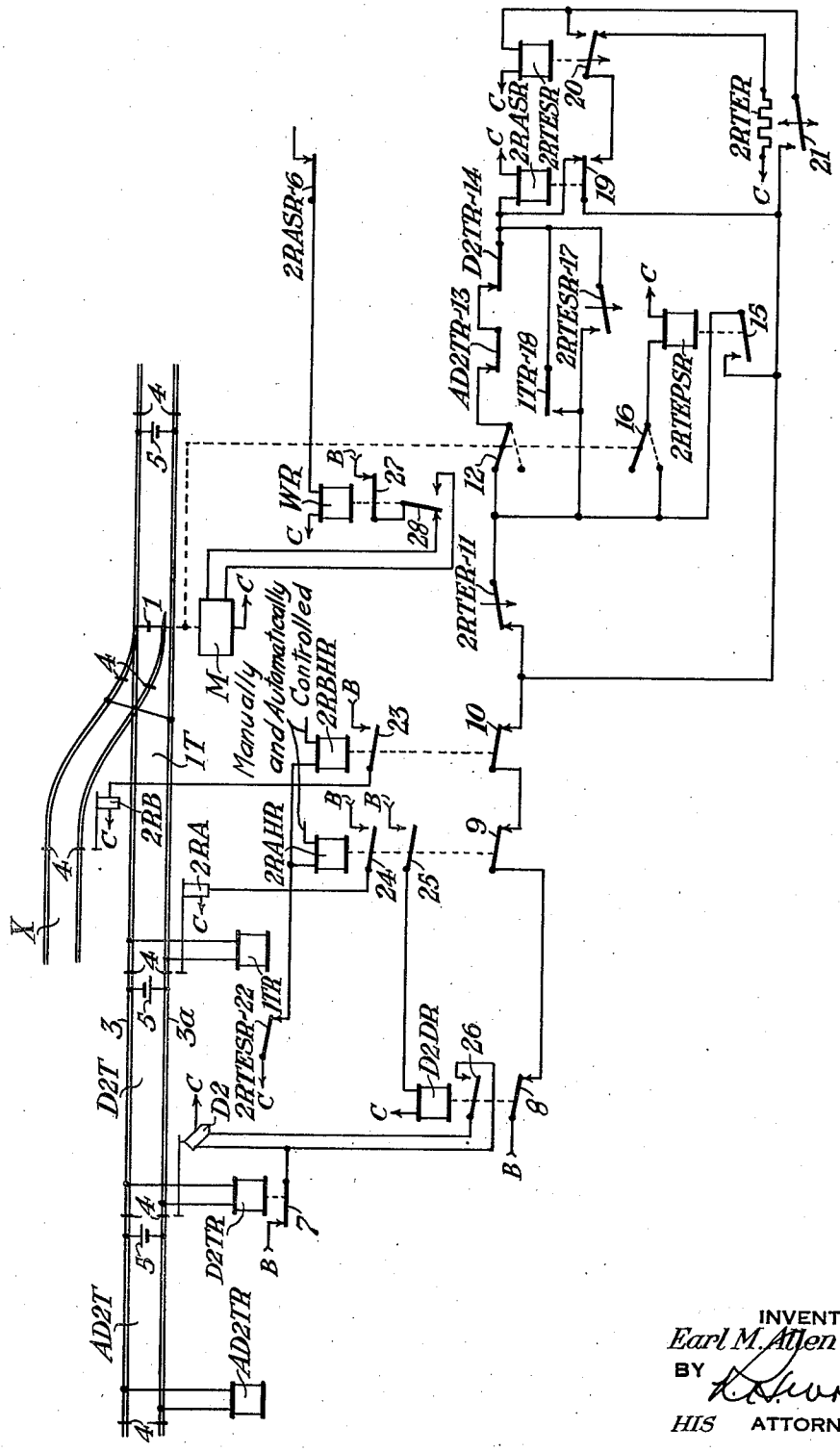
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RAILWAY TRAFFIC CONTROLLING APPARATUS

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INVENTOR
Earl M. Allen.
BY
HIS ATTORNEY

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RAILWAY TRAFFIC CONTROLLING APPARATUS

Earl M. Allen, Swissvale, Pa., assignor to The Union Switch & Signal Company, Swissvale, Pa., a corporation of Pennsylvania

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My invention relates to railway traffic controlling apparatus, and particularly to apparatus of the type involving a railway switch and a signal governing traffic movements over the switch.

