March 15, 1938. J. I. VAUGHN 2,111,329

INTERLOCKING SYSTEM FOR RAILROADS

Filed May 28, 1937 2 Sheets-Sheet 1

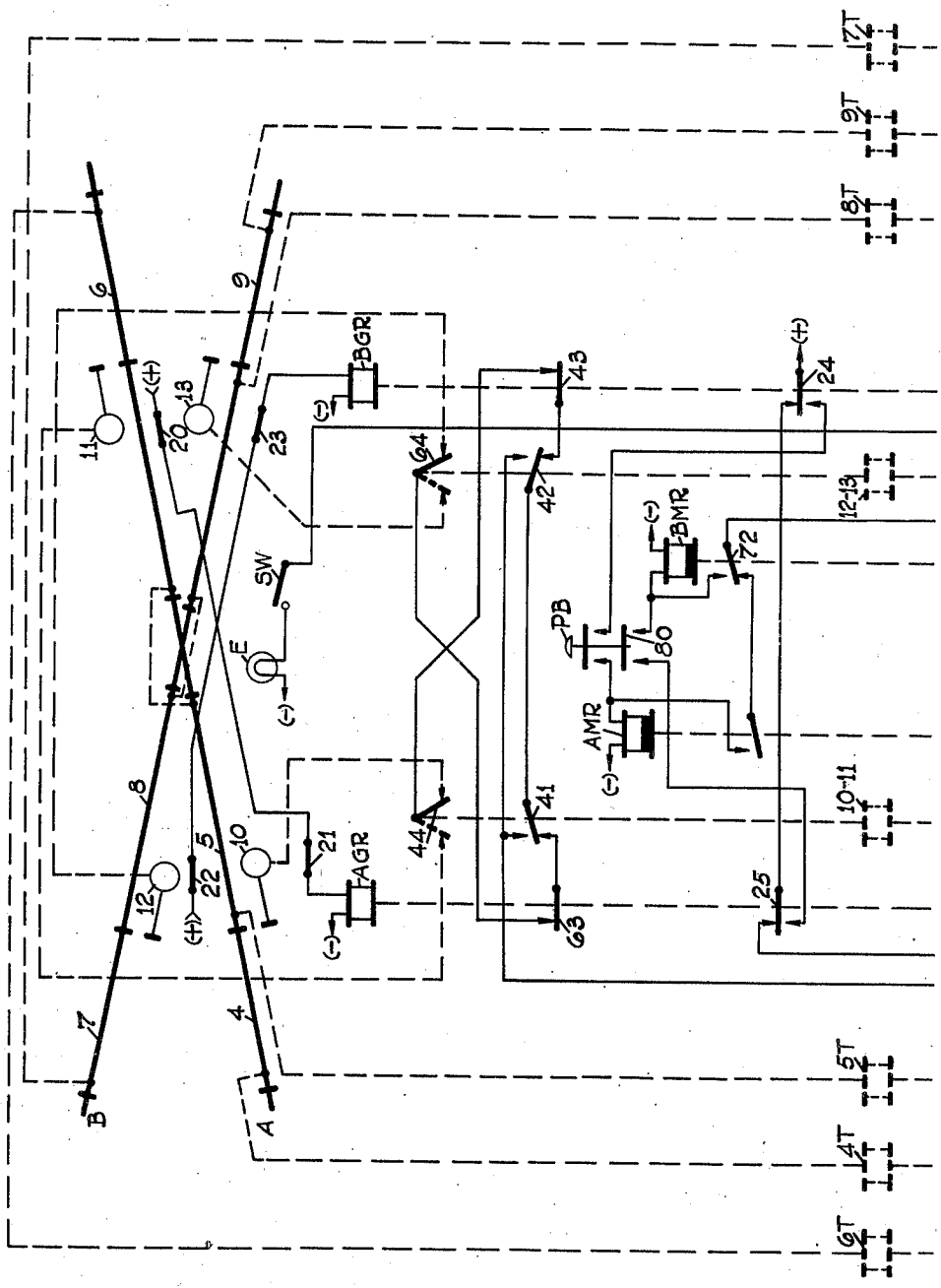


FIG. 1A.

