March 15, 1938. R. M. PHINNEY 2,111,513

INTERLOCKING SYSTEM FOR RAILROADS

Filed Oct. 16, 1934 2 Sheets-Sheet 1

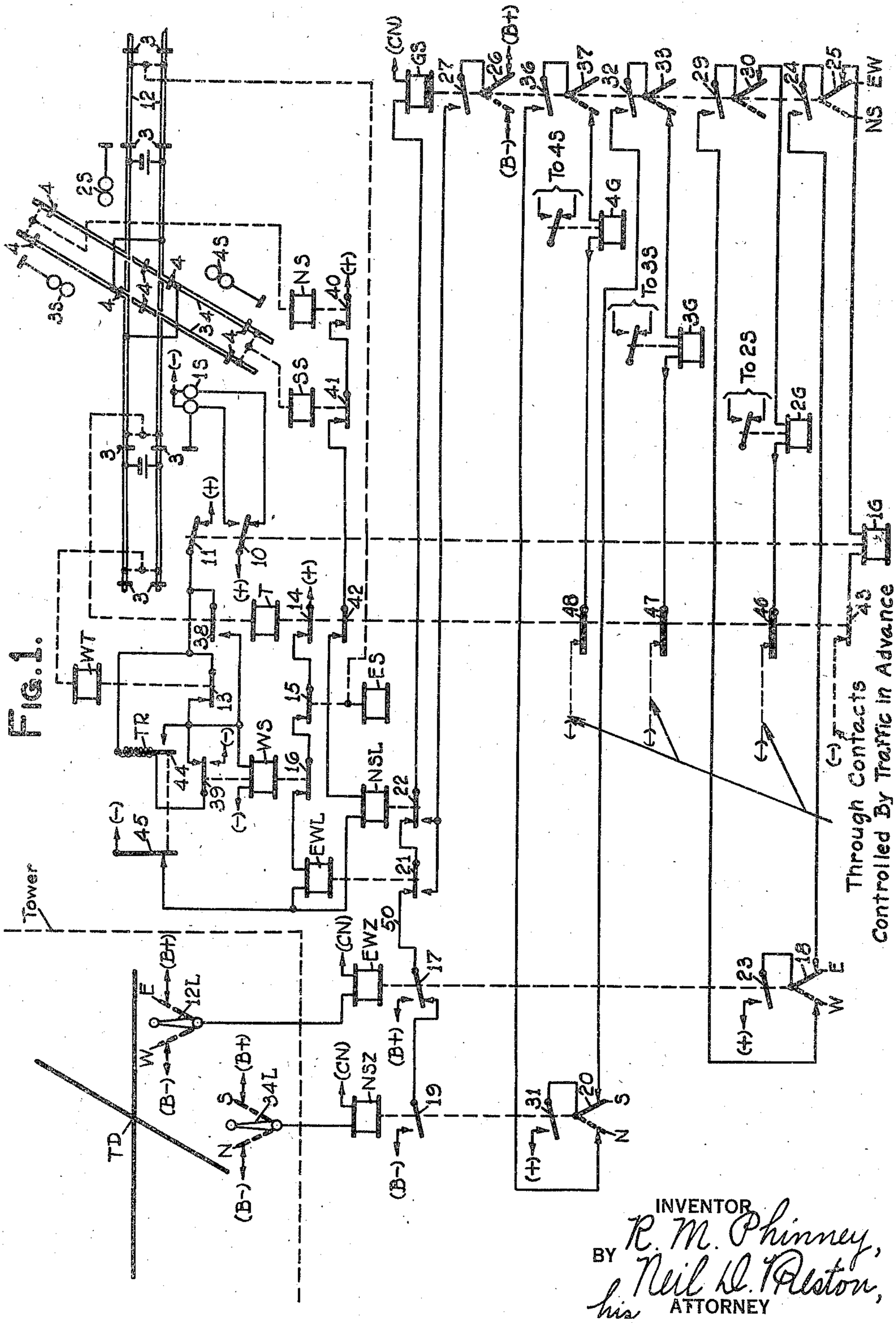

Fig. 1.

