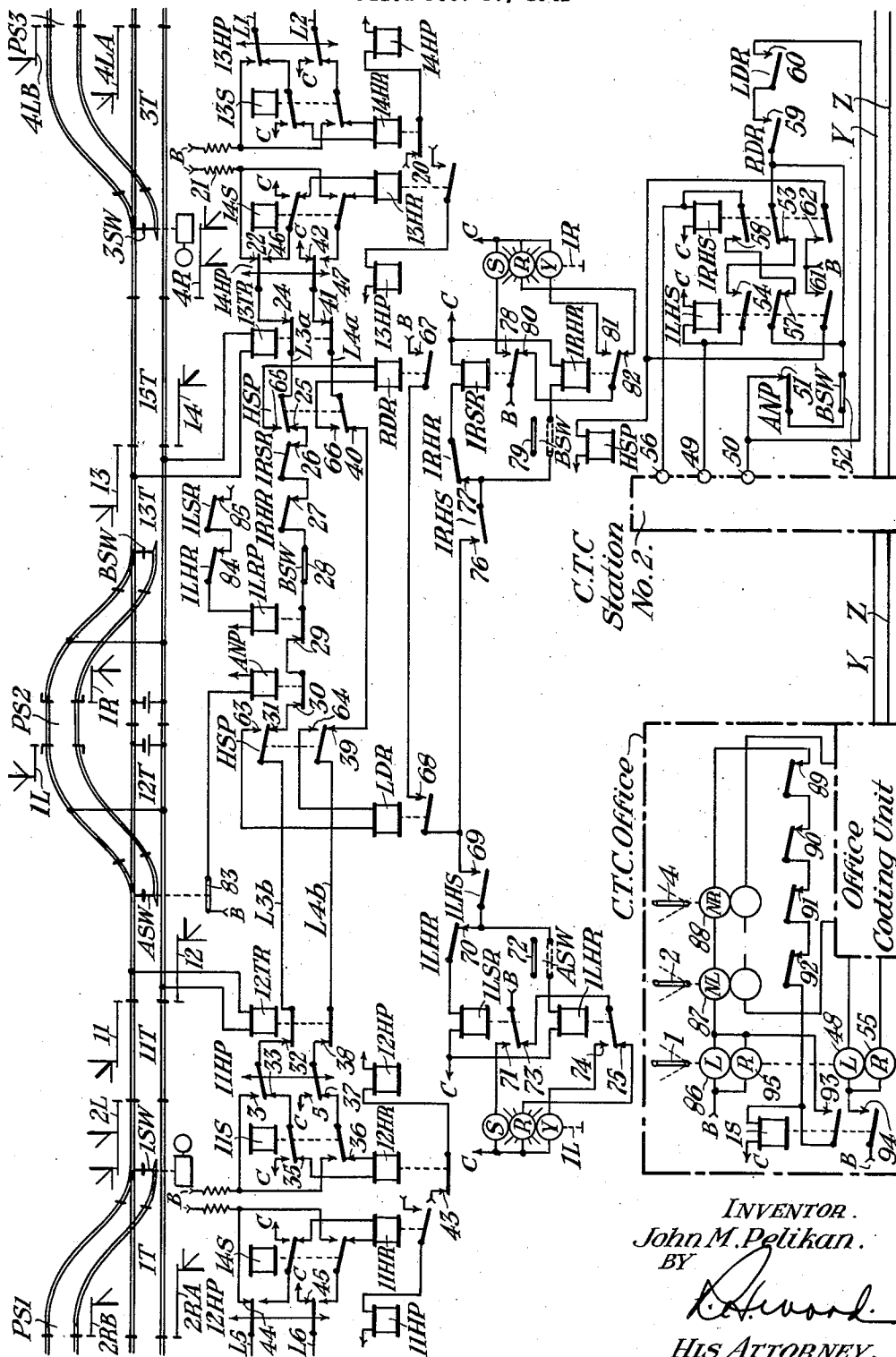


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RAILWAY TRAFFIC CONTROLLING APPARATUS

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RAILWAY TRAFFIC CONTROLLING
APPARATUS

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My invention relates to railway traffic controlling apparatus for governing the movement of traffic over a stretch of railway over which traffic moves in both directions, and more particularly to apparatus for signaling on a single track railway using a centralized traffic control system.

My invention is in the nature of an improvement on the invention of an application for Letters Patent, Serial No. 412,627, filed September 27, 1941, by Henry S. Young, for Railway traffic controlling apparatus, and in which application there is disclosed an absolute permissive block signal system employing circuits using two line wires which may be energized at one end or the other for establishing the direction of traffic over an associated stretch of railway, such directional control being manually governed from a central point by means of a centralized traffic control system.

Railways using a centralized traffic control system often have a siding that is used so little it does not warrant being fully equipped with signals and power switch machines, but which siding is used often enough that to abandon such a siding is unwise.

Accordingly, a feature of my invention is the provision of novel and improved railway traffic controlling apparatus for protecting traffic movements from a siding of a railway using a centralized traffic control system.

Another feature of my invention is the provision of novel and improved railway traffic controlling apparatus for governing leaving signals at a siding of a railway using a centralized traffic control system, it being contemplated that hand-throw switches are provided for the siding and a train enters the siding under telephone orders or similar instructions, but leaves the siding by signal indication.

