Sept. 18, 1945. E. M. ALLEN 2,385,179

RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed Nov. 11, 1942 2 Sheets-Sheet 1

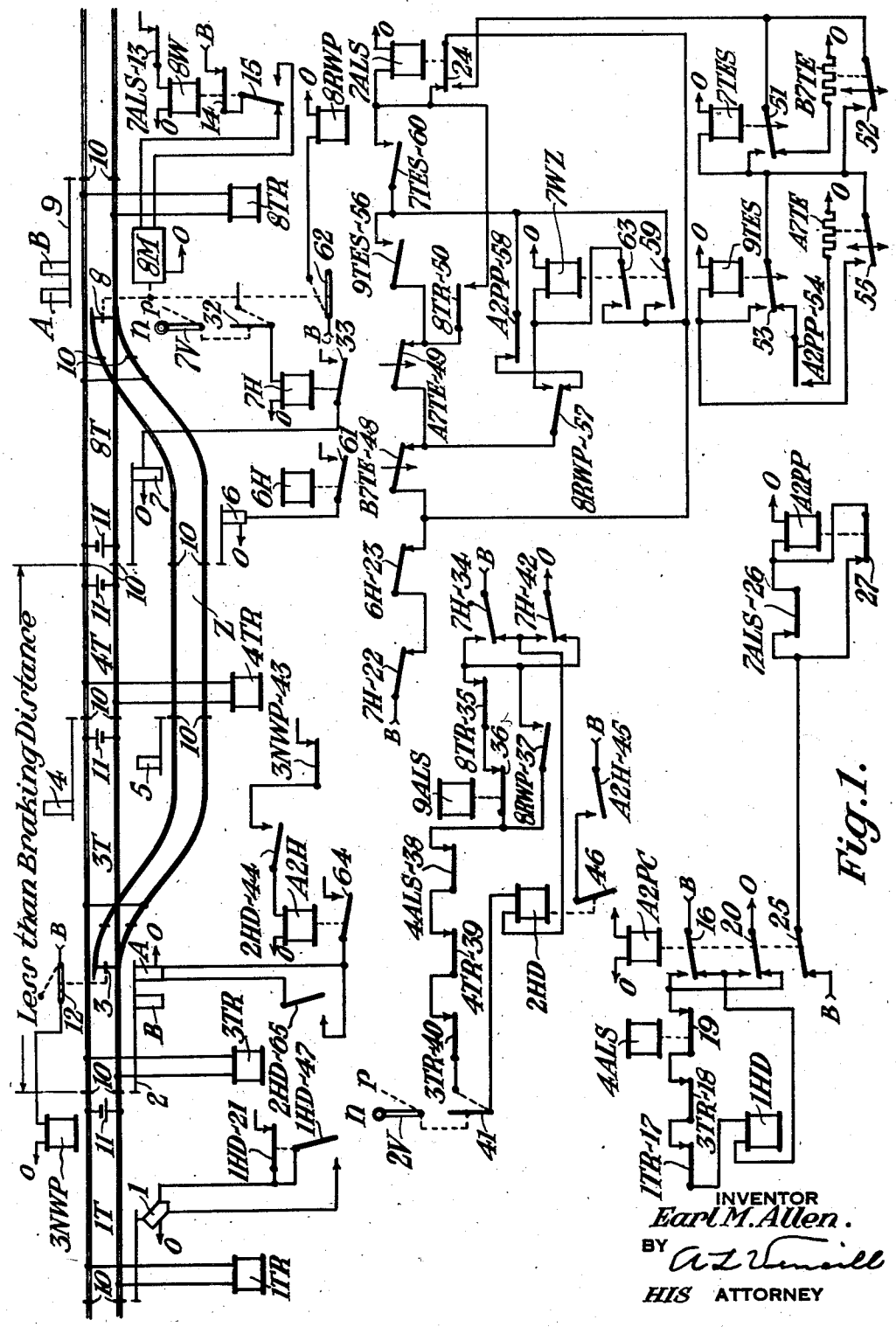


Fig. 1.

