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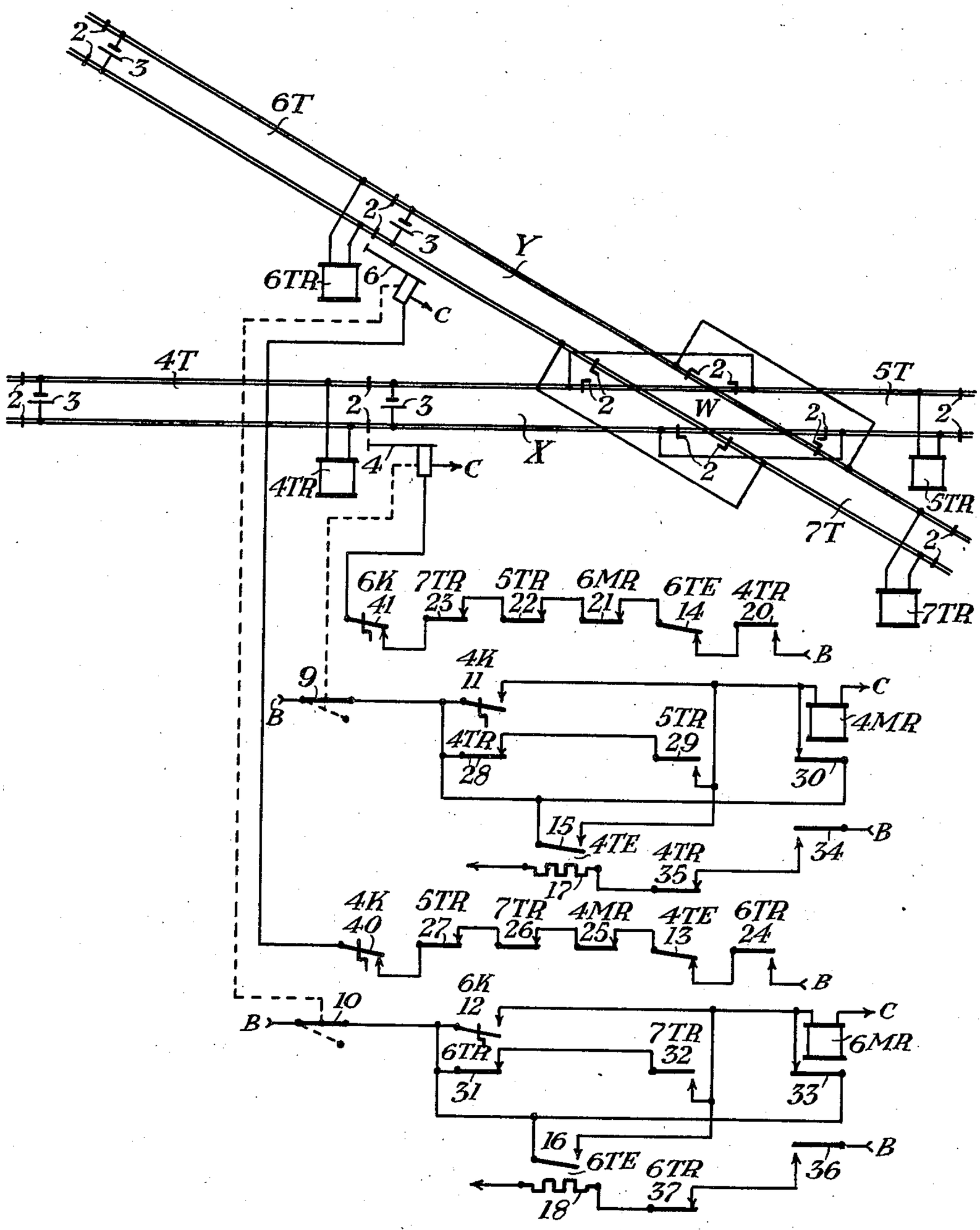

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RAILWAY TRAFFIC CONTROLLING APPARATUS

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My invention relates to railway traffic controlling apparatus, and particularly to apparatus for governing traffic at points where two or more tracks intersect or converge.