Still another feature of my invention is the provision of apparatus of the type here contemplated for governing the leaving signals of a siding of a single track railway through the medium of a two-wire line circuit of an associated absolute permissive block signal system and additional line circuits and track circuits are not required.

Again, a feature of my invention is the provision of novel railway traffic controlling apparatus for governing traffic movements entering a block of a single track railway over a switch at a location intermediate the opposing block signal locations.

My invention also includes the provision of novel lockout means at the centralized traffic control office to prevent the transmission of a code

to clear a leaving signal at a siding within a block of a single track railway when the block section at either side of such siding is occupied by a train approaching the siding or either of the two opposing block signals is cleared for a train to enter the block.

Other features, objects and advantages of my invention will appear as the specification progresses.

The above features, objects and advantages embodying my invention I obtain by providing a leaving signal at a track switch over which traffic may enter a block at a location intermediate the two ends of the block of a railway using a centralized traffic control system. For example, a leaving signal is placed at each end of a siding intermediate the ends of a given stretch of single track railway which uses a centralized traffic control system to govern an absolute permissive block signal system. A line code storage unit of the centralized traffic control system is located at such track switch, that is, at one end or the other of a siding, and the storage unit is provided with the usual code controlled stick relays, one such relay for each leaving signal to be controlled. When any one of the code controlled stick relays is picked up, a repeater relay is energized and picked up. Contacts of this repeater relay are interposed in the two-wire line circuit of the associated absolute permissive block signal system, so that when the repeater relay is picked up the line circuit extending along the section within which the particular track switch is located is opened and special control relays are connected thereto, a special control relay being connected to each end of the line circuit. In the absolute permissive block signal system here involved, the line circuit is a reversible circuit extending between the block signal locations of the associated block but sectionalized at each intermediate signal location. That is, this line circuit comprises a series of sections or individual circuits which are controlled in tandem and to which a current source is connected at one end or the other according to the direction of traffic established by the associated centralized traffic control system, and when any individual circuit of such line circuit is opened at a point intermediate its two ends, the current source at each end of such individual circuit is connected across the line wires. This line circuit includes a contact of each track relay of each track section of the block and consequently when the repeater relay is picked up to open a particular section of the line circuit and connect special control relays one to each end of the particular

section of the circuit, both of these special control relays are energized if the track sections at each side of the track switch or siding are unoccupied by a train approaching such track switch or siding and if neither one of the opposing block signals is cleared to permit a train to enter the block. Each such leaving signal is governed by a first signal control relay which is energized over a circuit including in series a front contact of the two special control relays and a front contact of the respective code controlled relay. This signal control relay when picked up completes an operating circuit for operating the leaving signal to a special "safe to leave" indication position, such indication informing the train crew that it is safe to enter the block over the respective track switch. Another or second signal control relay is provided for the leaving signal and is controlled over a contact of the usual switch circuit controller of the associated track switch in series with the circuit of the first mentioned signal control relay, and when a trainman operates the track switch in preparation for the train to enter the block, the leaving signal is operated from the "safe to leave" indication to a position for displaying the usual approach signal indication. The train upon entering the track circuit adjacent the track switch shunts the associated track relay to open the two-wire line circuit in the usual manner, and thereby causes the respective special control relay to be deenergized, which upon releasing deenergizes both signal control relays of the associated leaving signal, operating the leaving signal back to its usual stop indication. The code controlled relay is retained energized over a stick circuit governed by the special control relays and when either special control relay is released in response to the train leaving the siding, the code controlled relay and the other special control relay are restored to their normal positions. When the train has entirely moved over the track switch and the trainman has restored the switch to its normal position, the two-wire line circuit is then in the condition that corresponds to a train in the block and moving in the corresponding direction.

A lockout circuit is provided in the control machine at the centralized traffic control office to prevent the transmission of a code to select the code controlled relay of the line code storage unit associated with the respective switch or siding when the block section in which such track switch is located is occupied or a signal has been cleared to permit a train to enter such block.

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

The accompanying drawing is a diagrammatic view showing one form of apparatus embodying my invention when applied to a railway using a centralized traffic control system for governing the direction of traffic over a stretch provided with an absolute permissive block signal system which employs a two-wire line circuit of the form here involved.

Referring to the drawing, at the top portion there is illustrated a stretch of single track railway extending between the adjacent ends of two fully signaled sidings PS1 and PS3, and within which stretch another siding PS2 is located, it being understood that siding PS2 is one that does not warrant being fully signaled.

