Jan. 9, 1945. G. R. PFLASTERER 2,366,802

RAILWAY SIGNALING

Filed Feb. 12, 1943 2 Sheets-Sheet 1

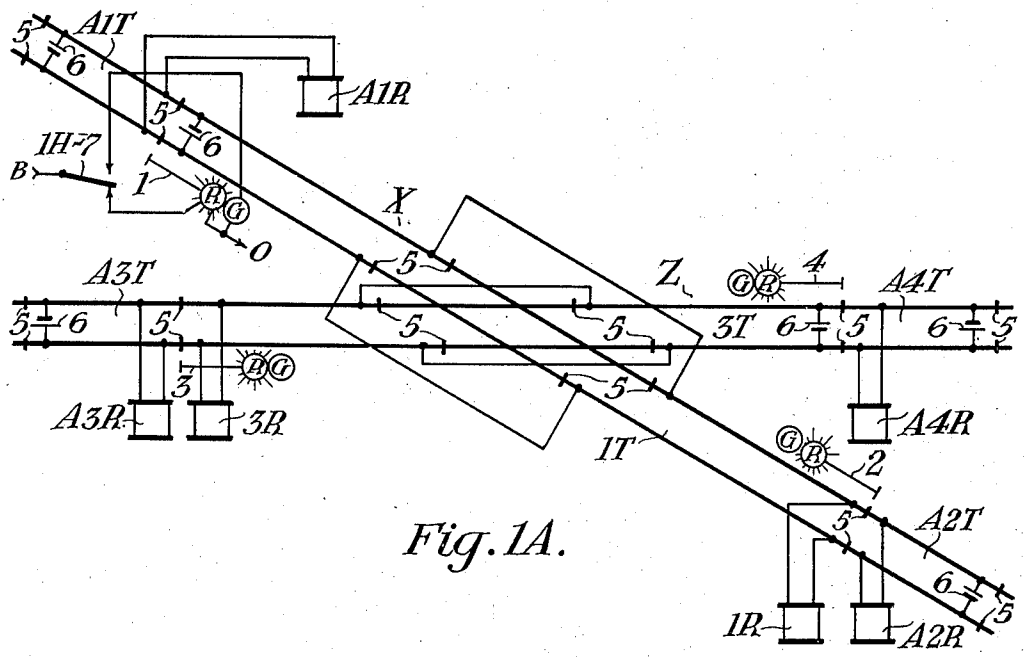


Fig. 1A.

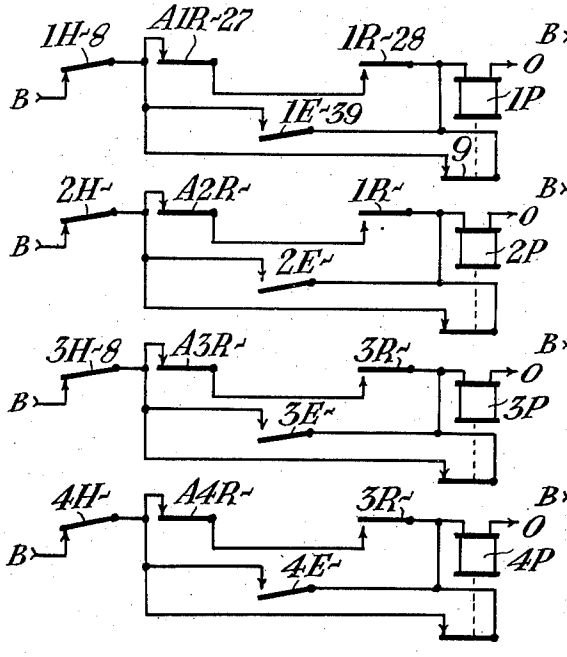


Fig. 1C.

