winding of relay 59WLS to terminal N. The stick circuit for this relay passes from terminal B, through contact 10 of lever DV, contact 12 of relay 59WLS, and the winding of relay 59WLS to terminal N.

Both a pick-up and a stick circuit are closed for energizing approach locking relay R58ALS, shown in Fig. 1*b*, the pick-up circuit for this relay passing from terminal B, through contacts 13 and 14 of relays R58HS and R58RP, respectively, contact R58AR–15, and the winding of relay R58ALS to terminal N. The stick circuit for relay R58ALS is the same as the pick-up circuit just traced except that it includes the front point of contact 17 of relay R58ALS instead of contact R58AR–15. Relay L66ALS is energized by circuits which are similar to the circuits just traced for relay R58ALS.

Pick-up and stick circuits are closed for energizing relay 55WS, the pick-up circuit passing from terminal B, through contact 19 of relay R56ALS, contact 55TR–20, and the winding of relay 55WS to terminal N. The stick circuit is the same as the pick-up circuit just traced except that it includes contact 21 of relay 55WS instead of contact 55TR–20. Pick-up and stick circuits are also closed for energizing relay 59WS, the pick-up circuit passing from terminal B, through contact 22 of relay 55WS, contact 24 of relay R58ALS in multiple with contact 25 of relay 57NP, contact 57TR–26 in multiple with contact 27 of relay 57NP, contact 59TR–28, and the winding of relay 59WS to terminal N. The stick circuit closed for this relay passes from terminal B, through contact 22 of relay 55WS, contact 24 of relay R58ALS in multiple with contact 25 of relay 57NP, contact 29 of relay 59WS, and the winding of relay 59WS to terminal N.

Switch locking relay 59LR is energized by a circuit passing from terminal B, through contact 30 of relay L60ALS, contact 31 of relay L66ALS, contact 59TR–32, contact 55TR–34, contact 35 of relay 59WS, and the winding of relay 59LR to terminal N. Relay 57LR is also energized by a circuit including the circuit for relay 59LR

as far as contact 35 of relay 59WS, and then passing through contact 36 of relay L58ALS, contacts 37 of relay R58ALS and 57TR–38, and the winding of relay 57LR to terminal N.

I shall assume that the dispatcher of leverman decides to arrange a route for a train to move from signal RB58 over switches A57, B57 and 59 reversed. He will, therefore, move lever 59V to its *r* position, thus closing contact 44 of lever 59V in its reverse position for energizing apparatus C through contact 40 of relay 59LR for operating motor M for reversing switch 59. When switch 59 leaves its normal position, relay 59NP becomes deenergized by the opening of contact 4 of switch 59.

Lamp 59E now becomes energized by a circuit passing from terminal EB of a suitable source of current, through contact 42 of relay 59RP, contact 43 of lever 59V in its *r* position, and lamp 59E to terminal EN of the same source of current.

As soon as switch 59 reaches its reverse position, relay 59RP becomes energized by a circuit passing from terminal B, through contact 4 of switch 59, contact 61 of relay 59WLS, and the winding of relay 59RP to terminal N. Relay 59RP, upon thus becoming energized, opens, at its contact 42, the circuit previously traced for lamp 59E, causing lamp 59E to be extinguished. The leverman will effect operation of switches A57 and B57 to the reverse position by manipulation of a similar switch control lever, not shown in the drawings.

He will then move lever 58V to its *r* position, thereby effecting energization of relay R58HS by current of reverse polarity through contact 45 in its *r* position. Relay R58HS, upon thus becoming energized, will open its contact 13 in the circuit previously traced for relay R58ALS, causing this relay to become deenergized. With relay R58ALS as well as relay 57NP now deenergized, the circuits previously traced for relay 59WS will be opened at contacts 24 and 25 of relays R58ALS and 57NP, respectively, causing relay 59WS to become deenergized. With relay 59WS thus deenergized, the circuits previously traced for relays 57LR and 59LR will be opened at contact 35 of relay 59WS, and the circuit for relay 57LR will also be opened at contact 37 of relay R58ALS. With relay 59LR deenergized, the pick-up circuit for relay 59WLS will be open at contact 11 of relay 59LR, but this relay will remain energized by its stick circuit previously traced.

