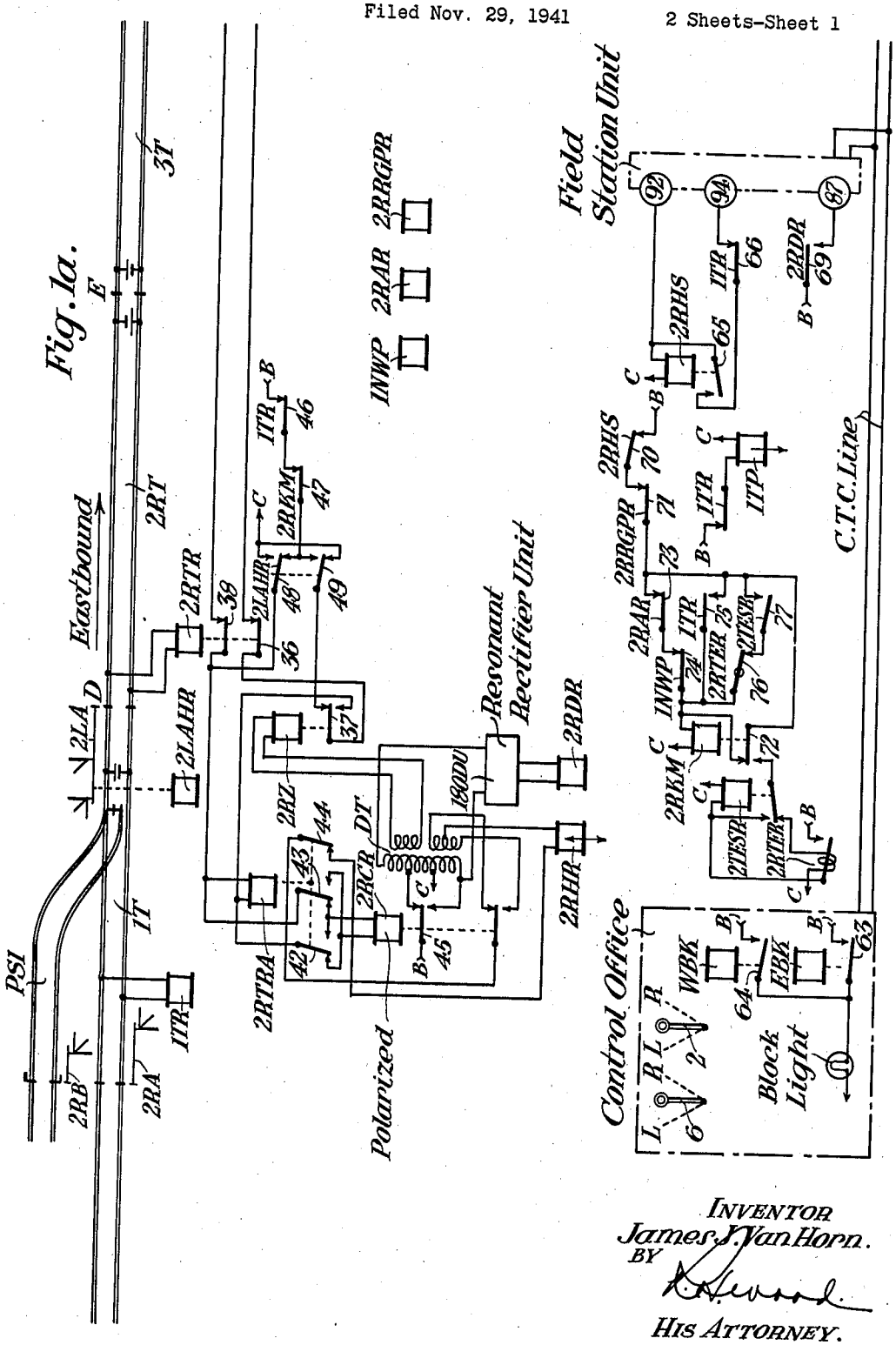
May 4, 1943. J. J. VAN HORN 2,318,545

RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed Nov. 29, 1941 2 Sheets-Sheet 1