More specifically, my invention relates to the release of approach and stick locking for a switch. One feature of my invention is the provision of novel and improved means for providing a short release period for the locking for low speed routes, while a longer release period is provided for the locking for higher speed routes.

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

The accompanying drawing is a diagrammatic view showing one form of apparatus embodying my invention.

Referring to the drawing, the reference characters 3 and 3a designate the track rails of a stretch of main railway track divided by insulated joints 4 to form a main section 1T, a first approach section D2T, and a second approach section AD2T. Each track section is provided with a track circuit including a track battery 5 connected across the rails adjacent one end of the section, and a track relay, designated by the reference character R preceded by the reference character for the associated section, connected across the rails adjacent the opposite end of the section.

A track switch 1 is included in section 1T for connecting the main track with an auxiliary track X. Switch 1 is provided with an operating mechanism M which as here shown is controlled by a polarized switch control relay WR.

Traffic moving toward the right as shown in the drawing, which I shall assume is the eastbound direction, is governed by a first signal 2RA for the main track, and by a second signal 2RB for the auxiliary track X. Signals 2RA and 2RB are controlled by signal control means here shown as first and second signal relays 2RAHR and 2RBHR, respectively. A distant signal D2 controls eastbound traffic movements on the main track through section D2T toward signal 2RA. The caution or 45° position of signal D2 is controlled by track relay D2TR, and the proceed or 90° position of this signal is controlled by a distant control relay D2DR. As shown in the drawing, the signals are of the semaphore type, but may be of any other suitable design.

The contacts operated by the various relays, by switch 1, and by the time element device 2RTER are identified by numbers, each such number having a distinguishing prefix from which it is separated by a dash when the associated contact is shown apart from the relay or other device by which it is operated. The prefix for each of these contact numbers comprise the reference character for the relay or other device by which the associated contact is operated. For example, contact 2RTESR—22, in the portion of the control circuits shown for relays 2RAHR and 2RBHR, is identified by the number 22 which is separated by a dash from the prefix 2RTESR which is the reference character for relay 2RTESR by which this contact is operated.

An approach and stick locking relay designated by the reference character 2RASR controls, in part, the switch control relay WR by means of a front contact 2RASR—6, so that relay WR cannot be energized for effecting operation of switch 1 unless relay 2RASR is energized. Only a portion of the normal and reverse control circuits for relay WR is shown in the drawing, and the portions of these circuits which are not shown may be controlled in any suitable manner, such for example as by a lever operated by a leverman in an interlocking tower.

Energization of locking relay 2RASR is controlled in part by time element means here shown as a thermal device 2RTER, by a first slow release auxiliary stick relay 2RTESR, and by a second auxiliary stick relay 2RTEPSR.

Time element means or device 2RTER operates a first time contact 2RTER—11 which is normally closed, and which opens in response to energization of device 2RTER, and which is slowly closed when device 2RTER becomes deenergized. Device 2RTER also operates a second normally open time contact 21 which is slow to close when device 2RTER becomes energized, and which is slow to open in response to deenergization of device 2RTER.

Contacts 12 and 16 are operated in conjunction with switch 1, so that contact 12 is closed only when switch 1 occupies the normal position, and contact 16 is closed only when switch 1 occupies the reverse position.

Only a portion of the control circuits for relays 2RAHR and 2RBHR is shown in the drawing. The portions not shown may be controlled in any suitable manner, such for example as by a lever operated by a leverman in an interlocking tower. Relay 2RAHR may also be controlled by a front contact of relay 1TR.

Having described, in general, the arrangement and control of the apparatus, I shall now describe, in detail, its operation.

As shown in the drawing, all parts are in the normal condition, that is, switch 1 is in its normal position; signals 2RA and 2RB are indicating stop; signal D2 is indicating caution; switch control relay WR is energized; track relays 1TR, D2TR and AD2TR are energized; locking relay 2RASR is energized; and relays 2RAHR, 2RBHR, D2DR, 2RTESR and 2RTEPSR, and time element device 2RTER are deenergized.

With track relay D2TR energized, signal D2 is retained in the 45° position by a circuit passing from terminal B of a suitable source of current, through contact 7 of relay D2TR, and the mechanism of signal D2 to terminal C of the same source of current.