Upon deenergization of relays 57LR and 59LR, a circuit is completed for operating the arm of signal RB58 to the proceed position, this circuit passing from terminal B, through contacts 46, 47, 48 and 49 of relays R58HS, 59RP, 59LR and R58ALS, respectively, contacts 57TR–50 and 59TR–51, contacts 52, 53 and 54 of relays 57LR, 57RP and L66ALS, respectively, and the mechanism of signal RB58 to terminal N. Signal RB58, upon being operated to the proceed position, opens its contact 8, thereby deenergizing relay R58RP.

A train, upon arriving on section R58AT, will deenergize relay R58AR, and upon passing signal RB58, will deenergize relay 57TR. Relay 57TR, upon becoming deenergized, will open the circuit traced for signal RB58 through contact 57TR–50, causing signal RB58 to change from the proceed indication to the stop indication. Relay R58RP will then again become energized by the circuit previously traced. Relay R58HS, being of the polar stick type, even though it should in some way become deenergized, will not again close its

contact 13 in the circuits for relay R58ALS until the leverman takes action to return lever 58V to its *n* position.

If the leverman returns lever 58V to its *n* position while the train is on section 57T, relay R58ALS will become energized by a second pick-up circuit which is the same as the pick-up circuit previously traced except that it includes contact 57TR–16 instead of contact R58AR–15. With relay R58ALS energized, contact 49 of relay R58ALS, as well as contact 57TR–50, will now be opened in the control circuit for signal RB58. With relay R58ALS again energized, contact 24 of relay R58ALS will be closed in the circuits previously traced for relay 59WS, and this relay will then become energized when the train has passed through sections 57T and 59T, and contacts 57TR–26 and 59TR–28 will have completed the pick-up circuit for relay 59WS. With relay 59WS energized, the circuits previously traced for relays 57LR and 59LR will also again be closed, and the pick-up circuit for relay 59WLS will also be closed.

I shall now assume that the leverman clears signal RB58 as before, and that a trainman reverses lever DV to provide for manual operation of switch 59 by lever MV. Lever DV, upon being moved to its *r* position, will open its contact 10, thereby deenergizing relay 59WLS. Relay 59WLS, upon becoming deenergized, opens the circuit previously traced for relay 59RP through contact 61. Relay 59RP, upon becoming deenergized, will open the circuit traced for signal RB58 through contact 47 of relay 59RP, causing the arm of signal RB58 to change from the proceed to the stop indication. With relay 59RP deenergized, the circuit previously traced for energizing lamp 59E through contact 42 of relay 59RP will again be closed, causing lamp 59E to be lighted.

I shall further assume that when the trainman has finished operating switch 59 manually, he leaves switch 59 in its reverse position and returns lever DV to its *n* position. I shall also further assume that the leverman at the remote point then returns lever 58V to its *n* position. If there is no train on section 57T or 59T, but a train has arrived on section R58AT, both the pick-up circuits previously traced for relay R58ALS will be open, and therefore a circuit will now be completed for energizing time element device 58TE, this circuit passing from terminal B, through contacts 13 and 14 of relays R58HS and R58RP, respectively, back point of contact 17 of relay R58ALS, and time element device 58TE to terminal N. Upon the lapse of a measured period of time device 58TE, will close its contact 18, thereby completing a third pick-up circuit for relay R58ALS, which is the same as the pick-up circuit first traced for this relay except that it includes contact 18 of device 58TE instead of contact R58AR–15. Relay 59WS and, in turn, relay 59LR will then become energized.