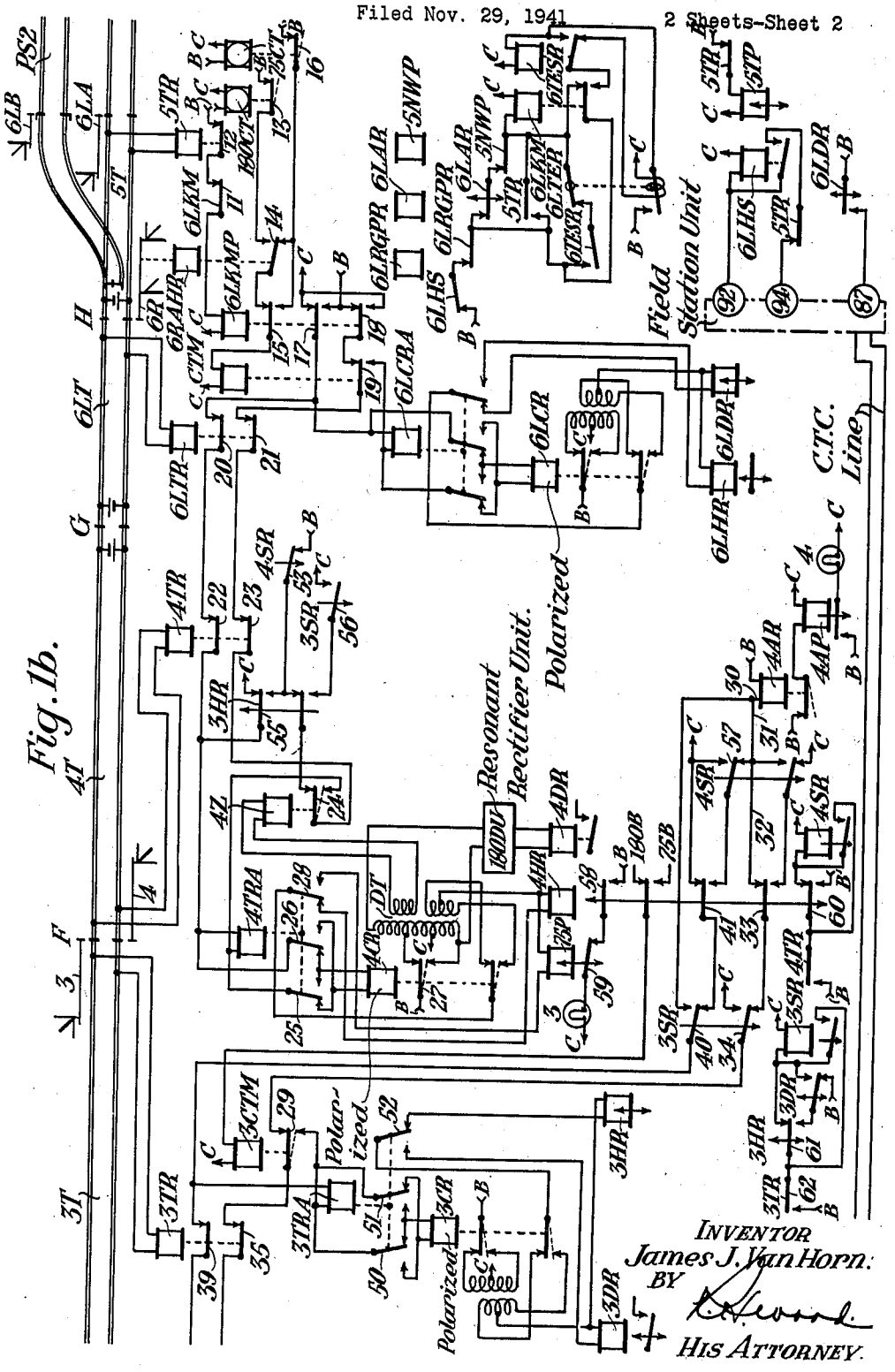


INVENTOR
James J. Van Horn.
BY
HIS ATTORNEY.

May 4, 1943. J. J. VAN HORN 2,318,545

RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed Nov. 29, 1941 2 Sheets-Sheet 2



Patented May 4, 1943

2,318,545

UNITED STATES PATENT OFFICE

2,318,545

RAILWAY TRAFFIC CONTROLLING APPARATUS

James J. Van Horn, Pittsburgh, Pa., assignor to The Union Switch & Signal Company, Swissvale, Pa., a corporation of Pennsylvania

Application November 29, 1941, Serial No. 420,923

19 Claims. (Cl. 246—3)

My invention relates to railway traffic controlling apparatus and is particularly directed to the control of traffic in a single track, two-direction system of signaling, this control being preferably exercised from a remotely located control office over a C. T. C. line circuit, although other manual control may be employed, if desired. The system employs non-coded track circuits and a polarized coded line circuit for providing selection of the traffic direction.

One object of my invention is to provide a relatively simple form of line wire circuit for selectively governing the traffic direction. Another object of my invention is to establish traffic in a given direction and maintain that direction during occupancy or during such time as the entrance signal for the given direction is cleared, merely by operation of the proper signal lever at the control office. A further object of my invention is to provide a simple form of block indication for informing the operator at the control office of the occupied or unoccupied condition of the single track stretch. Other objects, purposes, and characteristic features of my invention will become apparent from the description which follows.