This stretch of railway which constitutes a block is formed by the usual insulated rail joints into a series of consecutive track sections iden-

tified by the reference character T plus a distinctive numeral, and is provided with the usual arrangement of wayside signals. As here shown, signal 2RA or 2RB at siding PS1 and signal 4LA or 4LB at siding PS3 are opposing block signals for a block including track sections 1T, 11T, 12T, 13T, 15T and 3T, and each of which sections is provided with the usual closed track circuit, of which track circuits only those for sections 13T and 12T are shown. The spacing of trains moving in the same direction through the block is governed by intermediate signals 12 and 14 for eastbound traffic, and by intermediate signals 13 and 11 for westbound traffic. Furthermore, signals 2L and 4R function as entering signals at sidings PS1 and PS3, respectively. Specifically, the track diagram and related signals of the accompanying drawing correspond substantially to the track diagram and related signals disclosed by the aforementioned application Serial No. 412,627, and for the sake of clarity the track sections and signals of the accompanying drawing are given the same reference characters as the corresponding track sections and signals of application Serial No. 412,627. It is to be observed, however, that in the accompanying drawing, track sections 10T and 14T have been omitted and siding PS2 is located in track sections 12T and 13T. Track switches ISW and 3SW at sidings PS1 and PS3, respectively, may be power operated switches, but switches ASW and BSW of the siding PS2 are preferably hand-throw type of switches. According to my invention, two leaving signals 1L and 1R are provided at siding PS2, signal 1L governing train movements from the siding into the block over switch ASW, and signal 1R governing train movements from the siding into the block over switch BSW.

In order to simplify the drawing and to enable the circuits to be more readily traced, I have herein identified each relay by a letter or combination of letters with a prefix identifying the signal, switch or track section with which the relay is associated. The sources of current for energizing the various circuits are identified by the reference characters B and C which refer to the positive terminal and to the negative or common return terminal, respectively. Furthermore, in many instances a relay contact is shown remote from the relay winding and in each such instance the contact is provided with a reference character corresponding to that for the respective relay, plus a distinctive numeral. Also, the operating circuits for the different signals except the leaving signals 1L and 1R are not shown since these operating circuits would be in accordance with standard practice and form no part of my invention.

The various signals of the accompanying drawing, except signals 1L and 1R, are preferably controlled by circuits similar to those disclosed in the aforementioned application Serial No. 412,627, and in the accompanying drawing only the portion of these circuits required for a full understanding of my invention is shown and reference is made to application Serial No. 412,627 for a full description of such signal circuits. It is sufficient for my present application to point out that these control circuits include a reversible two-wire line circuit extending from the location of block signals 2RA and 2RB to the location of the opposing block signals 4LA and 4LB, but is sectionalized at the location of intermediate signals 11 and 12 and at the location of intermediate signals 13 and 14. That is, this line circuit com-

prises three sections or individual circuits arranged in tandem, a first one of which extends from the location of block signals 4LA and 4LB to the location of intermediate signals 13 and 14, a second one extends from the location of intermediate signals 13 and 14 to the location of intermediate signals 11 and 12, and the third one extends from the location of intermediate signals 11 and 12 to the location of block signal 2RA or 2RB. This line circuit is controlled by the track relays of the several track sections, each individual circuit being controlled by the track relays of the track sections along which that individual circuit extends. The line circuit is further controlled by directional relays, one at each of the block signal locations, and which directional relays are governed in turn by a centralized traffic control system. For example, eastbound traffic is established when a directional relay at block signal 2RA is released and a directional relay located at block signal 4LA is energized by proper codes of the centralized traffic control system. Such condition of the directional relays causes a current source to be connected to the east or right-hand end, as viewed in the drawing, of each section of the line circuit to energize a line relay at the west or left-hand end of the respective line circuit section, this condition being effected progressively starting at the east end of the block. Similarly, westbound traffic is established when the condition of the directional relays at the block signal locations is reversed in response to proper codes of the centralized traffic control system. When westbound direction for traffic is thus selected, a current source is connected to the west end of each of the sections of the line circuit to energize a line relay at the east end of the respective section of the circuit. Such action is effected progressively starting at the west end of the block. Current of normal or reverse polarity is supplied to the respective sections of the line circuit to provide control for three-position wayside signals in the usual manner, the polarity of the current being governed by means of the usual directional stick relays of the absolute permissive block signal system.

Since the siding PS2 is located within the stretch between the location of intermediate signals 11 and 12 and the location of intermediate signals 13 and 14, the section of the two-wire line circuit extending along this associated stretch of the track only is shown complete together with the left-hand end of the line circuit section extending between the location of block signal 4LA and the location of intermediate signals 13 and 14, and the right-hand end of the section of the line circuit extending from the location of the block signal 2RA to the location of the intermediate signals 11 and 12.

In other words, the control of leaving signals 1L and 1R at siding PS2 directly involves the section of the two-wire line circuit extending along the track sections within which siding PS2 is confined, and a description of this section of the two-wire line circuit, together with its relationship to the adjacent sections is sufficient for a full understanding of my invention.