With relay 59LR again energized, the pick-up circuit traced for relay 59WLS will become closed, and relay 59WLS will therefore again become energized and complete the circuit for energizing relay 59RP. With relay 59RP again energized, the leverman can now again clear signal RB58 by reversing lever 58V.

From the foregoing description, it follows that when a trainman restores lever DV to its *n* position, leaving switch 59 reversed after he is through operating switch 59 manually, relay 59RP cannot pick up until relay 59WLS has be-

come energized, and relay 59WLS cannot become energized until relay 59LR is again energized. Relay 59LR, in turn, cannot become energized until relay 59WS is energized, and relay 59WS can become energized only after energization of relay R58ALS when relay R58HS has been energized by current of normal polarity.

When signal RB58 has been caused to indicate stop by operation of lever DV to arrange switch 59 for manual operation, and later switch 59 is again arranged for operation by motor M, manual action is therefore required of the leverman to restore lever 58V to its *n* position before signal RB58 can again be cleared and before the leverman can again effect operation of switches 57 and 59. It will be noted that lamp 59E will remain lighted from the time the dual control lever DV is reversed until it is restored to the normal position, and lever 58V is again returned to its *n* position.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, a railway track switch, power apparatus manually controllable from a remote point for at times operating said switch from each of its extreme positions to the other, manual apparatus for at other times operating said switch, selector means for transferring operation of said switch from said power apparatus to said manual apparatus and from said manual apparatus to said power apparatus, a switch locking relay, means for normally energizing said switch locking relay but controlled to become deenergized whenever any signal is cleared for directing a train to proceed over said switch and to then remain deenergized until the train has passed said switch, a locking stick relay, a pick-up and a stick circuit for said locking stick relay each including a contact closed by said selector means when said selector means is arranged for power operation of said switch and said pick-up circuit also including a front contact of said switch locking relay, and clearing control means for a signal governing traffic movements over said switch controlled by a front contact of said locking stick relay.

2. In combination, a railway track switch, manually controllable power apparatus for at times operating said switch between its extreme positions, manually operable apparatus for at other times operating said switch, selector means for transferring operation of said switch from each said apparatus to the other, a normally energized switch locking relay, means for deenergizing said switch locking relay if any signal is controlled to direct a train to move over said switch, means for retaining said switch locking relay deenergized if a train occupies the route governed by said signal between said signal and said switch, a locking stick relay, a pick-up and a stick circuit for said locking stick relay each controlled by a contact closed by said selector means when said selector means is arranged for operation of said switch by said manually controllable power apparatus and said pick-up circuit also controlled by a front contact of said switch locking relay, and clearing control means for said signal including a front contact of said locking stick relay.

3. In combination, a given railway track switch located in a given track section which is included in each of a plurality of traffic routes over a track layout which embodies a plurality of track sections and track switches, manually controllable power apparatus for at times operating said switch between its extreme positions, manually operable apparatus for at other times operating said switch, selector means for transferring operation of said switch from each said apparatus to the other, a normally energized switch locking relay, a signal for each of said routes for governing traffic movements over its route, signal control means for each of said signals which upon being operated to control the associated signal to display a proceed indication deenergizes said switch locking relay, means for then retaining said switch locking relay deenergized while a train occupies any associated route between its signal and said given switch, a locking stick relay, a pick-up and a stick circuit for said locking stick relay each closed only if said selector means is arranged for operation of said switch by said manually controllable power apparatus and said pick-up circuit also controlled by a front contact of said switch locking relay, and signal clearing control means including a front contact of said locking stick relay.