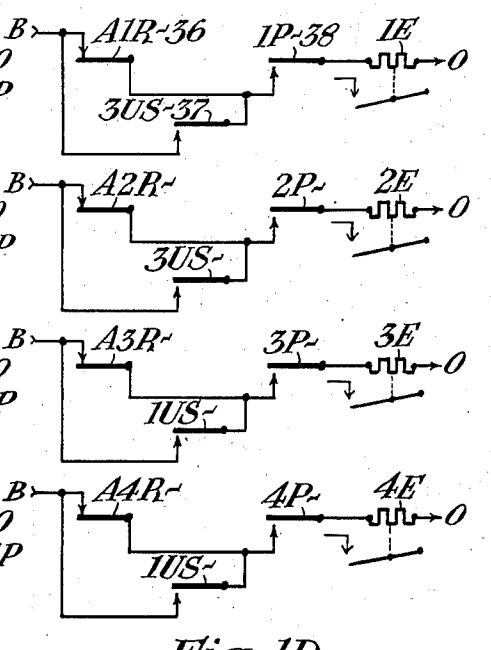


Fig. 1D.

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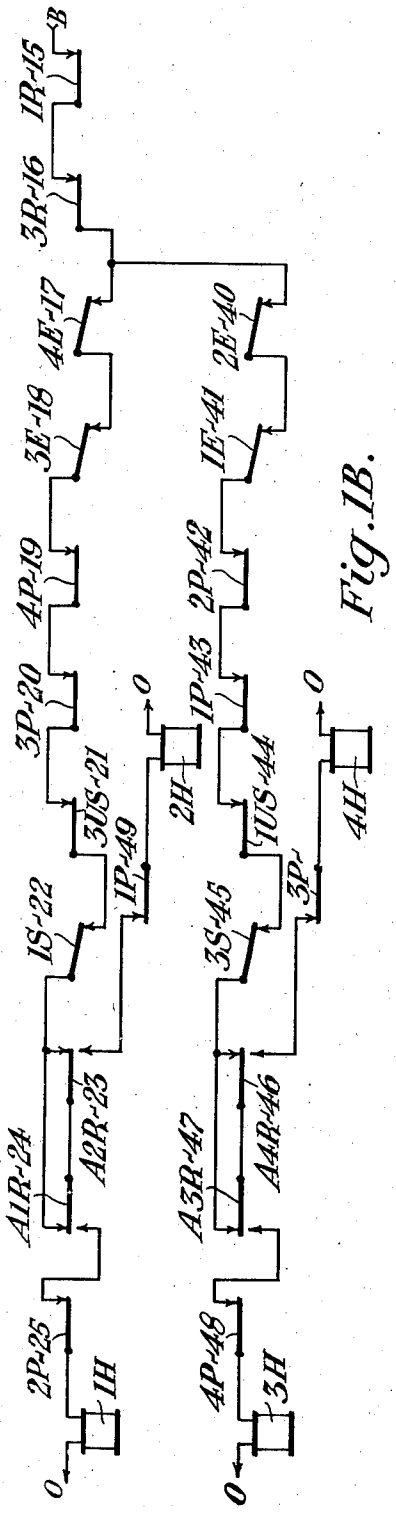


Fig. 1B.

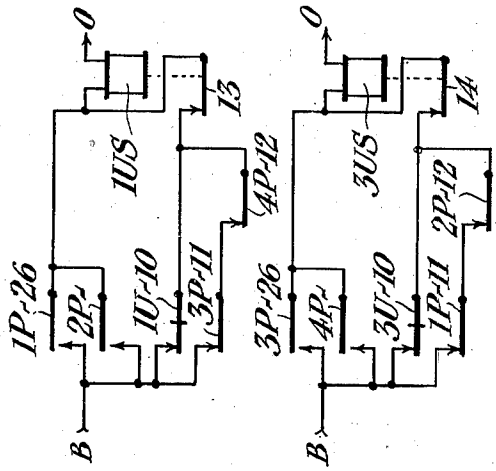


Fig. 1E.

