

Sept. 7, 1943.

C. H. LAY

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RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed Dec. 11, 1942

2 Sheets-Sheet 1

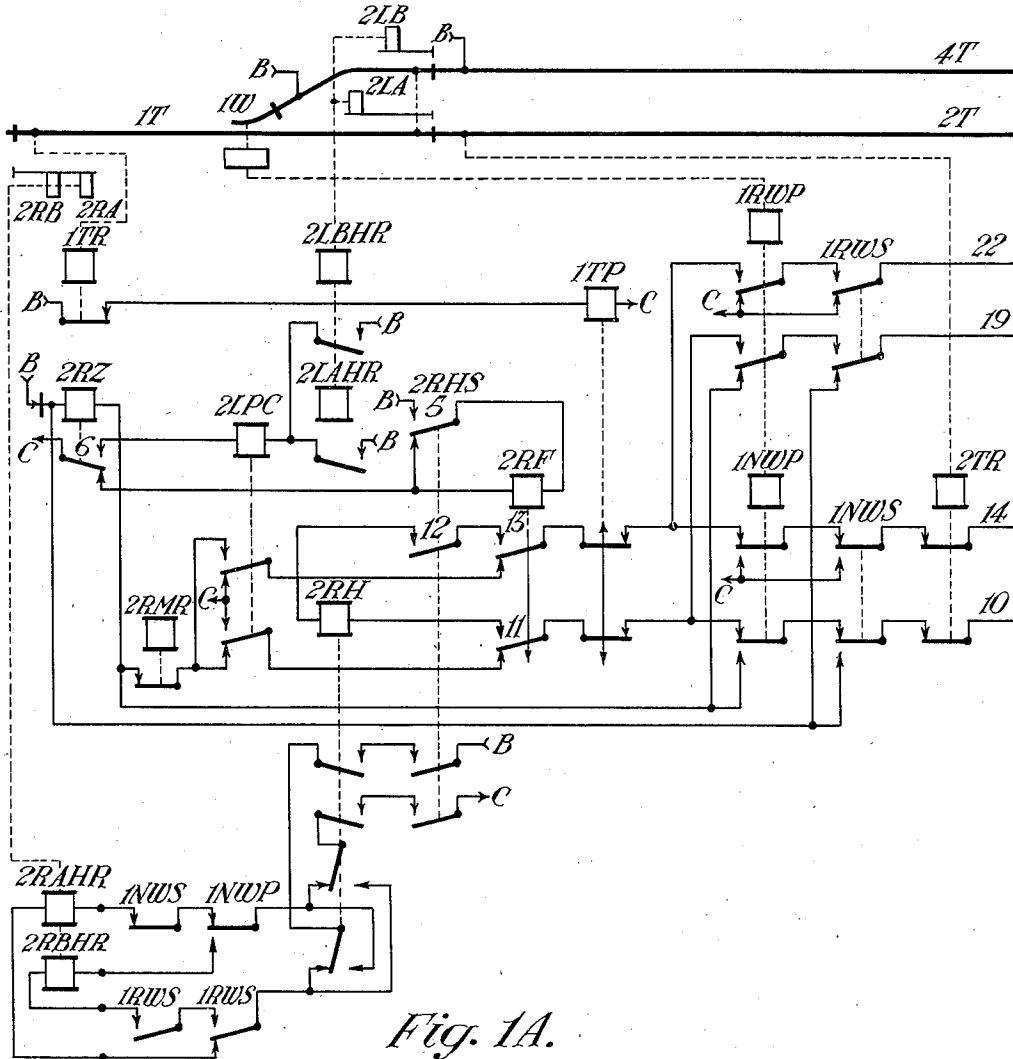


Fig. 1A.

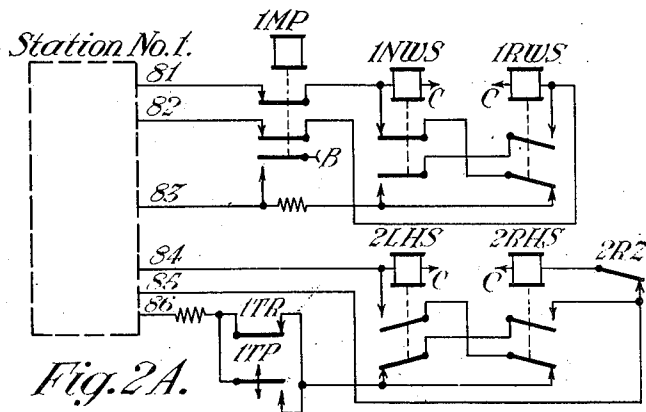


Fig. 2A.

