

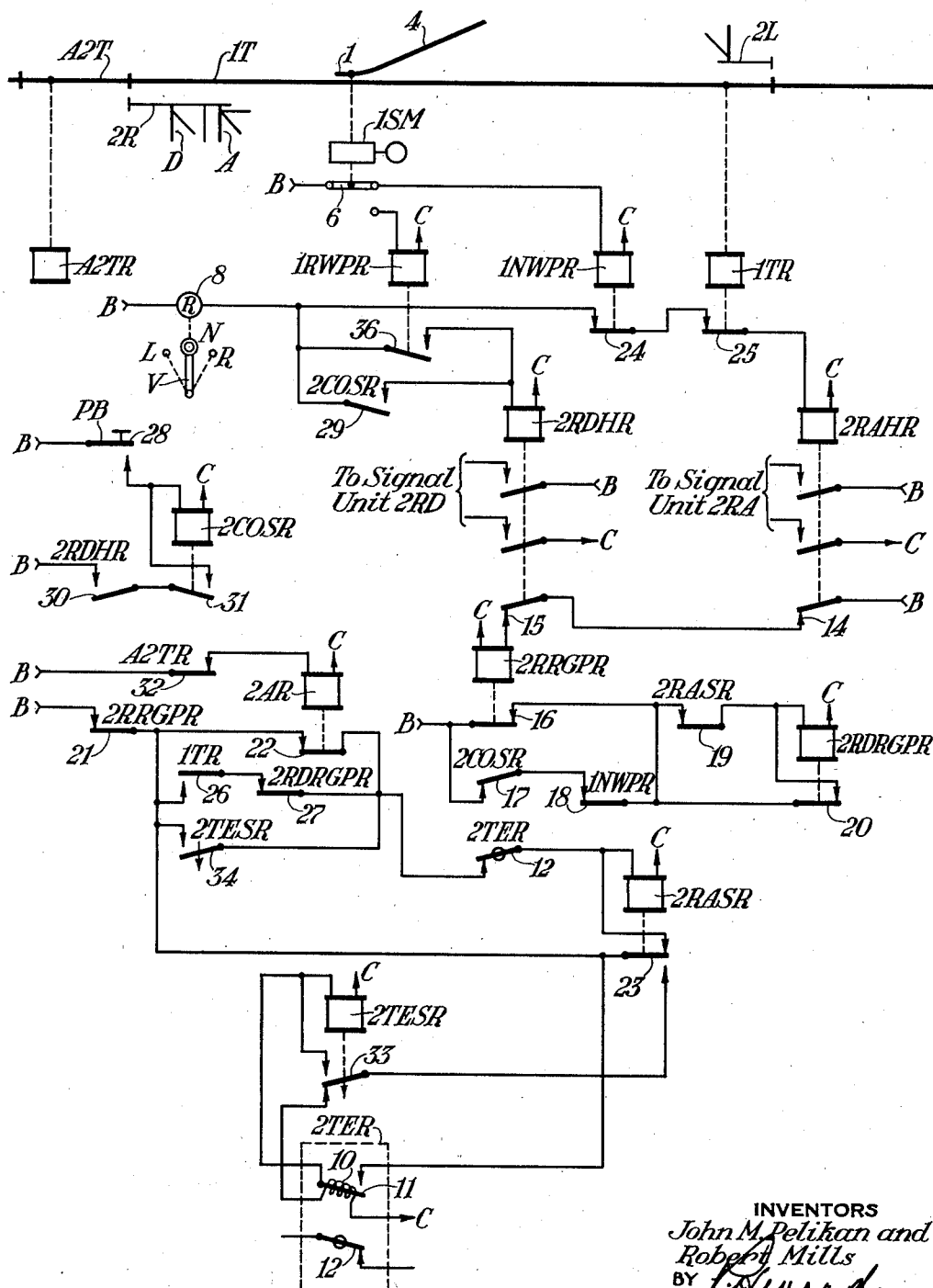
June 9, 1942.