INVENTOR
R. M. Phinney,
BY Neil W. Reston,
his ATTORNEY

March 15, 1938. R. M. PHINNEY 2,111,513

INTERLOCKING SYSTEM FOR RAILROADS

Filed Oct. 16, 1934 2 Sheets--Sheet 2

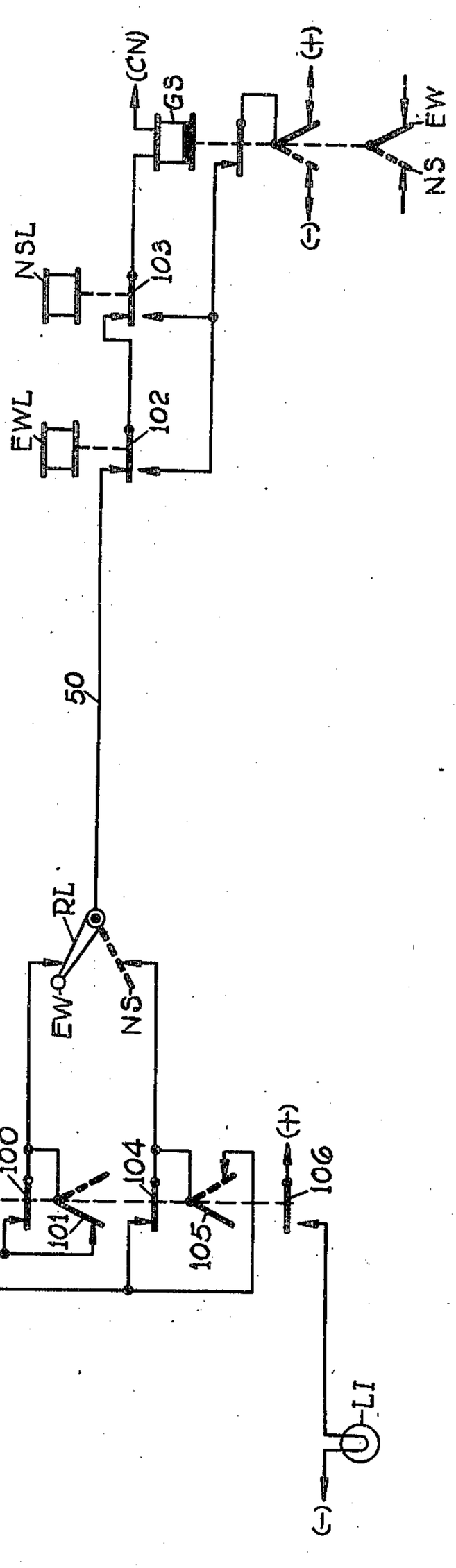

Fig. 2.

INVENTOR
BY R. M. Phinney,
his Neil W. Alston,
ATTORNEY

Patented Mar. 15, 1938 2,111,513

UNITED STATES PATENT OFFICE

2,111,513

INTERLOCKING SYSTEM FOR RAILROADS

Robert M. Phinney, Rochester, N. Y., assignor to General Railway Signal Company, Rochester, N. Y.

Application October 16, 1934, Serial No. 748,484

12 Claims. (Cl. 246—134)

This invention relates to interlocking systems for railroads and it more particularly pertains to systems of the type in which the movement of trains over conflicting routes is dispatched through the medium of wayside signal indications.

In interlocking traffic controlling devices in an interlocking system of the present type it is necessary to so interlock the various traffic controlling devices that conflicting routes cannot be set up. The present invention is shown applied to a system comprising conflicting routes such as railroad crossings.

The present invention is particularly applicable to a railroad crossing with provision of a signal selecting polar relay for clearing signals over the separate railroad tracks in accordance with the polarity of energization of the relay. The signal selecting relay is provided with a stick circuit for sticking the relay with the proper polarity in accordance with the position of this relay when the circuits are locked all of which will be specifically pointed out.

The present invention is shown applied to a railroad crossing having no switches. A modification discloses the use of a route lever in addition to the regular signal control levers together with an electric lock equivalent feature.

Various other characteristic features and advantages of the invention will be in part apparent and in part specifically pointed out as the decription progresses.

In describing the invention in detail reference will be made to the accompanying drawings, Fig. 1 of which is a diagrammatic illustration of one specific embodiment of the present invention as applied to the control of traffic over a railroad crossing.

Fig. 2 is a modified form of the route selecting portion of the circuit to which the electric lock equivalent feature is applied.

Although the traffic controlling system of the present invention may be applied to various track layouts involving conflicting routes and various other conditions encountered in practice, it has been specifically illustrated as applied to a railroad crossing comprising track 12 extending in an east-west direction crossed by track 34 extending in a north-south direction.

Apparatus

With reference to Fig. 1 of the accompanying drawings, railroad track 12 is illustrated as divided into various sections by insulated joints 3. Track 34 is similarly divided into sections by insulated joints 4.

The signalling arrangement provided as a typical example comprises signal 1S for governing east bound traffic over railroad track 12, signal 2S for governing west bound traffic over track 12, signal 3S for governing south bound traffic over track 34 and signal 4S for governing north bound traffic over track 34. The signals are illustrated as being of the color light signal type although they may be of any other suitable type governed in accordance with the present invention by associated levers 12L and 34L.