INVENTOR
Earl M. Allen.
BY A. L. Merrill
HIS ATTORNEY

Sept. 18, 1945. E. M. ALLEN 2,385,179

RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed Nov. 11, 1942 2 Sheets-Sheet 2

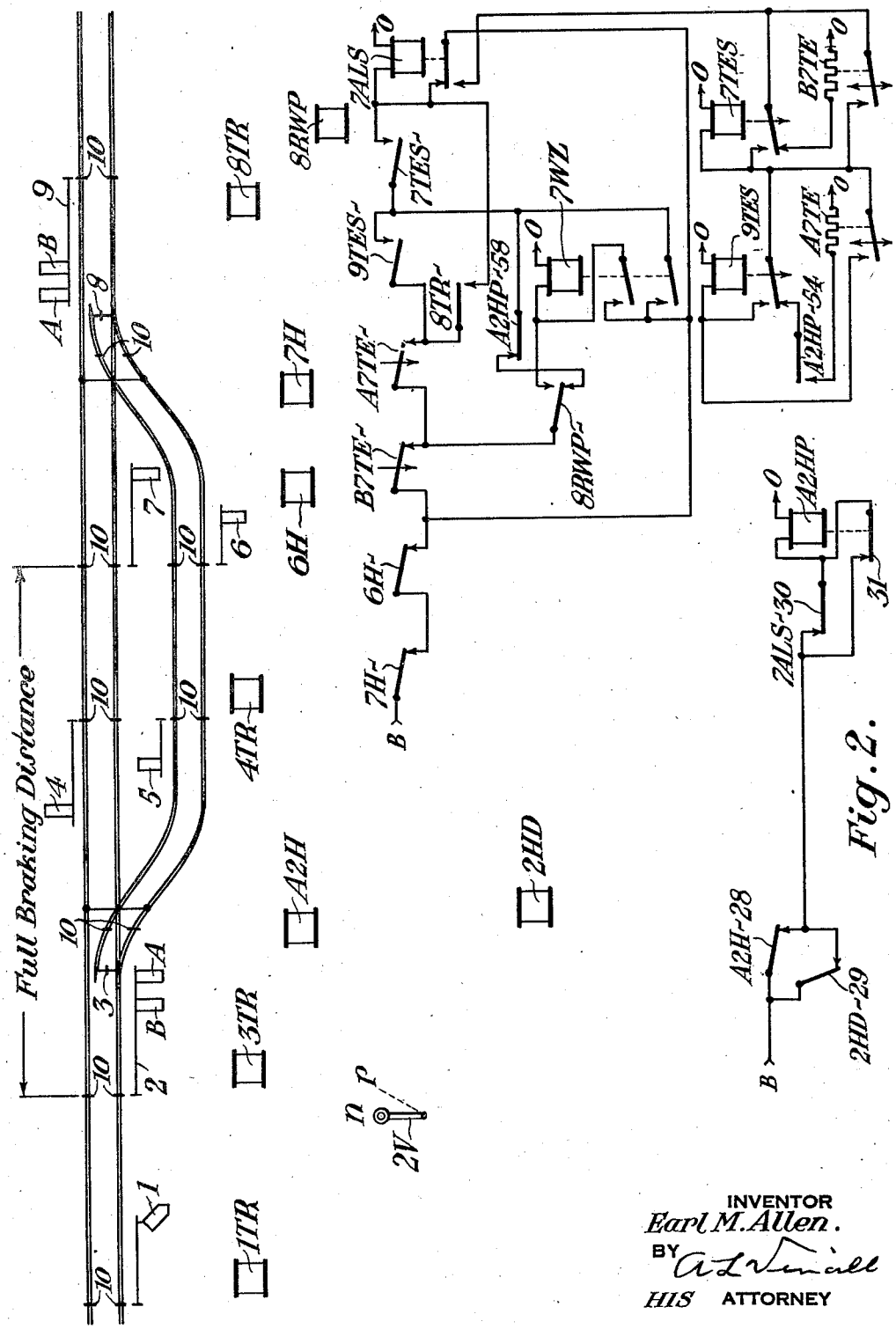


Fig. 2.

INVENTOR
Earl M. Allen.
BY A. L. Vinall
HIS ATTORNEY

Patented Sept. 18, 1945 2,385,179

UNITED STATES PATENT OFFICE

2,385,179

RAILWAY TRAFFIC CONTROLLING APPARATUS

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

Application November 11, 1942, Serial No. 465,215

10 Claims. (Cl. 246—161)

My invention relates to railway traffic controlling apparatus, and particularly to apparatus of the type involving a railway track switch, and signals governing traffic movements over the switch. More specifically, my invention relates to the release of approach or time locking for a railway track switch.

Means have previously been devised for providing a short release period for the locking for low speed traffic movements over a track switch in the reverse position, while a relatively long release period is provided for the locking for high speed traffic movements over the track switch in the normal or main line position. If a distant signal for a home signal in an interlocking plant is not operated to display the proceed indication, but is controlled to display a stop or a caution indication while its home signal is controlled to display some indication other than stop, such a long release period is not necessary, and is therefore undesirable since it unduly delays operations of the interlocking apparatus.