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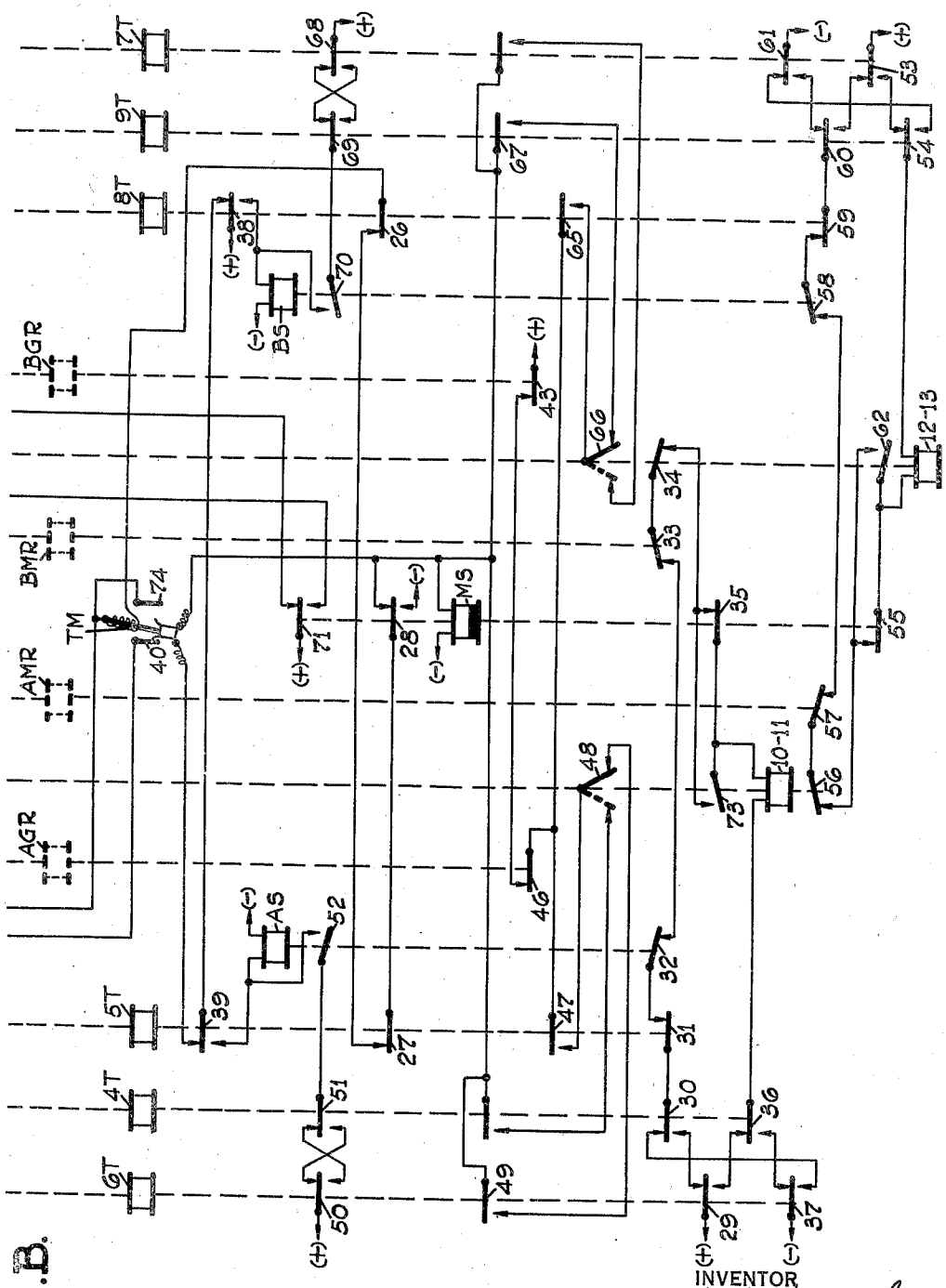


FIG. 1.B.

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2,111,329

UNITED STATES PATENT OFFICE

2,111,329

INTERLOCKING SYSTEM FOR RAILROADS

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Application May 28, 1937, Serial No. 145,338

13 Claims. (Cl. 246—134)

This invention relates to interlocking systems for railroads, and more particularly to interlocking systems automatically operated by the presence of trains.

This invention provides for the automatic setting up of routes through an interlocking plant by the presence of trains on the approach track sections to such routes. There is also provision made whereby alternate moves will be made over two conflicting routes when three or more trains arrive concurrently on the two routes.

