

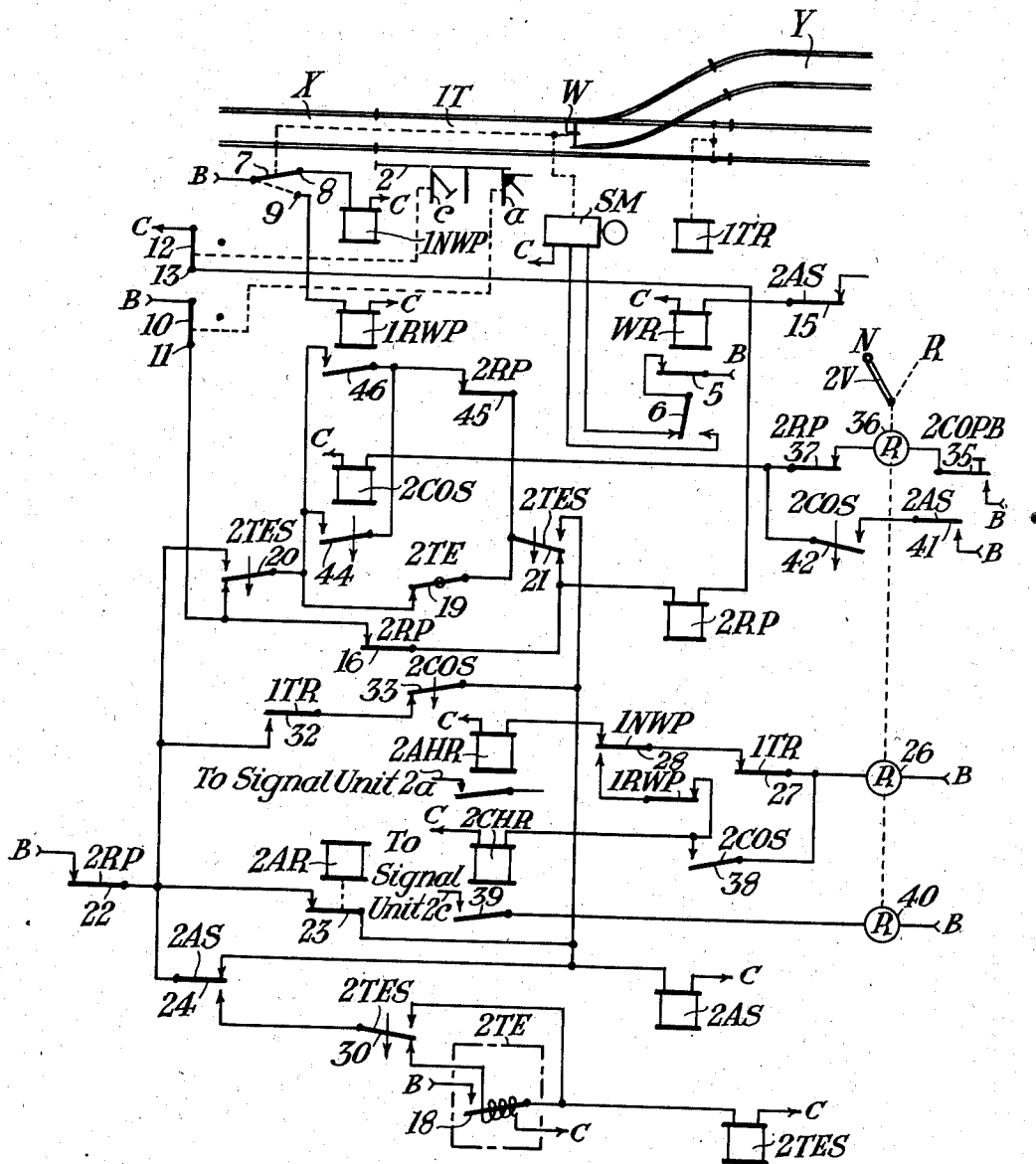
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RAILWAY TRAFFIC CONTROLLING APPARATUS

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RAILWAY TRAFFIC CONTROLLING
APPARATUS

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My invention relates to railway traffic controlling apparatus, and it has particular reference to the organization of such apparatus into railway traffic controlling systems for controlling the operation of railway track switches and signals governing traffic over such switches.