The condition of occupancy of the various track sections is preferably repeated in the tower by track relays or track repeating relays but for convenience in describing the invention applied to the track layout of Fig. 1 the detailed circuits of such relays have been omitted from the drawings. Such track sections into which the track is divided by suitable insulated joints are assumed to have track circuits of the usual closed circuit type. While the detailed track relay circuits are not shown, relay WT is illustrated in connection with the approach section to the west of the crossing and relay T is shown connected to the section including the crossing. These track relays are normally energized from the associated track batteries in the usual manner.

Relays G are associated with their respective signals as designated by the numerals preceding their letter reference characters. Each of these relays when deenergized causes its associated signal to indicate stop but when energized causes its associated signal to indicate proceed, subject to traffic conditions in accordance with the usual practice. The circuits for energizing the stop and proceed lamps of signal 1S are shown and since the circuits for the other signals controlled by relays 2G, 3G and 4G are the same, the circuits have been omitted but the contacts which control these signals have been identified by notations relating to the signals which these contacts control. Lever repeating relays EWZ and NSZ are controlled by the associated levers 12L and 34L.

A time element thermal relay TR and an associated stick relay WS are shown controlled by track relay WT associated with the west approach section. A similar thermal relay (not shown) and an associated stick relay ES are associated with the east approach section. East-west lock relay EWL is controlled by the east stick relay ES and the west stick relay WS in combination. It will be understood that north stick relay NS and south stick relay SS are con-

trolled by corresponding time element relays (not shown) and these stick relays in turn control a north-south lock relay NSL. Since the control for each of the approach sections is the same as indicated for the west approach section (shown as typical) it is not believed necessary to complicate the drawing by showing these thermal and stick relay circuits in detail.

Selecting stick relay GS of the slow acting polar neutral type is provided for selecting the proper signal relay (G with suitable preceding numerals) in accordance with the positions of the lever repeating relays.

A miniature track diagram TD corresponding to the actual track layout in the field is illustrated as being located in the tower with which the signal levers are associated. It will be understood that proper indication lamps or the like will be associated with this diagram to indicate the various conditions of the distant track section, but since this portion of the system forms no part of the present invention it has been omitted.

Referring to Fig. 2, east-west lock relay EWL and north-south lock relay NSL are assumed to be the corresponding relays of Fig. 1. Selecting stick relay GS is likewise assumed to be the corresponding relay of Fig. 1. A route lever RL is provided for operation in combination with the signal levers of Fig. 1 to properly energize relay GS in accordance with the route selected. It will be understood that the provision of lever RL in Fig. 2 eliminates the upper neutral contacts of the Z relays of Fig. 1 which apply (+) and (—) potentials to relay GS, but the lower neutral and polar contacts of the Z relays which apply (+) potentials through the selecting contacts of relay GS to the G relays are used in the circuit of Fig. 2. In other words, the circuit to the left of conductor **50** of Fig. 2 replaces the circuit to the left of conductor **50** of Fig. 1.

Lock repeating relay LP is of the neutral polar type, that is, its polar contacts are operated to the left when the lower winding is energized and to the right when the upper winding is energized. The neutral contacts assumed picked up positions when either winding of this relay is energized. When relay LP is deenergized a lock indicator lamp LI is lighted to indicate to the operator that the circuits are in a "hands off" condition or a condition which indicates that the signals are not in condition to be changed due to the locking feature being effective.

To simplify the illustrations, the circuits are illustrated in a conventional manner with the symbol (+) indicating the positive terminal and the symbol (—) indicating the negative terminal of a suitable battery or other source of current, with the circuits to which these terminals are connected having current flowing from (+) to (—). Symbol (B+) is associated with the (+) terminal and symbol (B—) is associated with the (—) terminal of a suitable battery or other source of current having a mid-tap (CN), with the circuits to which these terminals are connected having current flowing in one direction or the other as determined by the connection to (B+) or (B—).

It is believed that further description of the present invention will best set forth the characteristic features and functions of the system by considering the operation under certain characteristic or typical conditions.

Operation

Normal conditions.—Considering Fig. 1 first, with the detector track sections unoccupied and with the signal control levers in their at stop positions as shown, the various devices, relays and circuits assume positions and conditions of energization as illustrated. Since it is assumed that all of the illustrated track sections are unoccupied track relays T and WT are normally energized.

Since all signal levers are in their "at stop" positions relays EWZ and NSZ are deenergized and since these relays are deenergized, relay GS is deenergized. With the Z relays deenergized relays 1G, 2G, 3G and 4G are deenergized to light the red indication lamps of the associated signals. The red lamp of signal 1S, for example, is energized over a circuit extending from (+), back contact **10** of relay 1G and the red lamp of signal 1S, to (—).