The present invention also contemplates certain safety features particularly adaptable to railway practice. For example, it is well known to those familiar with the art of railway signalling that taking a clear signal away from an approaching train and permitting a conflicting route to be immediately set up is a dangerous condition, and should be prevented by giving the approaching train sufficient time to have either come to a stop or proceeded far enough into a route to have prevented the setting up of a conflicting route by having dropped the track relay of the detector track section.

Although the present system does not provide means under normal automatic operation whereby a signal can be taken away from an approaching train, there are certain accidental conditions which might cause such operation, such as momentary opening of a circuit due to a break in a wire, high resistance developing in a contact, or improper operation of a relay. Other conditions which might cause a signal to go to danger in front of an approaching train are the momentary loss of shunt under the approaching train, momentary dropping of a detector track relay, dropping of a leaving track relay by a train entering the interlocking from the opposite direction.

This invention provides a system wherein the above conditions do not allow improper or unsafe operations to occur by reason of the use of a time element, which time element also provides for the emergency release of routes requiring similar safety protection.

Other objects, purposes and characteristic features of the present invention will in part be pointed out hereinafter and will in part be apparent from the accompanying drawings. Any invention common to this application and the application of Wight Ser. No. 145,337 filed on the same date as the instant application will be claimed in said Wight application, and no claims to said common invention will be made herein.

The accompanying drawings (Figs. 1A and 1B) show one embodiment of the present invention as applied to a railway crossing system in which each track is signalled for both directions.

With reference to the drawings, the railway track A is illustrated as divided into track circuits 4, 5 and 6 and crossed by railway track B which is divided into track circuits 7, 8 and 9. This trackway has been indicated symbolically by single lines to conserve in space for the remaining parts of the invention.

The signalling arrangement comprises a means of governing traffic through the interlocking in either direction on each track. The signals illustrated are of the search light signal type, as shown in the Patent No. 1,835,150, granted to O. S. Field December 8, 1931, which are provided with contacts that are closed when the signal indicates danger and open when the signal indicates clear. Signals 10 and 11 govern traffic over track A, signal 10 governing east bound traffic and signal 11 west-bound traffic. Signals 12 and 13 govern traffic over track B, signal 12 governing east-bound traffic and signal 13 west-bound traffic.

Although search light signals have been illustrated, it is to be understood that color light signals having individual lamp units could as well be used, the green lamp being illuminated through a circuit including a front contact of a signal control relay, and the red lamp being illuminated through a circuit including a back contact of said signal control relay. A back contact on said signal control relay could be used in place of the contact illustrated as part of the mechanism of the search light signal.

The relays 10—11 and 12—13 are of the polar-neutral type and are used in setting up the route required under the various traffic conditions.

The relay MS is a slow release relay associated with the route control relays and is used in establishing a time interval between the placing of a signal at danger in front of an approaching train and the clearing of a signal governing traffic over a conflicting route.

The relays AS and BS are associated with the approach track sections and are conveniently termed receding stick relays as they prevent a receding route from being set up by a train leaving the interlocking when the approach track relay for that route is dropped.

The relays AGR and BGR are used in checking the danger position of the vanes in the signal mechanisms.

Relays AMR and BMR are slow release relays associated with the operation of the emergency release push-button.

The thermal relay TM is associated with the control of relay MS and provides the time interval required under the conditions hereinafter described.

The emergency release button PB is located so as to be conveniently used by the train men of either track and has also associated with it an indicator lamp E and switch SW to indicate when all the signals are at danger.

For the purpose of simplifying the illustration and facilitating in the explanation, various parts and circuits constituting the embodiment of the invention have been shown diagrammatically, the drawings have been made more with the purpose of making it easy to understand the principles and mode of operation than with the idea of illustrating the specific construction and arrangement of parts that would be employed in practice. The symbols (+) and (−) are employed to indicate the positive and negative terminals respectively of suitable batteries, or other sources of direct current; and the circuits with which these signals are used always have current flowing in the same direction.

The track relays are all energized under normal conditions through their respective track circuits, the detail of said circuits not being shown as these are well known to those familiar with the art.

As the signals are normally at danger, the relays AGR and BGR are normally energized through contacts closed when the signals are in their danger position.

Relay AGR is energized from (+), through a circuit including contact 20 of signal 11, contact 21 of signal 10, winding of relay AGR, to (−).

In a similar manner relay BGR is energized from (+), through a circuit including contact 22 of signal 12 and contact 23 of signal 13, winding of relay BGR, to (−).