4. In combination, a railway track switch, manually controllable power apparatus for at times operating said switch between its extreme positions, manually operable apparatus for at other times operating said switch, selector means for transferring operation of said switch from each said apparatus to the other, a switch locking relay, an approach locking relay, a signal for governing traffic movements over said switch, a manually controllable polar stick relay, energizing circuits for said approach locking relay including a normal polar contact of said polar stick relay, a circuit for energizing said switch locking relay controlled by a front contact of said approach locking relay and closed only if the route governed by said signal is unoccupied between said switch and said signal, a locking stick relay, a pick-up circuit for energizing said locking stick relay only if said selector means is arranged for operation of said switch by said manually controllable power apparatus and if said switch locking relay is energized, a stick circuit for retaining said locking stick relay energized when said switch locking relay becomes deenergized, and clearing control means for said signal controlled by a front contact of said locking stick relay and by a reverse polar contact of said polar stick relay.

5. In control apparatus for a railway track switch associated with a signal for governing traffic movements over said switch, in which operation of said switch by manually controllable power apparatus or by manually operable apparatus is selected by a dual control selector lever, the combination comprising, a switch locking relay, a normally energized approach locking relay, a locking stick relay having a pick-up and a stick circuit each of which is controlled by a contact of said dual selector lever closed only when said switch is arranged for power operation and said pick-up circuit also controlled by a front contact of said switch locking relay, a manually controllable device operable to a reverse position for clearing said signal only if said locking stick relay is energized, means con-

trolled by said manually controllable device for deenergizing said approach locking relay when said signal is cleared and requiring a manual operation for restoring said manually controllable device to its normal position in order to again energize said approach locking relay, and control means for said switch locking relay including a front contact of said approach locking relay.

6. In control apparatus for a railway track switch associated with a signal for governing traffic movements over said switch, in which operation of said switch by manually controllable power apparatus or by manually operable apparatus is selected by a dual control selector lever, the combination comprising, an approach locking relay, a locking stick relay having a pick-up and a stick circuit each of which includes a contact closed by said dual selector lever when in position for selecting power operation of said switch and said pick-up circuit also controlled by a contact which is closed only if said approach locking relay is energized when said switch is in a route governed by said signal, a polar stick relay, manually controllable means for energizing said polar stick relay by current of normal and reverse polarities, pick-up and stick circuits for said approach locking relay each including a normal polar contact of said polar stick relay, clearing control means for said signal including a reverse polar contact of said polar stick relay and controlled by a front contact of said locking stick relay, and control means for said switch including a front contact of said approach locking relay.

7. In control apparatus for a railway track switch associated with control apparatus for a signal for governing traffic movements over said switch, including manually controllable power apparatus for at times operating said switch and manually operable apparatus for at other times operating said switch and including selector means for transferring operation of said switch from each said apparatus to the other, and also including a normally energized switch locking relay together with means for deenergizing said switch locking relay if any signal is controlled to direct a train to move over said switch and means for retaining said switch locking relay deenergized if a train occupies the route governed by said any signal between said any signal and said switch, the combination comprising, a locking stick relay, a pick-up and a stick circuit for said locking stick relay each controlled by a contact closed by said selector means when said selector means is arranged for operation of said switch by said manually controllable power apparatus and said pick-up circuit also controlled by a front contact of said switch locking relay, and means including a front contact of said locking stick relay for controlling said first signal to display a proceed indication.

8. In control apparatus for a railway track switch associated with control apparatus for a signal for governing traffic movements over said switch, including manually controllable power apparatus for at times operating said switch and manually operable apparatus for at other times operating said switch and including selector means for transferring operation of said switch from each said apparatus to the other, and also including a normally energized switch locking relay together with means for deenergizing said switch locking relay if any signal is controlled to direct a train to move over said switch and means for retaining said switch locking relay deenergized if a train occupies the route governed by said any signal between said any signal and said switch, the combination comprising, a locking stick relay, a pick-up and a stick circuit for said locking stick relay each controlled by a contact closed by said selector means when said selector means is arranged for operation of said switch by said manually controllable power apparatus and said pick-up circuit also controlled by a front contact of said switch locking relay, and switch indication means controlled jointly by said switch and said locking stick relay.

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