A circuit is closed for energizing relay WS which extends from (+), back contact **11** of relay 1G, front contact **13** of relay WT and winding of relay WS, to (—). It will be understood that a similar circuit extending through a back contact of relay 2G and a front contact of the track relay associated with the east approach section maintains relay ES energized. With relays ES and WS energized and the track section associated with the railroad crossing unoccupied, a circuit is closed for energizing relay EWL which extends from (+), front contact **14** of relay T, front contact **15** of relay ES, front contact **16** of relay WS, winding of relay EWL and contact **45** of relay TR, to (—).

It will be understood that similar circuits controlled by the relays associated with the north-south railroad track are effective to normally energize relays NS and SS, which energize relay NSL from (+), front contacts **40**, **41** and **42** of relays NS, SS and T respectively and winding of relay NSL, to (—) at contact **45**.

Signal control.—An explanation will now be given of the individual control of the signals by their respective levers, subject to the interlocking features.

For example, assuming the system to be in its normal position as illustrated, the actuation of lever 12L to the right closes an obvious circuit for energizing relay EWZ and for actuating its polar contacts to the right. A circuit is now closed for energizing relay GS which extends from (B+), front contact **17** of relay EWZ, conductor **50**, front contact **21** of relay EWL, front contact **22** of relay NSL and winding of relay GS, to (CN). Current in this circuit is of such a direction that the polar contacts of relay GS are positioned to the right and the neutral contacts are picked up.

A circuit is now effective to energize relay 1G which extends from (+), front contact **23** of relay EWZ, polar contact **18** of relay EWZ in its right hand position, front contact **24** of relay GS, polar contact **25** of relay GS in its right hand position, and winding of relay 1G and front contact **43** of relay T, to (—). The energization of relay 1G opens back contact **10** which de-energizes the red lamp and closes front contact **10** which energizes the green lamp of signal 1S, thus clearing the signal for east bound traffic. The energization of relay 1G opens contact **11** which de-energizes relay WS and the de-energization of relay WS opens contact **16** which de-energizes relay EWL.

A stick circuit is now closed for maintaining relay GS energized which extends from (B+), contact **26** of relay GS in its right hand position, front contact **27** of relay GS, back contact **21** of

relay EWL, front contact 22 of relay NSL and winding of relay GS, to (CN). The current flow in this circuit is in the same direction as in the previously described energizing circuit for relay GS, so that this relay is stuck in its last actuated position which is effective to maintain the circuit of relay 1G closed.

With the system in its normal condition the actuation of lever 12L to the left energizes relay EWZ in an opposite direction which applies (B+) at front contact 17 to the above described circuit for energizing relay GS. Since current flowing in this circuit is the same as previously described the neutral contacts of relay GS will be picked up and the polar contacts will be actuated to the right. The actuation of relay EWZ to the left closes a circuit for picking up relay 2G which extends from (+), front contact 23 of relay EWZ, contact 18 of relay EWZ in its left hand dotted position, front contact 29 of relay GS, polar contact 30 of relay GS in its right hand position and winding of relay 2G, to (—). The picking up of relay 2G clears signal 2S (for west bound traffic) in a manner which will be obvious from a consideration of the clearing of signal 1S by relay 1G. The picking up of relay 2G also deenergizes relay ES in a manner which will be obvious from a consideration of the deenergization of relay WS by relay 1G. The dropping of relay ES opens the energizing circuit of relay EWL at front contact 15 and the dropping of relay EWL completes the above described stick circuit for relay GS for maintaining relay 2G energized.

With the system in its normal condition the operation of lever 34L to the right energizes relay NSZ which closes the above described circuit for relay GS but in this instance it extends from (B—) at front contact 19 of relay NSZ which positions the polar contacts of relay GS to the left. A circuit is closed for energizing relay 3G which extends from (+), front contact 31 of relay NSZ, contact 20 of relay NSZ in its right hand position, front contact 32 of relay GS, contact 33 of relay GS in its left hand dotted position and winding of relay 3G, to (—). Relay 3G clears signal 3S (for southbound traffic) in a manner which will be obvious from a consideration of the clearing of signal 1S by relay 1G. The energization of relay 3G deenergizes the north stick relay NS in a manner which will be obvious from a consideration of the deenergization of relay WS by the picking up of relay 1G. The deenergization of the north stick relay deenergizes relay NSL because of open front contact 40.

The dropping of relay NSL closes a stick circuit for relay GS which extends from (B—), contact 26 of relay GS in its left hand dotted position, front contact 27 of relay GS, back contact 22 of relay NSL and winding of relay GS, to (CN). This circuit maintains relay GS energized with its polar contacts positioned to the left for maintaining the circuit of relay 3G closed.