Interlocking systems heretofore proposed for controlling the operation of railway track switches and signals governing traffic over such switches, usually incorporate approach locking means rendered effective upon the approach of a train, to permit alteration of a route established for such train at the expiration of a predetermined time delay. Such a time delay ordinarily is enforced through the medium of a time release device having contacts which open and close at the end of one or more predetermined time intervals, and such systems have been arranged so as to insure against a reduction in the release period of the approach locking, should the contacts of the time release device fail to return to their normal positions after an operation of the device. One such system of this type is shown, for example, in United States Letters Patent No. 2,198,712 granted April 30, 1940, to H. C. Vantassell for Railway traffic controlling apparatus.

In such systems, it often happens that slow speed or call-on signals are employed to authorize a train to enter a section under reduced speed when conditions in advance are such that the high speed signal normally governing such movement is in its stop position. Where call-on signals are employed in addition to the usual high speed signals, it is advantageous to provide means for effecting release of the approach locking at the end of either a short or a long time release interval according as the call-on signal or high-speed signal is cleared. This arrangement avoids unduly tying up traffic by enabling an operator to make more rapid alterations of routes for approaching trains without sacrificing safety in operation, since a train approaching a call-on signal at a low rate of speed obviously may be brought to a stop or to a slow speed in an interval of time much less than that required by a train approaching a cleared high speed signal at a high rate of speed.

In view of the above-mentioned and other important considerations, it is an object of my invention to provide an interlocking system for controlling track switches and signals and incorporating novel and improved means for releasing the approach locking at the end of one or another of two different time release intervals.

Another object of my invention is to provide

an interlocking system of the type described and incorporating means for releasing the approach locking at the end of a relatively short time interval when a low speed signal is cleared and at the end of a relatively longer time interval when a high speed signal is cleared.

A further object is to provide means, in a system of the type shown in the aforesaid Vantassell Patent No. 2,198,712, for effecting different time releases of approach locking according as a high speed or a low speed signal is cleared.

The above-mentioned and other important objects and characteristic features of my invention which will become readily apparent from the following description, are attained in accordance with my invention by incorporating into a system of the type shown in Vantassell Patent No. 2,198,712, circuit means controlled by a call-on signal control relay or a diverging route relay, for effecting a time release of the approach locking at the end of a time interval shorter than that enforced when a high speed signal is cleared and then put to stop.

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 illustrating one form of apparatus embodying my invention.

Referring to the drawing, the diagram at the top represents a stretch of railway track X provided with a track section IT including a track switch W for connecting a diverging or auxiliary track Y to track X. Section IT is provided with a normally closed circuit track circuit including a normally energized track relay ITR as indicated conventionally in the drawing. Switch W is operatively associated with a power operated switch mechanism SM controlled through the medium of a polarized relay WR. It is deemed sufficient to state that mechanism SM is rendered effective to operate switch W only when front contact 5 of relay WR is closed, and that the switch mechanism is conditioned to operate switch W to its normal position, as shown, or to its reverse position according as polar contact member 6 of relay WR, as viewed in the drawing, is in its left-hand or its right-hand position, respectively. Switch W also has operatively associated therewith a movable contact member 7 which is operated into engagement with contact 8 when the switch is set for a high speed movement on track X and is operated into engagement with contact 9 when the switch is set for a diverging movement from track X onto the

diverging track Y. A normal switch repeater relay INWP is energized over a circuit which includes contact 7—8 of switch W, and a reverse switch repeater relay IRWP is energized over a circuit completed when contact 7—9 of switch W is closed. Relay INWP or IRWP when energized indicates that switch W occupies its normal or its reverse position, respectively.

The movement of traffic on the main track over switch W is governed by a signal, designated by the reference character 2, comprising a high speed unit *a* and a low speed unit *c*. Unit *a* of signal 2 normally indicates stop but may be cleared, when a signal control relay 2AHR is picked up, to permit a high speed movement over the switch on the main track when conditions are favorable for such movement. This unit may be of any suitable type, such as color light, position light, searchlight, etc., and is provided with a circuit controlling contact 10 which engages a fixed contact 11 when and only when unit *a* indicates stop.