The line circuit for the block disclosed in the drawing is shown as conditioned for eastbound traffic and hence current is supplied to line wires L1 and L2 of the section of the line circuit extending from block signal 4LA to intermediate signals 13 and 14, and a line relay 14HR is energized. Relay 14HR controls a slow acting repeater relay 14HP over an obvious circuit includ-

ing front contact 20 of relay 14HR. Relay 14HP on picking up connects the current source to the next adjacent section of the line circuit, that is, to the section of the line circuit extending from the location of signals 13 and 14 to the location of signals 11 and 12, and within which stretch of track the siding PS2 is located. This last mentioned section of the line circuit can be traced from terminal B over resistor 21, front contact 22 of relay 14HP, front contact 24 of track relay 13TR of section 13T, line wire L3a, back contact 25 of a repeater relay HSP to be referred to later, back contacts 26 and 27 of relays 1RSR and 1RHR associated with leaving signal 1R as will be later explained, contact 28 operated by the track switch BSW and closed only when the switch BSW is set at its normal position, front contacts 29 and 30 of relays 1LRP and ANP associated with signal 1L and switch ASW as will shortly appear, a second back contact 31 of repeater relay HSP, line wire L3b, front contact 32 of track relay 12TR of track section 12T, back contacts 33 and 35 of relays 11HP and 11S associated with signal 11 as will later appear, line relay 12HR, back contacts 36 and 37 of relays 11S and 11HP, respectively, front contact 38 of track relay 12TR, line wire L4b, back contacts 39 and 40 of repeater relay HSP, front contact 41 of track relay 13TR and front contact 42 of relay 14HP to terminal C of the same source of current. It is to be observed that this section of the line circuit is controlled by the section of the line circuit next to the right, by traffic in the track sections 12T and 13T, by the position of the track switches ASW and BSW, and also by the position of repeater relay HSP. Normally, line relay 12HR is picked up and controls a slow acting repeater relay 12HP over an obvious circuit including front contact 43 of relay 12HR. Relay 12HP on picking up controls at its front contacts 44 and 45 the connection of the current source to the section of the line circuit next to the left and which includes line wires L5 and L6 extending to the location of block signal 2RA.

When westbound direction of traffic is established and a current source is connected to line wires L5 and L6 at the left-hand end of the block, line relay 11HR is energized because repeater relay 12HP is released to connect relay 11HR to line wires L5 and L6, and relay 11HR on picking up completes a simple circuit for an associated slow acting repeater relay 11HP, and relay 11HP on picking up to close front contacts 3 and 5 connects, in turn, terminals B and C of the associated current source to line wires L3b and L4b of the circuit extending from location of signals 11 and 12 to the location of signals 13 and 14 with the result that line relay 13HR is energized over this section of the line circuit extending through track sections 12T and 13T, and explained above in detail. Line relay 13HR on picking up completes a simple circuit for its associated repeater relay 13HP, and relay 13HP on picking up connects terminals B and C of the associated current source to line wires L1 and L2.

It is to be pointed out that when westbound direction of traffic is established, and relays 11HR and 14HP become released due to a westbound train entering section 11T, the stick relay 11S associated with westbound signal 11 is picked up through the absolute permissive block signal system in the usual manner and pole changes the connection of terminals B and C to the line wires L3b and L4b. Likewise, when eastbound

traffic is established and relays 14HR and 14HP become released due to an eastbound train entering section 15T, stick relay 14S, associated with signal 14, is picked up in the usual manner by the absolute permissive block signal system and pole changes the connection of terminals B and C to the respective line wires L3a and L4a. The manner of employing the section of the line circuit extending along track sections 12T and 13T for governing leaving signals 1L and 1R will be taken up and described in detail shortly.

The centralized traffic control system may be any one of several well-known arrangements. For example, it may be of the impulse code type covered by Letters Patent of the United States No. 2,229,249, granted January 21, 1941, to L. V. Lewis, for Remote control system. In such centralized traffic control system control is effected between a central office and various stations located along the railway over a pair of line wires commonly identified as line wires Y and Z and which line wires extend from the office to each station so that control codes transmitted from the office are received at each station to effectively operate a line code storage unit at the station for which the code is intended. The line code storage unit when operated effectively energizes code controlled stick relays according to the code received, and the selected stick relay in turn governs a corresponding signal or other device. A control code is initiated by operating a lever of the machine at the office, an operation of the lever completing a circuit which causes an office coding unit to deliver a corresponding code to the line wires Y and Z.

The centralized traffic control system is shown only as required for an understanding of my invention. Referring to the drawing, the dot and dash line rectangle bearing the legend "C. T. C. office" represents the office of the centralized traffic control system. The numerals 1, 2 and 4 designate signal levers of the office machine, each of which levers is operable to a normal position indicated by full lines in the drawing, and either to a left or to a right position indicated by dotted lines in the drawing. As will appear later, lever 1 is used to control leaving signals 1L and 1R at siding PS2, lever 2 is used to control signals 2RA, 2RB and 2L at siding PS1, and lever 4 is used to control signals 4LA, 4LB and 4R at siding PS3. These levers operate circuit controlling contacts over which circuits are completed for the office coding unit, which in turn functions to deliver to wires Y and Z a code made distinctive for each of the different positions of the levers.

