

Feb. 5, 1952

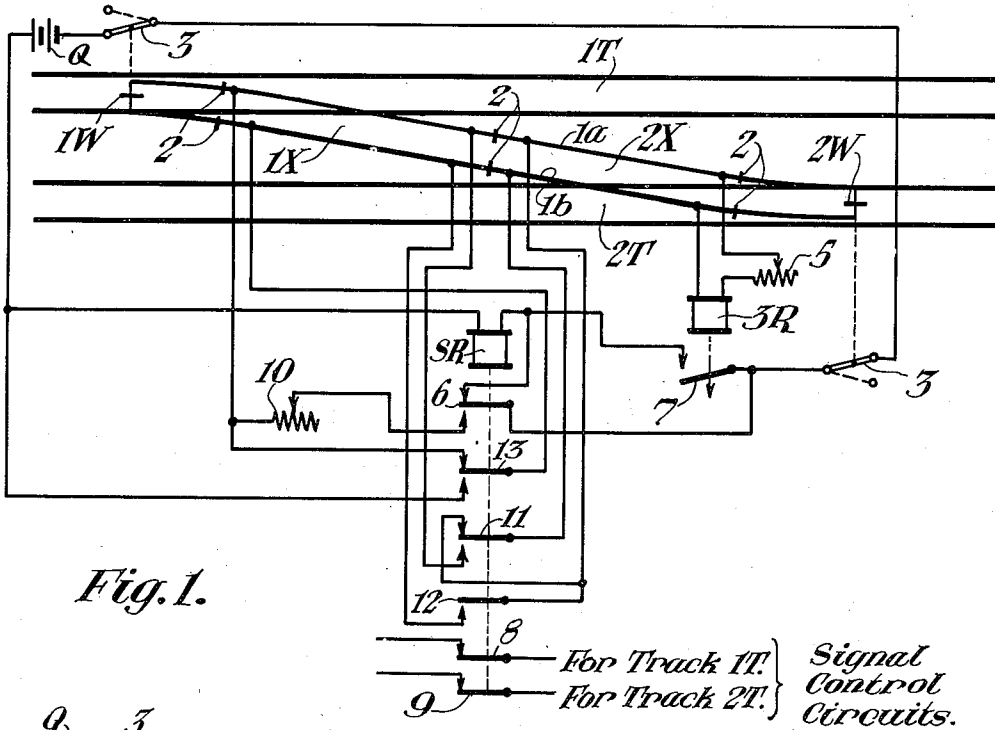
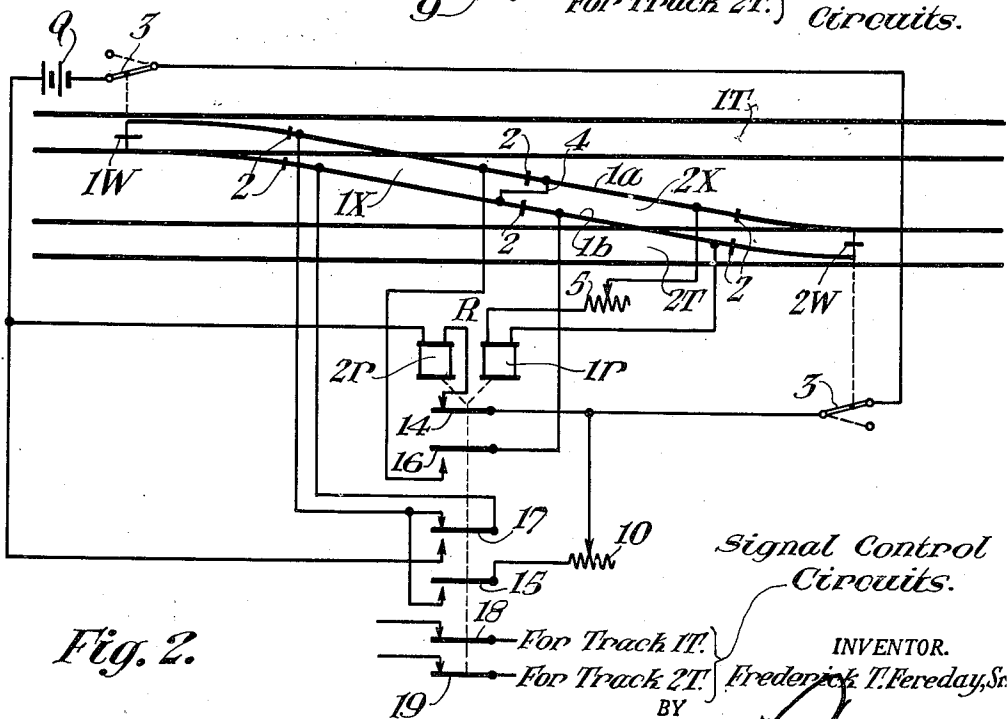
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2,584,566