J. M. PELIKAN ET AL

2,286,007

RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed Oct. 5, 1940



INVENTORS
John M. Pelikan and
Robert Mills
BY *Colwood*
THEIR ATTORNEY

UNITED STATES PATENT OFFICE

2,286,007

RAILWAY TRAFFIC CONTROLLING
APPARATUS

John M. Pelikan, Pittsburgh, Pa., and Robert
Mills, Kew Gardens, N. Y., assignors to The
Union Switch and Signal Company, Swissvale,
Pa., a corporation of Pennsylvania

Application October 5, 1940, Serial No. 359,890

5 Claims. (Cl. 246—160)

Our invention relates to railway traffic controlling apparatus, and it has particular reference to the organization of such apparatus into novel and improved railway traffic controlling systems for controlling the operation of either or both railway signals and track switches.

Interlocking systems heretofore proposed for controlling either or both railway signals and track switches ordinarily incorporate approach locking means rendered effective upon the approach of a train to prevent alteration of a route established for such train. Such systems incorporate means for effecting a normal or "track circuit" release of such locking after the train accepts the route, and also incorporate means for effecting a time release of such locking after enforcing a predetermined time delay. Where train order or "call-on" signals are incorporated into such interlocking systems, it has been customary to prevent a track circuit release of such approach locking when a "call-on" signal is displayed, by utilizing a stick relay controlled by the call-on signal lever or button and energized over a stick circuit controlled by the control relay of the call-on signal. Such systems rely upon the integrity of the stick circuit of the call-on control relay, since ordinarily no means is provided for checking this circuit with the result that if such circuit should fail, the stick relay might release to permit an improper release of the approach locking when the call-on signal is being displayed.

In view of the foregoing and other important considerations, it is an object of our present invention to provide a railway traffic controlling system of the above described class and incorporating novel and improved means for positively maintaining the approach locking effective when a call-on signal is being displayed.

Another object of our invention is to provide a remote control or interlocking system of the above described class and incorporating novel and improved means, including a relay arranged to be operated from a normal to an operated position only when the slow speed signal is cleared, for preventing the release of approach locking.

A further object of our invention is to provide a system of the class described and incorporating novel and improved means for preventing a track circuit release of the approach locking when a train accepts a slow speed signal and the approach section is occupied by a following train.

The above-mentioned and other important objects and characteristic features of our invention which will appear as the description proceeds,

are attained by providing for the slow speed signal a repeater relay having a pick-up circuit completed only if the approach locking is inactive and having a stick circuit effective to energize the repeater relay over its own front contact at all times except when the slow speed signal is cleared. The repeater relay is designed to control a contact interposed, in series with a contact of the track relay of the associated track section, in a circuit which renders the approach locking ineffective, thereby insuring that if the approach section is occupied, a track circuit release of the approach locking will not be effected if the slow speed signal has been cleared, but such release may be effected only through the medium of the usual timing device which introduces a predetermined time interval in the release of the approach locking.

We shall describe a preferred form of apparatus embodying our invention, and shall then point out the novel features thereof in claims.

Referring to the drawing, the diagram at the top represents a stretch of railway track comprising a switch section 1T and an approach section A2T. Section 1T includes a track switch 1 connecting a passing or siding track 4 to section 1T, and each section is provided with the usual closed circuit track circuit including a normally energized track relay as indicated diagrammatically in the drawing, these track relays being designated by the reference characters 1TR and A2TR, respectively.

Switch 1 is operated by a power actuated switch mechanism 1SM controlled in the usual manner, not shown, and has associated therewith two switch repeater relays 1NWPR and 1RWPR. These switch repeater relays are selectively energized in accordance with the position of switch 1 as indicated by the position of an associated circuit controlling contact member 6 which occupies a normal position, as shown in the drawing, when switch 1 is normal, to complete an obvious energizing circuit for relay 1NWPR, and which contact member is operated by the switch to a reverse position when the switch occupies its reverse position, to complete an obvious energizing circuit for relay 1RWPR.