The dot and dash line rectangle bearing the legend "C. T. C. station No. 2" designates a station located at siding PS2. The location of such a station may be at either end of the siding, and as shown in the drawing it is located at the east end. Two code controlled stick relays 1LHS and 1RHS are controlled by station No. 2. When lever 1 is moved to its left-hand position to close a contact L—48 and an office relay 1S to be later described is picked up closing front contact 94, the office coding unit delivers a code to wires Y and Z which is received at station No. 2 to cause positive energy to momentarily appear at a terminal 49 and to remain on a terminal 50. During the reception of such a code and terminal 49 is made positive, current flows through an operating winding of relay 1LHS to terminal C and that relay is picked up. Relay 1LHS when

thus picked up is retained energized by a stick circuit extending from terminal 50 over front contact 51 of relay ANP, contact 52 operated by switch BSW and closed at the normal position of the track switch, back contact 53 of relay 1RHS, front contact 54 and winding of relay 1LHS to terminal C. Lever 1 when operated to its right-hand position to close contact R—55, causes the office coding unit to deliver a code to the line wires Y and Z which is received at station No. 2 to cause positive energy to momentarily appear on a terminal 56 and to continue on terminal 50. Current flows from terminal 56 over the operating winding of relay 1RHS to terminal C and relay 1RHS is picked up in response to this code. Relay 1RHS is then retained energized subsequent to the code over a stick circuit extending from terminal 50 through front contact 51 of relay ANP, contact 52 operated by switch BSW, back contact 57 of relay 1LHS, front contact 58 and winding of relay 1RHS to terminal C. It is to be pointed out that a circuit path comprising front contacts 59 and 60 of two special control relays RDR and LDR to be shortly described, serves to shunt the stick circuits of relays 1LHS and 1RHS around front contact 51 of relay ANP and contact 52 of switch BSW. A repeater relay HSP is controlled by code controlled relays 1LHS and 1RHS, relay HSP being picked up over a simple circuit including either front contact 61 of relay 1LHS or front contact 62 of relay 1RHS. Thus repeater relay HSP is manually controlled through the medium of the centralized traffic control system and is picked up whenever either code controlled relay 1LHS or 1RHS is selected.

Contacts of repeater relay HSP are interposed in the section of the line circuit extending along track sections 12T and 13T as pointed out hereinbefore. That is to say, back contacts 31 and 39 of relay HSP are interposed in line wires L3b and L4b and back contacts 25 and 40 of relay HSP are interposed in line wires L3a and L4a. Thus when relay HSP is picked up it serves to open the associated line circuit at two points. In addition to this it connects two special control relays LDR and RDR to the circuit, one to each end of the circuit. To be explicit, when relay HSP picks up opening back contacts 31 and 39, the relay LDR is connected to the left-hand end of the circuit over front contacts 63 and 64 of relay HSP and relay LDR is picked up by the current source at the left-hand end of this section of the line circuit. Similarly, when relay HSP is picked up to open the line circuit at back contacts 25 and 40, relay RDR is connected to the right-hand end of this section of the line circuit over front contacts 65 and 66 of relay HSP, and relay RDR is energized by the current source at the right-hand end of this line circuit section. It is to be observed that relay RDR is energized unless relay 14HP is released because the section of the line circuit including line wires L1 and L2 is open due to a westbound train occupying track section 3T or 15T, or because the directional relay at the east end of the block has been picked up by the centralized traffic control system for clearing the block signal 4LA or 4LB for a westbound train. If relay 14HP is released, due to an eastbound train moving through section 15T, the relay RDR is energized because stick relay 14S is picked up and connects the associated current source to the line wires L3a and L4a. In connection with the special control relay LDR, it is to be pointed out that when eastbound direction of traffic is estab-

lished, the opening of the line circuit at a mid point such as back contacts 31 and 39 of relay HSP, causes line relay 12HR to be deenergized and released so that relay 12HP is in turn released to open the next adjacent section of the line circuit and in turn cause the line relay at the west end of the block to be released with the result the associated directional relay (relay 2RDR of Fig. 1A of Serial No. 412,627) is picked up and connects the associated current source to the west end of line wires L5 and L6. This energizes relay 11HR and in turn relay 11HP, so that relay 11HP is picked up closing front contacts 3 and 5 to connect the associated current source to line wires L3b and L4b with the result that special control relay LDR is energized and picked up. Relay LDR is not energized when relay 11HP is released because the section of the line circuit including line wires L5 and L6 is open due to an eastbound train occupying section 1T or 11T, or signal 2RA or 2RB has been cleared by means of the centralized traffic control system. In case relay 11HP is released due to a westbound train in section 11T, then special control relay LDR is energized because stick relay 11S is now picked up in the usual manner and connects the current source to line wires L3b and L4b.

In the case westbound traffic is established at the time the repeater relay HSP is picked up in response to a code, then the opening of the line circuit at a mid point, such as back contacts 25 and 40 of relay HSP, causes relays 13HR and 13HP to be released to disconnect the current source from line wires L1 and L2 and deenergize the associated line relay at the east end of the block and cause the associated directional relay (relay 4LDR of Fig. 1C of Serial No. 412,627) to be picked up to connect the associated current source to the line wires L1 and L2. Relays 14HR and 14HP are now energized and picked up connecting the B and C terminals to the line wires L3a and L4a and special control relay RDR is energized.