TRAFFIC PROTECTION APPARATUS

Filed Feb. 20, 1947

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

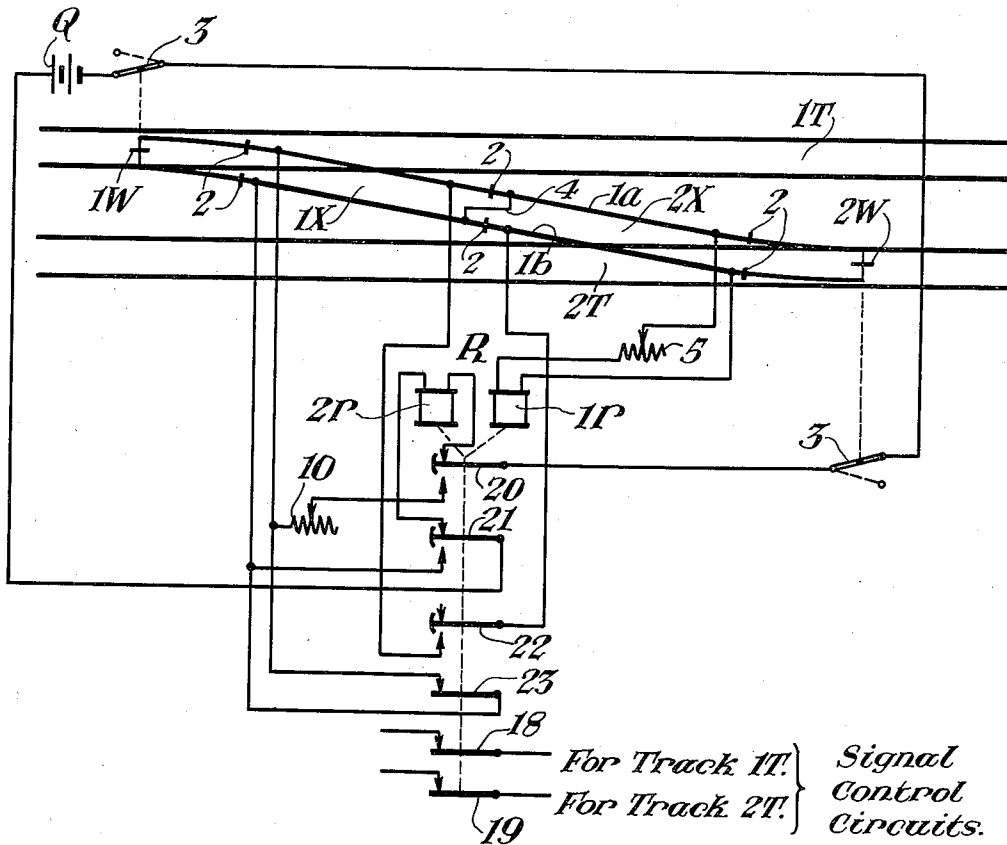


Fig. 3.

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TRAFFIC PROTECTION APPARATUS

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11 Claims. (Cl. 246-219)

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My invention relates to traffic protection apparatus, and particularly to apparatus for providing crossover protection for trains moving along railway tracks which are interconnected by a crossover track through hand-operated track switches.