Both a pick-up and a stick circuit are closed for locking relay 2RASR, the pick-up circuit passing from terminal B through contacts 8, 9 and 10 of relays D2DR, 2RAHR and 2RBHR, respectively, contact 2RTER—11, contact 12 of switch 1, contacts AD2TR—13 and D2TR—14, and the winding of relay 2RASR to terminal C. The stick circuit is the same as the pick-up circuit just traced as far as contact 10 of relay 2RBHR, and then passes through the front point of contact 19 of relay 2RASR, and the winding of relay 2RASR to terminal C.

I shall assume that the leverman desires to arrange for an eastbound train to move over the main line with switch 1 in its normal position. As shown in the drawing, switch 1 is in its normal position, and the leverman has therefore only to clear signal 2RA by energizing relay 2RAHR. Relay 2RAHR, upon becoming energized, completes a circuit for operating the arm of signal 2RA to a position for directing traffic movements over switch 1 in the normal position, this circuit passing from terminal B, through contact 24 of relay 2RAHR, and the mechanism of signal 2RA to terminal C. With relay 2RAHR energized, relay D2DR becomes energized by its circuit passing from terminal B through contact 25 of relay 2RAHR, and the winding of relay D2DR to terminal C. With relay D2DR energized, the arm of signal D2 will be operated to the 90° position by a circuit passing from terminal B, through contact 7 of relay D2TR, contact 26 of relay D2DR, and the mechanism of signal D2 to terminal C. Relays 2RAHR and D2DR, upon becoming energized, open the pick-up and stick circuits for relay 2RASR at contacts 9 and 8, respectively.

If now the eastbound train moves through section AD2T and enters section D2T, contact 7 of relay D2TR will open, thereby causing the arm of signal D2 to move to the stop position., If, when the train enters section 1T relay 2RAHR becomes deenergized due to the deenergization of relay 1TR, or if the leverman manually opens the circuit for relay 2RAHR, contact 24 of relay 2RAHR will open the circuit previously traced for signal 2RA, causing the arm of this signal to also move to the stop position.

With the train in section 1T, a second pick-up circuit is completed for relay 2RASR, which is the same as the pick-up circuit previously traced as far as contact 2RTER—11, and then passes through contact 1TR—18, and the winding of relay 2RASR to terminal C. When the train leaves section D2T, relay D2TR again becomes energized and completes the pick-up circuit first traced for relay 2RASR.

I shall now assume that the leverman again clears signal 2RA for an eastbound train to proceed on the main track over switch 1 in its normal position, and that after the train enters section AD2T, the leverman returns the arm of signal 2RA to the stop position by deenergizing relay 2RAHR, and thereby also deenergizes relay D2DR. With relay 2RASR remaining deenergized on account of its first pick-up circuit being open at contact AD2TR—13 and its second pick-up circuit being open at contact 1TR—18, and with relays 2RAHR and D2DR again deenergized, an energizing circuit for the time element device 2RTER is completed, passing from terminal B, through contacts 8, 9 and 10 of relays D2DR, 2RAHR and 2RBHR, respectively, back point of contact 19 of relay 2RASR, back point of contact 20 of relay 2RTESR, and the control element of device 2RTER to terminal C.

Contact 21 of device 2RTER, which is slow in picking up, completes a pick-up circuit for relay 2RTESR upon the lapse of a measured period of time, which is the same as the energizing circuit for device 2RTER as far as contact 10 of relay 2RBHR, and then passes through contact 21 of device 2RTER, and the winding of relay 2RTESR to terminal C. A stick circuit for relay 2RTESR is then closed, which is the same as the pick-up circuit for this relay as far as contact 10 of relay 2RBHR, and then passes through the back point of contact 19 of relay 2RASR, front point of contact 20 of relay 2RTESR, and the winding of relay 2RTESR to terminal C. With relay 2RTESR energized, the energizing circuit for device 2RTER is opened at the back point of contact 20 of relay 2RTESR. Contact 2RTER—11, which is slow to close, will complete a third pick-up circuit for relay 2RASR after the lapse of a further period of time, this circuit being the same as the second pick-up circuit previously traced as far as contact 2RTER—11, and then passing through contact 2RTESR—17, and the winding of relay 2RASR to terminal C.