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2 Sheets-Sheet 2

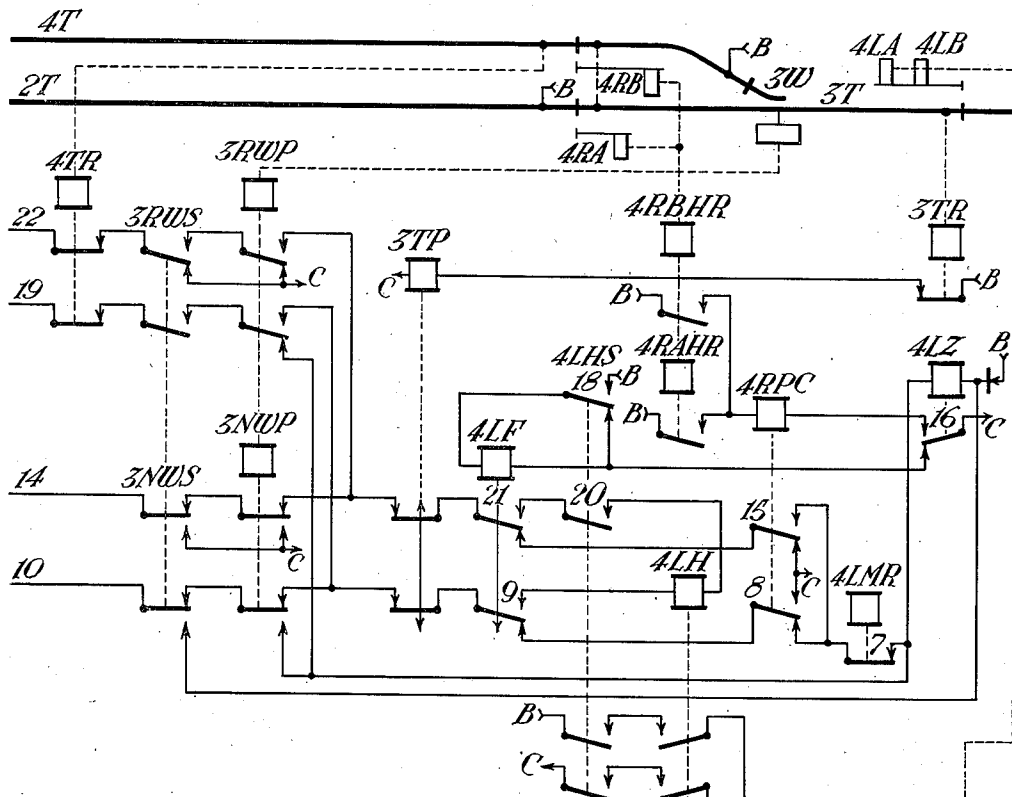


Fig. 1B.

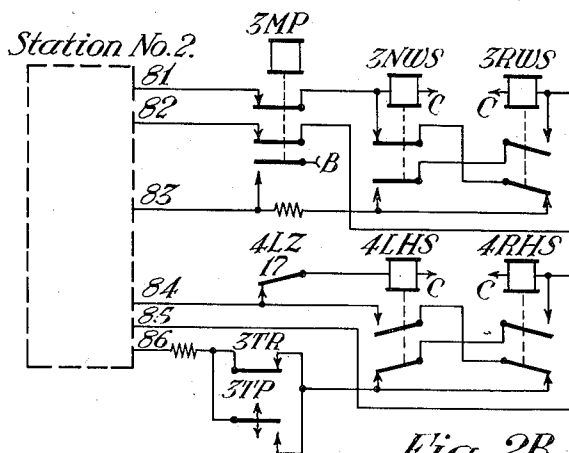


Fig. 2B.