The special control relays LDR and RDR, together with the code controlled relays 1LHS and 1RHS serve to govern signal control relays for the leaving signals 1L and 1R. When code controlled relay 1LHS is selected and special control relays LDR and RDR are picked up by the line circuit as explained above, a circuit is formed for a signal control relay 1LSR of signal 1L, this circuit extending from terminal B over front contact 67 of relay RDR, front contact 68 of relay LDR, front contact 69 of relay 1LHS, back contact 70 of another signal control relay 1LHR for signal 1L, winding of relay 1LSR and to terminal C. Leaving signal 1L is preferably a three-position color light signal, and relay 1LSR when picked up closing front contact 71 completes a simple operating circuit for a lamp S of signal 1L, and the lamp S is illuminated to display a special "safe to leave" indication. Switch ASW would next be reversed by a trainman in preparation for a train to leave siding PS2 in response to leaving signal 1L displaying its "safe to leave" indication, and a circuit is formed from terminal B over front contacts 67, 68 and 69 in series, contact 72 operated by switch ASW and closed only when switch ASW is at its reverse position, winding of relay 1LHR and to terminal C. Relay 1LHR when picked up opening back contact 70 deenergizes relay 1LSR. An operating circuit is now formed extending from terminal B over back contact 73 of relay 1LSR, front contact 74 of

relay 1LHR, lamp Y of signal 1L and terminal C, and lamp Y is illuminated to display an approach indication. Under normal conditions both relays 1LSR and 1LHR are released, closing back contacts 73 and 75 to complete an operating circuit for lamp R of signal 1L and that lamp is illuminated to display a stop indication.

When code controlled relay 1RHS is selected and special control relays LDR and RDR are picked up by means of the line circuit in the manner explained hereinbefore, a circuit is formed for a signal control relay 1RSR for signal 1R, this circuit extending from terminal B over front contacts 67 and 68 of relays RDR and LDR, respectively, front contact 76 of relay 1RHS, back contact 77 of another signal control relay 1RHR for signal 1R, winding of relay 1RSR and to terminal C. Relay 1RSR on picking up closing front contact 78 completes an operating circuit for lamp S of signal 1R and that lamp is illuminated to cause signal 1R to display its "safe to leave" indication. When track switch BSW is reversed by a trainman, in preparation for a train to move from siding PS2, a circuit is formed for signal control relay 1RHR, such circuit including terminal B, front contacts 67, 68 and 76, contact 79 operated by switch BSW and closed only at the reverse position, winding of relay 1RHR and terminal C. Relay 1RHR on picking up opens the circuit for relay 1RSR, and with relay 1RSR released and relay 1RHR picked up, an operating circuit is formed over back contact 80 of relay 1RSR and front contact 81 of relay 1RHR for lamp Y of signal 1R and that lamp is illuminated to display an approach indication. Normally, lamp R of signal 1R is illuminated over a circuit completed at back contacts 81 and 82 of relay 1RSR and 1RHR, respectively.

The positions of switches ASW and BSW and of the leaving signals 1L and 1R are checked by the line circuit of the associated block. Relay ANP is normally energized over an obvious circuit including contact 83 connected to switch ASW and closed only at the normal position of this switch, and front contact 30 of relay ANP is interposed in the line circuit, as explained hereinbefore. Contact 28 operated by switch BSW is included in the line circuit to check the position of switch BSW. A repeater relay 1LRP is controlled over a circuit including in series back contacts 84 and 85 of the signal control relays 1LHR and 1LRS, respectively, of signal 1L, and front contact 29 of relay 1LRP is interposed in the line circuit. The position of signal 1R is checked by the fact that back contacts 26 and 27 of signal control relays 1RSR and 1RHR are interposed in the line circuits.

In describing the operation of the system, I shall assume that the apparatus is in the position illustrated in the drawing, that is, the line circuit is conditioned for eastbound traffic. I shall also assume that the block is unoccupied, the block signals are at stop, and that signal levers 2 and 4 at the office are set at their normal positions. I shall next assume that it is desired to move a train from siding PS2 over the track switch ASW. To do this, the operator moves lever 1 to the left position where a lockout circuit is closed for relay 1S, such lockout circuit including terminal B, lever contact L-86 of lever 1, contacts NL-87 and NR-88 of levers 2 and 4, respectively, back contacts 89, 90, 91 and 92 of indication relays (not shown) for the block and block signals as described in the previously referred to application Serial No. 412,627, winding

of relay IS and terminal C. Relay IS is also provided with a stick circuit including lever contact L—86 and its own front contact 93. With relay IS picked up, a circuit is formed over its front contact 94 and lever contact L—48 for the office coding unit and a code is delivered to line wires Y and Z which is received at station No. 2 to select code controlled relay ILHS and relay ILHS on picking up completes its own stick circuit by which it is retained energized subsequent to the code. Repeater relay HSP now picks up to open the line circuit at two places and to connect the special control relays LDR and RDR to the respective ends of the line circuit. Relays LDR and RDR are picked up because the block is unoccupied, and the block signals are at stop, and these two relays in connection with the code controlled relays ILHS complete the circuit for the signal control relay ILSR, which on picking up operates signal IL to display its S lamp as an indication that it is safe for the train to leave the siding. A trainman now throws switch ASW to its reverse position, and with switch ASW reversed, relay ILHR is selected and signal IL is operated to display its Y lamp as an approach signal indication. It is to be noted that when switch ASW is reversed, relay ANP is released, and also that when signal control relays ILHP and ILSR are picked up, repeater relay ILRP is released, but such operation of these relays at this time does not disturb the line circuit because relay HSP on picking up opens the circuit at points outside of the control of the relays ANP and ILRP. It is also to be noted that code controlled relay ILHS is retained picked up over the path including front contacts 59 and 60 of relays RDR and LDR subsequent to operation of switch ASW. The train upon entering track section 12T shunts track relay 12TR which opens the line circuit and releases special control relay LDR and that relay upon releasing in turn deenergizes the signal control relay ILHR to restore signal IL to its normal stop position. Relay LDR when released also opens the stick circuit for code controlled relay ILHS with the result that relay ILHS is released causing repeater relay HSP to be also released. This operation results in the line circuit being restored to its normal condition, that is, to the condition corresponding to a westbound train occupying section 12T. When the train has fully moved out of the siding PS2, the trainman restores switch ASW to its normal position.