A requisite for crossover protection apparatus is that it must be so arranged that a car or locomotive, while occupying a crossover such, for example, as one connecting two main tracks, while the switches are in the normal position for train movements along the main tracks, will cause a signal for each main track to indicate stop if the car or locomotive is within fouling distance of that main track. In crossover protection schemes embodying track circuits, one characteristic should therefore be high shunting sensitivity in order to insure that the crossover track circuits will be shunted when occupied by a car or train, although the crossover track has high contact resistance due to the infrequency of train movements over the crossover.

One feature of my invention is the provision of improved shunting sensitivity through determination of the condition of occupancy of a crossover track by the picking up of a track relay instead of by release of a track relay.

Another feature of my invention is the provision of one track circuit including the rails of two sections of a crossover track.

Still another feature of my invention is an arrangement embodying a relay which has two windings, one of which performs the functions of a track relay and the other of which performs the functions of a stick relay.

The apparatus of my invention is an improvement over that which is disclosed in the copending application, Serial No. 671,191, filed May 21, 1946, by Lowell B. Yarbrough for traffic protection apparatus.

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

In the accompanying drawings, Fig. 1 is a diagrammatic view showing one form of apparatus embodying my invention, in which a crossover track is divided into two sections and one track circuit is arranged to include the rails of both sections for controlling one slow release track relay through back contacts of an associated stick relay; Fig. 2 is a diagrammatic view showing a modified form of the apparatus of Fig. 1, in which one relay having two windings is used and one of the windings performs the functions of the track relay shown in Fig. 1 and controls a

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front contact which closes before a back contact of the relay opens, and the other winding performs the functions of the stick relay shown in Fig. 1; and Fig. 3 is a diagrammatic view, similar to Fig. 2, showing a further modified form of the apparatus of Fig. 1, in which a relay having two windings is provided with continuity contacts each of which becomes closed at its front point before it opens at its back point when this relay becomes energized.

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

Referring first to Fig. 1, a stretch of railway is shown comprising two main tracks designated by the reference characters 1T and 2T, connected with each other by a crossover track through hand-operated switches, designated by the reference characters 1W and 2W. The crossover track is divided by insulated joints 2 into two sections 1X and 2X.

A contact device 3 is operated in conjunction with each of the switches 1W and 2W. Each of these contacts is arranged to be closed when its switch is in the normal position, as shown in the drawing, for traffic movements along the associated main track, and to be open when its switch is in the reverse position for traffic movements over the crossover track.

One track circuit is provided, including the rails of both sections 1X and 2X of the crossover track. Sections 1X and 2X are interconnected, at their adjacent ends, through back contacts of a stick relay SR. A slow release track relay 3R is connected through a usual impedance 5 across the rails of section 2X adjacent the opposite end of this section. A suitable source of current, shown as a battery Q, is at times connected across the rails of section 1X, adjacent the opposite end of this section, through switch contacts 3 and through back contacts of relay SR.

Relay SR has a pick-up and a stick circuit each controlled by the switch contacts, and the pick-up circuit is also controlled by a front contact of relay 3R.

Signal control circuits for tracks 1T and 2T include front contacts of relay SR, so that signals for these tracks can be cleared only if relay SR is energized, and will indicate stop if relay SR is deenergized.

Referring next to Fig. 2, a stretch of railway is here also shown comprising two main tracks designated by the reference characters 1T and 2T, connected with each other by a crossover track through hand-operated switches 1W and 2W. The crossover track is here also divided by

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insulated joints 2 into two sections 1X and 2X. Switch contacts 3 are operated in conjunction with switches 1W and 2W, as in Fig. 1.

One track circuit is provided, including the rails of both sections 1X and 2X of the crossover, as in Fig. 1. Sections 1X and 2X are here interconnected at their adjacent ends through a jumper 4 and a back contact of a track and stick relay R, instead of through two back contacts of a relay SR as shown in Fig. 1.