With the system in its normal condition the actuation of lever 34L to the left energizes relay NSZ which again applies (B—) to the circuit of relay GS at front contact 19. This positions the polar contacts of relay GS to the left as before. The closure of front contact 31 of relay NSZ and contact 20 of relay NSZ in its left hand dotted position extends the circuit from (+) at contacts 31 and 20, through front contact 36 of relay GS, contact 37 of relay GS in its left hand dotted position and the winding of relay 4G, to (—). The energization of relay 4G clears signal 4S in a manner which will be obvious from a consideration of the clearing of signal 1S by relay 1G. The energization of relay 4G deenergizes the south stick relay SS which deenergizes relay NSL, all of which will be obvious from a consideration of the manner in which relay WS is deenergized by the energization of relay 1G and relay EWL is deenergized by the deenergization of relay WS.

The deenergization of relay NSL again closes the above described stick circuit for relay GS which maintains the polar contacts of this relay in their left hand dotted positions for maintaining the energizing circuit of relay 4G closed.

When the train enters the track section including the crossing in response to a clear signal, all signals are put to stop by the deenergization of the G relays such as illustrated by front contact 43 of relay T, and other contacts not shown, opening the circuit of relay 1G. Relays 2G, 3G, and 4G are provided with similar contacts 46, 47, and 48, respectively. Likewise the opening of front contacts 14 and 42 of relay T deenergizes lock relays EWL and NSL which locks relay GS in its then existing position.

The selection of the G relays by relay GS is such that signal 3S or 4S cannot be cleared as long as signal 1S or 2S is cleared. This is because relay GS maintains its polar contacts in their right hand positions as long as signal 1S or 2S is clear, due to the deenergization of relay EWL by relay ES or WS as previously described. Therefore the energization of relay NSZ from the corresponding lever is ineffective to energize relay GS for changing the positions of its polar contacts, with the result that relays 3G and 4G cannot be selected until signals 1S and 2S are put to stop resulting in the energization of relay EWL. The same discussion applies to signals 3S or 4S being clear when an attempt is made to clear either 1S or 2S. In this case relay GS will have its polar contacts positioned to the left by means of its stick circuit being closed through back contact 22 of relay NSL so that the position of relay GS cannot be changed by the operation of relay EWZ.

Time release.—In order to allow sufficient time for a train approaching a signal to stop after such signal has been restored to a stop condition before another signal can be cleared, a time release feature has been provided. This is conveniently referred to as approach locking and time release. If the operator sets up a particular route by clearing a signal for that route in anticipation of the approach of a train (in a manner previously described) and then attempts to alter the route already established, he is prevented from clearing a conflicting signal for a predetermined time after the signals governing the route have been returned to their stop conditions. This time is measured by a time element device TR which includes both the heating and cooling time of the thermal element of relay TR as more specifically pointed out in applicant's copending application Ser. No. 463,940, filed June 26, 1930.

It will be assumed, for example, that the operator returns signal 1S to stop by restoring lever 12L to its neutral position which deenergizes relay 1G by opening front contact 23 of relay EWZ. It will be recalled that the energization of relay 1G deenergizes stick relay WS at open back contact 11 so that relay WS is in its deenergized position at this time.

It will also be assumed that due to a train in the west approach track section relay WT is deenergized. Since relay T is energized, because the track section including the railroad crossing

is not occupied at this time, back contact 38 is open and since relay WT is deenergized front contact 13 is open. Therefore a circuit is closed for energizing the heating element of relay TR which extends from (+), back contact 11 of relay 1G, through the heating element of relay TR and back contact 39 of relay WS, to (—).

Sufficient current flows through the heating element of relay TR to cause it to actuate its contacts 44 and 45 to the right. With contact 44 closed a circuit is effective to energize relay WS which extends from (+), back contact 11 of relay 1G, contact 44 of relay TR in its right hand position and winding of relay WS, to (—). The picking up of relay WS interrupts the circuit of relay TR at contact 39 so that, due to the resistance of relay WS inserted in series with the heating element of relay TR, the heating effect is negligible which permits relay TR to gradually restore its contacts to their left hand positions. During this time relay WS is maintained energized over a circuit including the heating element of relay TR, front contact 39 and winding of relay WS, to (—).

During the entire period of operation of the thermal relay the energizing circuits of relays EWL and NSL have been opened at contact 45 of relay TR. Thus the time is measured by both the heating and cooling periods of the relay. When contact 45 is closed, (—) potential is applied to relays EWL and NSL so that these relays close their front contacts 21 and 22 thus completing the circuit for energizing relay GS in accordance with the next signal to be cleared as determined by the picking up of relay EWZ or NSZ in response to the actuation of lever 12L or 34L.