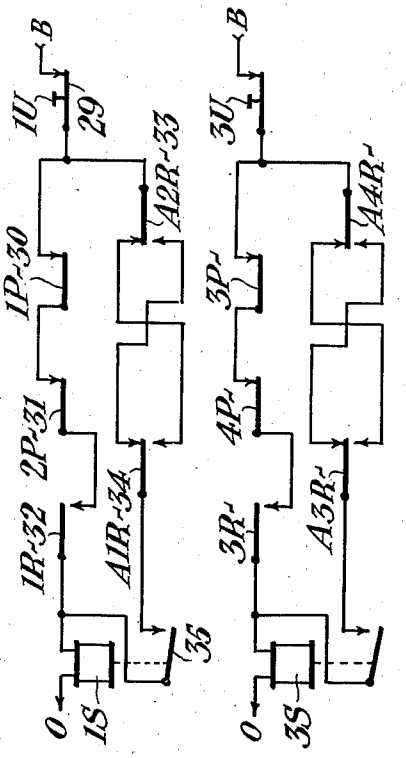


Fig. 1F.

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2,366,802

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RAILWAY SIGNALING

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Application February 12, 1943, Serial No. 475,595

8 Claims. (Cl. 246—114)

My invention relates to railway signaling, and particularly to signaling for the control of traffic movements along intersecting tracks. More specifically, my invention relates to time element means, for preventing a change of route in the event of a momentary loss of shunt, and for at other times manually effecting a change of route.

In an arrangement which was previously provided, an electrically operable device, such for example, as a thermal relay, becomes energized automatically, for preventing a change of route, in the event of a momentary loss of shunt while a train is approaching a signal which governs traffic movements across an intersection of two tracks. A separate time element device, such for example, as a clockwise time release, was provided for at times manually effecting a change of route.

One feature of my invention is the provision of means for at times controlling manually, for effecting a change of route, the same time element devices as are controlled automatically for preventing a change of route in the event of a momentary loss of shunt.

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

In the accompanying drawings, Figs. 1A to 1F, inclusive, are diagrammatic views showing one form of apparatus embodying my invention, in which Fig. 1A shows two intersecting railway tracks with two signals for each track, one on each side of the intersection, for governing traffic movements in opposite directions over the intersection; Fig. 1B shows energizing circuits for signal control relays; Fig. 1C shows control circuits for signal repeater stick relays, one for each signal; Fig. 1D shows control circuits for thermal time element devices, one for each signal; Fig. 1E shows control circuits for manual control stick relays, one for each track; and Fig. 1F shows control circuits for directional stick relays, one for each track.

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

In each of the views, the contacts operated by the various relays or other devices are identified by numbers, such numbers having distinguishing prefixes from which they are separated by a dash when the contacts are shown apart from the relay or other device by which they are operated. The prefix for each of these contact numbers comprises the reference character for the respective relay or other device by which the associated contact is operated. For example, contact 2P—25, shown adjacent the symbol for relay 1H in the upper left-hand portion of Fig. 1B, is identified by the number 25 separated by a dash from the prefix 2P which is the reference character for relay 2P by which this contact is operated.

Referring first to Fig. 1A, two intersecting railway tracks are designated by the reference characters X and Z, and are divided into sections by insulated joints 5. Track X is divided into sections A1T, 1T and A2T, and track Z is divided into sections A3T, 3T and A4T. A track battery 6 is connected across the rails adjacent one end of each section, and a track relay designated by a reference character which is the same as the reference character for the associated track section except that it includes the letter R instead of the letter T, is connected across the rails adjacent the opposite end of each section. Track sections A1T, A2T, A3T and A4T will be referred to as approach sections, and sections 1T and 3T will be referred to as crossing track sections.

Signals designated by the reference characters 1 and 2 are located adjacent the ends of track section 1T for governing traffic movements in opposite directions on track X across the intersection of the two tracks. Signals designated by the reference characters 3 and 4 are located adjacent the ends of track section 3T for governing traffic movements in opposite directions on track Z across the intersection of the two tracks. As here shown, each of these signals is of the color light type having a proceed lamp G and a stop lamp R, but may be of any other suitable design.

I shall assume that traffic movements toward the right, as shown in the drawings, on tracks X and Z are in the eastbound direction, and that traffic movements toward the left, as shown in the drawings, are in the westbound direction.

Referring now to Fig. 1B, circuits are here shown for energizing signal control relays 1H, 2H, 3H and 4H for signals 1, 2, 3 and 4, respectively.