Relay R has a first winding 1r connected through a usual impedance 5 across the opposite end of section 2X. A battery Q is at times connected across the opposite end of section 1X through switch contacts 3 and through back contacts of relay R.

Relay R has also a second winding 2r which is controlled by switch contacts 3 and by a front contact of relay R. This front contact of relay R is adjusted to become closed before the back contacts of relay R open when that relay becomes energized.

Signal control circuits for tracks 1T and 2T include front contacts of relay R.

Referring now to Fig. 3, the arrangement shown here differs from that shown in Fig. 2 in that relay R is here equipped with three contacts of the type known as continuity contacts, each of which becomes closed at its front point before it opens at its back point when relay R becomes energized. The front points of two of these contacts are used in the control circuit for winding 2r of relay R, and the back points of the same two contacts are used for connecting battery Q across the rails of section 1X. The third continuity contact is used for interconnecting one side of the adjacent ends of sections 1X and 2X.

Having described, in general, the arrangement of the various parts of apparatus embodying my invention, I shall now describe the circuits and operation in detail.

As shown in the drawings, all parts of the various forms of apparatus are in the normal condition, that is, each of the switches 1W and 2W is in the normal position for a train movement along main track 1T or 2T, respectively; relay SR in Fig. 1, and winding 2r of relay R in Figs. 2 and 3 are energized; relay 3R in Fig. 1 and winding 1r of relay R in Figs. 2 and 3 are deenergized; and the contacts of relays SR and R in the signal control circuits are closed.

In Fig. 1, relay SR is energized by a stick circuit, this circuit passing from battery Q, through contacts 3 of switches 1W and 2W, front point of contact 6 of relay SR, and winding of relay SR back to battery Q. With relay SR energized, contacts 8 and 9 of this relay are closed in signal control circuits for tracks 1T and 2T, respectively. Also, with relay SR energized, a shunt path is connected across the rails of section 1X through the front point of contact 13 of relay SR, and a shunt path is connected across the rails of section 2X through the front point of contact 11 of relay SR.

I shall assume that, with apparatus arranged as shown in Fig. 1, a trainman reverses switches 1W and 2W for a train to move over the crossover track. Switch contacts 3 will therefore be opened, causing relay SR to become deenergized and in turn open the signal control circuits for tracks 1T and 2T, whereupon the signals for these tracks will indicate stop.

I shall assume further that a train then moves over the crossover track from one of the main tracks to the other, and that a trainman then

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restores switches 1W and 2W to their normal position, but that a car is left standing on section 1X.

Upon restoration of switches 1W and 2W to the normal position, a track circuit is completed, passing from battery Q, through contacts 3 of switches 1W and 2W, back point of contact 6 of relay SR, an impedance 10, rail 1a of section 1X, back point of contact 11 of relay SR, rail 1b of section 2X, winding of relay 3R, impedance 5, rail 1a of section 2X, contact 12 of relay SR, rail 1b of section 1X, and back point of contact 13 of relay SR, back to battery Q. Relay 3R, however, on account of being shunted by the car on section 1X, does not become energized. Relay SR, therefore, remains deenergized and the signals for tracks 1T and 2T remain at stop.

I shall also assume further that the trainman then again reverses switches 1W and 2W to permit removal of the car from section 1X, and, that after the car has been thus removed, he again restores the switches to the normal position. Relay 3R will thereupon become energized by the track circuit previously traced.

With relay 3R energized, a pick-up circuit is completed for relay SR, which is the same as the stick circuit previously traced for this relay except that it includes contact 7 of relay 3R instead of the front point of contact 6 of relay SR. Relay SR, upon becoming energized, completes its stick circuit previously traced, and closes its contacts 8 and 9 in the signal control circuits for tracks 1T and 2T.

In Fig. 2, the circuit by which winding 2r of relay R is energized passes from battery Q, through contacts 3 of switches 1W and 2W, contact 14 of relay R, and winding 2r back to battery Q. With relay R energized, a shunt path is connected across the rails of section 1X through the front point of contact 17.