One feature of my invention is the provision of a medium release period when a distant signal is controlled to display a caution or a stop indication while its home signal is controlled to display some indication other than stop. This medium release period is shorter than the long release period which is provided for high speed traffic movements, but is longer than the short release period which is provided for low speed traffic movements.

I shall describe a few 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 two distant signals are provided for a given home signal because there is less than braking distance between the home signal and its first distant signal; and Fig. 2 is a diagrammatic view showing a modified form of the apparatus of Fig. 1, in which there is full braking distance between a home signal and its distant signal, and hence only the one distant signal is necessary for the home signal.

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

Referring first to Fig. 1, there is less than braking distance between a home signal 7, which governs traffic movements in a given direction, which I shall assume is the eastbound direction, over a switch 8 of an interlocking plant, and the first eastbound signal in the rear of signal 7 which, as shown, is also a home signal 2 which governs traffic movements over a switch 3. In addition to arm A of signal 2, which serves as the first distant signal for home signal 7, a second distant signal 1 is provided for signal 7. Signal 1 and arm A of signal 2 are both constructed so that they are capable of displaying the proceed, caution, and stop indications. A dwarf signal 6 governs traffic movements over switch 8 in the reverse position, from a side track Z. Signals 4, 5 and 9 corresponding to signals 7, 6 and 2, respectively, govern traffic movements in the opposite or westbound direction. The various signals shown in the drawings may be of any suitable design such, for example, as the semaphore or the searchlight type.

The rails of the stretch of track shown in the drawings are divided by insulated joints 10 to form track sections 1T, 3T, 4T and 8T. Each of these track sections is provided with a track circuit including a source of current such as a battery 11 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 its section, connected across the rails adjacent the opposite end of the section.

The contacts operated by the various relays, time element devices, levers and track switches 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 comprises the reference character for the relay or other device by which the associated contact is operated. For example, contact 1HD—21 shown in the upper left-hand portion of Fig. 1 of the drawings, in the operating circuits for signal 1, is identified by the number 21 which is separated by a dash from the prefix 1HD which is the reference character for relay 1HD by which this contact is operated.

Signals 6 and 7 are controlled by home relays 6H and 7H, respectively, only a portion of the control circuit for relay 7H being shown, including a contact 32 of a signal lever 7V which has a normal position *n* and a reverse position *r*. Relay 6H may be similarly controlled by a lever 6V which is not shown in the drawings.

Arm A of signal 2 is controlled by a neutral relay A2H and by a polarized relay 2HD. Relay 2HD is controlled, in part, by a contact 41 closed in the *r* position of a signal lever 2V having a normal position *n* and a reverse position *r*. The po-

larity of energization of relay 2HD is controlled by contacts 7H—34 and 7H—42 of relay 7H, so that relay 2HD is energized in a normal direction only if relay 7H is energized.

Signal 1 is controlled by a polarized relay 1HD in such a manner that signal 1 will indicate proceed only if arm A of signal 2 indicates proceed. A repeater relay A2PC which controls the polarity of energization of relay 1HD is controlled by relays A2H and 2HD in such a manner as to be energized only if arm A of signal 2 is controlled to indicate proceed.

Switch 8 is provided with an operating mechanism 8M which, as here shown, is controlled by a polarized switch control relay 8W. A normal switch indication relay 3NWP is so controlled by a contact 12 operated by switch 3 as to be energized only when switch 3 occupies the normal position. A reverse switch indication relay 8RWP is so controlled by a contact 62 operated by switch 8 as to be energized only when switch 8 occupies the reverse position.

An approach or time locking stick relay, here shown as a time locking stick relay designated by the reference character 7ALS, controls, in part, the switch control relay 8W by means of a front contact 7ALS—13, so that relay 8W cannot be energized for effecting operation of switch 8 unless relay 7ALS is energized.

Only a portion of the normal and reverse control circuits for relay 8W is shown in the drawings. 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 the interlocking tower.

Energization of locking stick relay 7ALS is controlled, in part, by time element means here shown as two thermal devices B7TE and A7TE, by two slow release stick relays 7TES and 9TES designated first and third auxiliary stick relays, respectively, by a second auxiliary or short time release stick relay 7WZ, and by a medium time release stick relay A2PP.

Referring now to Fig. 2, a medium time release stick relay A2HP is here shown controlled by relays A2H and 2HD instead of by relay A2PC as is shown for relay A2PP in Fig. 1. Relay A2HP here controls the second time element device A7TE and a medium time release circuit for relay 7ALS similarly to the manner shown for relay A2PP in Fig. 1. Other parts of the apparatus of Fig. 2 are controlled as in Fig. 1.