I will describe one form of railway traffic controlling apparatus embodying my invention, and will 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 reference characters X and Y designate two intersecting railway tracks. Track X is divided, by means of insulated joints 2, into sections 4T and 5T. Track Y is divided, by means of insulated joints 2, into sections 6T and 7T. The sections 4T and 6T I shall term approach sections and the sections 5T and 7T, containing the intersection W, I shall term detector sections.

Each section in each of the tracks X and Y is provided with a track circuit including a track battery 3 connected across the rails at one end of the section. Each section is also provided with a track relay connected across the rails at the other end of the section and designated by the reference character R with a prefix the same as the reference character of the associated section.

The detector sections 5T and 7T are made electrically separate from each other but each is continuous throughout its length. This is accomplished by means of insulated joints 2 adjacent the intersection W and conductors around the joints in the usual manner.

Traffic from left to right over track X, I will term eastbound traffic, while traffic from left to right over track Y, I will term southbound traffic.

Eastbound traffic on track X is governed by a traffic governing device here shown as a signal and designated by the reference character 4. Southbound traffic on track Y is governed by a traffic governing device here shown as a signal and designated by the reference character 6.

Signals 4 and 6 are here shown as semaphore signals each having a blade occupying a normal position, as shown in the drawing, to indicate "stop" but movable to a different position to indicate "proceed". Associated with signals 4 and 6 are contacts 9 and 10 governed in accordance with the indication of the signals, respectively, by any usual and well known means. That is, each of contacts 9 and 10 is closed only when the associated signal indicates "stop".

Each signal is provided with a normally energized approach locking relay designated by the reference character MR with a prefix the same as the reference character of the associated signal.

Each approach locking relay is provided with a timing device here shown as a thermal relay and designated by the reference character TE with a distinguishing prefix.

The thermal relays 4TE and 6TE are provided with contacts 13 and 14, respectively, which contacts are closed when the associated thermal relay is in its initial or deenergized condition, and are provided with contacts 15 and 16, respectively, which contacts are closed only when the associated thermal relay completes its operation a predetermined interval of time after the heating elements 17 and 18, respectively, are energized.

The reference characters 4K and 6K designate the usual manually operable releases which are provided for the emergency release of the approach locking associated with signals 4 and 6, respectively. Emergency release 4K is provided with contacts 40 and 11 which are closed only when the release 4K is in its initial and operated condition, respectively; and release 6K is provided with contacts 41 and 12 which are closed only when the release 6K is in its initial and operated conditions, respectively.

It will be noted that the relay contacts are not in all instances directly under the relay actuating such contacts. Each such contact, however, is provided with the same reference character as that applied to the actuating relay.

The signal 4 is provided with a circuit which passes from terminal B of a suitable source of current through back contact 20 of track relay 4TR, contact 14 of thermal relay 6TE, front contact 21 of approach locking relay 6MR, front contact 22 of track relay 5TR, front contact 23 of track relay 7TR, contact 41 of emergency release 6K, and signal 4 to terminal C of the same source of current. Thus, signal 4 may be automatically caused to indicate proceed when relay 4TR is released by a train occupying section 4T, provided that the approach locking relay 6MR is in its normal condition, that detector sections 5T and 7T are both unoccupied and that thermal relay 6TE and emergency release 6K are both in their initial conditions.

The signal 6 is provided with a circuit which passes from terminal B through back contact 24 of track relay 6TR, contact 13 of thermal relay 4TE, front contact 25 of relay 4MR, front contact 26 of relay 7TR, front contact 27 of re-

lay 5TR, contact 40 of emergency release 4K, and signal 6 to terminal C. Thus, signal 6 may be automatically caused to indicate proceed when relay 6TR is released by a train occupying section 6T provided that the approach locking relay 4MR is in its normal condition, that detector sections 5T and 7T are both unoccupied and that thermal relay 4TE and emergency release 4K are both in their initial conditions.