I accomplish the foregoing objects by normally transmitting a master code of normal relative polarity over the line circuit for establishing traffic in the normal direction over the stretch. When the traffic direction is reversed, master code of reverse relative polarity is transmitted over the line circuit and feed-back code is effective during off intervals in the master code for restoring the apparatus to its normal condition following the exit of the train. I check the traffic direction by means of a polarized line relay and employ the proceed code detecting relays at the two ends of the stretch for controlling the block indication at the control office.

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

Figs. 1*a* and 1*b* of the accompanying drawings when placed end to end with Fig. 1*a* at the left are a diagrammatic view showing one form of apparatus embodying my invention as applied to a stretch of single track having one intermediate signal location and two cut section locations within the stretch.

Referring to the drawings, the stretch of track between the passing sidings PS1 and PS2 is divided by the usual insulated rail joints at locations D, E, F, G, and H into a number of track circuit sections 2RT, 3T, 4T, and 6LT. Locations E and G are cut section locations and F is an intermediate signal location.

The basic operation is as follows. The system is so arranged that normally, master code of positive polarity is effective in the line circuit and causes traffic to be established in the eastbound direction. Under normal conditions, therefore, in order to permit an eastbound train to enter the stretch, all that the operator is required to do is to clear one of the eastbound headblock signals 2RA or 2RB. To reverse the established traffic direction, the operator must first detect the master code of positive polarity at the west end of the stretch, reverse the polarity of the master code, check the stop position of the eastbound headblock signals 2RA and 2RB, and apply feed-back code to the line circuit at the west end to provide control for the westbound headblock signals 6LA and 6LB.

Normally, the approach locking repeater relay 6LKMP at the east end is maintained energized over a circuit which includes the front contact 11 of relay 6LKM and front contact 12 of the track relay 5TR for the approach section 5T. Relay 6LKM is the usual approach locking relay controlled by signals 6LA and 6LB in well-known manner so that its front contact 11 is closed when both of these signals are at stop. With relay 6LKMP energized, the code transmitting relay CTM will operate at either the 75 or the 180 code rate according as the home relay 6RAHR for signal 6RA is energized or deenergized. The 180 code circuit for relay CTM includes the coding contact 13 of the 180 code transmitter 180CT, the front point of contact 14 of relay 6RAHR, and the front point of contact 15 of relay 6LKMP. The 75 code circuit for relay CTM includes the coding contact 16 of the 75 code transmitter 75CT, the back point of contact 14 of relay 6RAHR, and the front point of contact 15 of relay 6LKMP. When relay 6LKMP is deenergized, as it will be for a westbound move, a 75 code circuit will be effective for relay CTM over coding contact 16 and the back point of contact 15 of relay 6LKMP.

When relay 6LKMP is energized so that the front points of contacts 17 and 18 are closed, relay CTM will apply code current impulses of positive relative polarity to the line circuit over the front point of its contact 19. This code is transmitted over the front contacts 20 and 21, and 22 and 23 of the intervening track relays 6LTR and 4TR, respectively, and the back point of contact 24 of the code following relay 4Z, to the location F where it maintains the polarized

relay 4TRA operated to its normal position, as shown. The code following relay 4CR is of the two position biased polar type and responds to current of one polarity only. Relay 4CR will respond to the code of positive polarity which it receives over the polar contacts 25 and 26 of relay 4TRA because these polar contacts occupy the normal position. Should contacts 25 and 26 occupy the reverse position, the code of positive polarity would merely hold the contact finger 27 of relay 4CR more strongly in its released position. Accordingly, relay 4CR (as well as the corresponding relays 2RCR and 6LCR at locations D and G, respectively,) will operate only if the polarity of the line circuit code corresponds with the position assumed by the associated polarized relay.

The code operation of relay 4CR will energize one or both of the code detecting relays 4HR and 4DR, respectively, according as the code which is supplied to the decoding transformer DT is 75 or 180. The manner in which this decoding apparatus operates is well known so that a detailed description is unnecessary. Relay 4HR will be energized when the code is either 75 or 180, and relay 4DR will be energized only when the code is 180. It will be noted that relay 4HR is controlled over the polar contact 28 of relay 4TRA in its normal position so that it will not become energized when the code in the line circuit is of negative relative polarity.