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

As shown in the drawings, all parts are in the normal condition, that is, switches 3 and 8 are in their normal positions; signal 1 is indicating caution, and all other signals shown in the drawings are indicating stop; normal switch indication relay 3NWP is energized; switch control relay 8W is energized; switch mechanism 8M is retained in its normal position by a circuit controlled by relay 8W; relay 1HD is energized by current of reverse polarity, and hence signal 1 is indicating caution; stick relays 7ALS, A2PP and A2HP are energized; and relays 8RWP, 6H, 7H, A2H, 2HD, A2PC, 7WZ, 7TES, 9TES, and time element devices A7TE and B7TE are deenergized.

With switch 3 in the normal position, normal switch indication relay 3NWP is energized by a circuit passing from terminal B of a suitable source of current, through contact 12 of switch 3 in the normal position, and the winding of relay 3NWP to terminal O of the same source of current.

Relay 8W is shown energized by current of normal polarity by a circuit, only a portion of which is shown, including contact 7ALS—13. The mechanism 8M of switch 8 is retained in the normal position by a circuit passing from terminal B, through contacts 14 and 15 of relay 8W, and mechanism 8M to terminal O.

Relay 1HD is energized by current of reverse polarity in a circuit passing from terminal B, through the back point of contact 16 of relay A2PC, the winding of relay 1HD, contacts 1TR—17 and 3TR—18, contact 19 of a relay 4ALS which may be controlled similarly to relay 7ALS, and the back point of contact 20 of relay A2PC to terminal O. With relay 1HD energized by current of reverse polarity, signal 1 is retained in the caution position by a circuit, only a portion of which is shown, including contact 1HD—21.

Relay 7ALS is energized by a stick circuit passing from terminal B, through contacts 7H—22 and 6H—23, front point of contact 24 of relay 7ALS, and the winding of relay 7ALS to terminal O.

With relay 7ALS energized, a pick-up circuit is closed for relay A2PP passing from terminal B, through contact 25 of relay A2PC, contact 7ALS—26, and the winding of relay A2PP to terminal O. A stick circuit for relay A2PP is also closed, which is the same as the pick-up circuit just traced, except that it includes contact 27 of relay A2PP instead of contact 7ALS—26.

Relay A2HP, shown in Fig. 2, is energized by pick-up and stick circuits including contacts A2H—28 and 2HD—29 in multiple. The pick-up circuits also include contact 7ALS—30, and the stick circuits include contact 31 of relay A2HP.

I shall assume that with switches 3 and 8 in the normal position, as shown, a leverman arranges for an eastbound high speed traffic movement over the main line by placing signal levers 2V and 7V in their *r* positions in the scheme shown in Fig. 1.

With lever 7V in its *r* position, its contact 32 will be closed in the portion of the circuit shown for energizing relay 7H. The arm of signal 7 will therefore be controlled to indicate caution by a circuit, a portion of which is shown, including contact 33 of relay 7H. By means of a distant relay, not shown, the arm of signal 7 may then be controlled to indicate proceed.

With lever 2V in the *r* position, and with relay 7H energized, a circuit will be completed for energizing relay 2HD by current of normal polarity, passing from terminal B, through front point of contact 7H—34, contact 8TR—35, contact 36 of relay 9ALS, contacts 4ALS—38, 4TR—39 and 3TR—40, contact 41 of lever 2V closed in the *r* position, winding of relay 2HD, and the front point of contact 7H—42 to terminal O. With relay 2HD energized, a circuit, only a portion of which is shown, will be completed for energizing relay A2H, including contact 3NWP—43 and contact 2HD—44, and the winding of relay A2H to terminal O. With relay A2H energized, and with relay 2HD energized by current of normal polarity, arm A of signal 2 will be operated to the proceed position by a circuit including contact 64 of relay A2H, contact 2HD—65, and the mechanism of arm A of signal 2.

With relay A2H energized, and with relay 2HD energized by current of normal polarity, a circuit will also be completed for energizing the repeater relay A2PC, passing from terminal B, through

contact A2H—45, contact 46 of relay 2HD, and the winding of relay A2PC to terminal O.

With relay A2PC energized, the circuit previously traced for relay 1HD will be pole changed by contacts 16 and 20 of relay A2PC to energize relay 1HD by current of normal polarity. The arm of signal 1 will therefore be operated to the proceed position by a circuit including contact 1HD—21, contact 1HD—47, and the mechanism of signal 1 to terminal O.