It is to be observed that relays 12HR and 12HP are released when the line circuit is opened by operation of repeater relay HSP, and consequently the eastbound signal 12 is set at its stop position. However, relays 11HR and 11HP are picked up and westbound signal 11 is operated to its proceed position so that the train moving out of the siding over switch ASW is given a proper proceed signal indication at the westbound signal 11. Furthermore, operation of signal IL will be effected through stick relay IIS in the event there is another westbound train moving in section 11T.

In the event the train on siding PS2 is to move east, then the operator moves lever 1 to its right position closing lever contacts R—95 and R—55. Lockout relay IS is now picked up over the lockout circuit closed at lever contact R—95 and relay IS when picked up completes at its front contact 94 a circuit for the office coding unit, and a code is delivered to line wires Y and Z which selects code controlled relay IRHS at station No. 2. Relay IRHS on picking up energizes repeater re-

lay HSP, and relay HSP on picking up opens the line circuit and connects special control relays LDR and RDR to the opposite ends of the line circuit in the manner already explained. Again relays LDR and RDR are picked up because the block is unoccupied and the block signals are at stop, and these relays in connection with the code controlled relay IRHS complete the circuit for signal control relay IRSR which operates signal IR to display its S lamp. The trainman next reverses track switch BSW and when this takes place relay IRHR is energized to operate signal IR to display its Y lamp as an approach signal indication. While the operation of switch BSW and relays IRSR and IRHR opens the line circuits, it does not disturb the condition of relays LDR and RDR since the point at which the line circuit is opened by repeater relay HSP is outside of the control of switch BSW and the relays associated with signal IR. Furthermore, code controlled relay IRHS is retained picked up over the circuit path including contacts 59 and 60 of the special control relays, after switch BSW is reversed. The train upon entering the track circuit of section 13T shunts track relay 13TR and opens the line circuit to deenergize relay RDR with the result that signal IR is set to display its stop indication, and relays IRHS and HSP are restored to their normal positions. Since relays 14HR and 14HP are picked up, the eastbound signal 14 is controlled to a proceed position for the train moving out of the siding over switch BSW. Switch BSW is restored to its normal position by the trainman when the train has completely left the siding and the line circuit is then restored to the position corresponding to an eastbound train moving through the block and occupying section 13T.

It is clear that the lockout circuit for relay IS at the office cannot be picked up to send a code to station No. 2 unless both levers 2 and 4 occupy their normal positions and unless the network controlled by the associated indication relays is closed.

Apparatus embodying my invention has the advantage that movements from a rarely used siding of a railway using a centralized traffic control system can be governed by signal indication without additional line circuits or additional track circuits and the expense of fully signaling such siding is avoided.

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 railway traffic controlling apparatus the combination comprising, a stretch of railway track over which traffic moves in both directions and including a passing siding, a two-wire line circuit extending along said stretch controlled by traffic occupying the stretch and adaptable of being connected to a current source at one end or the other to establish the direction for traffic to move through the stretch, a leaving signal at each end of the siding to govern traffic entering said stretch from said siding, two control relays, manually controlled means including a repeater relay effective when picked up to open said line circuit and connect said control relays one to each end portion of the line circuit, and operating

means for said signals controlled by said manually controlled means and said control relays to selectively operate one or the other of said leaving signals.

2. In railway traffic controlling apparatus the combination comprising, a stretch of railway track over which traffic moves in both directions and including a passing siding, a two-wire line circuit responsive to traffic occupying the stretch and the positions of the track switches of said siding and adaptable of being connected to a current source at either end of the stretch for establishing the direction which traffic is to move over the stretch, two leaving signals one at each end of said siding to govern traffic entering the stretch from the siding, two control relays, a repeater relay effective when picked up to open said line circuit at two points one point adjacent each of the two ends of said siding and to connect one of said control relays to one end portion of the line circuit and the other control relay to the other end portion of the line circuit, manually controlled means to govern said repeater relay, and two operating circuits one for each of said leaving signals and selectively controlled by said manually controlled means and said control relays.

3. In railway traffic controlling apparatus the combination comprising, a stretch of single track railway including a passing siding and provided with a block signal at each end to govern traffic entering the stretch, a reversible line circuit extending between the two locations of said block signals for selectively controlling said signals and responsive to traffic occupying the stretch, a leaving signal at each end of said siding to govern traffic entering said stretch from the siding, two control relays, a repeater relay, said repeater relay provided with contacts interposed in said line circuit to open the line circuit and connect said control relays one to each end of the line circuit when the repeater relay is picked up, two manually controlled relays one for each of said leaving signals, circuit means including contacts of said manually controlled relays to pick up said repeater relay when either one of the manually controlled relays is energized, and a control circuit for each of said leaving signals and including in series a contact of each of said control relays and a contact of the respective manually controlled relay.