From the above it will be seen that the response of a G relay to clear a signal, followed by the restoration of the associated signal lever to normal for putting the cleared signal to stop, if the approach section be unoccupied, causes a predetermined time to be measured off by relay TR before this same signal or any other signal can be cleared. Such an arrangement serves to prevent the quick reversal of traffic direction or the quick shifting of clear signals for conflicting routes by the quick manipulation of the signal levers. Thus adequate protection is given to the movement of trains over the illustrated railroad crossing.

Front contact 13 of relay WT is provided so that the time delay in clearing a subsequent signal as above described is eliminated. For example, if there is no train on the approach section, relay WT will be energized and when signal 1G is put to stop a circuit is effective to immediately pick up relay WS extending from (+), back contact 11 of relay 1G, front contact 13 of relay WT and winding of relay WS, to (—). Therefore the same, or another signal, can be immediately cleared when signal 1G is put to stop if there is no train in the west approach section.

Back contact 38 of relay T likewise provides a direct circuit for picking up relay WS when relay 1G is deenergized to put signal 1S to stop. This contact serves the purpose of rendering the time delay feature ineffective when the section associated with the railroad crossing is occupied because it is unnecessary to introduce this time delay under this condition. This is due to the fact that the dropping of relay T locks the signal clearing circuits by dropping relays EWL and NSL so that all signals are put to stop while the train is in the detector track section, thus obviating the need of operating the time measuring device.

It will be observed from the above description that the operator may change a route only after a predetermined time in the face of an on-coming train which allows the train sufficient time to stop before it reaches the detector track section. It will be understood that the same time delay feature functions in connection with the other three signals associated with the illustrated railroad crossing, since there will be a time element relay and a stick relay together with an approach track relay (similar to relay WT) for each of these other routes.

Description of modification.—The circuit disclosed in Fig. 2 is designed to make use of a route lever and the electric lock equivalent feature in connection with the circuits illustrated in Fig. 1. In this arrangement it is necessary for the operator to operate lever 12L or 34L for clearing an east signal, a west signal, a south signal or a north signal and in addition it is necessary to operate route lever RL for clearing an east-west route or a north-south route.

Assuming the circuits in the condition illustrated in Fig. 2, a circuit is closed for energizing relay LP and positioning its polar contacts to the left and for energizing relay GS and positioning its polar contacts to the right which extends from (+), lower winding of relay LP, front contact 100 and polar contact 101 in multiple, contact of lever RL in its upper position, conductor 50, front contact 102 of relay EWL, front contact 103 of relay NSL and winding of relay GS, to (CN). Although relay GS is energized and its polar contents are positioned to the right no circuit is completed for energizing a G relay until a signal clearing lever 12L or 34L is actuated to energize one of the Z relays.

For example, if lever 12L is operated to the right for clearing signal 1S as before, since this is a signal on the east-west railroad track, lever RL will be in its upper position. Therefore with relay GS energized and with its polar contacts actuated to the right and with relay EWZ energized and with its polar contacts actuated to the right, the above described circuit is completed for energizing relay 1G. It will be obvious that the actuation of lever 12L to the left energizes relay EWZ and positions its polar contacts to the left which closes the above described circuit for energizing relay 2G since relay GS will remain in the position illustrated in Fig. 2 because lever RL remains in its upper position.

With lever 34L actuated to either of its positions a selection is made of signal relays 3G and 4G, because relay GS will be energized with its polar contacts in their left hand dotted positions due to lever RL being in its lower dotted position. The circuit for energizing relay GS with lever RL in its lower dotted position extends from (—), upper winding of relay LP, front contact 104, contact of lever RL in its lower dotted position, conductor 50, front contacts 102 and 103 of lock relays EWL and NSL and winding of relay GS, to (CN). Due to the slow acting feature of relay LP, the actuation of lever RL from its upper to its lower position completes the above described circuit through the upper winding of relay LP and through front contact 104 before the relay actuates its polar contacts to the right. When these contacts are actuated to the right then contact 105 bridges contact 104 to maintain the circuit complete.

If lever RL is returned to its upper position,

then relay LP is energized through its lower winding to position its polar contacts to the left over a circuit including front contact 100 before contact 101 is shifted to the left. It will thus be seen that as long as the circuit to relay GS is not locked against completion through a winding of relay LP, the actuation of lever RL actuates the polar contacts to corresponding positions, that is, to the left when lever RL is in its east-west or upper position and to the right when lever RL is in its north-south or lower position.