Relay 3CTM is operated either at 180 or 75 code, according as relay 4HR is energized or deenergized, respectively, as will be apparent from the drawing. Operation of the coding contact 29 of relay 3CTM will apply code of positive relative polarity to the line circuit extending between locations D and F, and to polarized relay 2RTRA as follows: Starting at the positive terminal B, the circuit includes the winding of the approach relay 4AR, wires 30, 31, and 32, front point of contact 33 of relay 4HR, back point of contact 34 of the directional stick relay 3SR, front point of contact 29 of relay 3CTM, front contacts 35 and 36 of the intervening track relays 3TR and 2RTR, back point of contact 37 of relay 2RZ, winding of relay 2RTRA, front contacts 38 and 39 of relays 2RTR and 3TR, back point of contact 40 of relay 3SR, and the front point of contact 41 of relay 4HR, to the negative terminal C of the source.

As in the case of relay 4TRA, the polarized relay 2RTRA will be energized in the normal direction so that its polar contacts 42 and 43 occupy the normal or left-hand position. Since these polar contacts now agree in position with the polarity of energization of the line circuit, relay 2RCR will be energized over an obvious circuit and will follow the line circuit code impulses. If the code is 75, relay 2RHR will be energized from the decoding transformer DT. If the code is 180, then both relays 2RHR and 2RDR will be energized. It will be noted that relay 2RHR is energized over the polar contact 44 of relay 2RTRA which is closed to the left. Accordingly, relay 2RHR will not become energized when the polarity of the line circuit code is negative, as it will be when the entrance signal 6L is cleared for a westbound move or the stretch is occupied by a westbound train.

When relay 2RCR is following code, the polarized impulse relay 2RZ will receive an energizing impulse from the decoding transformer DT each time that the back point of contact 45 closes. The manner in which this impulse operation of relay 2RZ is obtained is well known, and is described, for example, in the United States Reissue Patent No. 21,783 granted to Herman G. Blosser on April 29, 1941.

Each time that relay 2RZ closes the front point of its contact 37, an impulse of feed-back code will be supplied to the line circuit during the off period of the master code being received by relay 2RCR. The circuit for supplying the feed-back code includes the front contacts 46 and 47 of relays 1TR and 2RKM, and the back points of contacts 48 and 49 of relay 2LAHR. This feed-back code is polarized, being of negative polarity when relay 2LAHR is deenergized, as shown, and of positive polarity when this relay is energized. That is to say, the feed-back code is either positive or negative according as signal 2LA is cleared or not.

Relay 3TRA will be energized by the feed-back code during the time that the back point of coding contact 29 of relay 3CTM is closed so that relay 3CR will be caused to follow the feed-back code, provided that relay 3TRA has properly responded to the polarity of this code so that its polar contacts 50 and 51 occupy a position in agreement with the code polarity, whereby the polarized relay 3CR is permitted to respond, as previously explained.

Code operation of relay 3CR on feed-back code will cause the energization of relay 3HR over the polar contact 52 in its right-hand position when the polarity of the code is negative, and will cause the energization of relay 3DR over polar contact 52 in its left-hand position, when the code is positive. Relay 3HR thus provides the approach aspect and relay 3DR provides the clear aspect of the intermediate signal 3, in the usual manner.

It will be apparent from the foregoing that the master code in the section D—E provides a channel for the return of feed-back code to location F so that block control of the intermediate signal 3 may be provided. A reversal of the polarity of the master code will cause relay 4HR at the intermediate signal to release due to opening of polar contact 28 of relay 4TRA, thus insuring that the eastbound intermediate signal 4 will remain at stop under the westbound traffic condition. The opening of the front point of contact 60 of relay 4HR will prevent pick-up of the eastbound directional stick relay 4SR under the westbound traffic condition. The eastbound directional stick relay 3SR will be picked up in the usual manner over the front point of contact 61 of relay 3HR and the back contact 62 of relay 3TR at the moment when the train enters section 2RT. Relay 3SR will subsequently remain energized over its stick circuit until feed-back code to pick up relay 3HR is restored in section D—F.

The operation of the line circuit between signals 3 and 6L on feed-back code is identical with that just described for the block between signals 2R and 3 except for the inclusion of a back contact 53 of the opposing directional stick relay 4SR, and the inclusion of the additional front contact 56 of the directional stick relay 3SR when relay 3HR is deenergized, in order to provide control for following moves. The feed-back code which is applied at location F is detected at the east end H by relays 6LHR and 6LDR in the same manner as described for relays 3HR and 3DR at location F so that no further description of this operation is required.

When an eastbound move is to be made and

signal 2RA is cleared for such a move, the approach locking relay 2RKM governed by signal 2RA will be deenergized and so will open the feed-back circuit described above for the control of signal 3, at its front contact 47. Relay 3CR will accordingly be deenergized causing relay 3HR to release, and as relay 3SR will also be deenergized, both front contacts 55 and 56 of relays 3HR and 3SR, respectively, will be open so that no feed-back code will be applied to the line circuit between locations F and H. Accordingly, relays 6LHR and 6LDR will both be deenergized so that signal 6L must remain in the stop position. Master code alone will thus be applied for the eastbound traffic condition.