When these relays are energized, the stick circuit for relay MS is completed, the energization of which was effected by the last train passing through the interlocking plant. Relay MS is held in its energized position from (+), through a circuit including front contact 24 of relay BGR, front contact 25 of relay AGR, winding of relay TM, front contact 26 of relay 8T, front contact 27 of relay 5T, front contact 28 of relay MS, winding of relay MS, to (−). Although this circuit includes the winding of thermal relay TM, it is evident that the high resistance of the winding of relay MS is sufficient to limit the flow of current in the winding of relay TM so as to cause its contacts to remain in their normal position.

With no trains within the limits of the interlocking plant and the relays in their normal position, assume a train approaching on track A to have entered track section 4, thus setting up a route through the interlocking plant in a manner about to be described in detail.

The dropping of relay 4T causes the energization of relay 10—11 from (+), through a circuit including front contact 29 of relay 6T, back contact 30 of relay 4T, front contact 31 of relay 5T, back contact 32 of relay AS, back contact 33 of relay BMR, back contact 34 of relay 12—13, front contact 35 of relay MS, winding of relay 10—11, back contact 36 of relay 4T, front contact 37 of relay 6T, to (−). When relay 10—11 picks up it closes a stick circuit through its front contacts 13 shunting front contact 35 of relay MS out of its control circuit.

With the route relay 10—11 in its energized position and the detector track circuits unoccupied, a circuit is closed for energizing the control mechanism in signal 10 to its clear position from (+), through a circuit including front contact 38 of relay 8T, front contact 39 of relay 5T, back contact 40 of relay TM, front contact 41 of relay 10—11, back contact 42 of relay 12—13, front contact 43 of relay BGR, polar contact 44 of relay 10—11 in its right hand position, winding of signal 10 mechanism relay, to (−). The energization of the winding of the signal mechanism effects the operation of the vane of the mechanism in such a way as to substitute the green spectacle for the red spectacle in line with the beam of light emitted from the signal.

It may be well to point out at this time that the route relays 10—11 and 12—13 are electrically interlocked so that only one may be energized at a time, and also that the signals for one track may be cleared only when the route relay for the other track is down.

The opening of contact 21 of signal 10 when signal 10 clears deenergizes relay AGR, and the opening of front contact 25 of relay AGR effects the dropping of relay MS.

As a train accepts signal 10 and drops track relay 5T the control of signal 10 will be deenergized by reason of front contact 39 of relay 5T being opened. The winding of the signal control mechanism being deenergized effects the replacement of the green spectacle with a red spectacle in line with the beam of light emitted from the signal.

The dropping of the detector track relay 5T closes a circuit for energizing the relay AS from (+), through a circuit including front contact 38 of relay 8T, back contact 39 of relay 5T, winding of relay AS, to (−).

As the train enters track circuit 6 and drops relay 6T a circuit is closed for energizing relay MS from (+), through a circuit including front contact 45 of relay BGR, front contact 46 of relay AGR, back contact 47 of relay 5T, polar contact 48 of relay 10—11 in its right hand position, back contact 49 of relay 6T, winding of relay MS, to (−).

The dropping of relay 6T closes the stick circuit for relay AS from (+), through a circuit including back contact 50 of relay 6T, front contact 51 of relay 4T, front contact 52 of relay AS, winding of relay AS, to (−).

As the train leaves track section 5 and relay 5T picks up, the circuit for energizing relay MS is broken through back contact 47 of relay 5T; relay MS, however, being a slow release relay will remain in its picked up position until its stick circuit is completed by the closing of front contact 27 of relay 5T.

The relay AS having been picked up when the train entered the detector track section and held in its energized position until the train has left track section 6, locks out the control of relay 10—11 by opening the circuit at back contact 32, thus preventing the setting up of a route when the relay 6T drops, due to the passage of the train through track section 6 while leaving the plant.

As the train leaves the interlocking plant, relay AS is deenergized through the opening of the circuit at back contact 50 of relay 6T.

Having thus described the operation during the passage of a train over track A, assume a train to approach signal 12 on track B under similar conditions, the interlocking plant being unoccupied when the train approaches.