When the circuit of relay GS becomes locked by the deenergization of relay EWL or NSL, then relay LP is deenergized. If lever RL is actuated to its lower dotted position under this condition and the circuits then become unlocked, that is, relays EWL and NSL both picked up, relay GS cannot be energized and relay LP cannot be energized because of the open circuit at front contact 104 of relay LP. It therefore becomes necessary to restore lever RL to its upper position for energizing relay LP and closing front contact 104 before lever RL can be effective in its lower position for reversing the circuits through relays LP and GS.

For the reversed condition, relay LP will have its polar contacts positioned to the right with lever RL in its lower dotted position. Then when the circuit of relay GS is locked by the dropping of one of the lock relays relay LP is deenergized. If lever RL is then moved to its full line position relay LP cannot be energized (even though both lock relays are picked up) because contact 101 is positioned to the right and contact 100 is open. It therefore becomes necessary to actuate lever RL to its lower position for picking up relay LP through its upper winding and its polar contact 105 in its right hand dotted position, when the circuit to relay GS becomes unlocked, before the actuation of lever RL to its upper position can be effective to energize relay LP in an opposite sense through its lower winding.

As long as relay LP is deenergized a circuit is closed through its back contact 106 for lighting lamp LI as a visual indication to the operator that the circuits are locked. In other words, this is a "hands off" indication meaning that the lock relays are deenergized for preventing the energization of relay GS over the circuit including lever RL. This lamp also serves as an indication to the operator that the circuit of relay GS is locked due to lever RL having been actuated while one of the lock relays was deenergized and that it is necessary to restore this lever to its former position before it can be effective to reverse the signal stick relay GS.

Referring to Fig. 1, it will be noted that the east-west and the north-south signals are controlled by separate and individual levers through the medium of circuits leading to separate Z relays. This enables the control of these signals to be handled from separate offices if desired. In other words, the signals controlling traffic over track 12 can be controlled by lever 12L located in an office associated with this railroad track, while lever 34L can be located in a separate office associated with railroad track 34, since the signals controlled by lever 34L might be associated with a railroad track under entirely separate management or supervision. Irrespective, however, of the location of these signal control levers the interlocking and the protection features are effective for traffic over the railroad crossing illustrated in the manner previously described.

It is to be understood that, although only two specific embodiments of the present invention have been disclosed, the principals of the invention may be applied to various other types of systems and that various types of track layout may be controlled in a similar manner without departing from the spirit of the present invention, the present disclosures having been chosen merely for providing simplified showings which could be clearly described in the specification.

Having described a traffic controlling system as one specific embodiment of the present invention it is desired to be understood that this form is selected to facilitate in the disclosures rather than to limit the number of forms which it may assume and it is to be further understood that various modifications, adaptations and alterations may be applied to the specific form shown in order to meet the requirements of practice without in any manner departing from the spirit or scope of the present invention except as limited by the appended claims.

Having described my invention, what I claim is:—

1. In an interlocking system for railroads, a pair of intersecting track sections, signals for governing traffic over said sections in opposite directions, a selecting relay, means responsive to the operation of said relay for selecting a plurality of said signals controlling one of the track sections, a manually controlled lever, means responsive to the actuation of said lever for selectively operating said relay, means including said relay for selectively clearing but one of said plurality of signals, and means for locking said relay, against control by the lever, in its last operated position.

2. In a traffic controlling system for railroads, a first stretch of track, a second stretch of track intersecting said first stretch of track, a plurality of signals for each of said stretches of track, a signal lever, a selecting stick relay, means responsive to the actuation of said lever for operating said selecting stick relay, means responsive to the operation of said selecting stick relay for selecting the signals for one of said stretches of track, and means responsive to the actuation of said lever for clearing but a single one of said signals selected by said selecting stick relay.

3. In a traffic controlling system for railroads, a first stretch of track, a second stretch of track intersecting said first stretch of track, a plurality of signals for each of said stretches of track, a signal lever, a selecting stick relay, means responsive to the actuation of said lever for operating said selecting stick relay, means responsive to the operation of said selecting stick relay for selecting the signals for one of said stretches of track, means responsive to the actuation of said lever for clearing a single one of said signals selected by said selecting stick relay, and means responsive to the clearing of said signal for locking said selecting stick relay.

4. In a traffic controlling system for railroads, a first stretch of track, a second stretch of track intersecting said first stretch of track, a plurality of signals for each of said stretches of track, a signal lever, a selecting stick relay, means responsive to the actuation of said lever for operating said selecting stick relay, means responsive to the operation of said selecting stick relay for selecting the signals for one of said stretches

of track, means responsive to the actuation of said lever for clearing a single one of said signals selected by said selecting stick relay, and means responsive to the clearing of said signal for locking and sticking said selector stick relay in its last actuated position.