As the eastbound train proceeds through the stretch and passes signal 4, the eastbound directional stick relay 4SR will be energized in the usual manner. Since relay 4HR is now deenergized because the train is between the signals 4 and 6R, relay 3CTM will operate at the 75 code rate so that master code of positive polarity will be applied to the line circuit between signals 2R and 4 over the front point of contact 57 of relay 4SR and the back points of contacts 41 and 40 of relays 4HR and 3SR, respectively. Since the line circuit code is 75 and is of positive polarity, relay 2RHR at location D will be energized in the manner previously described, to provide an approach aspect on signal 2RA, in preparation for a following move into the single track stretch. If signal 2RA is maintained at stop, then the coded feed-back circuit will be operative to provide an approach aspect on the westbound signal 3.

If a westbound move is to be made with the stretch unoccupied, the clearing operation for signal 6LA or 6LB will open the control circuit for relay 6LKMP at front contact 11, thus releasing relay 6LKMP, whereupon relay CTM will operate on 75 code. The deenergization of relay 6LKMP reverses the polarity of the master code supplied to the line circuit between signals 4 and 6R over its contacts 17 and 18 so that relay 4TRA will now close its polar contacts to the reverse or right-hand position. With relays 4HR and 4SR both deenergized, the polarity of the line circuit between signals 2R and 4 will also be reversed to negative, whereupon relay 2RTRA will likewise reverse its polar contacts, thus preventing the display of a proceed aspect by signal 2RA or 2RB.

It is apparent from the foregoing that the presence of negative polarity master code prevents the clearing of an eastbound signal and provides a path for the coded feed-back circuit which is effective in establishing westbound signal control.

In order to provide a block indication at the control office, any of the usual and well-known indication arrangements may be employed. One suitable arrangement for a stretch having but one intermediate signal location is to control the block indication light on the C. T. C. panel over a front contact 63 or 64 of the usual eastbound or westbound block indication relay EBK or WBK, in multiple, as shown in the drawings. With this arrangement, the block light will indicate occupancy of the stretch independently of the position of the entrance signals. Other well-known block indication arrangements may be used where the stretch includes more than one intermediate signal location.

If it is desired to approach light the intermediate signals, a series relay such as 4AR may be used. This relay is connected into the master code circuit and will be deenergized only when the block between signals 2R and 4 is occupied. When relay 4AR is deenergized, a circuit will be completed for lighting the lamp of the eastbound signal 4 in the usual manner.

The approach lighting of the westbound signal 3 can be limited to the time during which the block between signals 3 and 6R is occupied. This is accomplished by means of the relay 75P at location F. This relay will be energized only when the associated line circuit is transmitting master code of negative polarity. The illumination of signal 3 will then be controlled over the back contacts 58 and 59 of relays 4HR and 75P respectively. If relay 75P is not used and the illumination of signal 3 is controlled over the back contact 58 of relay 4HR alone, then signal 3 will be illuminated under the same conditions which cause illumination of signal 4.

Relay 2RHS is the usual home stick relay for the eastbound signal 2R and becomes picked up when signal lever 2 at the control office is moved to the R position, thereby transmitting a C. T. C. code to the field station unit at the west end for energizing the terminal 92 which causes pick-up of relay 2RHS. Once relay 2RHS picks up, it closes a stick circuit for itself over the front contact 65 and the front contact 66 of relay 1TR, to the energized terminal 94. The details of the communication system by means of which the operator at the control office may selectively operate the apparatus at the field station locations over the C. T. C. line and receive indications from these field stations, do not enter actively into my present invention. One form of communication system suitable for use in my system is that shown in Letters Patent of the United States No. 2,229,249 granted to Lloyd V. Lewis on January 21, 1941, for Remote control system, and the numbering of the terminal wires which are used to perform analogous functions corresponds with that used in this patent.

When the eastbound train enters section 2RT, relay 2RTR will be shunted so that relay 2RCR will release due to opening of the line circuit at front contacts 36 and 38 of relay 2RTR. Deenergization of relay 2RCR will discontinue the code output from transformer DT so that relay 2RDR will release, closing its back contact 69 to energize terminal 87 of the field station unit. Energization of this terminal causes a C. T. C. indication code to be transmitted in well-known manner to the control office for energizing the eastbound block indication relay EBK which now closes its front contact 63 to energize the block light for providing a block occupied indication.