The dropping of relay 7T closes a circuit for energizing relay 12—13 from (+), through a circuit including back contact 53 of relay 7T, front contact 54 of relay 9T, winding of relay 12—13, front contact 55 of relay MS, back contact 56 of relay 10—11, back contact 57 of relay AMR, back contact 58 of relay BS, front contact 59 of relay 8T, front contact 60 of relay 9T, back contact 61 of relay 7T, to (—). As soon as relay 12—13 picks up it shunts front contact 55 of relay MS out of its control by a circuit through its own front contact 62.

When relay 12—13 is in its energized position a circuit is closed for energizing the control winding in signal 12 from (+), through a circuit including front contact 38 of relay 8T, front contact 39 of relay 5T, back contact 40 of relay TM, front contact 42 of relay 12—13, back contact 41 of relay 10—11, front contact 63 of relay AGR, polar contact 64 of relay 12—13 in its right hand position, winding of the control mechanism in signal 12, to (—). The energization of said winding causes the vane in the signal to rotate to a position where the beam of light will pass through the green spectacle instead of the red spectacle.

Relay BGR is deenergized by the opening of contact 22 on signal 12 when signal 12 is cleared, the dropping of which relay opens the control circuit of relay MS at front contact 24.

As the train accepts signal 12, the control of the signal is opened at front contact 38 of relay 8T, thus causing the green spectacle which was in line with the beam of light emitted from the signal to be replaced with a red spectacle.

The dropping of relay 8T also closes a circuit for energizing relay BS from (+), through a circuit including back contact 38 of relay 8T, winding of relay BS, to (—).

As the train enters track section 9, the dropping of track relay 9T closes a circuit for energizing relay MS from (+), through a circuit including front contact 45 of relay BGR, front contact 46 of relay AGR, back contact 65 of relay 8T, polar contact 66 of relay 12—13 in its right hand position, back contact 67 of relay 9T, winding of relay MS, to (—).

The dropping of relay 9T also closes the stick circuit for relay BS from (+), through a circuit including front contact 68 of relay 7T, back contact 69 of relay 9T, front contact 70 of relay BS, winding of relay BS, to (—).

It will be noted that the opening of back contact 58, when relay BS picks up, opens the control of relay 12—13, thus preventing the energization of relay 12—13 on reverse polarity and the clearing of signal 13 after the train leaves the detector track circuit.

As the train leaves track section 8, the control of relay MS is opened by the picking up of relay 8T, but the relay remains in a picked up position due to its slow release feature until the closing of front contact 26 of relay 8T completes its stick circuit.

As the train leaves the interlocking plant, the opening of back contact 69 of relay 9T when relay 9T picks up, deenergizes relay BS, and the system is again restored to its normal conditions.

Having thus described in detail the passage of a train through the interlocking plant from west to east on each of tracks A and B, it is obvious that the operation for the passage of trains from east to west is similar to that just described and employs the same control circuits for the route relays, using opposite polarity, the signal controls and energization controls for relay MS being selected by the polar contacts in the left hand position.

The use of the thermal relay TM provides a time interval between the time when a signal changes from clear to danger and the clearing of any signal, providing that the detector track sections are unoccupied the operation of this relay can best be understood by assuming a traffic condition under which the operation of the relay is required.

Assume a train to approach signal 10 on track A, clearing the signal in a manner similar to that previously described, and a few moments later a train to approach signal 12 on track B and entering the approach section 7T, thus receiving a danger indication from signal 12 on account of signal 10 being clear.

If, for some reason, the route relay 10—11 is deenergized, thus causing signal 10 to go to danger, neither route relay may be energized until relay MS is first picked up through a back contact on the thermal relay TM. Both of the signals 10 and 12 will display a danger indication until one of the route relays is energized.

The energizing circuit for relay TM is from (+), through a circuit including front contact 24 of relay BGR, front contact 25 of relay AGR, winding of relay TM, front contact 26 of relay 8T, front contact 27 of relay 5T, back contact 28 of relay MS, to (—).

The closing of the front contact on relay TM at the end of the time interval closes a circuit for energizing relay MS from (+), through a circuit including front contact 24 of relay BGR, front contact 25 of relay AGR, front contact 74 of relay TM, winding of relay MS, to (—). The relay MS in its picked up position closes its stick circuit as has previously been described.