5. In a traffic controlling system for railroads, a pair of intersecting track sections forming a crossing, signals for governing traffic over said sections, a selecting relay, means controlled by said relay for selecting said signals in groups, a manually controlled signal control relay, means responsive to the operation of said signal control relay for operating said selecting relay, and means controlled by said signal control relay and said selecting relay in combination for selecting and clearing a particular signal of a selected group.

6. In a traffic controlling system for railroads, a pair of intersecting track sections, signals for governing traffic over said sections, a selecting relay, means controlled by said relay for selecting said signals in groups, a manually controlled signal control device, means responsive to the operation of said device for operating said selecting relay, means controlled by said device and said selecting relay in combination for selecting and clearing a particular signal of a selected group, and means responsive to the clearing of said signal for sticking said selecting relay in its existing condition.

7. In an interlocking system for railroads, a pair of intersecting track sections, signals for governing traffic over said sections, a direction selecting relay, a signal lever for each of said sections, means responsive to the actuation of one of said levers for operating said direction selecting relay, a section selecting relay responsive to the operation of said direction selecting relay for selecting the signals for a particular one of said sections, means responsive to the actuation of said lever for clearing a particular one of said selected signals, means responsive to the clearing of said signal for locking said section selecting relay, means responsive to the restoration of said lever for restoring said signal to stop, a time delay device, and means including said time delay device for allowing the clearing of any one of said signals only after an appreciable time delay after said signal has been restored to stop under the traffic condition when there is a train approaching a signal on the approach section to such signal.

8. In an interlocking system for railroads, a pair of intersecting track sections, signals for governing traffic over said sections, a selecting relay, a signal lever for each of said sections, means responsive to the actuation of one of said levers for operating said selecting relay, means responsive to the operation of said selecting relay for selecting the signals for a particular one of said sections, means responsive to the actuation of said lever for clearing a particular one of said selected signals, means responsive to the clearing of said signal for locking said selector relay, means responsive to the restoration of said lever for restoring said signal to stop, a time delay device, means controlled by said time delay device for automatically delaying the clearing of any of said signals for an appreciable time after said signal has been restored to stop, and means controlled over a track section in advance of said intersecting sections for preventing the operation of said time delay device.

9. In an interlocking system for railroads, a pair of intersecting track sections, signals for governing traffic over said sections, a selecting relay, a signal lever for each of said sections, means responsive to the actuation of one of said levers for operating said selecting relay, means responsive to the operation of said selecting relay for selecting the signals for a particular one of said sections, means responsive to the actuation of said lever for clearing a particular one of said selected signals, means responsive to the clearing of said signal for locking said selector relay, means responsive to the restoration of said lever for restoring said signal to stop, a time delay device, means controlled by said time delay device for automatically delaying the clearing of any of said signals for an appreciable time after said signal has been restored to stop, and means controlled over said intersecting track section for preventing the operation of said time delay device.

10. In an interlocking system for railroads, a pair of intersecting track sections, signals for governing traffic over said sections, a selecting relay, means responsive to the operation of said selecting relay for selecting a plurality of said signals, a manually controlled lever, means responsive to the actuation of said lever for selectively operating said selecting relay, means including said selecting relay for selectively clearing said plurality of signals, means for locking said selecting relay in its last operated position, a normally energized lock repeating relay, means responsive to the locking of said selecting relay for releasing said lock repeating relay, and means responsive to the release of said lock repeating relay for nullifying the control of said selecting relay by said lever.

11. In an interlocking system for railroads, a pair of intersecting track sections, signals for governing traffic over said sections, a selecting relay, means responsive to the operation of said selecting relay for selecting a plurality of said signals, a manually controlled lever, means responsive to the actuation of said lever for selectively operating said selecting relay, means including said selecting relay for selectively clearing said plurality of signals, means for locking said selecting relay in its last operated position, a normally energized lock repeating relay, means responsive to the locking of said selecting relay for releasing said lock repeating relay, and means responsive to the release of said lock repeating relay for nullifying the control of said selecting relay by said lever unless said lever is temporarily placed in the position last effecting the operation of said selecting relay.

12. In an interlocking system for railroads; a pair of intersecting track sections; signals for governing traffic over said sections in opposite directions; a selecting stick relay; means responsive to the operation of said stick relay for selecting a plurality of said signals controlling traffic over one of the track sections; a manually controlled lever; means responsive to the actuation of said lever for selectively operating said stick relay; means including said stick relay for selectively clearing but one of said plurality of signals; and means for completing the stick circuit for, and locking, said stick relay, against control by the lever, in its last operated position.

ROBERT M. PHINNEY.