In Fig. 1C, pick-up and stick circuits are shown for energizing signal repeater stick relays 1P, 2P, 3P and 4P for signals 1, 2, 3, and 4, respectively.

In Fig. 1D, circuits are shown for energizing time element devices 1E, 2E, 3E and 4E for signals 1, 2, 3 and 4, respectively. As here shown, time element devices E are of the thermal type, but may be of any other suitable design.

In Fig. 1E, pick-up and stick circuits are shown for energizing manual control stick relays 1US and 3US for tracks X and Z, respectively.

In Fig. 1F, pick-up and stick circuits are shown for energizing directional stick relays 1S and 3S for tracks X and Z, respectively. Push button circuit controllers 1U and 3U are provided for tracks X and Z, respectively.

As shown in the drawings, all parts are in their normal condition, that is, each of the track sections is unoccupied and hence the track relays are energized; the red or stop lamp R for each of the signals is lighted; relays 1P, 2P, 3P, 4P, 1US and 3US are energized; and relays 1H, 2H, 3H, 4H, 1S and 3S, and time element devices 1E, 2E, 3E and 4E are deenergized.

With relay 1H deenergized, the circuit by which lamp R of signal 1 is lighted passes from terminal B of a suitable source of current, through the back point of contact 1H—7, and lamp R of signal 1 to terminal 0 of the same source of current. Lamp R of each of the other signals is lighted by a circuit which is similar to the circuit shown for lamp R of signal 1, and is therefore not shown in the drawings.

Relay 1P, shown in Fig. 1C, is energized by a stick circuit passing from terminal B, through contact 1H—8, contact 9 of relay 1P, and the winding of relay 1P to terminal 0. Each of the relays 2P, 3P and 4P is energized by a stick circuit which is similar to the stick circuit just traced for relay 1P, and will therefore be readily understood.

Relay 1US is energized by two stick circuits, one of which passes from terminal B, through contact 1U—10, contact 13 of relay 1US, and the winding of relay 1US to terminal 0. The other stick circuit passes from terminal B, through contacts 3P—11 and 4P—12, contact 13 of relay 1US, and the winding of relay 1US to terminal 0.

I shall assume that an eastbound train on track X enters section A1T, deenergizing track relay A1R. Relay 1H will therefore be energized by a circuit passing from terminal B, through contacts 1R—15, 3R—16, 4E—17, 3E—18, 4P—19, 3P—20, 3US—21, 1S—22, front point of contact A2R—23, back point of contact A1R—24, contact 2P—25 and the winding of relay 1H to terminal 0. With relay 1H energized, the circuit previously traced for lamp R of signal 1 will be opened at the back point of contact 1H—7, and lamp G of this signal will be lighted by a circuit passing from terminal B, through the front point of contact 1H—7, and lamp G to terminal 0. With relay 1H energized, the stick circuit traced for relay 1P will be opened at contact 1H—8, causing relay 1P to become deenergized. With relay 1P deenergized, a pick-up circuit for relay 1US will be completed, passing from terminal B, through contact 1P—26, and the winding of relay 1US to terminal 0. There will be no change in the condition of relay 1US, however, since it is already energized by its stick circuits previously traced. With relay 1P deenergized, one of the stick circuits for relay 3US will be opened at contact 1P—11, but relay 3US will remain energized by its other stick circuit.

The train, upon passing signal 1, will deenergize relay 1R, and hence the circuit previously traced for relay 1H will be opened at contact 1R—15, causing relay 1H to become deenergized. Green lamp G of signal 1 will therefore be extinguished, and red lamp R will again become lighted by its circuit previously traced.

When the train leaves section A1T, permitting relay A1R to become energized, relay 1P will again become energized, by a pick-up circuit passing from terminal B, through contacts 1H—8, A1R—27 and 1R—28, and the winding of relay 1P to terminal 0. Relay 1P, upon becoming energized, opens the pick-up circuit previously traced for relay 1US through contact 1P—26, but relay 1US will remain energized by its stick circuits. With relay 1P now energized, relay 1S will become energized by a pick-up circuit passing from terminal B, through contact 29 of push button circuit controller 1U, contacts 1P—30, 2P—31, and 1R—32, and the winding of relay 1S to terminal 0.