The movement of traffic on the main track into section 1T in the normal direction from left to right as viewed in the drawing is governed by a signal 2R comprising a high speed signal unit A which normally indicates stop but which may be cleared to indicate proceed when section 1T is unoccupied and switch 1 is normal; and an auxiliary slow speed and "call-on" sig-

nal unit D which may be cleared to permit a train operating in the normal direction of traffic on the main track to enter section 1T whenever switch 1 is reversed and/or section 1T is occupied by a preceding train. The movement of traffic on the main track into section 1T against the normal direction of traffic is controlled by a slow speed signal 2L, which may be cleared if switch 1 is normal.

The units A and D of signal 2R are controlled by signal control relays 2RAHR and 2RDHR, respectively, and signal 2L may be controlled by another signal control relay, not shown since the control of this signal forms no part of our present invention. The local signal control circuits are not shown in detail in the drawing, but it is to be understood that each signal unit will be cleared when the corresponding signal control relay is energized, and will indicate stop when its signal control relay is deenergized. Relays 2RAHR and 2RDHR are controlled through the medium of a manually operable lever V, which may, for example, be a signal control lever of an interlocking machine positioned at a point remote from the signals. Lever V normally occupies an intermediate or normal position N, and is movable to one extreme position R to select signal 2R for control, and to another extreme position L to select signal 2L for operation. At least one control contact is provided for lever V, and as shown, contact 8 of lever V bears the reference character R to indicate that this contact is closed in the right-hand position R of the lever. When lever V is operated to its right position, relay 2RAHR is energized if switch 1 is normal and traffic conditions in section 1T are favorable for the display of the high speed aspect of signal unit A, but when switch 1 is reversed and/or a call-on push button PB is actuated to pick up a call-on relay 2COSR, relay 2RDHR is energized.

Associated with units A and D of signal 2R there is a back locking relay 2RRGPR which is energized when and only when relays 2RAHR and 2RDHR are released to cause units A and D to indicate stop. Associated with unit D of signal 2R there is a normally energized repeater relay 2RDRGPR which may be picked up when and only when an approach locking relay 2RASR, hereinafter referred to in detail, is picked up; and which repeater relay is provided with a stick circuit which is effective to maintain the relay energized over its own front contact until unit D of signal 2R is cleared.

Also associated with units A and D of signal 2R there is approach locking relay 2RASR which normally is energized when units A and D of signal 2R indicate stop and approach section A2T is unoccupied. Relay 2RASR, in accordance with the usual practice, is employed to prevent operation of switch 1 when the relay is deenergized to render active the approach locking. When section A2T is occupied and section 1T is also occupied, relay 2RASR may be energized provided that units A and D of signal 2R display stop. Associated with relay 2RASR is means for effecting a time release of the approach locking at the end of the predetermined time interval. As shown, such means comprise a time element relay 2TER and a stick relay 2TESR.

The time element relay 2TER may be of any suitable type such as, for example, the thermal relay illustrated and described in Letters Patent of the United States, No. 2,114,895 granted on April 19, 1938, to Harry E. Ashworth for Thermal relay. Relay 2TER is provided with a thermal

element 10 effective to close a time contact 11 at the end of a predetermined interval of time after energization of the relay, and with a checking contact 12 which opens shortly after the energization of the relay and closes only when time contact 11 assumes its normal position. Relay 2TER normally is deenergized but becomes energized over a circuit completed when units A and D of signal 2R indicate stop and approach locking relay 2RASR is released, and when relay 2TER closes its time contact 11, relay 2TESR becomes energized.

In order to simplify the drawing, we have shown relay contacts at times disposed remote from the relays which cause them to operate, but in each case such contacts bear the reference characters identifying not only the respective relay operating such contacts but also a number individual to each of such contacts.