The approach locking relay 4MR is provided with three pickup circuits and with one stick circuit. The first pickup circuit for relay 4MR passes from terminal B through contact 9 closed when signal 4 indicates stop, contact 11 of emergency release 4K and relay 4MR to terminal C. The second pickup circuit passes from terminal B through contact 9, front contact 28 of relay 4TR, back contact 29 of relay 5TR and relay 4MR to terminal C. The third pickup circuit passes from terminal B through contact 9, contact 15 of thermal relay 4TE and relay 4MR to terminal C. The stick circuit passes from terminal B through contact 9, front contact 30 of relay 4MR and relay 4MR to terminal C. Thus relay 4MR will be released when signal 4 is caused to indicate "proceed", and may be energized again when signal 4 indicates "stop" either by the operation of the emergency release 4K, or by the release of relay 5TR provided relay 4TR is energized, or by relay 4TE completing its operation. When relay 4MR is energized it will be stuck in that condition as long as signal 4 indicates "stop".

The approach locking relay 6MR is also provided with three pickup circuits and a stick circuit. The first pickup circuit passes from terminal B through contact 10 closed only when signal 6 indicates stop, contact 12 of emergency release 6K and relay 6MR to terminal C. The second pickup circuit passes from terminal B through contact 10, front contact 31 of relay 6TR, back contact 32 of relay 7TR, and relay 6MR to terminal C. The third pickup circuit passes from terminal B through contact 10, contact 16 of relay 6TE, and relay 6MR to terminal C. The stick circuit passes from terminal B through contact 10, front contact 33 of relay 6MR and relay 6MR to terminal C. Thus relay 6MR will be released when signal 6 is caused to indicate "proceed" and may be energized again provided signal 6 indicates "stop", either by the operation of emergency release 6K, or by the release of relay 7TR provided relay 6TR is energized, or by relay 6TE completing its operation. When relay 6MR is picked up it will be held in that condition as long as signal 6 indicates "stop".

The thermal relay 4TE is provided with the circuit which passes from terminal B through back contact 34 of relay 4MR, front contact 35 of relay 4TR and heating element 17 to terminal C. The thermal relay 6TE is provided with a similar circuit which passes from terminal B through back contact 36 of relay 6MR, front contact 37 of relay 6TR and heating element 18 to terminal C. Thus, the operation of either relay 4TE or relay 6TE may be initiated when the associated approach locking relay is released provided the track relay for the corresponding approach section is in its energized condition.

Having thus described in general the various parts of the apparatus embodying my invention, I will now explain their operation.

I shall first assume that with all parts in their normal condition as shown in the drawing, an eastbound train enters section 4T so that relay 4TR becomes released. When relay 4TR is released, signal 4 will be automatically caused to indicate "proceed" by the closing of back contact 20 of relay 4TR in the previously traced control circuit for signal 4. When signal 4 indicates "proceed", contact 9 will be opened so that approach locking relay 4MR becomes released. When relay 4MR is released it will be noted the control circuit for signal 6 will be opened by the opening of front contact 25 of relay 4MR so that signal 6 can not be caused to indicate "proceed".

When the train enters section 5T, the control circuit for signal 4 will be interrupted by the opening of front contact 22 of relay 4TR so that signal 4 will be caused to assume its stop position. When the rear of the train leaves section 4T so that relay 4TR again assumes its energized condition, it will be noted that the second of the previously traced pickup circuits for relay 4MR will be closed so that relay 4MR will again assume its energized condition. When the train departs from section 5T so that relay 5TR again assumes its energized condition, all parts will be in their normal condition ready for the next train.

I shall next assume that an eastbound train on track X, after entering section 4T and releasing relay 4TR, reverses its direction and departs from section 4T without entering section 5T. When this occurs, signal 4 will again assume its stop condition and relay 4MR will remain in its released condition until such time as one of its pickup circuits is closed. When relay 4MR is in its released condition and relay 4TR is in its energized condition, it will be apparent that the previously traced control circuit for thermal relay 4TE will be closed. The closing of this control circuit will initiate the operation of the relay 4TE. Shortly after the operation of relay 4TE is initiated, contact 13 of relay 4TE in the control circuit for signal 6 will become opened. When relay 4TE completes its operation at the expiration of a given time interval so that contact 15 becomes closed, the third of the previously traced pickup circuits for relay 4MR will be closed. Thus, relay 4MR will again assume its energized condition, to close its front contact 25 in the control circuit for signal 6 and to disconnect energy from heating element 17 of thermal relay 4TE, so that contact 13 of relay 4TE in the control circuit for signal 6 may again become closed upon the cooling of heating element 17.