Referring again to the pick-up of relay 2RHS over the C. T. C. code equipment, when this relay picks up, its back contact 70 will open the normally closed circuit for the locking relay 2RKM for signal 2R, releasing this relay so as to prevent the supply of feed-back code at the west end and thus prevent the establishment of westbound traffic at such time as relay 2RHS is energized for clearing the eastbound signal 2R. The stick circuit for relay 2RKM also includes the front contact 71 of relay 2RRGPR (which is energized only when signal 2R is at stop), and the front point of its own front contact 72. The pick-up circuit for relay 2RKM also includes front contact 73 of the approach relay 2RAR and the front contact 74 of relay 1NWP which repeats the normal position of the track switch 1 for the passing siding PS1. Front

contacts 73 and 74 of relays 2RAR and 1NWP can be shunted in the usual manner over either one of two parallel paths, the first of which includes the back contact 75 of track relay 1TR and the second of which includes the checking contact 76 of the usual time element release 2RTER and the front contact 77 of the time element stick relay 2TESR. All of these circuits for relay 2RKM are well known in C. T. C. signaling and are shown merely to make the disclosure more complete.

At the east end of the single track stretch, relay 6LHS will be similarly controlled by a movement of signal lever 6 at the control office to the L position and when picked up for clearing the westbound signal 6L, will cause the locking relay 6LKM to release so as to lock out the eastbound traffic direction.

From the foregoing description it will be apparent that I have provided a simple form of coded line circuit control for traffic moving in either direction over a stretch of single track. By employing master and feed-back codes and by polarizing these codes, I obtain selective control of the traffic direction as well as control of the signal indications over the stretch.

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 combination with a stretch of track over which traffic may move in either direction, a line circuit extending from one to the other end of said stretch, means for normally transmitting line current impulses of a master code from one to the other end of said line circuit to establish traffic in the normal direction over said stretch, an entrance signal for each traffic direction over said stretch, means effective when the entrance signal for said normal direction is at stop for transmitting line current impulses of a feed-back code during off intervals in said master code from said other end to said one end of the line circuit, means responsive to the receipt of said feed-back code at said one end for controlling the entrance signal for the reverse traffic direction, and means effective when the entrance signal for said normal direction is cleared for discontinuing said feed-back code to thereby prevent clearing of the entrance signal for said reverse direction.

2. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, a first entrance signal for the normal direction of traffic and a second entrance signal for the reverse direction of traffic, means for normally transmitting line current impulses of a master code from one to the other end of said line circuit to provide control for said first signal, means effective when said first signal is at stop for transmitting line current impulses of a feed-back code during off intervals in said master code from said other to said one end of the line circuit, said feed-back code impulses being of positive or of negative polarity in accordance with the condition of traffic moving in said reverse direction beyond said stretch, a polarized relay responsive to the receipt of said feed-back code at said one end for selectively governing the indication of said second entrance signal according as said feed-back code is positive or negative, and means effective when said first entrance signal is cleared for discontinuing said feed-back code to thereby prevent clearing of said second entrance signal.

3. In combination with a stretch of track over which traffic may move in either direction, a line circuit extending from one to the other end of said stretch for controlling traffic over the stretch, an eastbound and a westbound entrance signal for said stretch, means for transmitting line current impulses of a master code of positive or negative relative polarity from said one to said other end in accordance with the direction of traffic being established over said stretch, a polarized line relay adjacent said other end assuming a normal or a reverse position according as said master code impulses are of positive or negative polarity, means effective when said polarized relay is in its normal position for clearing said eastbound signal, other means effective when said polarized relay is in its normal position and said eastbound signal is at stop for transmitting line current impulses of a feed-back code from said other to said one end, means responsive to the receipt of said feed-back code at said one end for clearing said westbound signal, and means effective when said eastbound signal is cleared for discontinuing said feed-back code to thereby prevent clearing of said westbound signal.

4. In combination with a stretch of track over which traffic may move in either direction, a line circuit extending from one to the other end of said stretch for controlling traffic over the stretch, a normal direction entrance signal and a reverse direction entrance signal located at said other and said one end respectively of said stretch, means effective when and only when said reverse entrance signal is at stop for transmitting line current impulses of a master code from said one to said other end of the stretch, means responsive to the receipt of said master code at said other end for clearing said normal entrance signal, means controlled by said master code effective when and only when said normal entrance signal is at stop for transmitting line current impulses of a feed-back code during off intervals in said master code from said other end to said one end, and means responsive to the receipt of said feed-back code at said one end for clearing said reverse entrance signal.

5. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, means for transmitting line current impulses of a master code of positive relative polarity in a given direction over said line circuit to thereby permit traffic moving in the normal direction to enter said stretch, means for reversing the polarity of said line current impulses to thereby prevent normal direction traffic from entering said stretch, and means effective when the polarity of said line current impulses is reversed for transmitting line current impulses of a feed-back code during off intervals in said master code in the reverse direction over said line circuit to thereby permit traffic moving in the reverse direction to enter said stretch.

6. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, a normally energized traffic direction control relay, means effective when said relay is energized for transmitting line current impulses of a master code of given polarity over said line circuit to thereby permit traffic moving in the

normal direction to enter said stretch, means for deenergizing said relay to reverse the traffic direction over said stretch, means effective when said relay is deenergized for reversing the polarity of the master code transmitted over said line circuit, means responsive to said reverse polarity master code for preventing normal direction traffic from entering said stretch, and means operating when said reverse polarity master code is effective for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit to thereby permit traffic moving in the reverse direction to enter said stretch.

7. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, a normally energized traffic direction control relay, means effective when said relay is energized for transmitting line current impulses of a master code of given polarity over said line circuit to thereby permit traffic moving in the normal direction to enter said stretch, manually controlled means for deenergizing said relay to reverse the traffic direction over said stretch, means effective when said relay is deenergized for reversing the polarity of the master code transmitted over said line circuit, means responsive to said reverse polarity master code for preventing normal direction traffic from entering said stretch, and means operating when said reverse polarity master code is effective for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit to thereby permit traffic moving in the reverse direction to enter said stretch.

8. Apparatus for controlling traffic moving in one or the other direction over a stretch of track by means of a line circuit comprising, in combination, means for transmitting current impulses of a master code of given polarity over the line circuit, means responsive to said current impulses for establishing traffic in the normal direction over the stretch, means for reversing the polarity of said master code impulses, means responsive to master code impulses of said reverse polarity for preventing entry of normal direction traffic into the stretch, means for transmitting current impulses of a feed-back code during off intervals in said master code over the line circuit, and means responsive to said feed-back code impulses for permitting traffic moving in the reverse direction to enter said stretch.

9. Apparatus for controlling traffic moving in one or the other direction over a stretch of track by means of a line circuit comprising, in combination, means for transmitting current impulses of a master code of given polarity over the line circuit, means responsive to said current impulses for permitting initiation of traffic in the normal direction over said stretch, means for transmitting current impulses of a feed-back code during off intervals in said master code over the line circuit, means responsive to said feed-back code impulses for permitting initiation of traffic in the reverse direction over said stretch, means for discontinuing said feed-back code to prevent completion of traffic in said reverse direction and permit completion of traffic in said normal direction, and means for reversing the polarity of said master code to prevent completion of traffic in said normal direction and permit completion of traffic in said reverse direction.

10. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, a normally energized traffic direction control relay, means effective when said relay is energized for transmitting line current impulses of a master code of given polarity over said line circuit to permit initiation of the normal traffic direction over said stretch, means for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit to permit initiation of the reverse traffic direction over said stretch, means for discontinuing said feed-back code during the time that said master code is effective for completing said normal traffic direction, means for deenergizing said relay, and means effective when said relay is deenergized for reversing the polarity of said master code to prevent completion of said normal traffic direction and for completing the reverse traffic direction.

11. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, a traffic direction control relay operable to a first or a second position, means effective when said relay is operated to its first position for transmitting line current impulses of a master code of given polarity over said line circuit to permit initiation of the normal traffic direction over said stretch, means for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit to permit initiation of the reverse traffic direction over said stretch, means for discontinuing said feed-back code dring the time that said master code is effective for completing said normal traffic direction, means effective when said relay is operated to its second position for reversing the polarity of said master code, and means including a polarity responsive device governed by said master code of reverse polarity for preventing completion of said normal traffic direction and for completing the reverse traffic direction.

12. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, a first and a second normally energized checking relay adjacent the respective ends of the stretch for checking the stop position of the entrance signal associated therewith, means effective when said first checking relay is energized for transmitting line current impulses of a master code of given polarity over said line circuit to permit initiation of the normal traffic direction over said stretch, means effective when said second checking relay is energized for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit to permit initiation of the reverse traffic direction over said stretch, means for selectively deenergizing said first or said second checking relay, means effective when said second checking relay is deenergized for discontinuing said feed-back code to prevent initiation of said reverse traffic direction, and means effective when said first checking relay is deenergized for reversing the polarity of said master code to prevent intiation of said normal traffic direction.

13. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, a first and a second entrance signal at the respective ends of said stretch for controlling the entry of normal and reverse traffic respectively into said stretch, a first and a second manually oper-

able lever for governing said first and said second entrance signal respectively, means effective when said first signal is at stop for transmitting line current impulses of a master code of given polarity over said line circuit to permit clearing of said second signal by said second lever, means effective when said second signal is at stop for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit to permit clearing of said first signal by said first lever, means effective when said second signal is cleared for discontinuing said feed-back code to prevent clearing of said first signal, and means effective when said first signal is cleared for reversing the polarity of said master code to prevent clearing of said second signal.

14. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, means for transmitting line current impulses of a master code of given polarity over said line circuit, first decoding means selectively responsive to said master code of given polarity and effective for controlling the entry of normal direction traffic into said stretch, means for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit, second decoding means selectively responsive to said feed-back code and effective for controlling the entry of reverse direction traffic into said stretch, means effective for establishing normal traffic conditions by discontinuing said feed-back code to render said second decoding means ineffective, and means effective for establishing reverse traffic conditions by reversing the polarity of said master code to thereby render said first decoding means ineffective.

15. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, means for transmitting line current impulses of a master code of given polarity over said line circuit, first decoding means selectively responsive to said master code of given polarity and effective for controlling the entry of normal direction traffic into said stretch, means for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit, second decoding means selectively responsive to said feed-back code and effective for controlling the entry of reverse direction traffic into said stretch, manually controlled means effective for establishing normal traffic conditions by discontinuing said feed-back code to render said second decoding means ineffective, and manually controlled means effective for establishing reverse traffic conditions by reversing the polarity of said master code to thereby render said first decoding means ineffective.

16. In combination with a stretch of track over which traffic may move in either direction, a line circuit for controlling traffic over said stretch, means for transmitting line current impulses of a master code of given polarity over said line circuit, first decoding means selectively responsive to said master code of given polarity and effective for controlling the entry of normal direction traffic into said stretch, means for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit, second decoding means selectively responsive to said feed-back code and effective for controlling the entry of reverse direction traffic into said stretch, manually operable means at a control office effective for establishing normal traffic conditions by causing said feed-back code to be disconnected to thereby render said second decoding means ineffective, manually operable means at said control office effective for establishing reverse traffic conditions by causing the polarity of said master code to be reversed to thereby render said first decoding means ineffective, and a block indicator at said control office for providing an indication when either said first or said second decoding means is effective.

17. In combination with a stretch of track over which traffic may move in either direction, said stretch including a first and a second adjoining track section, an intermediate signal adjacent the junction of said two sections, a line circuit for controlling traffic over said stretch, means for transmitting line current impulses of a master code of given polarity over said line circuit from said first to said second section for permitting traffic moving in the normal direction to enter said second section, means for reversing the polarity of said master code to thereby prevent normal direction traffic from entering said stretch, means effective when the polarity of said master code is reversed for transmitting line current impulses of a feed-back code during off intervals in said master code over the line circuit from said second section to said first section to thereby permit traffic moving in the reverse direction to enter said first section, and means adjacent said junction and responsive to the presence of said feed-back code in the line circuit for said first section for controlling the indication of said intermediate signal.

18. In combination with a stretch of track over which traffic may move in either direction, said stretch including a first and a second adjoining track section, an intermediate signal adjacent the junction of said two sections, a line circuit for controlling traffic over said stretch, means for transmitting line current impulses of a master code of given polarity over said line circuit from said first to said second section for permitting traffic moving in the normal direction to enter said second section, means effective prior to the establishment of traffic in the normal direction for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit from said second to said first section to thereby permit traffic moving in the reverse direction to enter said first section, means effective during occupancy of said first section by said reverse direction traffic for transmitting line current impulses of a master code of reverse polarity over the line circuit of said second section to thereby provide a channel for the return of feed-back code to the intermediate signal location, means effective when master code of said reverse polarity is present in the line circuit for said second section for supplying feed-back code thereto, and means effective when said feed-back code is received at the intermediate signal location for controlling the indication of said intermediate signal.

19. In combination with a stretch of track over which traffic may move in either direction, said stretch including a first and a second adjoining track section, an intermediate signal adjacent the junction of said two sections, a line circuit for controlling traffic over said stretch, means for transmitting line current impulses of a master code of normal polarity over said line circuit from said first to said second section for per-

mitting traffic moving in the normal direction to enter said second section, an entrance signal for reverse direction traffic entering said first section, means effective prior to the establishment of traffic in the normal direction for transmitting line current impulses of a feed-back code during off intervals in said master code over said line circuit from said second to said first section to thereby permit clearing of said entrance signal for reverse direction traffic, means effective during occupancy of said first section by said reverse direction traffic for transmitting line current impulses of a master code of reverse polarity to the line circuit of said second section to thereby provide a channel for the return of feed-back code to the intermediate signal location, means effective when said master code is present in the line circuit for said second section for supplying feed-back code thereto, and means effective when said feed-back code is received at the intermediate signal location for clearing said intermediate signal.

JAMES J. VAN HORN.