There having been sufficient time for an approach train on track A to have come to a stop before passing signal 10, either of the two route relays may now be energized with relay MS in its energized position, depending upon which one has the quicker operating characteristics. If the approaching train on track A had not been able to stop in the rear of signal 10 and had dropped track relay 5T, it would have opened the control circuit for relay 10—11 at front contact 31 of relay 5T, and also opened the signal control circuit at front contact 39 of relay 5T. This condition would allow route relay 12—13 to pick up but would not allow signal 12 to clear due to the control of that signal being open.

Again assume two trains to have been approaching on tracks A and B respectively, the first train having cleared signal 10. An emergency release of the route set up so as to clear signal 12 for the train on track B may be accomplished by the operation of the emergency release push button located so as to be accessible to the trainmen from either track.

Assume a trainman to press the button PB under said conditions. A circuit is closed for energizing relay BMR from (+), through a circuit including front contact 24 of relay BGR, back contact 25 of relay AGR, contact 80 of push button PB, winding of relay BMR, to (—).

Relay MS, having been deenergized upon the clearing of signal 10 closes a stick circuit for relay BMR from (+), through a circuit including back contact 71 of relay MS, front con-

tact 72 of relay BMR, winding of relay BMR, to (—).

The picking up of relay BMR opens a circuit for the control of relay 10—11 at back contact 33, thus causing signal 10 to go to danger, which will cause the energization of relay TM through a circuit as previously described. The closing of back contact 74 of relay TM causes the energization of relay MS which in turn closes the control of relay 12—13 through its front contact 55, and signal 12 is cleared as a result of the picking up of the relay 12—13.

The picking up of relay MS opens the stick circuit for relay BMR at back contact 71. Relay BMR is slow in releasing thus allowing relay 12—13 time to pick up, in preference to relay 10—11, by locking out the control of relay 10—11 at back contact 33. This obviously insures the picking up of the relay for the route to be cleared in preference to the relay for the route just released.

An indicator lamp is associated with the emergency release push button to indicate when the signal for the route to be released has gone to danger and also when the signal for the route desired has been cleared. A switch SW has been shown in series with the indicator lamp E which switch is closed when the door of the push button housing is open, so as to allow the indicator light E to be illuminated only at such times as the operation of the emergency release is desired. The indicator lamp E is illuminated when the signals are all at danger through a circuit from (+), including front contact 71 of relay MS through the switch SW in its closed position, indicator lamp E, to (—).

When signal 12 clears and relay MS drops, the control of the lamp E is opened at front contact 71, thus indicating to the trainman that signal 12 has been cleared.

Alternate moves over two conflicting routes are provided under heavy traffic conditions by allowing a route relay on one route to be picked up while there is a train passing through an interlocking plant on a conflicting route, and the presence of said train on the detector track section holds that conflicting route relay down. The signal governing traffic over the route for which the route relay was energized will not clear until the detector track sections for both tracks are unoccupied.

This feature of the invention can best be understood by assuming an east bound train M on track A to be passing through the plant, and at the same time approach sections 4 and 7 of tracks A and B respectively to become occupied by approaching trains N and O, respectively. The route relay 12—13 picks up as soon as the train O approaching on track B enters section 7, regardless of the fact that the approaching train N on track A may have entered section 4 prior to the train O on track B having entered section 7. The circuit for the control of relay 12—13 is closed, with the train O on approach section 7, as soon as relay 10—11 drops and closes back contact 56 provided the relay MS has been reenergized, it having been dropped by passing of train M over track section 5.

After the first train M on track A leaves the interlocking plant, signal 12 clears; and, after the train O on track B has accepted signal 12 and the route relay 12—13 has been dropped by reason of the opening of the circuit at front contact 59 of relay 8T, a circuit is closed for energizing relay 10—11 at back contact 34 of relay 12—13, assuming that relay MS has been picked up since the train accepted signal 12. With relay 10—11 picked up, signal 10 clears for the train N on track A as soon as the train O on track B leaves track section 8 and track relay 8T closes its front contact 38.

In a similar manner alternate moves are provided for as many trains as may occupy two approach sections, such as, 4 and 7, 4 and 9, 6 and 7 or 6 and 9, before a train passing through the interlocking has passed entirely off the detector and approach sections of tracks A and B respectively.

It is obvious, from the example given, that the selection of a front contact of the track relay for the detector track section and the selection of a front and a back contact of the two approach track relays respectively, in the control of the route relay for that route, is the means for providing said alternate operation. It is also obvious that similar operation is provided for train movements from east to west.