4. In railway traffic controlling apparatus the combination comprising, a stretch of single track railway formed into consecutive track circuited sections for a signal system and including a passing siding having a track switch in a particular one of said sections, a leaving signal for said siding to govern traffic entering the stretch from the siding over said track switch, said signal adaptable to display a "safe to leave" indication and a proceed indication, a line circuit for said signal system and responsive to traffic occupying said stretch, a control relay, a manually controlled relay, means controlled by said manually controlled relay to interpose said control relay in said line circuit to energize the control relay when the stretch is unoccupied, and circuit means governed by said control relay and by said track switch to operate said signal to its "safe to leave" indication when the control relay is energized and the switch is normal and to its proceed indication when the control relay is energized and the switch is reversed.

5. In railway traffic controlling apparatus the combination comprising, a single track railway

using a centralized traffic control system and formed with a block extending between two fully signaled passing sidings, said block arranged with consecutive track circuited sections, a line circuit for said block extending between said fully signaled sidings and controlled by the track circuit of each section and adapted to be connected to a current source at one end or the other by said centralized traffic control system to establish the direction of traffic over said block, another siding having a track switch in the block intermediate said two fully signaled sidings and provided with a leaving signal to govern traffic entering said block over said track switch, two control relays, another relay energized by a pick-up circuit which is governed by said centralized traffic control system and said other relay operative when energized to open said line circuit at a point adjacent said other passing siding and to connect said two control relays one to each end portion of the line circuit to energize the control relays when the block to each side of said other siding is unoccupied, a stick circuit including a contact controlled by said switch and closed only when the switch is normal to retain said other relay energized, and a control circuit including in series a front contact of each of said control relays for governing said leaving signal.

6. In railway traffic controlling apparatus the combination comprising a single track railway using a centralized traffic control system and formed with a block extending between opposing block signal locations, said block arranged with consecutive track circuited sections and provided with two intermediate signal locations, a line circuit extending between said block signal locations but sectionalized at each said intermediate signal location, said line circuit controlled by the track circuit of each said section and adapted to be connected to a current source at one end or the other by said centralized traffic control system to establish the direction of traffic over the block, a passing siding located between said intermediate signal locations and provided with a leaving signal at each end to govern traffic entering the block from the siding, two control relays, two code controlled relays one for each said leaving signal and governed by said centralized traffic control system, means controlled by each code controlled relay when energized to open said line circuit at two points corresponding to each end of said siding and to connect said control relays one to each end portion of the line circuit to energize the control relays when said block to each side of said siding is unoccupied, and two signal control circuits one for each leaving signal and each signal control circuit including in series a front contact of each of said control relays and a front contact of the respective code controlled relay.

7. In railway traffic controlling apparatus the combination comprising, a single track railway using a centralized traffic control system and formed with a block extending between opposing block signal locations and provided with two intermediate signal locations, said block arranged with consecutive track circuited sections, a reversible line circuit for said block arranged with three sections having their adjacent ends at said intermediate signal locations and adapted to be controlled in tandem by said centralized traffic control system to establish the direction of traffic over the block, a passing siding located between said intermediate signal locations, a leaving signal at each end of said siding to govern

traffic entering said block from the siding, a circuit network controlled by the positions of said leaving signals and the track switches of said siding interposed in said line circuit, two control relays, two code controlled relays one for each said leaving signal and governed by said centralized traffic control system, a repeater relay energized over a front contact of either one of said code controlled relays, said repeater relay provided with two contact members which are interposed in said line circuit one to each side of said circuit network, each said contact member operative to open the line circuit and connect a respective one of the control relays to the line circuit when said repeater relay is energized, and two signal control circuits one for each said leaving signals and each said signal control circuit including in series a front contact of each said control relays and a front contact of the respective code controlled relay.

8. In railway traffic controlling apparatus the combination comprising, a single track railway using a centralized traffic control system and formed with a block extending between opposing block signal locations, said block arranged with consecutive track circuited sections, a line circuit for said block extending between said block signal locations and controlled by the track circuit of

each of said sections and adapted to be connected to a current source at one end or the other by said centralized traffic control system to establish the direction of traffic through said block, a track switch in said block intermediate said block signal locations and provided with a leaving signal to govern traffic entering the block over said track switch, two control relays, another relay energized by a pick-up circuit which is governed by said centralized traffic control system and said other relay effective when energized to open said line circuit at a point adjacent said switch and to connect said two control relays one to one end portion of the line circuit and the other to the other end portion the line circuit to energize each of said control relays by the current source at the corresponding end of the block when the respective track sections are unoccupied, a stick circuit including two alternative paths to retain said other relay energized, one of said paths including a contact controlled by said switch and the other of said paths including in series a front contact of each of said control relays, and a control circuit including in series a front contact each of said controls relays for governing said leaving signal.

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