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UNITED STATES PATENT OFFICE

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RAILWAY TRAFFIC CONTROLLING
APPARATUS

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6 Claims. (Cl. 246—3)

My invention relates to railway traffic controlling apparatus, and more particularly to circuits for use in connection with a centralized traffic control system for the control of railway signals governing traffic movements in opposite directions over track switches. In its specific embodiment as illustrated herein my invention is applied to the control of the entering signals located at the opposite ends of a passing siding of a single track railway, and forms a part of a single track signaling system in which the head block signals and the track switches at the ends of the passing tracks are subject to manual control from a central office through the medium of a code type communication system, such, for example, as that shown in Letters Patent of the United States to L. V. Lewis, No. 2,229,249, issued January 21, 1941, for Remote control systems.

One feature of my invention resides in the provision of reversible line circuits for the control of the entering signals, together with means for preventing a signal which has been cleared from being put to stop as the result of an inadvertent attempt by the operator to clear a conflicting signal controlled by a different lever, and in respect to this feature, my invention is an improvement upon that disclosed in Letters Patent of the United States to H. S. Young, No. 2,282,841, issued May 12, 1942, for Railway traffic controlling apparatus.

One object of my invention resides in the provision of a system of route circuits, corresponding to the two routes which the passing tracks afford, for controlling the opposing entering signals so that the condition of each is dependent upon that of the other when the track switches have been positioned to establish a route through both ends of the siding, but not otherwise.

A further object of my invention resides in the provision of means for interlocking the code responsive relays by which the opposing entering signals are manually governed in such a manner as to facilitate their control by "composite" codes, by means of which, as explained in the above-mentioned Lewis patent, the operation of the track switch to a new position, and the clearing of the signal governing traffic movements over the route thereby established, is effected in a single operation.

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

Referring to the accompanying drawings, Figs. 1A and 1B include a single line track diagram representing portions of railway track including

the track switches 1W and 3W, respectively, which portions may be combined by placing Fig. 1A at the left of Fig. 1B to illustrate a typical passing siding in a stretch of single track railway. These views also include in diagrammatic form the circuits for the track relays for the stretch, and a route circuit network controlled by the track relays and conforming to the track layout comprising the line circuits for controlling the opposing entrance signals 2RA and 4LA for governing traffic over the lower main track, and also those for controlling the corresponding signals 2RB and 4LB which govern traffic movements in opposite directions over the upper, or side track.

Fig. 2A shows the circuits for the code controlled relays controlled by a station unit No. 1 of the centralized traffic control system, for effecting the manual control of the track switch 1W and of the associated entering signals 2RA and 2RB, as well as of the corresponding leaving signals 2LA and 2LB, this view corresponding generally to the one illustrating similarly designated relays and comprising a portion of Fig. 8 of the Lewis patent hereinbefore referred to. Fig. 2B shows a similar station unit No. 2 located at the other end of the siding for controlling the track switch 3W, the entering signals 4LA and 4LB and the leaving signals 4RA and 4RB.

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

It is to be understood that those relays shown herein which bear designations similar to those of the relays of the Lewis patent and for which the circuits are not shown in the present application function like the corresponding relays of the patent. Thus the relays 2RMR and 4LMR are approach locking stick relays which are energized only when the associated signals 2R and 4L are at stop, like the relays RMR and LMR of Fig. 9 of the patent; relays 1MP and 3MP correspond with relay MP of Fig. 8 of the patent; relays NWS, RWS, LHS and RHS are the code-controlled switch and signal stick relays controlled over connections to terminals 81 to 86 of the station coding units as in Fig. 8 of the patent, while the relays NWP and RWP are normal and reverse switch indication relays which may be either simple repeaters indicating the normal and reverse positions of the track switch like relay RWP of Fig. 9 of the patent, or they may in addition repeat the position of the switch control relays like relays NKR and RKR of the patent.

It will be understood that Figs. 1A and 1B may also be arranged with Fig. 1A at the right of Fig. 1B to illustrate the opposite ends of the single track stretch governed by the opposing head block signals 4RA, 4RB and 2LA, 2LB, but the circuits for these signals are not shown since suitable circuits are well known. For an understanding of the relation of these signals to the present invention, it is believed sufficient to point out that signals 4RA and 4RB are governed by the code controlled relay 4RHS, and the signals 2LA and 2LB by the corresponding relay 2LHS.