The apparatus embodying our invention is in its normal condition, as represented in the drawing, when sections A2T and 1T are unoccupied, and switch 1 and lever V are in their respective normal positions. In this condition of the apparatus, relay 1NWPR is energized to indicate that switch 1 occupies its normal position; and back locking relay 2RRGPR is energized over a circuit which may be traced from one terminal B of a suitable source of current, such as a battery not shown, through back contact 14 of relay 2RAHR, back contact 15 of relay 2RDHR and the winding of relay 2RRGPR to the other terminal C of the source of current. With unit D of signal 2R indicating stop, repeater relay 2RDRGPR is energized over a circuit which extends from terminal B through front contact 16 of relay 2RRGPR or back contact 17 of relay 2COSR and front contact 18 of relay 1NWPR, then through front contact 19 of relay 2RASR or front stick contact 20 of relay 2RDRGPR and the winding of relay 2RDRGPR to terminal C. Approach locking relay 2RASR also is energized over a circuit extending from terminal B through front contact 21 of relay 2RRGPR, front contact 22 of an approach relay 2AR controlled over an obvious circuit governed by traffic conditions in advance of section 1T (this control of relay 2AR being indicated conventionally by representing its control circuit as being controlled by front contact 32 of approach track relay A2TR), checking contact 12 of relay 2TER and the winding of relay 2RASR to terminal C. With relay 2RASR energized, its front contact 23 is closed to complete an obvious stick circuit for that relay extending from terminal B through front contact 21 of relay 2RRGPR, front contact 23 of relay 2RASR and the winding of relay 2RASR to terminal C.

With the apparatus in the condition just described, unit A of signal 2R may be cleared by operating lever V to its right-hand position R to close contact 8 and thereby complete for relay 2RAHR an energizing circuit which extends from terminal B through contact 8 of lever V, front contact 24 of relay 1NWPR, front contact 25 of relay 1TR and the winding of relay 2RAHR to terminal C. Relay 2RAHR picks up to control unit A of signal 2R to display proceed, and also to open back contact 14 to deenergize relay 2RRGPR which thereupon releases to open front contact 21 and thereby release relay 2RASR. The release of relay 2RASR of course imposes the approach locking upon the apparatus, and when approach relay 2AR releases due to a train in approach section A2T, front contact 22 of relay 2AR opens to condition the apparatus so

that the approach locking is maintained effective and can be released under the conditions assumed, only through the medium of time element relay 2TER, as will be made clear presently. The approach locking is released, however, when the train in section A2T accepts the clear indication of unit A of signal 2R and enters section 1T to cause relay 1TR to release and open its front contact 25 and thereby deenergize relay 2RAHR which releases to control unit A of signal 2R to indicate stop. Relay 2RAHR also closes its back contact 14 to thereby complete the previously traced energizing circuit of back locking relay 2RRGPR which relay accordingly picks up to close its front contact 21 and thereby enable back contact 26 of relay 1TR to effect a track circuit release of the approach locking by establishing a circuit extending from terminal B through front contact 21 of relay 2RRGPR, back contact 26 of relay 1TR, front contact 27 of repeater relay 2RDRGPR, checking contact 12 of relay 2TER and the winding of relay 2RASR to terminal C. It is, of course, obvious that when this train vacates approach section A2T, relay 2AR will pick up to close its front contact 22 and thereby establish the normal energizing circuit of relay 2RASR, which circuit holds the approach locking inactive when the train vacates section 1T and relay 1TR picks up to open its back contact 26.