When the train enters section A2T, a stick circuit will be completed for relay 1S after the train has left section A1T, passing from terminal B, through contact 29 of circuit controller 1U, back point of contact A2R—33, front point of contact A1R—34, contact 35 of relay 1S, and the winding of relay 1S to terminal 0.

When the train leaves section 1T, the pick-up circuit traced for relay 1P will be opened at contact 1R—28, but relay 1P will remain energized by its stick circuit previously traced. While the train is receding through section A2T, relay 1S will be retained in the energized condition by its stick circuit previously traced, and therefore the energizing circuit for relay 2H will be open at contact 1S—22, which prevents relay 2H from becoming energized for clearing signal 2.

When the train leaves section A2T, the stick circuit traced for relay 1S will become opened at the back point of contact A2R—33, and hence relay 1S will become deenergized. This will complete the return of all parts of the apparatus to the normal condition.

I shall again assume that an eastbound train enters section A1T, effecting the energization of relay 1H, as previously described, which then results in the lighting of lamp G of signal 1 as before. I shall further assume that, before the train reaches signal 1, a momentary loss of shunt occurs in approach track section A1T, so that relay A1R becomes momentarily energized. With relay 1H thus deenergized, signal 1 will again be controlled to display the red or stop indication. Relay 1P will not, however, become energized by its pick-up circuit since contact 1R—28 is now open. With relay 1P deenergized, the circuit for relay 2H will be open at contact 1P—49, and the circuits for relays 3H and 4H will be open at contact 1P—43, and hence none of these other signals can be operated to the proceed condition. An energizing circuit for relay 1E is now closed, passing from terminal B, through contacts A1R—36 and 1P—38, and time element device 1E to terminal 0. Upon the termination of the momentary loss of shunt before time element device 1E has had time to close its front contact, relay 1H will again become energized by its circuit previously traced, causing signal 1 to again display the green or proceed indication.

I shall again assume that an eastbound train enters section A1T, effecting the lighting of lamp G of signal 1 as before, but that the train stops before reaching signal 1, for some reason. I shall further assume that it is then decided to permit an eastbound train, which has now arrived on section A3T of track Z, to proceed over the crossing before the train on track X.

A trainman will therefore depress push button circuit controller 3U, thereby opening contact 3U—10 in one of the stick circuits for relay 3US, causing relay 3US to become deenergized since the other stick circuit for relay 3US is at this time open at contact 1P—11. With relay 3US deenergized, the circuit traced for relay 1H will

be opened at contact 3US—21, causing relay 1H to become deenergized, and thus causing signal 1 to again display the stop indication. A second energizing circuit for time element device 1E will now be closed, passing from terminal B, through contacts 3US—37 and 1P—38, and time element device 1E to terminal 0. Time element device 1E, upon closing its front contact, completes a second pick-up circuit for relay 1P, passing from terminal B, through contacts 1H—8 and 1E—39, and the winding of relay 1P to terminal 0. Relay 1P, upon becoming energized, opens the energizing circuit for relay 1E at contact 1P—38, causing time element device 1E to become deenergized.

As soon as time element device 1E has cooled sufficiently for its back contact to close, a circuit will be completed for energizing relay 3H, passing from terminal B, through contacts 1R—15, 3R—16, 2E—40, 1E—41, 2P—42, 1P—43, 1US—44, 3S—45, front point of contact A4R—46, back point of contact A3R—47, contact 4P—48, and the winding of relay 3H to terminal 0. Relay 3H, upon becoming energized, extinguishes the red lamp of signal 3 and effects the lighting of green lamp G of signal 3. The operation of the apparatus for track Z as the train proceeds will now be similar to the operation previously described for the movement of a train over track X. When the train leaves section 3T, relay 3R will become energized, permitting relay 1H to again become energized, and signal 1 to again be operated to the proceed indication.