It follows that, under the procedure just outlined, the locking release period is the time required for the third pick-up circuit for relay 2RASR to become closed after the leverman deenergizes relay 2RAHR, and includes both the pick-up time for device 2RTER, through its contact 21, and the release time for device 2RTER, through its contact 2RTER—11.

I shall next assume that there is a train on auxiliary track X, and that the leverman desires to permit this train to pass over switch 1 in the reverse position to the main line. With relay 2RASR energized, the leverman can supply current of reverse polarity to relay WR through contact 2RASR—6, causing the polar contact of relay WR to close in the reverse position, and thereby completing the reverse operating circuit for mechanism M for switch 1, this circuit passing from terminal B, through contact 27 of relay WR, contact 28 of relay WR closed in its right-hand or reverse position, and mechanism M to terminal C. With relay 2RTESR deenergized on account of relay 2RASR having become energized, the leverman will now energize relay 2RBHR by its circuit which includes contact 2RTESR—22. The arm of signal 2RB will then be operated to the position for directing traffic movements over switch 1 in the reverse position, by its circuit passing from terminal B, through contact 23 of relay 2RBHR, and the mechanism of signal 2RB to terminal C. With relay 2RBHR energized, the pick-up and stick circuits for relay 2RASR will be opened at contact 10 of relay

2RBHR, causing relay 2RASR to become deenergized.

I shall further assume that the leverman now decides to hold the train on track X, instead of permitting it to proceed past signal 2RB. He will therefore deenergize relay 2RBHR, thus causing the arm of signal 2RB to return to its stop position.

The energizing circuit previously traced for device 2RTER will now again close. Before contact 2RTER—11 opens, however, a pick-up circuit is completed for relay 2RTEPSR, passing from terminal B, through contacts 8, 9 and 10 of relays D2DR, 2RAHR and 2RBHR, respectively, contact 2RTER—11, contact 16 of switch 1, and the winding of relay 2RTEPSR to terminal C. Relay 2RTEPSR, upon becoming energized, completes its stick circuit which is the same as the pick-up circuit just traced as far as contact 10 of relay 2RBHR, and then passes through contact 15 of relay 2RTEPSR, contact 16 of switch 1, and the winding of relay 2RTEPSR to terminal C.

As soon as relay 2RTESR becomes energized by its pick-up circuit previously traced, a fourth pick-up circuit will now be completed for relay 2RASR, which is the same as the pick-up circuits previously traced for this relay as far as contact 10 of relay 2RBHR, and then passes through contact 15 of relay 2RTEPSR, contact 2RTESR—17, and the winding of relay 2RASR to terminal C. Relay 2RASR, therefore, now becomes energized after the closing period of contact 21 only, instead of having to wait through both the closing period of contact 21 and the subsequent closing period of contact 2RTER—11 as in the case of the third pick-up circuit traced for relay 2RASR.

I shall now assume that all parts of the apparatus are again returned to the normal condition, and that the leverman again reverses switch 1 and clears signal 2RB. I shall further assume that the leverman then again returns the arm of signal 2RB to the stop position before a train passes this signal, and thereby again starts the operation of time element device 2RTER. I shall also further assume that the leverman then again clears the arm of signal 2RB and that again, before a train passes this signal, he returns the arm of signal 2RB to the stop position.

I shall also assume that contact 2RTER—11 is already open when the leverman returns the arm of signal 2RB to the stop position the second time, because of his having returned this signal to stop the first time. Relay 2RTEPSR will therefore not now be energized, on account of contact 2RTER—11 being open. The energizing circuit for device 2RTER will, however, now be closed, causing this device to close its contact 21 and energize relay 2RTESR. On account of device 2RTER being now energized before being returned to the normal condition following its previous energization, the time required for closing its contact 21 will be less than the time usually required for this contact to close. However, on account of relay 2RTEPSR being deenergized, relay 2RASR cannot now become energized until contact 2RTER—11 has again closed and completed the third pick-up circuit for relay 2RASR, whereas in the usual operation when the leverman returns the arm of signal 2RB to the stop position before a train passes this signal, the release period for relay 2RASR includes only the pick-up time of contact 21 of device 2RTER and the pick-up time of relay 2RTESR.

It follows that the locking relase period, when the leverman returns the arm of signal 2RB to the stop position and then again clears the signal and almost immediately again returns the arm of signal 2RB to the stop position, includes part of the closing period for contact 21 of device 2RTER when device 2RTER becomes energized, and also includes the closing period for contact 2RTER—11 when device 2RTER becomes deenergized.