In the event, however, that a following train occupies section A2T when the first train is in section 1T, and it is desired to have the following train enter section 1T under the conditions assumed, slow speed signal unit D of signal 2R may be cleared by operating lever V to its right-hand position R, and by actuating push button PB. With contact 28 of push button PB closed, relay 2COSR picks up over an obvious circuit to close its front contact 29 and thereby establish for relay 2RDHR a circuit extending from terminal B through contact 8 of lever V, front contact 29 of relay 2COSR and the winding of relay 2RDHR to terminal C. When relay 2RDHR picks up, unit D of signal 2R is controlled to its clear condition; back contact 15 of relay 2RDHR is opened to deenergize back locking relay 2RRGPR; and front contact 30 of relay 2RDHR closes to complete an obvious stick circuit for relay 2COSR, which circuit includes the source of current, front contact 30 of relay 2RDHR and front contact 31 of relay 2COSR as well as the winding of the latter relay. With the back locking relay 2RRGPR released to open its front contact 21, relay 2RASR also is released to impose the approach locking on the apparatus. Also, repeater relay 2RDRGPR is released since its pick-up circuit is open at front contact 19 of relay 2RASR and both alternate paths comprising front contact 16 of relay 2RRGPR and back contact 17 of relay 2COSR, in the stick circuit path of relay 2RDRGPR, are open. It follows that with the following train in the approach section and unit D of the signal cleared as a call-on signal, the operator cannot release the approach locking immediately by restoring lever V to its N position to cause relay 2RDHR to release and close its back contact 15 and pick up relay 2RRGPR, because front contact 27 of relay 2RDRGPR is open in the circuit whereby track circuit release of the approach locking is effected, and front contact 22 of approach relay 2AR is also open. The restoration of lever V to its N position and consequent restoration of the call-on signal to stop, however, permits a time

release of the approach locking to be effected since with front contact 21 and back contact 23 of relays 2RRGPR and 2RASR closed, respectively, relay 2TER becomes energized over a circuit extending from terminal B through front contact 21 of relay 2RRGPR, back contact 23 of relay 2RASR, back contact 33 of relay 2RTESR and thermal unit 10 of relay 2TER to terminal C. The energization of relay 2TER causes its checking contact 12 interposed in the previously traced energizing circuit of relay 2RASR to become opened, and at the end of its predetermined time interval relay 2TER closes its time contact 11 to establish a pick-up circuit for relay 2TESR, which circuit extends from terminal B through front contact 21 of relay 2RRGPR, time contact 11 of relay 2TER and the winding of relay 2TESR to terminal C. Relay 2TESR in picking up closes its front contact 33 to complete through that contact, back contact 23 of relay 2RASR and front contact 21 of relay 2RRGPR a stick circuit for relay 2TESR, and relay 2TER becomes deenergized since with back contact 33 of relay 2TESR open, the energizing circuit of the time element relay is likewise open. Front contact 34 of relay 2TESR is now closed to shunt around back contact 26 of relay 1TR and front contact 27 of relay 2RDRGPR, so that when checking contact 12 of relay 2TER closes at the end of the predetermined cooling period of the relay, the approach locking is released in response to relay 2RASR picking up over a circuit extending from terminal B through front contact 21 of relay 2RRGPR, front contact 34 of relay 2TESR, checking contact 12 of relay 2TER and the winding of relay 2RASR to terminal C. Relay 2RASR in picking up opens its back contact 23 to thereby open the previously mentioned stick circuit of relay 2TESR which relay thereupon releases to open its front contact 34 interposed in the previously traced pick-up circuit of relay 2RASR, but relay 2RASR is now retained picked up over its stick circuit which includes front contact 21 of relay 2RRGPR and its own front contact 23. Repeater relay 2RDRGPR now becomes energized over its previously traced circuit since front contact 19 of relay 2RASR is closed in the pick-up circuit of this relay and front contact 16 of relay 2RRGPR and back contact 17 of relay 2COSR are both closed, the latter contact having become closed when relay 2COSR dropped upon the interruption of its stick circuit at front contact 30 of relay 2RDHR when relay 2RDHR was released by the restoration of lever V to its normal position.