I shall now assume again that a train on track X enters section A1T, after the return of all parts of the apparatus to the normal condition, causing signal 1 to display the proceed indication. I shall further assume that the train then stops and reverses its movement, backing out of section A1T. Time element device 1E will then be energized by a circuit passing from terminal B, through contacts A1R—36 and 1P—38, and time element device 1E to terminal 0. With time element device 1E energized, relay 1P will become energized by its second pick-up circuit previously traced. With relay 1P energized, time element device 1E will become deenergized because contact 1P—38 will be open in the energizing circuit for time element device 1E. The apparatus is thereby restored to its normal condition.

I shall now again assume that an eastbound train on track X enters section A1T, causing signal 1 to display the proceed indication, and that the train then proceeds over the intersection, but that after passing signal 2 it is decided to reverse the direction of traffic movement, and hence the train stops in section A2T. In order to clear signal 2, a trainman will depress push button 1U, thereby opening its contact 29 and breaking the stick circuit previously traced for relay 1S. Relay 1S will therefore be deenergized, and a circuit will now be completed for energizing relay 2H which is the same as the circuit previously traced for relay 1H as far as contact 1S—22, and then passes through the front point of contact A1R—24, back point of contact A2R—23, contact 1P—49, and the winding of relay 2H to terminal 0. Relay 2H will then effect the lighting of lamp G of signal 2, similarly to the manner described in which relay 1H effects the lighting of lamp G of signal 1.

From the foregoing description and the accompany drawings, it follows that in apparatus embodying my invention for railway signaling for intersecting tracks, the same time element device is used to prevent a change of route in the event of a momentary loss of shunt in an approach track section, to enforce a time interval, after a train backs out of an approach track section, before a signal for a different route can be cleared, and to effect a change in route if, after a signal has been cleared for one track, it is desired to return that signal to stop before a train passes it, and then permit a signal to clear for the other track.

Although I have herein shown and described only one form of railway signaling 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 control means for railway signaling for two intersecting railway tracks, including a signal for each of said tracks each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a normally energized repeater stick relay for each of said signals, a time element device for each of said signals, a normally energized manually controllable stick relay for each of said tracks, automatic means for controlling each of said signals to display its second indication when a train on its track approaching the intersection arrives at a given distance from the signal if the repeater stick relay for the other signal and the manually controllable stick relay for the other track are energized, means for deenergizing each of said repeater stick relays if its signal is controlled to display the second indication, manual means for deenergizing the manually controllable stick relay for each of said tracks only if the signal for the other track is controlled to display the second indication, a pick-up circuit for each of said manually controllable stick relays controlled by a back contact of the repeater stick relay for the signal for its track, an energizing circuit for each of said time element devices closed if the repeater stick relay for its own signal is deenergized and if a back contact of the manually controllable stick relay for the other track is closed, and means controlled by energization of each of said time element devices for energizing the repeater stick relay for its signal.

2. In control means for railway signaling for two intersecting railway tracks, including a signal for each of said tracks each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a normally energized repeater stick relay for each of said signals, a time element device for each of said signals, automatic means for controlling each of said signals to display its second indication when a train approaching the intersection arrives at a given distance from the signal if the repeater stick relay for the other signal is energized, means for deenergizing each of said repeater stick relays if its signal is controlled to display the second indication, manually controllable means for each of said signals for initiating return of its signal to the stop indication and for effecting energization of the time element device for its signal only if the repeater stick relay for its signal is deenergized, and means responsive to each of said time element devices after becoming energized

for energizing the repeater stick relay for its signal.

3. In control means for railway signaling for two intersecting railway tracks, including a signal for each of said tracks each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a normally energized repeater stick relay for each of said signals, a time element device for each of said signals, automatic means for controlling each of said signals to display its second indication when a train approaching the intersection arrives at a given distance from the signal if the repeater stick relay for the other signal is energized, means for deenergizing each of said repeater stick relays if its signal is controlled to display the second indication, a normally closed manually controllable contact for each of said tracks each of which upon becoming opened initiates return of the signal for the other track to the stop indication, a traffic responsive contact for each of said signals each closed only if there is no approaching train within the given distance from its signal, a first and a second circuit for energizing each of said time element devices each controlled by a back contact of the repeater stick relay for the corresponding signal and the first circuit also controlled by the traffic responsive contact for the same signal and the second circuit also controlled to become closed only if the manually controllable contact for the other track becomes opened, and means responsive to each of said time element devices after becoming energized for energizing the repeater stick relay for its signal.