With relay A2PC energized, the pick-up and stick circuits previously traced for relay A2PP will be opened at contact 25 of relay A2PC, causing relay A2PP to be deenergized.

Relay 7H, upon becoming energized, opens its contact 7H—22, thereby breaking the stick circuit previously traced for relay 7ALS and causing relay 7ALS to become deenergized.

I shall now assume that an eastbound train moves over the stretch of track shown, and passes signal 7. If now relay 7H becomes deenergized, either by a contact of relay 8TR, not shown, in the circuit for relay 7H, or by the leverman returning lever 7V to the *n* position and thereby opening contact 32 in the circuit for relay 7H, a pick-up circuit will be completed for relay 7ALS, passing from terminal B, through contacts 7H—22, 6H—23, B7TE—48, A7TE—49, 8TR—50, and the winding of relay 7ALS to terminal O. With relay 7ALS thus energized, relay 8W can become energized by current of reverse polarity for effecting operation of switch 8 to the reverse position, if desired, after the train leaves section 8T.

I shall assume that all parts of the apparatus are returned to the normal condition after the eastbound train passes over the stretch of track shown, and that the leverman again arranges for a high speed traffic movement by placing signal levers 2V and 7V in the *r* position for clearing signal 7 and arm A of signal 2. I shall further assume that the leverman returns the arm of signal 7 to the stop position before the eastbound train passes this signal.

With contact 8TR—50 open, relay 7ALS will remain deenergized, but a circuit will be completed for energizing the first time element device B7TE, this circuit passing from terminal B, through contacts 7H—22 and 6H—23, back point of contact 24 of relay 7ALS, back point of contact 51 of relay 7TES, and time element device B7TE to terminal O. Upon the lapse of a measured period of time after the completion of this circuit, contact 52 of device B7TE will complete a pick-up circuit for energizing relay 7TES, which is the same as the circuit previously traced for time element device B7TE except that it includes contact 52 of device B7TE instead of the back point of contact 51 of relay 7TES. Relay 7TES, upon becoming energized, completes its stick circuit which is the same as its pick-up circuit just traced except including the front point of contact 51 of relay 7TES instead of contact 52 of time element device B7TE. Relay 7TES, upon opening the back point of its contact 51, deenergizes time element device B7TE which then starts to cool.

With relay 7TES energized, a circuit is completed for energizing the second time element device A7TE, which is the same as the stick circuit for relay 7TES as far as the front point of contact 51 of relay 7TES, and then passes through the back point of contact 53 of relay 9TES, contact A2PP—54, and time element device A7TE to terminal O. Upon the lapse of a measured period of time after the completion of this circuit, contact 55 of time element device A7TE will be closed, completing a pick-up circuit for relay 9TES which is the same as the stick circuit for relay 7TES as far as the front point of contact 51 of relay 7TES, and then passes through contact 55 of time element device A7TE, and the winding of relay 9TES to terminal O. Relay 9TES, upon becoming energized, completes its stick circuit which is the same as the pick-up circuit just described except including the front point of contact 53 of relay 9TES instead of contact 55 of time element device A7TE. Relay 9TES, upon becoming energized, opens, at the back point of its contact 53, the circuit previously traced for time element device A7TE, and thus causes device A7TE to start to cool.

When time element device A7TE has cooled sufficiently, a second pick-up circuit will be completed for relay 7ALS passing from terminal B, through contacts 7H—22, 6H—23, B7TE—48, A7TE—49, 9TES—56, and 7TES—60, and the winding of relay 7ALS to terminal O.

I shall next assume that all parts of the apparatus are again returned to the normal condition and that the leverman places lever 7V in the *r* position for controlling signal 7 to display the proceed or caution indication depending on whether its distant control relay, which is not shown, is energized or deenergized, but that before he clears arm A of signal 2, he decides to set up a different route. He therefore does not move lever 2V to its *r* position, and hence relays 2HD and A2H do not become energized. Relay A2PP therefore remains energized by its stick circuit previously traced.

In order to arrange a different route, the leverman will restore lever 7V to the *n* position, thereby deenergizing relay 7H and completing the energizing circuit previously traced for time element device B7TE. Relay 7TES will become energized as previously described, but time element device A7TE will not become energized because contact A2PP—54 will now be open.

As soon as time element device B7TE has cooled sufficiently after the opening of contact 51 of relay 7TES at its back point, a third pick-up circuit will be completed for energizing relay 7ALS, constituting a medium time release circuit. This circuit passes from terminal B, through contacts 7H—22, 6H—23, B7TE—48, back point of contact 8RWP—57, contacts A2PP—58 and 7TES—60, and the winding of relay 7ALS to terminal O.