Unit *c* of signal 2 normally indicates stop but may be cleared by causing a signal control relay 2CHR to pick up when switch W is set for a diverging movement, or when a call-on signal control relay, designated by the reference character 2COS, is energized. Unit *c* has operatively associated therewith a contact member 12 which is arranged to engage a fixed contact member 13 when and only when the unit indicates stop.

An approach locking relay, designated by the reference character 2AS, controls, in part, the switch control relay WR in such manner that relay WR can be energized when and only when relay 2AS is picked up to close its front contact 15.

A signal repeater relay 2RP, normally energized over a stick circuit including its own front contact 16 and completed when signal units *a* and *c* indicate stop and contacts 10—11 and 12—13 are closed, cooperates with an approach relay 2AR, track relay 1TR, call-on control relay 2COS, and with time element means, hereinafter referred to, in the control of the approach locking relay 2AS. The approach relay 2AR is arranged to be controlled in any suitable manner, not shown, so as to be released when a train approaches section 1T on track X while moving from left to right as viewed in the drawing.

The time element means comprise a time element device 2TE and a stick relay 2TES. Device 2TE operates a first contact 18 which is normally open and which is slow to close when the device is energized. Device 2TE also operates a second contact 19 which is normally closed, and which opens in response to energization of device 2TE and is slow to close when the device becomes de-energized.

In order to simplify the drawing, relay contacts have been represented at times remote from the relays which cause such contacts to operate, but in such cases each contact bears a reference character relating not only to the respective relay operating such contact but also a number individual to each of such contacts. For example, the reference character 2AS has been placed immediately above contact 15 to indicate that this contact is operated by relay 2AS, and this contact has been represented closed to indicate that relay 2AS is normally picked up.

The apparatus embodying my invention is in its normal condition, as represented in the drawing, when approach relay 2AR is picked up, section 1T is unoccupied and units *a* and *c* of signal

2 indicate stop, respectively. In this condition of the apparatus, relay 2RP is energized over two alternate circuit paths, a first or pick-up circuit of which extends from one terminal B of a suitable source of current, such as a battery not shown but having its opposite terminals designated by the reference characters B and C, through contact 10—11 operated by unit *a* of signal 2, back point of contact 20 of relay 2TES, back point of contact 19 of time element device 2TE, back point of contact 21 of relay 2TES, the winding of relay 2RP and contact 13—12 operated by unit *c* of signal 2 to terminal C. The second or stick circuit path in the energizing circuit of relay 2RP includes its own front contact 16 connected around back points of contacts 20 and 21 of relay 2TES and back point of contact 19 of time element device 2TE. Relay 2AS is energized over a circuit extending from terminal B through front contact 22 of relay 2RP, front contact 23 of approach relay 2AR, and the winding of relay 2AS to terminal C, and relay 2AS is provided with an alternate stick circuit path which includes its own front contact 24 connected in the just traced circuit around front contact 23 of relay 2AR. Relay WR is energized over a circuit, a portion of which is represented including front contact 15 of relay 2AS. The remainder of the circuit of relay WR, not shown, may be controlled in any suitable manner, such for example as by a lever operated by a leverman in an interlocking tower. Relays 1TR and 2AR also are energized.

Under the above assumed conditions, the operator may clear unit *a* of signal 2 by moving a signal lever 2V from its normal position N to its reverse position R. Lever 2V is provided with contacts each bearing a reference character N or R to indicate that such contact is closed in the normal (N) or reverse (R) position of the lever, respectively. When lever 2V is operated to its reverse position, relay 2AHR is caused to become picked up over a circuit extending from terminal B through contact 26 of lever 2V, closed in the reverse position of the lever, front contact 27 of relay 1TR, front contact 28 of normal switch repeater relay INWP, and the winding of relay 2AHR to terminal C. Relay 2AHR when picked up causes unit *a* of signal 2 to clear over circuit means not shown but indicated conventionally in the drawing. When unit *a* clears, contact 10—11 opens to cause relay 2RP to release, and relay 2RP opens its front contact 22 in turn to cause relay 2AS to release. Contacts 16 and 24 of relays 2RP and 2AS, respectively, open to open the stick circuit paths in the energizing circuits of the respective relays.