Track circuit release of the approach locking also is prevented in the event that unit D of signal 2R is utilized as a slow speed signal to govern trains operating from section 1T over switch 1 into diverging track 4. For example, if switch 1 is reversed so that switch repeater relay 1RWPR is picked up and relay 1NWPR is released, the operation of lever V to its right-hand position R causes relay 2RDHR to become energized over a circuit extending from terminal B through contact 8 of lever V, front contact 36 of relay 1RWPR and the winding of relay 2RDHR to terminal C. Relay 2RDHR picks up to control unit D of signal 2R to its clear condition, and also to open at back contact 15 the previously traced energizing circuit for back locking relay 2RRGPR, whereupon repeater relay 2RDRGPR is caused to release since front contact 16 of relay 2RRGPR and front contact 18 of relay 1NWPR, which contacts are con-

nected in alternate circuit paths in both the stick and the pick-up circuits of relay 2RDRGPR, are now open. Approach locking relay 2RASR also is caused to release since its energizing circuits are open at front contact 21 of relay 2RRGPR.

In the event that a train accepts the low speed aspect of unit D of signal 2R and enters section 1T while section A2T is occupied by a following train, relay 1TR is released and closes its back contact 26, but an immediate energization of the approach locking relay 2RASR is not effected at this time through the medium of the previously traced circuit providing track circuit release of the approach locking, since front contact 27 of relay 2RDRGPR is now open. The approach locking may be released, however, through the medium of the timing apparatus by moving lever V to its N position to cause relay 2RDHR to release and set signal unit D to stop. When relay 2RDHR drops, relay 2RRGPR picks up and relay 2TER accordingly becomes energized in the manner pointed out heretofore. At the end of the predetermined time interval of relay 2TER, its time contact 11 becomes closed to pick up relay 2TESR, and when checking contact 12 of relay 2TER closes, approach locking relay 2RASR is caused to pick up over its previously traced circuit including front contact 21 of relay 2RRGPR, front contact 34 of relay 2TESR and checking contact 12 of relay 2TER.

It is, of course, readily apparent that when either signal unit 2RA or 2RD is cleared and a train occupies approach section A2T so that approach relay 2AR is released to hold open front contact 22 interposed in the previously traced normal energizing circuit of approach locking relay 2RASR, the apparatus is conditioned to prevent immediate release of the approach locking should the cleared signal be set to stop, and under such assumed condition, release of the approach locking is effected only through the medium of the time release apparatus. That is to say, under the assumed conditions relays 2RASR, 2AR and 2RRGPR are released, the latter relay being held released due to one of the two signal units being cleared. When this cleared signal unit is set to stop by the operator restoring lever V to its mid or normal position N in an attempt to release the approach locking and alter the established route, back locking relay 2RRGPR picks up to close its front contact 21. Time element relay 2TER thereupon becomes energized over front contact 21 of relay 2RRGPR and back contact 23 of relay 2RASR, and the apparatus functions in the manner explained in detail heretofore to reenergize relay 2RASR at the end of the heating and cooling time of relay 2TER. When relay 2RASR picks up at the end of the predetermined delay period enforced by relay 2TER, the approach locking is released and the established route may be altered.

From the foregoing description, it is readily apparent that our invention provides a very simple arrangement of circuits whereby track circuit release of approach locking may be effected for trains accepting a high speed indication of a signal. It is further apparent that the track circuit release of the approach locking is prevented when the slow speed signal is used as a call-on signal. In addition, it is apparent that by interposing contacts of the approach locking relay in the pick-up circuit of the repeater relay of the slow speed signal, and by interposing a contact of the repeater relay of the slow speed signal in the track circuit release circuit of the

approach locking relay, an arrangement is provided wherein the timing relay must be utilized to effect the release of the approach locking, and all dependency upon the integrity of the stick circuit of the call-on stick relay is avoided.

Although we have herein shown and described only one form of railway traffic controlling apparatus embodying our 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 our invention.