It is thought that my invention may be more readily understood by a description of its operation under different assumed conditions, and accordingly, starting with the apparatus in its normal condition as shown, it will first be assumed that the operator transmits a control code to station No. 1 to pick up relays 1 NWS and 2RHS, for the purpose of clearing signal 2RA for a train movement over the route including sections 1T, 2T and 3T of the lower main track. In Fig. 1A, the energization of relay 2RHS completes a circuit from one terminal B of a suitable local source of current at its front contact 5 through the winding of a directional relay 2RF and the back contact 6 of a lockout relay 2RZ to the other terminal C of the same source.

It is to be understood that separate sources having corresponding terminals B and C are provided at stations Nos. 1 and 2, and that the terminals C of the two sources are connected together at times over connections afforded by one or more of the line wires of the route circuit network. Normally the terminals B of the two sources are also connected together, over a circuit extending from terminal B in Fig. 1A through relay 2RZ over wire 10 and thence through relay 4LZ to terminal B in Fig. 1B. As shown in the drawings, this circuit includes oppositely connected rectifier elements which serve to limit the flow of current to a negligible value even though the voltages of the two sources are unequal. It follows that normally relays 2RZ and 4LZ are both deenergized, and since the back contact 6 of relay 2RZ is closed, relay 2RF picks up in response to the energization of relay 2RHS and energizes the signal relay 2RH in series with relay 4LZ, over the established route circuit. This route circuit may be traced from terminal B, Fig. 1B, through relay 4LZ, front contact 7 of relay 4LMR, back contacts 8 and 9 of relays 4RPC and 4LF, front contacts of relays 3TP, 3NWP and 3NWS, wire 10, front contacts of relays 2TR, 1NWS, 1NWP and 1TP, front contact 11 of relay 2RF, through relay 2RH, front contacts 12 and 13 of relays 2RHS and 2RF and thence over the return portion of the route circuit including wire 14 and similar to the portion already traced to terminal C at back contact 15 of relay 4RPC. It is to be understood that since the flow of current through relay 2RH is from right to left, its polar contacts will be operated to their right-hand or reverse position to energize relay 2RAHR in the reverse direction, causing signal 2RA to indicate caution.

The energization of relay 4LZ prepares a circuit for relay 4RPC at front contact 16, Fig. 1B, and opens the circuit for relay 4LHS at back contact 17, Fig. 2B. It follows that a code received at station No. 2 for energizing relay 4LHS would be ineffective; relay 4RHS, however, may be energized to pick up relay 4RAHR to clear the advance signal 4RA, and to complete a circuit for the pole changer relay 4RPC.

When relay 4RPC becomes energized, its contacts 8 and 15 pick up to reverse the polarity of the current supplied to relay 2RH, so that relay 2RH will close its left-hand polar contacts to energize relay 2RAHR in the normal direction, causing signal 2RA to indicate proceed.

It will be noted that if the leaving signal 4RA is cleared when the entering signal 2RA is at stop, that is to say, prior to the energization of relays 2RH and 4LZ, relay 4RPC remains released. If relay 4RPC should pick up before relay 2RF becomes energized, a circuit would be completed from terminal B, Fig. 1A, through relay 2RZ over back contact 11 of relay 2RF and wire 10 to terminal C at front contact 8 of relay 4RPC, and relay 2RZ would pick up to open its back contact in the circuit for relay 2RHS, Fig. 2A, which would prevent the clearing of signal 2RA, but this is avoided because relay 4RPC is prevented from picking up until after relay 2RZ is disconnected from the route circuit by the operation of relay 2RF.

I shall next assume that signal 2RA indicates caution to control a train approaching from the left, that signal 4RA is at stop and that the operator sends a code including elements for picking up relays 3RWS and 4LHS for the purpose of reversing switch 3 and clearing signal 4LB for a train approaching from the right. Initially relay 3NWS will release and only relay 3RWS will pick up in response to delivery element of the code, the circuit for relay 4LHS being open at contact 17, but the release of relay 3NWS removes relay 4LZ from the route circuit, establishing connections directly from terminals B and C to wires 10 and 14 at its back contacts, so as to maintain relay 2RH energized in the reverse direction, and it follows that the energization of signal 2RA is not interfered with. Relay 4LZ will release and then relay 4LHS will pick up, the duration of the delivery element being sufficient for the purpose, since none of the relays involved are slow acting. Relay 4LHS, at contact 18, connects terminal B to one terminal of relay 4LF, the other terminal of which is connected to terminal C at back contact 16 of relay 4LZ, so that relay 4LF picks up. Relay 3RWS operates switch 3W to reverse in the usual manner, whereupon the reverse indication relay 3RWP picks up, completing a route circuit for relay 4LH extending from terminal B, Fig. 1A, over a back contact of relay 1RWS, wire 19, front contacts of relays 4TR, 3RWS, 3RWP and 3TP, front contact 9 of relay 4LF through relay 4LH, over contacts 20 and 21 of relays 4LHS and 4LF and the return portion of the route circuit including wire 22 and extending to terminal C at a back contact of relay 1RWS. Relay 4LH therefore becomes energized in the reverse direction and in turn energizes relay 4LBHR in the reverse direction to cause signal 4LB to indicate caution.