Under the assumed conditions, if a train approaches section 1T and causes approach relay 2AR to release, the approach locking is imposed upon the system. This is effected due to the fact that if, at this time, the leverman restores lever 2V to its normal position, relay 2AHR releases, unit *a* goes to stop, and contact 10—11 closes to cause relay 2RP to become energized over its previously traced pick-up circuit, which circuit includes normally closed contact 19 of time element device 2TE and hence provides a check that the contacts of device 2TE are in their normal positions. Front contact 22 of relay 2RP accordingly closes, but with both front contacts 23 and 24 of relays 2AR and 2AS open, relay 2AS remains in its released position for a relatively long time interval imposed by time element device 2TE, which device becomes energized over a

circuit extending from terminal B through front contact 22 of relay 2RP, back point of contact 24 of relay 2AS, back point of contact 30 of relay 2TES, and the winding of relay 2TE to terminal C. At the end of a first predetermined time interval, contact 18 of relay 2TE closes to complete an obvious circuit for relay 2TES, which relay picks up to operate its contacts 20, 21 and 30 from their back to their front points. An obvious stick circuit for relay 2TES is now completed at the front point of contact 30 of relay 2TES, which stick circuit holds that relay energized when contact 18 of device 2TE opens due to its energizing circuit being opened at the back point of contact 30 of relay 2TES. At the end of a second predetermined time interval, contact 19 of device 2TE closes and relay 2AS becomes energized over a circuit extending from terminal B through front contact 22 of relay 2RP, front point of contact 20 of relay 2TES, back point of contact 19 of device 2TE, front point of contact 21 of relay 2TES, and the winding of relay 2AS to terminal C. Relay 2AS operates its contact 24 from its back point to deenergize stick relay 2TES, and contact 24 engages its front point to complete the stick circuit for relay 2AS, which circuit holds that relay energized after relay 2TES releases its contacts 20 and 21 at the end of its slow release interval. Front contact 15 of relay 2AS, interposed in the control circuit of relay WR, is now closed and it follows that the apparatus is effective to require a predetermined time interval to expire before control of switch W can be effected if a high speed signal is cleared and then set to stop when approach relay 2AR is released.

If, however, unit *a* is cleared and the train accepts the signal and enters section 1T, then the approach locking is caused to be immediately released, in the following manner: relay 2AHR releases due to the opening of contact 27 of relay 1TR, and unit *a* goes to stop to close contact 10—11 and cause relay 2RP to become energized over its previously traced pick-up circuit. Relay 2RP of course picks up to close its front contact 22, and relay 2AS accordingly becomes energized over what I shall term a track circuit release circuit which extends from terminal B through front contact 22 of relay 2RP, back contact 32 of track relay 1TR, back contact 33 of call-on control relay 2COS, and the winding of relay 2AS to terminal C. It is to be noted that this circuit includes a back contact 33 of relay 2COS, and that this circuit is effective to release the approach locking whenever a train accepts a high speed signal aspect and enters section 1T.

In the event that switch W is in its normal position but conditions are such that high speed unit *a* of signal 2 displays stop, unit *c* of signal 2 may be cleared by the leverman reversing signal lever 2V and closing push button 2COPB. When this happens, relay 2COS picks up over a pickup circuit extending from terminal B through contact 35 of push button 2COPB, contact 36 of lever 2V, closed in the reverse position of the lever, front contact 37 of relay 2RP and the winding of relay 2COS to terminal C. Relay 2COS, when picked up, closes its front contact 38 to complete a circuit extending from terminal B through contact 26 of lever 2V, closed in the reverse position of the lever, front contact 39 of relay 2COS and the winding of relay 2CHR to terminal C, whereupon relay 2CHR picks up and causes unit *c* of signal 2 to clear over a circuit including

front contact 39 of relay 2CHR and contact 40 of lever 2V, which contact is closed in the reverse position of the lever. Contact 12—13 accordingly opens, relay 2RP releases, and relay 2AS in turn releases to close its back contact 24 and thereby complete an obvious stick circuit for relay 2COS, which circuit extends from terminal B through back contact 41 of relay 2AS, front contact 42 of relay 2COS, and the winding of relay 2COS to terminal C. The leverman may now release push button 2COPB.