I shall next assume that all parts of the apparatus are again returned to their normal condition, and that the leverman decides to direct a train to move from siding Z to the main line over switch 8 in the reverse position. He will therefore energize relay 8W by current of reverse polarity which will then complete a reverse operating circuit for switch operating mechanism 8M passing from terminal B, through contact 14 of relay 8W, contact 15 of relay 8W in the reverse position, and mechanism 8M to terminal O. The leverman will then energize relay 6H by operating its lever, corresponding to lever 7V shown for signal 7, to the *r* position. Signal 6 will then be cleared by its circuit including contact 61 of relay 6H. Relay 6H, upon becoming energized, will deenergize relay 7ALS by opening its contact 6H—23.

I shall further assume that before the train passes signal 6, the leverman decides to arrange a different route. He will therefore return signal

6 to stop by deenergizing relay 6H. With switch 8 in the reverse position, reverse switch indication relay 8RWP will be energized by its circuit passing from terminal B, through contact 62 of switch 8, and the winding of relay 8RWP to terminal O.

When the leverman deenergizes relay 6H, a pickup circuit will therefore be completed for energizing the short time release stick relay 7WZ, this circuit passing from terminal B, through contacts 7H—22, 6H—23, and B7TE—48, front point of contact 8RWP—57, and the winding of relay 7WZ to terminal O. Relay 7WZ, upon thus becoming energized, will complete its stick circuit passing from terminal B, through contacts 7H—22 and 6H—23, contact 63 of relay 7WZ, and the winding of relay 7WZ to terminal O. With relay 6H deenergized, the energizing circuit for time element device B7TE will be completed as previously traced.

As soon as relay 7TES becomes energized, a fourth or short time release circuit will be completed for relay 7ALS passing from terminal B, through contacts 7H—22 and 6H—23, contact 59 of relay 7WZ, contact 7TES—60, and the winding of relay 7ALS to terminal O.

I shall now assume that all parts of the apparatus are again returned to the normal condition, and that the leverman again clears signal 6 for a traffic movement from siding Z over switch 8 in its reverse position, and that he again returns signal 6 to stop before a train passes this signal. I shall further assume that he then again clears signal 6 but again quickly returns it to the stop indication. By returning signal 6 to stop the first time, the heating of time element device B7TE has been begun, and then the clearing of signal 6 deenergizes relay 7WZ which cannot now again pick up because back contact B7TE—48 is open due to the heating of time element device B7TE when signal 6 was first returned to the stop indication.

Therefore, when the leverman returns signal 6 to the stop indication the second time, the circuit will again be closed for energizing time element device B7TE and continuing it to the condition in which its contact 52 closes the pick-up circuit for relay 7TES. Device B7TE will then be deenergized by the opening of the back point of contact 51 of relay 7TES. Upon the lapse of a measured period of time, contact B7TE—48 will complete the pick-up circuit previously traced for relay 7WZ. The short time release circuit previously traced for relay 7ALS will then again be completed.

It follows that, if the leverman clears signal 6 for a low speed traffic movement and then puts it to stop, and then again clears signal 6 and again returns it to the stop indication after time element device B7TE has started to heat, but before a train has passed signal 6, protection is provided against a reduction of the time of energization of relay 7ALS by the short release circuit.

In the form of aparatus shown in Fig. 2, the circuits for relay A2HP are controlled directly by contacts of relays A2H and 2HD instead of by relay A2PC which is in turn controlled by these two relays, as shown in Fig. 1. Relay A2HP of Fig. 2 is therefore energized, similarly to relay A2PP of Fig. 1, only if signal A2 is controlled to indicate stop or caution, causing contact A2H—28 or 2HD—29 in the circuits for relay A2HP to be closed, and becomes deenergized if arm A of signal 2 is controlled to indicate proceed because then, relay A2H will be energized and relay 2HD will be energized by current of normal polarity causing its contact 2HD—29 in the circuits for relay A2HP to be opened. The operation of the form of apparatus shown in Fig. 2 for providing a medium time release of the locking will, therefore, be understood in view of the foregoing description of the operation of the apparatus of Fig. 1 for providing medium time release of the locking.