Having thus shown one particular embodiment of the present invention as applied to a track layout having a railway crossing, it is desired to be understood that the invention is not limited to the particular type of system as shown in the drawings, and that additions, modifications and changes may be made to adapt the invention to the particular signal problem encountered in practice, all without departing from the spirit of the present invention or its scope, except as demanded by the scope of the following claims.

What I claim is:—

1. In a traffic controlling system for railroads; a track layout having a plurality of conflicting routes; signals for governing traffic over said routes; a neutral relay; means for at times clearing one of said signals only if said neutral relay is picked up; a thermal relay; a detector track section for each route; a circuit means for picking up said neutral relay when said signals are all at stop, and said thermal relay has completed its operation to its energized position; circuit means for energizing said thermal relay when said neutral relay is dropped away providing said detector track sections are unoccupied and said signals are at stop; circuit means for picking up said neutral relay independently of the operation of said thermal relay, when a train is leaving a detector track section; and circuit means for retaining said neutral relay in its picked up position when said detector track sections are unoccupied and said signals are at stop.

2. In a traffic controlling system for railroads; a track layout having at least two conflicting routes; signals for governing traffic over each route; an approach track section for each signal; a route relay for each route; circuit means for energizing each one of said route relays when its approach section is occupied, but effective to energize only one of said route relays at any one time; a time element device; a manually operable contactor; circuit means responsive to the operation of said contactor for effecting the release of one of said route relays, followed by the energization of a second route relay for a conflicting route, only at the end of a predetermined time interval measured by said device; and circuit means for clearing each signal when and only when the route relay for such signal is energized.

3. In a traffic controlling system for railroads; a track layout having a plurality of conflicting routes; signals for governing traffic over each

route; an approach section for each signal; a route relay for each route; circuit means for energizing each of said route relays when a train occupies an approach section for that route; circuit means for allowing the energization of the route relay for only one conflicting route at any one time; a time element device; a manually operable contactor; circuit means for allowing the energization of a second route relay, only after said device has completed its operation, providing the energization of said device has been rendered effective by the release of a first route relay due either to the manual operation of said contactor or to an abnormal operating condition; and circuit means for clearing each signal only when the route relay for that signal is energized.

4. In a traffic controlling system for railroads; a track layout having a first stretch of track crossed by a second stretch of track; signals for governing traffic over each track; an approach section for each signal; a route relay for each track; circuit means for energizing each of said route relays when a train occupies an approach section for that route; circuit means for allowing the energization of only one route relay at any one time; circuit means for energizing alternately first one route relay and then the other route relay as long as following trains occupy approach sections on both tracks before a preceding train has left the approach section for the opposing signal on that particular track; and circuit means for clearing each signal only when its respective route relay is energized.

5. In a traffic controlling system for railroads; a first stretch of track crossed by a second stretch of track; signals for governing traffic over each track; an approach section for each signal; a route relay for each track; circuit means for distinctively energizing each of said route relays when a train occupies its respective approach section; said circuit means including means for allowing the energization of only one route relay at any one time; a time element device; a manually operable contactor for releasing a first route relay and rendering said device effective; circuit means for energizing a second route relay only after said device has completed its operation, providing said device has been rendered operable by the operation of said contactor; circuit means for energizing alternately first one route relay and then the other route relay when following trains occupy approach sections or both tracks before a preceding train has left the approach section for the opposing signal on that particular track; and circuit means for clearing each signal when its respective route relay is energized in a particular distinctive position.

6. In a traffic controlling system for railroads; a track layout having a first stretch of track crossed by a second stretch of track; signals for governing traffic over each stretch of track; an approach section for each signal; a route relay for each track; circuit means for energizing each of said route relays when an approach section for that track is occupied; said circuit means including means for allowing the energization of only one route relay at any one time; circuit means for causing said route relays to be energized alternately, when and only when trains occupy approach sections on both tracks before a preceding train has left the approach section for the opposing signal on that particular track; a time element device; circuit means for rendering said device operable when by reason of an abnormal operating condition a first route relay is deenergized; circuit means for permitting the energization of a second route relay only after said device has completed its operation, providing said device has been rendered operable; and circuit means for permitting the clearing of only one signal when the route relay for that track is energized.