If, now, approach relay 2AR is released by a train approaching section 1T, the apparatus is arranged to permit an operation of switch W at the end of a time release period shorter in duration than that enforced when a high speed signal is cleared and then put to stop. For example, if with the apparatus in the condition just described, the leverman restores lever 2V to its normal position, contact 40 of lever 2V opens and unit *c* accordingly goes to stop to close its contact 12—13 and cause repeater relay 2RP to become energized over its previously traced pick-up circuit including back points of contacts 20 and 21 of relay 2TES and back point of contact 19 of device 2TE. Relay 2RP picks up to close its front contact 22 and thereby energize time element device 2TE over a circuit previously traced, and at the end of a predetermined time interval, contact 18 of device 2TE closes to energize relay 2TES. When this happens, contact 38 of relay 2TES operates away from its back point to deenergize device 2TE, and this contact engages its front point to complete the previously mentioned stick circuit of relay 2TES. Contacts 20 and 21 of relay 2TES also operate to their front points, whereupon relay 2AS is energized over a circuit extending from terminal B through front contact 22 of relay 2RP, front point of contact 20 of relay 2TES, front contact 44 of relay 2COS, front contact 45 of relay 2RP, front point of contact 21 of relay 2TES, and the winding of relay 2AS to terminal C. It is to be noted that the circuit just traced includes front contact 44 of relay 2COS and front contact 45 of relay 2RP, which contacts provide an alternate path around contact 19 of time element device 2TE interposed in the previously traced circuit over which relay 2AS is released at the end of the predetermined time interval imposed when a high speed signal is cleared and lever 2V is restored to normal. Thus, the time interval imposed when a low speed signal is cleared and then set to stop is determined only by the time required for contact 18 of device 2TE to close, and does not include the time required for the other contact 19 of device 2TE to be restored to its normal position. It follows, therefore, that when a low speed signal is cleared and then set to stop, the approach locking is released at the end of a time interval considerably shorter than that imposed when a high speed signal is cleared and then restored to its stop indication.

The apparatus further is arranged so that when unit *c* is cleared for a diverging route, the shorter time interval is imposed on the release of the approach locking. For example, if switch W is in its reverse position, relay 1RWP is then energized, and front contact 46 of this relay is then connected, in series with front contact 45 of relay 2RP, around contact 19 of device 2TE in the previously traced circuit over which relay 2AS is energized at the end of the long time release interval. It follows, therefore, that when

unit c is cleared and then set to stop with switch W in its reverse position, the alternate path formed by contacts 46 and 45 of relays 1RWP and 2RP, respectively, enables relay 2AS to become energized at the end of the time required for contact 18 of device 2TE to close, and such time interval does not include the time required for contact 19 of device 2TE to close.

The apparatus is additionally arranged so that when unit c is cleared as a call-on signal, track circuit release of approach locking cannot be effected. For example, assume that call-on relay 2COS is picked up, and unit c of signal 2 is cleared. When the train accepts this indication and enters section 1T, relay 1TR releases, but with back contact 33 of relay 2COS now open, the previously traced circuit, over which track circuit release of the approach locking is effected when a train accepts a high speed signal and enters section 1T, accordingly cannot be completed. In such an event, the approach locking is released only at the end of the short time release interval, i. e. the interval required for device 2TE to close its contact 18. If, however, unit c is cleared for a diverging route and relay 2COS is released, then when the train enters section 1T, relay 1TR closes its back contact 32 and completes through back contact 33 of relay 2COS the previously traced track circuit release circuit for relay 2AS, whereupon relay 2AS picks up to release immediately the approach locking.

From the foregoing description, it is readily apparent that I have provided an interlocking system for controlling railway switches and signals governing traffic over such switches, and have incorporated therein novel and improved means for effecting the release of approach locking in such a system at the end of a relatively short or a relatively long time interval according as a slow speed signal is cleared and then set to stop, or a high speed signal is cleared and then set to stop. In addition, the apparatus is arranged to provide a track circuit release for the approach locking when the high speed signal, or a low speed diverging route signal, is accepted by a train, but such track circuit release is not effected when the low speed signal employed as a call-on indication is accepted by a train.