Assuming now that the train approaching from the right enters section 3T; relays 3TR, 4LHS, 4LH, 3TP and 4LF will release in that order, deenergizing relay 4LBHR and thereby restoring signal 4LB to stop. When the train passes into section 4T and vacates section 3T, the operator may send a code to release relay 3RWS and to energize relays 3NWS and 4RHS, in order to clear signal 4RA to permit the train approaching from the left to pass through section 3T. When relay 3NWS picks up, the route circuit for relay 2RH is shifted to extend from wire 10 over the

lower front contact of relay 3NWS and the back contact of relay 3NWP through relay 4LZ to terminal B, that is, relay 4LZ is inserted into the route circuit in series with relay 2RH.

Relay 3NWS operates switch 3W to normal, causing the normal indication relay 3NWP to pick up to shift the route circuit for relays 2RH and 4LZ to the path including front contact 7 of relay 4LMR, this route circuit being the same as that already traced at the beginning of this description. Relay 3NWP also completes a circuit, not shown, for relay 4RAHR, whereupon signal 4RA is caused to indicate caution or proceed and then relay 4RPC picks up, causing signal 2RA to indicate proceed.

It might happen that the operator would inadvertently send a code for clearing signal 4LA in place of one for clearing signal 4RA, under the conditions just described, in which case relays 3NWS and 4LHS would pick up.

Relay 3NWS would insert relay 4LZ into the route circuit as in the preceding case, but the opening of its back contact 17 now would cause relay 4LHS to release. Relay 3NWS operates switch 3W to normal and relay 3NWP establishes the route circuit, as before, but signal 4RA of course remains at stop, and it will be seen that the apparatus is left in the same condition as if relay 4LHS had not been operated by the code. In other words, the clearing of a signal for one direction nullifies any attempt to clear the opposing signal for the same route.

It will next be assumed that the train approaching from the left stops in section 2T, and that the operator sets up a "run-around" route for the opposing train by sending a code to reverse switch 1 and to clear signal 2LB and a second code to reverse switch 3 and clear signal 4LB. Upon the completion of the operation of the track switches to reverse, the route circuit including relay 4LH already traced, will be extended from wires 19 and 22 over front contacts of relays 1RWP and 1RWS to the back contacts 11 and 13 of relay 2RF, and will be completed from back contact 11 over the lower back contact of relay 2LPC and the front contact of relay 2RMR through relay 2RZ to terminal B, and from back contact 13 over the upper back contact of relay 2LPC to terminal C. Relay 2RZ will therefore be energized in series with relay 4LH and will complete the circuit for relay 2LPC to reverse the polarity of the current supplied to relay 4LH, that is, relay 2RZ will function like relay 4LZ already described, to lock out the code control of the opposing signal and to so control the associated pole changer relay as to avoid any connection over the route circuit network which includes the two sources of current in series.

A further feature of the circuits related to the foregoing is provided by making relays 2RF and 4LF slow release. Assuming that relays 4LF and 4LHS are picked up, energizing relays 2RZ and 4LH in series, and that relay 2LPC is picked up so that relay 4LH is energized in the normal direction. If relay 4LHS then releases to open the route circuit at contact 20, relay 2RZ releases, and in turn releases relay 2LPC. Relay 4LF becomes deenergized due to the opening of front contact 18 of relay 4LHS, but its winding is short circuited over back contact 18 and its release is thereby delayed until after relay 2LPC releases. It will be seen that like terminals of the two current sources are connected together over the route circuit network only when the pole changer relays are released, and that the

two sources are not connected together at any time in such a way that their voltages are additive.

Although I have in the foregoing described only a few of the possible operations involving the control of the signals at two adjacent stations, it is believed that in view of the symmetry of the circuits for two directions the operation of the apparatus of my invention under other assumed conditions will be readily understood without further description.