I shall assume that with apparatus as shown in Fig. 2, a trainman reverses switches 1W and 2W for a train to move over the crossover track. Switch contacts 3 will thereby be opened, causing winding 2r of relay R to become deenergized. Front contacts 18 and 19 of relay R in the signal control circuits will therefore become opened, causing the signals for tracks 1T and 2T to indicate stop.

I shall assume further that a train then moves over the crossover track, and that a trainman then restores switches 1W and 2W to the normal position, but that a car is left standing on section 1X.

Upon the restoration of switches 1W and 2W to the normal position, a track circuit is completed, passing from battery Q, through contacts 3 of switches 1W and 2W, impedance 10, contact 15 of relay R, rail 1a of section 1X, contact 16 of relay R, rail 1b of section 2X, winding 1r of relay R, impedance 5, rail 1a of section 2X, jumper 4, rail 1b of section 1X, and the back point of contact 17 of relay R, back to battery Q. Winding 1r, on account of being shunted by the car in section 1X, remains deenergized, and the back contacts of relay R therefore remain closed and its front contacts remain open, so that the signals for tracks 1T and 2T controlled by this relay will continue to indicate stop.

I shall also assume further that the trainman again reverses switches 1W and 2W, for removal of the car from section 1X, and that, after the car has been removed, he again restores switches 1W and 2W to the normal position.

Winding 1r will thereupon become energized by the track circuit previously traced for this relay. Winding 1r, upon becoming energized, closes contact 14 of relay R, thereby completing a circuit previously traced for energizing winding 2r of relay R. The back contacts of relay R in the track circuit previously traced will now be opened, causing winding 1r to become deenergized. The front contacts of relay R will, however, be held closed by winding 2r. Contacts 18 and 19 of this relay will therefore now be closed in signal control circuits for tracks 1T and 2T.

In Fig. 3, the circuit by which winding 2r of relay R is energized passes from battery Q, through contacts 3 of switches 1W and 2W, front point of contact 20 of relay R, winding 2r, and front point of contact 21 of relay R, back to battery Q. With winding 2r of relay R energized, a shunt path is completed across the rails of section 1X by contact 23 of relay R.

I shall now assume that, with apparatus arranged as shown in Fig. 3, a trainman reverses switches 1W and 2W for a train to move over the crossover track. Switch contacts 3 will therefore open the circuit traced for winding 2r of relay R, causing relay R to become deenergized. With relay R deenergized, contacts 18 and 19 of this relay will open the signal control circuits for tracks 1T and 2T, causing the signals controlled by these circuits to indicate stop.

I shall assume further that a train proceeds over the crossover, and that the trainman restores switches 1W and 2W to the normal position, but that a car has been left on section 1X.

With switches 1W and 2W restored to the normal position, a track circuit is completed, passing from battery Q, through contacts 3 of switches 1W and 2W, back point of contact 20 of relay R, impedance 10, rail 1a of section 1X, contact 22 of relay R, rail 1b of section 2X, winding 1r, impedance 5, rail 1a of section 2X, jumper 4, rail 1b of section 1X, and the back point of contact 21 of relay R, back to battery Q. Winding 1r, on account of being shunted by the car on section 1X, will remain deenergized, and the back contacts of relay R will therefore remain closed, and the front contacts will remain open, so that the signals for tracks 1T and 2T controlled by this relay will continue to indicate stop.

I shall also assume further that a trainman again reverses switches 1W and 2W for removal of the car from section 1X and that, after the car has been thus removed, he again restores switches 1W and 2W to the normal position. Winding 1r will thereupon become energized by its track circuit previously traced. Winding 1r, upon becoming energized, completes the circuit previously traced for winding 2r through the front points of contacts 20 and 21. Contacts 20 and 21 will then open at their back points, causing winding 1r to become deenergized. With the front contacts of relay R now closed, contacts 18 and 19 of relay R will be closed in the signal control circuits for tracks 1T and 2T.