7. In a traffic controlling system for railroads; a track layout having at least two conflicting tracks; signals for governing traffic over each of said tracks in both directions; an approach section for each signal; a route relay for each track; circuit means for energizing each of said route relays when one of its respective approach sections is occupied; said circuit means including means for allowing the energization of only one of said route relays at any one time; circuit means for causing said two route relays to be alternately energized when following trains occupy the respective approach sections on both of said tracks, prior to a preceding train having left the approach section for the opposing signal on that particular track; a time element device; a manually operable contactor, track sections between said opposing signals for each track; circuit means for rendering said device operable when a first route relay drops, providing said track sections are unoccupied; circuit means for dropping said first route relay upon operation of said contactor; circuit means for allowing a second route relay to be energized only after said device has completed its operation, providing said device is rendered operable; and circuit means for clearing each signal only when its respective route relay is energized.

8. In a traffic control system for railroads; a track layout having a plurality of conflicting routes; signals for governing traffic in both directions over each route; an approach section for each signal; a detector track section for each route; a route relay for each route; circuit means for energizing each route relay when an approach section to that route is occupied by an approaching train and for deenergizing such relay when the detector track section for that route becomes occupied; circuit means for allowing the energization of only one route relay at any one time; a single relay for each track for preventing the energization of the route relay for that track when one or the other of said approach sections for that track is occupied by a train after the train has left the detector track section for that route; and circuit means for clearing each signal when its respective route relay is energized.

9. In an automatic crossing signalling system, the combination with a railway crossing including two railway tracks crossing each other, a signal for each track for governing the movement of railway vehicles over said crossing, a route relay for each signal, circuits for energizing said route relays so interlocked that only one of said route relays may be energized at one time, an approach section for each signal including a track circuit and a track relay, a clearing circuit for each signal including a front contact of its associated route relay, and means effective if one of said signals is at proceed and both of said approach sections are occupied for deenergizing the route relay for said one signal and putting said one signal to stop and causing the other route relay to be energized to clear its associated signal irrespective of the order in which said approach sections were occupied.

10. In an automatic crossing signalling system, the combination with a railway crossing including two railway tracks crossing each other, a signal for each track for governing the movement of railway vehicles over said crossing, a route relay for each signal, circuits for energizing said route relays so interlocked that only one of said route relays may be energized at one time, an approach section for each signal including a track circuit and a track relay, a clearing circuit for each signal including a front contact of its associated route relay, and manually operable means effective if operated when one of said signals is indicating proceed and both of said approach sections are occupied for deenergizing the route relay for said one signal and putting said one signal to stop and causing the other route relay to be energized to clear its associated signal irrespective of the order in which said approach sections were occupied.

11. In an automatic crossing signalling system, the combination with a railway crossing including two railway tracks crossing each other, a signal for each track for governing the movement of railway vehicles over said crossing, a route relay for each signal, circuits for energizing said route relays so interlocked that only one of said route relays may be energized at one time, an approach section for each signal including a track circuit and a track relay, a clearing circuit for each signal including a front contact of its associated route relay, and means effective if one of said signals is at proceed and both of said approach sections are occupied for deenergizing the route relay for said one signal and putting said one signal to stop and causing the other route relay to be energized to clear its associated signal after the lapse of a predetermined time irrespective of the order in which said approach sections were occupied.

12. In an automatic crossing signalling system, the combination with a railway crossing including two railway tracks crossing each other, a signal for each track for governing the movement of railway vehicles over said crossing, a route relay for each signal, circuits for energizing said route relays so interlocked that only one of said route relays may be energized at one time, an approach section for each signal including a track circuit and a track relay, a clearing circuit for each signal including a front contact of its associated route relay, and manually operable means effective if operated when one of said signals is indicating proceed and both of said approach sections are occupied for deenergizing the route relay for said one signal and putting said one signal to stop and causing the other route relay to be energized to clear its associated signal after the lapse of a predetermined time interval irrespective of the order in which said approach sections were occupied.

13. In an automatic crossing signalling system, the combination with a railway crossing including two railway tracks crossing each other, a signal for each track for governing the movement of railway vehicles over said crossing, a route relay for each signal, an approach section for each signal including a track circuit and a track relay, circuits for energizing said route relays including back contacts of their associated approach track relays and so interlocked that only one of said route relays may be energized at one time, a clearing circuit for each signal including a front contact of its associated route relay, and means effective if one of said signals is at proceed and both of said approach sections are occupied for deenergizing the route relay for said one signal and putting said one signal to stop and causing the other route relay to be energized to clear its associated signal irrespective of the order in which said approach sections were occupied.

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