From the foregoing description and the accompanying drawings, it follows that, in apparatus embodying my invention, I have devised means for providing three different time periods for releasing approach or time locking in a railway interlocking control system. A long release period is provided if a distant signal is controlled to indicate proceed while its home signal is controlled to display an indication other than stop; a medium release period is provided if a distant signal is controlled to indicate other than proceed while its home signal is controlled to display an indication other than stop; and a short release period is provided if a low speed route is arranged for a traffic movement over a switch in the reverse position. Two time element devices and two slow release stick relays controlled by the time element devices, and also a short time release stick relay and a medium release stick relay are included in the apparatus for accomplishing these results.

Although I have herein shown and described only a few forms of railway traffic controlling 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 release means for energizing an approach or time locking stick relay in a railway interlocking control system, including a time element device, including a first slow release auxiliary stick relay and a second auxiliary stick relay, including means for energizing said second auxiliary stick relay if said time element device is deenergized and if a given track switch is in the reverse position, including an energizing circuit for said time element device controlled by back contacts of said locking stick relay and said first auxiliary stick relay, including means for energizing said first auxiliary stick relay if said locking stick relay is deenergized and if said time element device is energized, the combination comprising, a second time element device slow to pick up and slow to release, a third auxiliary stick relay slow to release, an energizing circuit for said second time element device controlled by a front contact of said first auxiliary stick relay and by a back contact of said third auxiliary stick relay, a pick-up and a stick circuit for said third auxiliary stick relay both controlled by a front contact of said first auxiliary stick relay and the pick-up circuit controlled also by a front contact of said second time element device, a pick-up circuit for said locking stick relay controlled by back contacts of both said time element devices and by front contacts of said first and third auxiliary stick relays, and a second pick-up circuit for said locking stick relay controlled by front contacts of said first and second auxiliary stick relays.

2. Release means for energizing an approach or time locking stick relay in a railway interlocking control system including a signal for governing low speed traffic movements over a given track switch and including a second signal for at times

governing medium speed traffic movements and for at other times governing high speed traffic movements over said switch, comprising in combination, a circuit becoming closed for energizing said stick relay upon the lapse of a short period of time after said first signal becomes controlled to indicate stop after having been cleared to direct a low speed traffic movement over said switch, a second circuit controlled to become closed only if said first circuit is open for energizing said stick relay upon the lapse of a medium period of time after said second signal becomes controlled to indicate stop after having been cleared for directing a medium speed traffic movement over said switch, and a third circuit controlled to become closed only if said second circuit is open for energizing said stick relay upon the lapse of a long period of time after said second signal becomes controlled to indicate stop after having been cleared for directing a high speed traffic movement over said switch.

3. Means for releasing approach or time locking apparatus in a railway interlocking control system including a signal for governing a train moving at low speed toward a given section of track and including a second signal for at times governing a train moving at medium speed and for at other times governing a train moving at high speed toward said given section of track, comprising in combiation, means for releasing said locking apparatus upon the lapse of a short period of time after said first signal becomes controlled to indicate stop after having been cleared to direct a train moving at low speed toward said given section of track, other means effective only if said first means is ineffective for releasing said locking apparatus upon the lapse of a medium period of time after said second signal becomes controlled to indicate stop after having been cleared to direct a train moving at medium speed toward said given section of track, and still other means effective only if said other means is ineffective for releasing said locking apparatus upon the lapse of a long period of time after said second signal becomes controlled to indicate stop after having been cleared to direct a train moving at high speed toward said given section of track.

4. In release means for energizing an approach or time locking stick relay in a railway interlocking control system, in which a time element device is controlled by back contacts of the locking stick relay and of a slow release auxiliary stick relay, in which said auxiliary stick relay is controlled by a front contact of said time element device and by a back contact of said locking stick relay, in which a second auxiliary stick relay has a pick-up circuit controlled by a back contact of said time element device if a given track switch is in the reverse position and has a stick circuit which then remains closed as long as an associated signal is controlled to indicate stop, the combination comprising, a second time element device slow to pick up and slow to release, a third slow release auxiliary stick relay, an energizing circuit for said second time element device controlled by a front contact of said first auxiliary stick relay and by a back contact of said third auxiliary stick relay, a pick-up and a stick circuit for said third auxiliary stick relay controlled by front contacts of said second time element device and of said first auxiliary stick relay respectively, a pick-up circuit for said locking stick relay controlled by back contacts of both said time element devices and by front contacts of said first and third auxiliary stick relays, a second pick-up circuit for said locking stick relay controlled by front contacts of said first and second auxiliary stick relays, and a third pick-up circuit for said locking stick relay controlled by a back contact of said first time element device and by a front contact of said first auxiliary stick relay.