Although I have herein shown and described only a few forms of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In traffic protection apparatus for a stretch of railway in which two main tracks are inter-

connected by a crossover track which is divided into two sections by means including a pair of insulated joints between adjacent ends of said sections, the combination comprising, a slow release track relay connected across the rails of one of said sections adjacent its opposite end, a stick relay, a track battery connected across the rails of the other section adjacent its opposite end through normally closed contacts of the crossover track switches and through back contacts of said stick relay, a circuit path including a back contact of said stick relay for connecting one rail of one of said sections with a rail of the other section adjacent said pair of insulated joints, a second circuit path including a second back contact of said stick relay for interconnecting the other rails of said sections adjacent said pair of insulated joints, a pick-up and a stick circuit for said stick relay each controlled by normally closed contacts of said crossover track switches and said pick-up circuit also controlled by a front contact of said track relay, and signal control means controlled by said stick relay.

2. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through two hand-operated track switches each of which has a normal position for traffic movements along its main track and a reverse position for traffic movements over said crossover track and in which said crossover track is divided into two sections, the combination comprising, a slow release track relay, a stick relay, a track circuit including the rails of said crossover track and the winding of said track relay as well as a suitable source of current and also including back contacts of said stick relay for interconnecting said track sections and including normally closed contacts of said track switches, a pick-up and a stick circuit for said stick relay each controlled by normally closed contacts of said switches and said pick-up circuit also controlled by a front contact of said track relay, and signal control means controlled by said stick relay.

3. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through hand-operated track switches and in which said crossover track is divided into two sections, the combination comprising, a stick relay, a contact of each of said switches each closed if its switch is in the position for traffic movements along its main track but open if its switch is in the position for traffic movements over said crossover track, a slow release track relay connected across the rails of said crossover track adjacent one of its ends, a source of current connected across the rails of said crossover track adjacent its other end through said switch contacts and through back contacts of said stick relay, means including a back contact of said stick relay for interconnecting said sections, a pick-up and a stick circuit for said stick relay each controlled by said switch contacts and said pick-up circuit also controlled by a front contact of said track relay, and signal control means controlled by said stick relay.

4. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through hand-operated track switches and in which said crossover track is divided into two sections, the combination comprising, a contact of each of said switches each closed if its switch is arranged

for traffic movements along its main track but open if its switch is arranged for traffic movements over said crossover track, a stick relay, a track relay connected across the rails of one of said sections adjacent one end of said crossover track, a source of current connected across the rails of the other of said sections adjacent the opposite end of said crossover track through said switch contacts and through back contacts of said stick relay, means including back contacts of said stick relay for interconnecting said two sections, a pick-up and a stick circuit for said stick relay each controlled by said switch contacts and said pick-up circuit also controlled by a front contact of said track relay, and signal control means controlled by said stick relay.

5. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through hand-operated track switches and in which said crossover track is divided into two sections, the combination comprising, a contact of each of said switches each closed if its switch is arranged for traffic movements along its main track but open if its switch is arranged for traffic movements over said crossover track, a stick relay winding, a track relay winding connected across the end of one of said sections adjacent one end of said crossover track, a source of current connected across the end of the other section adjacent the opposite end of said crossover track through said switch contacts and through back contacts controlled by said stick relay winding, means including a back contact controlled by said stick relay winding for interconnecting said track sections, a pick-up and a stick circuit for said stick relay winding each controlled by said switch contacts and said pick-up circuit also controlled by a front contact which is controlled by said track relay winding, and signal control means controlled by said stick relay winding.

6. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through hand-operated track switches and in which said crossover track is divided into two sections, the combination comprising, a contact of each of said switches each closed if its switch is arranged for traffic movements along its main track but open if its switch is arranged for traffic movements over said crossover track, a stick relay winding, a track relay winding, means including a back contact controlled by said stick relay winding for interconnecting said track sections, a track circuit for said crossover track including said stick relay winding and the rails of both of said sections interconnected by said means including a back contact controlled by said stick relay winding and also including a source of current controlled by said switch contacts, means controlled by said switch contacts and by said track relay winding for controlling said stick relay winding, and signal control means controlled by said stick relay winding.

7. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through hand-operated track switches and in which said crossover track is divided into two sections, the combination comprising, a contact of each of said switches each closed if its switch is arranged for traffic movements along its main track but open if its switch is arranged for traffic movements over said crossover track, a relay having a stick relay winding and a track relay winding and hav-

ing a front contact which closes before its back contacts open when said relay becomes energized, means including a back contact controlled by said stick relay winding for interconnecting said track sections, a track circuit for said crossover track including said track relay winding and the rails of both of said sections interconnected by said means including a back contact controlled by said stick relay winding and also including a source of current controlled by said switch contacts, means controlled by said switch contacts and by said front contact of said relay for controlling said stick relay winding, and signal control means controlled by said stick relay winding.

8. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through hand-operated track switches and in which said crossover track is divided into two sections, the combination comprising, a contact of each of said switches each closed if its switch is arranged for traffic movements along its main track but open if its switch is arranged for traffic movements over said crossover track, a relay having a stick relay winding and a track relay winding and having continuity contacts each of which becomes closed at its front point before opening at its back point when said track relay winding becomes energized, means including a back contact controlled by said stick relay winding for interconnecting said track sections, a track circuit for said crossover track including said track relay winding and the rails of both of said sections interconnected by said means including a back contact controlled by said stick relay winding and also including a source of current and the back points of two said continuity contacts and controlled by said switch contacts, a control circuit for said stick relay winding including the front points of said two continuity contacts and controlled by said switch contacts, and signal control means controlled by said stick relay winding.

9. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through two track switches one at each end of said crossover track and in which said crossover track is divided into two sections, the combination comprising, a contact of each of said switches each closed if its switch is arranged for traffic movements along its main track but open if its switch is arranged for traffic movements over said crossover track, a relay having a stick relay winding and a track relay winding and having a front contact which closes before its back contacts open when said relay becomes energized, said track relay winding connected across the end of one of said sections adjacent one end of said crossover track, a source of current connected across the end of the other section adjacent the opposite end of said crossover track through means including said switch contacts and a back contact controlled by said stick relay winding, means including a back contact controlled by said stick relay winding for interconnecting said track sections, means controlled by said switch contacts and by said front contact of said relay for controlling said stick relay winding, and signal control means controlled by said stick relay winding.

10. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through hand-operated track switches and in which said crossover track is divided into two sections, the com-

9 bination comprising, a contact of each of said switches each closed if its switch is in position for traffic movements along its main track but open if its switch is in position for traffic movements over said crossover track, a relay having a stick relay winding and a track relay winding and having a front contact which closes before its back contacts open when said relay becomes energized, said track relay winding connected across the end of one of said sections adjacent one end of said crossover track, a source of current connected across the end of the other section adjacent the opposite end of said crossover track through said switch contacts and through back contacts controlled by said stick relay winding, means including a back contact controlled by said stick relay winding for interconnecting said track sections, a pick-up and a stick circuit for said stick relay winding each controlled by said switch contacts and said pick-up circuit also controlled by said front contact, and signal control means controlled by said stick relay winding.

11. In traffic protection apparatus for a stretch of railway in which two main tracks are interconnected by a crossover track through two track switches one at each end of said crossover track and in which said crossover track is divided into two sections, the combination comprising, a contact of each of said switches each closed if the associated switch is arranged for traffic movements along the associated main track but open

if said associated switch is arranged for traffic movements over said crossover track, a stick relay winding, a track relay winding connected across the end of one of said sections adjacent one end of said crossover track, a source of current connected across the end of the other section adjacent the opposite end of said crossover track through means including said switch contacts and a back contact controlled by said stick relay winding, means including a back contact controlled by said stick relay winding for interconnecting said track sections, means controlled by said switch contacts and by said track relay winding for controlling said stick relay winding, and signal control means controlled by said stick relay winding.

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