Having thus described our invention, what we claim is:

1. In combination with a section of railway track provided with a track circuit including a track relay and having a signal indicating proceed, slow speed or stop for governing the movement of traffic over the section, signal control means for controlling said signal to indicate proceed or slow speed in accordance with traffic conditions on said section, an approach relay operated to an active condition by traffic approaching the section, a locking relay normally energized when said signal indicates stop and said approach relay is inactive, a repeater relay having a pick-up circuit governed by said locking relay and a stick circuit governed by said signal control means and conditioned to be effective to hold said repeater relay energized over its own front contact at all times except when said signal indicates slow speed, and a restoring circuit for said locking relay including in series a back contact of said track relay and a front contact of said repeater relay.

2. In combination with a section of railway track provided with a track circuit including a track relay and having a signal indicating proceed, slow speed or stop for governing the movement of traffic over the section, signal control means for controlling said signal to indicate proceed or slow speed in accordance with traffic conditions on said section, an approach relay operated to an active condition by traffic approaching the section, a locking relay normally energized when said signal indicates stop and said approach relay is inactive, a repeater relay having a pick-up circuit governed by said locking relay and a stick circuit governed by said signal control means and conditioned to be effective to maintain such relay energized over its own front contact at all times except when said signal indicates slow speed, and a circuit for energizing said locking relay when a train accepts the proceed indication but not when it accepts the slow speed indication, said circuit including in series a back contact of the track relay and a front contact of said repeater relay.

3. In combination with a section of railway track provided with a track circuit including a track relay and having a signal indicating proceed, slow speed or stop for governing the movement of traffic over the section, signal control means for controlling said signal to indicate proceed or slow speed in accordance with traffic conditions on said section, an approach relay operated to an active condition by traffic approaching the section, a locking relay normally energized when said signal indicates stop and said approach relay is inactive, a stick relay normally energized over a stick circuit governed by said signal control means and conditioned to be effective to hold such relay energized over its own front contact at all times except when said signal indicates slow speed, said stick relay

having a pick-up circuit governed by a front contact of said locking relay, and a circuit for energizing said locking relay when a train accepts the proceed indication but not when it accepts the slow speed indication, said circuit including in series a back contact of the track relay and a front contact of said stick relay.

4. In combination with a section of railway track provided with a track switch and a track circuit including a track relay, a signal indicating proceed, slow speed or call-on, or stop for governing the movement of traffic over the section, control means effective when said section is unoccupied and said switch is in its normal position for causing said signal to indicate proceed and when said switch is in its reverse position for causing said signal to indicate slow speed, other means effective to cause said signal to indicate call-on when said section is occupied, an approach relay operated to an active condition by traffic approaching the section, a locking relay normally energized when said signal indicates stop and said approach relay is inactive, a stick relay normally energized over a stick circuit controlled by said switch and by said other means and caused to be effective to hold such relay energized over its own front contact at all times except when said signal indicates slow speed or call-on, said stick relay having a pick-up circuit controlled by a front contact of said locking re-

lay, a first restoring circuit including in series a front contact of said repeater relay and a back contact of said track relay for energizing said locking relay when a train enters said section and said signal indicates proceed, and means for energizing said locking relay at the end of a predetermined time interval after a train enters said section when said signal indicates slow speed or call-on.

5. The combination with a section of railway track provided with a track circuit including a track relay and having a signal indicating proceed, slow speed or stop for governing the movement of traffic over the stretch, and an approach relay operated to an active condition by traffic approaching the section and a locking relay normally energized when said signal indicates stop and said approach relay is inactive, of a repeater relay having a pick-up circuit controlled by a front contact of said locking relay and having a stick circuit controlled by said signal and caused to be effective to energize said repeater relay over its own front contact at all times except when said signal indicates slow speed, and a restoring circuit for said locking relay including in series a back contact of said track relay and a front contact of said repeater relay.

JOHN M. PELIKAN.
ROBERT MILLS.