5. In release means for energizing an approach or time locking stick relay in a railway interlocking control system, in which a time element device is controlled by back contacts of the locking stick relay and of a slow release auxiliary stick relay, in which said auxiliary stick relay is controlled by a front contact of said time element device and by a back contact of said locking stick relay, in which a second auxiliary stick relay has a pick-up circuit controlled by a back contact of said time element device if a given track switch is in the reverse position and has a stick circuit which then remains closed as long as an associated signal is controlled to indicate stop, the combination comprising, a second time element device slow to pick up and slow to release, a third slow release auxiliary stick relay, an energizing circuit for said second time element device controlled by a front contact of said first auxiliary stick relay and by a back contact of said third auxiliary stick relay, a pick-up and a stick circuit for said third auxiliary stick relay controlled by front contacts of said second time element device and of said first auxiliary stick relay respectively, a pick-up circuit for said locking stick relay controlled by back contacts of both said time element devices and by front contacts of said first and third auxiliary stick relays, a second pick-up circuit for said locking stick relay controlled by front contacts of said first and second auxiliary stick relays, and a third pick-up circuit for said locking stick relay controlled by a back contact of said first time element device and by a front contact of said first auxiliary stick relay if the track switch is in the normal position and if a distant signal for an associated home signal has not been controlled to indicate proceed.

6. In release means for energizing an approach or time locking stick relay in a railway interlocking control system, including means for energizing said locking stick relay upon the lapse of a relatively long period of time after an associated home signal is controlled to indicate stop, the combination comprising, a medium release stick relay, a pick-up and a stick circuit for said medium release stick relay each of which is closed only if a distant signal for said home signal is controlled to display an indication other than proceed and said pick-up circuit also including a front contact of said locking stick relay, and a circuit including a front contact of said medium release stick relay for energizing said locking stick relay upon the lapse of a medium period of time after said associated home signal is controlled to indicate stop.

7. In release means for energizing an approach or time locking stick relay in a railway interlocking control system, including a time element device, including means controlled by said locking stick relay for energizing said time element device when an associated home signal is controlled to display the stop indication after having been controlled to display some other indication, the combination comprising, a second time element device, means controlled by said first time element device upon the lapse of a measured period of time after it becomes energized for energiz-

ing said second time element device, a circuit controlled by said first and second time element devices upon the lapse of a second measured period of time after said second time element device becomes energized for energizing said locking stick relay, and a second circuit controlled by said first time element device for energizing said locking stick relay if a distant signal for said home signal has displayed the stop or caution indication while the home signal displayed an indication other than stop and thereby providing a shorter release time than is provided by said first circuit.

8. In release means for energizing an approach or time locking stick relay in a railway interlocking control system, including a time element device, including means controlled by said locking stick relay for energizing said time element device when an associated home signal is controlled to display the stop indication after having been controlled to display some other indication, including a short release circuit controlled by the pick-up operation only of said time element device for energizing said locking stick relay if a given track switch is in the reverse position, the combination comprising, a second time element device, means controlled by the pick-up operation of said first time element device for energizing said second time element device, a long release circuit responsive to the pick-up and release operations of both said time element devices for energizing said locking stick relay, and a medium release circuit responsive to the pick-up and release operations of only said first time element device for energizing said locking stick relay if a distant signal for an associated home signal has continued to display the stop or caution indication while the associated home signal was controlled to display an indication other than stop.

9. In release means for energizing an approach or time locking stick relay in a railway interlocking control system, including means for energizing said locking stick relay upon the lapse of a relatively long period of time after an associated home signal is controlled to indicate stop, the combination comprising, a medium release stick relay, means for normally energizing said medium release stick relay but for deenergizing it if a distant signal for an associated home signal is controlled to display the proceed indication, and a circuit controlled by a front contact of said medium release stick relay for energizing said locking stick relay upon the lapse of a shorter period of time than is provided by said long release means.

10. In release means for energizing an approach or time locking stick relay in a railway interlocking control system, including a time element device, including means controlled by said locking stick relay for energizing said time element device when an associated home signal is controlled to display the stop indication after having been controlled to display some other indication, the combination comprising, a second time element device, means responsive to the pick-up operation of said first time element device for energizing said second time element device only if a distant signal for said associated home signal has been controlled to display the proceed indication while said associated home signal displayed an indication other than stop, long release means responsive to the pick-up and release operations of both said time element devices for energizing said locking stick relay, and shorter release means responsive to the pick-up and release operations of only said first time element device for energizing said locking stick relay if the distant signal for said associated home signal has continued to display an indication other than proceed while said associated home signal displayed an indication other than stop.

EARL M. ALLEN.