Although I have herein shown and described only one form 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 a railway interlocking system of the class comprising, a railway track switch, a signal indicating proceed, slow speed, or stop, for governing traffic over said switch, an approach locking relay normally energized over a stick circuit completed when said signal is at stop and which relay when deenergized prevents operation of the switch, a time element device having a first time contact which is slow to close when said device is energized and having a second time contact which opens upon energization of said device and which is slow to close when said device becomes deenergized, a stick relay provided with a pick-up circuit including said first time contact of said time element device, an energizing circuit for said time element device com-

pleted when said signal is at stop and including a back contact of said locking relay and a back point of a contact of said stick relay, a stick circuit for said stick relay including a front point of said contact of said stick relay, and a first pick-up circuit for said approach locking relay completed when said signal is at stop and including said second time contact of said time element device and a front point of a second contact of said stick relay; the combination with the foregoing apparatus of, a signal control relay effective when energized for causing said signal to indicate call-on, manually operable means for energizing said signal control relay, and an auxiliary pick-up circuit for said approach locking relay, said circuit including a front contact of said signal control relay and said front point of said other contact of said stick relay.

2. In a railway interlocking system of the class comprising, a railway track switch, a signal indicating proceed, slow speed, or stop, for governing traffic over said switch, an approach locking relay normally energized over a stick circuit completed when said signal is at stop and which relay when deenergized prevents operation of the switch, a time element device having a first time contact which is slow to close when said device is energized and having a second time contact which opens upon energization of said device and which is slow to close when said device becomes deenergized, a stick relay provided with a pick-up circuit including said first time contact of said time element device, an energizing circuit for said time element device completed when said signal is at stop and including a back contact of said locking relay and a back point of a contact of said stick relay, a stick circuit for said stick relay including a front point of said contact of said stick relay, and a first pick-up circuit for said approach locking relay completed when said signal is at stop and including said second time contact of said time element device and a front point of a second contact of said stick relay; the combination with the foregoing apparatus of, a switch repeater relay energized only when said switch is set for a slow speed movement, and an auxiliary pick-up circuit for said approach locking relay, said circuit including a front contact of said switch repeater relay and said front point of said other contact of said stick relay.

3. In a railway interlocking system of the class comprising, a railway track switch, a signal indicating proceed, slow speed, or stop, for governing traffic over said switch, an approach locking relay normally energized over a stick circuit completed when said signal is at stop and which relay when deenergized prevents operation of the switch, a time element device having a first time contact which is slow to close when said device is energized and having a second time contact which opens upon energization of said device and which is slow to close when said device becomes deenergized, a stick relay provided with a pick-up circuit including said first time contact of said time element device, an energizing circuit for said time element device completed when said signal is at stop and including a back contact of said locking relay and a back point of a contact of said stick relay, a stick circuit for said stick relay including a front point of said contact of said stick relay, and a first pick-up circuit for said approach locking relay completed when said signal is at stop and including said second time contact of said time element device and a front point of a second contact of said stick relay; the

combination with the foregoing apparatus of, a signal control relay effective when energized for causing said signal to indicate call-on, manually operable means for energizing said signal control relay, a switch repeater relay energized only when said switch is set for a slow speed movement, and an auxiliary pick-up circuit for said approach locking relay, said circuit being conditioned to be completed whenever either said switch repeater relay or said signal control relay is energized.

4. In a railway interlocking system of the class comprising, a railway track switch, a relay responsive to traffic adjacent said switch, a signal indicating proceed, slow speed, or stop, for governing traffic over said switch, an approach locking relay normally energized over a stick circuit completed when said signal is at stop and which relay when deenergized prevents operation of the switch, a time element device having a first time contact which is slow to close when said device is energized and having a second time contact which opens upon energization of said device and which is slow to close when said device becomes deenergized, a stick relay provided with a pick-up circuit including said first time contact

5 of said time element device, an energizing circuit for said time element device completed when said signal is at stop and including a back contact of said locking relay and a back point of a contact of said stick relay, a stick circuit for said stick relay including a front point of said contact of said stick relay, and a first pick-up circuit for said approach locking relay completed when said signal is at stop and including said second time contact of said time element device and a front point of a second contact of said stick relay; the combination with the foregoing apparatus of, a signal control relay effective when energized for causing said signal to indicate call-on, manually operable means for energizing said signal control relay, an auxiliary pick-up circuit for said approach locking relay, said circuit including a front contact of said signal control relay and said front point of said other contact of said stick relay, and another auxiliary pick-up circuit for said approach locking relay, said other circuit including a back contact of said traffic responsive relay and a back contact of said signal control relay.

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