I shall next assume that the leverman again twice clears the arm of signal 2RB and then returns it to the stop position as before, but that contact 20 of relay 2RTESR becomes closed immediately at its front point, as well as contact 2RTER—11 being already open, when the leverman returns the arm of signal 2RB to the stop position the second time. With relay 2RTESR energized, device 2RTER is deenergized, and hence the third pick-up circuit for relay 2RASR will now become closed after only the time required for contact 2RTER—11 to become closed.

From the foregoing description and the accompanying drawing, it follows that in apparatus embodying my invention, I have employed means for providing a short release period for the switch locking for a low speed route and for providing a longer release period for a higher speed route. In the means which I have employed, if for some reason the thermal time element device is already partially heated when it becomes energized for effecting energization of relay 2RASR for a low speed route, the heating of the device must first be completed and then the device must be cooled before the locking for the low speed route is released.

Although I have herein shown and described only one form 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 combination, a stretch of railway track including a switch, a signal for governing traffic movements over said switch when said switch is in the normal position, a second signal for governing traffic movements over said switch when said switch is in the reverse position, an approach locking relay, an auxiliary stick relay, a second auxiliary stick relay, a time element device, first and second signal control means controlled by a back contact of said first auxiliary stick relay for clearing said first and second signals respectively, a pick-up circuit for said approach locking relay controlled by said time element device in the deenergized condition and by said switch in the normal position and closed only if said stretch of track is unoccupied within a given distance in the rear of said first signal, a second pick-up circuit for said approach locking relay controlled by said time element device in the deenergized condition and by a front contact of said first auxiliary stick relay, a third pick-up circuit for said approach locking relay controlled by front contacts of said first and second auxiliary stick relays, a pick-up circuit for said second auxiliary stick relay controlled by said time element device in the deenergized condition and by said switch in the reverse position, a stick circuit for said second auxiliary stick relay controlled by said switch in the reverse position, an energizing circuit for said time element device controlled by back contacts of said approach

locking and first auxiliary stick relays, a pick-up circuit for said first auxiliary stick relay controlled by said time element device in the energized condition, a stick circuit for said first auxiliary stick relay controlled by a back contact of said approach locking relay, means controlled by said first and second signal control means upon becoming energized for opening all the pick-up and stick circuits for said first and second auxiliary stick relays and for said approach locking relay and for opening the energizing circuit for said time element device, and means controlled by a front contact of said approach locking relay for controlling operation of said switch between its normal and reverse positions.

2. In combination, a stretch of railway track including a switch, a signal for governing traffic movements over said switch when said switch is in the normal position, a second signal for governing traffic movements over said switch when said switch is in the reverse position, an approach locking relay, an auxiliary stick relay, a time element device, a first time contact which becomes opened by said time element device when said time element device becomes energized and which is slow to close when said time element device becomes deenergized, a second time contact which is slow to be closed by said time element device when said time element device becomes energized and which opens in response to deenergization of said time element device, first and second signal control means controlled by a back contact of said auxiliary stick relay for clearing said first and second signals respectively, a pick-up circuit for said approach locking relay controlled by said first time contact and by said switch in the normal position and closed only if said stretch of track is unoccupied within a given distance in the rear of said first signal, a second pick-up circuit for said approach locking relay controlled by said first time contact and by a front contact of said auxiliary stick relay, a circuit for energizing said time element device controlled by back contacts of said approach locking and auxiliary stick relays, a pick-up circuit for said auxiliary stick relay controlled by said second time contact, a stick circuit for said auxiliary stick relay controlled by a back contact of said approach locking relay, means controlled by said first and second signal control means upon becoming energized for opening all the pick-up and stick circuits for said auxiliary stick relay and said approach locking relay and for opening the energizing circuit for said time element device, and means controlled by a front contact of said approach locking relay for controlling operation of said switch between its normal and reverse positions.