Although I have herein shown and described only one form of railway traffic controlling 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 a centralized traffic control system for governing traffic movements over a stretch of railway track including two track switches located at different stations and adapted to establish traffic routes through both stations when operated to corresponding normal or reverse positions, a signal for each route at each station, manually controllable switch and signal control means at each station for governing the operation of the track switch and signals at that station, a route circuit network of interconnected circuits connecting said stations including a signal circuit for each signal, each signal circuit including contacts controlled by the switch and signal control means at the same station and also including contacts controlled by the switch control means at the other station, a lockout relay at each station controlled over said route circuit network by the signal control means at the other station and adapted to be energized only when the switch control means at the two stations have been conditioned to establish a route through both stations, and means preventing the operation of the signal control means at each station when the lockout relay at the same station is energized.

2. In a centralized traffic control system for governing traffic movements over a stretch of railway track including two track switches located at different stations and adapted to establish traffic routes through both stations when operated to corresponding normal or reverse positions, a signal for each route at each station, manually controllable switch and signal control means at each station for governing the operation of the track switch and signals at that station, a signal circuit for controlling each signal including contacts controlled by the signal control means at the same station and contacts controlled by the switch control means at both stations, and lockout means controlled by each signal control means when energized for preventing the energization of the signal control means at the other station when the switch control means at the two stations have been conditioned to establish a route through both stations.

3. In a centralized traffic control system for governing traffic movements over a stretch of railway track including two track switches located at different stations and adapted to establish traffic routes through both stations when operated to corresponding normal or reverse positions, a signal for each route at each station, manually controllable switch and signal control means at each station for governing the operation of the track switch and signals at that sta-

tion, a signal relay and a lockout relay at each station, a circuit for energizing each signal relay including contacts closed when the signal control means at the same station is energized and contacts controlled by the switch control means at both stations, means for extending the circuit for the signal relay at one station to include in series therewith the lockout relay at the other station when the switch control means at both stations have been operated to corresponding normal or reverse positions, and means controlled by each lockout relay when energized for preventing the energization of the associated signal control means.

4. In combination with a stretch of single track railway including two track switches connected by passing tracks, entering signals for governing traffic movements over each route provided by one track switch and leading into said passing tracks, leaving signals for governing traffic movements over each route provided by the other track switch and leading out of said passing tracks, independently operable switch and signal control means associated with each track switch for controlling its operation and for selectively clearing that signal which governs traffic movements over the route established by such operation, a pole changer controlled by each leaving signal for reversing the polarity of the current supplied to that entering signal which governs traffic movements into the route governed by such leaving signal, and means controlled jointly by the switch control means for the two track switches for preventing the operation of said pole changer except when a route is established which includes both track switches in corresponding positions.

5. In combination with a stretch of single track railway including two track switches connected by passing tracks, entering signals for governing traffic movements over each route provided by one track switch and leading into said passing tracks, leaving signals for governing traffic movements over each route provided by the other track switch and leading out of said passing tracks, independently operable switch and signal control means associated with each track switch for con-

trolling its operation and for selectively clearing that signal which governs traffic movements over the route established by such operation, a polarized signal relay for controlling said entering signals, a pole changer controlled by said leaving signals for reversing the polarity supplied to said signal relay when a leaving signal is energized, and means controlled by the switch control means associated with said leaving signals for preventing the operation of said pole changer except when a route is established which includes both track switches in corresponding positions.

6. In a centralized traffic control system for a stretch of single track railway including two track switches at spaced locations connected by passing tracks with signals at each location for governing traffic movements in opposite directions over the track switch at that location, said system including switch and signal control means at each location manually controllable from a central office for governing the operation of the track switch and signals at that location, with line circuits connecting the two stations for energizing those signals at each location which govern traffic movements toward the other location in accordance with said manual control, the combination of a lockout relay at each station effective when energized to render the control means for the signals controlled over said line circuits non-responsive to said manual control, with means for energizing the lockout relay at each location over the line circuit for a signal at the other location when such signal has been cleared for a traffic movement over a route including one passing track, such route including both track switches in corresponding positions, and means for releasing said energized lockout relay, without interrupting the circuit for such signal, in response to the central office control of the switch and signal control means at the same location to establish a route over the other passing track.

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