4. In control means for railway signaling for two intersecting railway tracks, including a signal for each of said tracks each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a normally energized repeater stick relay for each of said signals, a time element device for each of said signals, a manually controllable stick relay for each of said tracks, a normally closed manually controllable contact for each of said manually controllable stick relays, a pick-up circuit for each of said manually controllable stick relays controlled by a back contact of the repeater stick relay for the signal for the associated track, a stick circuit for each of said manually controllable stick relays controlled by its manually controllable contact, automatic means for controlling each of said signals to display its second indication when a train approaching the intersection arrives at a given distance from the signal if the repeater stick relay for the other signal and the manually controllable stick relay for the other track are energized, means for deenergizing each of said repeater stick relays if its signal is controlled to display the second indication, an energizing circuit for each of said time element devices controlled by a back contact of the manually controllable stick relay for the other track, and means controlled by energization of each of said time element devices for energizing the repeater stick relay for its signal.

5. In control means for railway signaling for two intersecting railway tracks, including a signal for each of said tracks each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a normally closed repeater contact for each of said signals each of which becomes opened if its signal is controlled to display the second indication, automatic means for each of said signals responsive to an approaching train for controlling its signal to display the second indication if the repeater contact for the other signal is closed, a time element device for each of said repeater contacts, means controlled by each of said time element devices after becoming energized for effecting the closing of the corresponding repeater contact after its signal is again controlled to indicate stop, automatic means for energizing each of said time element devices if a train backs away from its signal, and manually controllable means for energizing each of said time element devices and for returning its signal to the stop indication while a train is approaching its signal.

6. In control means for railway signaling for two intersecting railway tracks, including a signal for each of said tracks each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a normally closed repeater contact for each of said signals each of which becomes opened if its signal is controlled to display the second indication, a time element device for each of said signals, automatic means for each of said signals responsive to an approaching train for controlling its signal to display the second indication if the repeater contact for the other signal is closed, means controlled by each of said time element devices after becoming energized for effecting the closing of the corresponding repeater contact after its signal is again controlled to indicate stop, automatic means for at times energizing each of said time element devices if the repeater contact for its signal is open, and manually controllable means for at other times energizing each of said time element devices if the repeater contact for its signal is open and for returning its signal to the stop indication.

7. In control means for railway signaling for two intersecting railway tracks, including two signals for each of said tracks one for each direction each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a directional stick relay for each of said tracks, a pick-up circuit for each of said directional stick relays closed only if both signals for its track are controlled to indicate stop and if its track is occupied by a train between the two signals for its track, stick circuit means for each of said directional stick relays for then retaining the corresponding relay energized while its track is occupied by a train receding from the intersection within a given distance beyond one of the signals for its track, and means for controlling each of said signals to display the second indication only if the directional stick relay for its track is deenergized.

8. In control means for railway signaling for two intersecting railway tracks, including two signals for each of said tracks one for each direction each normally displaying a stop indication and each also capable of displaying a second indication for directing traffic movements across the intersection of said tracks, the combination comprising, a directional stick relay for each of said tracks, a repeater stick relay for each of said

signals, a pick-up circuit for each of said repeater stick relays closed only if its signal is controlled to indicate stop after a train has proceeded past its signal into the crossing track section for its signal, a stick circuit for each of said repeater stick relays for then retaining its stick relay energized while its signal is controlled to indicate stop, a pick-up circuit for each of said directional stick relays controlled by front contacts of the repeater stick relays for both signals for the corresponding track and closed only if its track is occupied between its two signals, stick circuit means for each of said directional stick relays including a manually controlled normally closed contact for then retaining the corresponding directional stick relay energized while a train is receding within a given distance from one of its signals, and means for controlling each of said signals to display the second indication only if the directional stick relay for its track is de-energized.

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