3. In combination, a stretch of railway track including a switch, a first and a second signal for governing traffic movements over said switch in its normal and reverse positions respectively, a locking stick relay, a first and a second auxiliary stick relay, time element means, a first time contact opened by said time element means upon energization of said time element means and which is slow to close upon deenergization of said time element means, a second time contact of said time element means which is slow to close upon energization of said time element means, a pick-up circuit for said locking stick relay controlled by said first time contact and by a front contact of said first auxiliary stick relay, a stick circuit for said locking stick relay, a circuit for energizing said time element means controlled by back contacts of said locking and first auxiliary stick relays, a pick-up circuit for said first auxiliary stick relay controlled by said second time contact, a stick circuit for said first auxiliary stick relay controlled by a back contact of said locking stick relay, a pick-up circuit for said second auxiliary stick relay controlled by said first time contact and by said switch in one of its extreme positions, a stick circuit for said second auxiliary stick relay controlled by said switch in said one extreme position, a second pick-up circuit for said locking stick relay controlled by front contacts of said first and second auxiliary stick relays, means associated with said signals for opening the pick-up and stick circuits for said locking and auxiliary stick relays and the energizing circuit for said time element means if either of said signals is controlled to direct a traffic movement over said switch, and means controlled by a front contact of said locking stick relay for effecting operations of said switch to its normal and reverse positions.

4. In combination, a stretch of railway track including a switch, a signal for governing traffic movements over said switch, a locking relay, a first and a second auxiliary stick relay, time element means, a first time contact opened by said time element means in response to energization of said time element means and which is slow to close upon deenergization of said time element means, a second time contact controlled by said time element means and which is slow to close upon energization of said time element means, a pick-up circuit for said locking relay controlled by said first time contact and by a front contact of said first auxiliary stick relay, a stick circuit for said locking relay, a second pick-up circuit for said locking relay controlled by front contacts of said first and second auxiliary stick relays, a circuit for energizing said time element means controlled by back contacts of said locking and first auxiliary stick relays, a pick-up circuit for said first auxiliary stick relay controlled by said second time contact, a stick circuit for said first auxiliary stick relay controlled by a back contact of said locking relay, a pick-up circuit for said second auxiliary stick relay controlled by said first time contact, a stick circuit for said second auxiliary stick relay, means associated with said signal for opening the pick-up and stick circuits for said locking and auxiliary stick relays and the energizing circuit for said time element means if said signal is controlled to direct a traffic movement over said switch, and means controlled by said locking relay for preventing operation of said switch unless said locking relay is energized.

5. In combination, a stretch of railway track including a switch, a signal for governing traffic movement over said switch, a locking relay, an auxiliary stick relay, time element means, a first time contact opened by said time element means in response to energization of said time element means and which is slow to close upon deenergization of said time element means, a second time contact controlled by said time element means which is slow to close upon energization of said time element means, a normally open release contact, means controlled by said second time contact for closing said release contact, means controlled by a back contact of said locking relay for subsequently maintaining said release contact closed, a pick-up circuit for said locking relay controlled by said first time contact and by said release contact, a second pick-up circuit for said locking relay controlled by said release con-

tact and by a front contact of said auxiliary stick relay, a stick circuit for said locking relay, a circuit for energizing said time element means controlled by a back contact of said locking relay, a pick-up circuit for said auxiliary stick relay controlled by said first time contact, a stick circuit for said auxiliary stick relay, means associated with said signal for opening the pick-up and stick circuits for said locking and auxiliary stick relays and the energizing circuit for said time element means if said signal is controlled to direct a traffic movement over said switch, and means controlled by said locking relay for preventing operation of said switch unless said locking relay is energized.

6. In combination, a stretch of railway track including a switch, a first and a second signal for governing traffic movements over said switch in the normal and reverse positions respectively, a locking relay, an auxiliary stick relay, time element means, a first time contact opened by said time element means in response to energization of said time element means and which is slow to close upon deenergization of said time element means, a second time contact controlled by said time element means which is slow to close upon energization of said time element means, a pick-up circuit for said locking relay controlled by said first and second time contacts, a second pick-up circuit for said locking relay controlled by said second time contact and by a front contact of said auxiliary stick relay, a stick circuit for said locking relay, a circuit for energizing said time element means controlled by a back contact of said locking relay, a pick-up circuit for said auxiliary stick relay controlled by said first time contact and by said switch in one of its extreme positions, a stick circuit for said auxiliary stick relay, means associated with said signals for opening the pick-up and stick circuits for said locking and auxiliary stick relays and the energizing circuit for said time element means in response to the control of either of said signals to direct a traffic movement over said switch, and means controlled by said locking relay for preventing operation of said switch unless said locking relay is energized.

EARL M. ALLEN.