From the foregoing description of the apparatus embodying my invention, it will be obvious that when relay 4MR is released by the clearing of signal 4 in response to the occupancy of section 4T by a train, the relay 4MR can not be immediately restored to its energized condition if such train departs from section 4T without entering section 5T. That is, under this condition relay 4MR will remain released until relay 4TE completes its operation a measured interval of time after the train leaves section 4T. As long as relay 4MR is in its released condition, signal 6 can not be cleared. Therefore, momentary losses of shunt by a train occupying section 4T will not permit the clearing of signal 6 for another train in section 6T desiring to move over the intersection W. If a momentary loss of shunt should occur while a train moving towards the intersection is occupying section 4T, the relay 4MR can not be energized until a measured amount of time is consumed which amount will be sufficient to allow the train in section 4T either to come to a stop before passing signal

4 or to enter detector section 5T. In either event, the two trains will be prohibited from moving over the intersection simultaneously.

Signal 6 and its associated apparatus will operate in a manner similar to that just described for signal 4 and its associated apparatus.

It will be understood that usually directional stick relays will be provided for each track X and Y which relays will prevent the clearing of the signals when trains receding from the intersection occupy the approach sections 4T and 6T. It will be understood also that usually tracks X and Y will be provided with signals to govern traffic movements over the intersection in the directions opposite to those governed by signals 4 and 6. Since such directional stick relays and opposing signals are not required for the purposes of explaining my invention, they are omitted for the sake of simplicity.

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

Having thus described my invention, what I claim is:

1. In combination, a stretch of railway track having an approach section, a traffic controlling device for said stretch having a normal condition but operable to a different condition, means for at times automatically causing said traffic controlling device to assume such different condition when a train enters said approach section, a normally energized approach locking relay, means for deenergizing said approach locking relay when said traffic controlling device is in such different condition, a timing device, means for initiating the operation of said timing device when the train leaves said approach section effective if said approach locking relay is then deenergized, means for energizing said approach locking relay when said timing device completes its operation, and another traffic controlling device rendered inoperative as long as said approach locking relay is deenergized.

2. In combination, a stretch of railway track having an approach section including a track circuit having a track relay, a traffic controlling device for said stretch having a normal condition but operable to a different condition, means for at times automatically causing said traffic controlling device to assume such different condition when the track relay is released by a train entering said approach section, a normally energized approach locking relay, means for deenergizing said approach locking relay when said traffic controlling device is in such different condition, a timing device, means effective to initiate the operation of said timing device when the track relay is energized by the train leaving the approach section provided said approach locking relay is then deenergized, means effective to energize said approach locking relay when said timing device completes its operation, and another traffic controlling device rendered inoperative as long as said approach locking relay is deenergized.

3. In combination, a stretch of railway track, a signal for said stretch, means for at times automatically causing said signal to indicate proceed when a particular approach zone is occupied by a train, an approach locking relay deenergized when said signal indicates proceed, a timing device, means for initiating the operation of said device when the train leaves said approach zone provided said approach locking relay is then deenergized, means for energizing said approach locking relay when said timing device completes its operation, and another signal for an intersecting track controlled by said approach locking relay.

4. In combination, a stretch of railway track divided into an approach section and a detector section each having a track circuit including a track relay, a signal for said stretch, an approach locking relay, a thermal relay controlled by said approach locking relay and the track relay for the approach section, a circuit for said approach locking relay including a contact closed when said signal indicates stop and a back contact of the track relay for the detector section as well as a front contact of the track relay for the approach section, another circuit for said approach locking relay including a contact closed when the signal indicates stop and a contact of said thermal relay, and another signal controlled by said approach locking relay.

5. In combination, a stretch of railway track including an approach section having a track relay, a signal for said stretch controlled by said track relay, an approach locking relay controlled by said signal, a thermal relay for at times controlling said approach locking relay, a circuit for said thermal relay including a front contact of the track relay for the approach section and a back contact of the approach locking relay, and a traffic controlling device controlled by said approach locking relay.

6. In combination, two intersecting railway tracks each having an approach section and a detector section, said detector sections including the intersection; two signals, one for each track for governing traffic over the intersection, means for at times causing one of said signals to indicate proceed when the associated approach section is occupied by a train provided the other signal is indicating stop and provided both detector sections are unoccupied, two normally energized approach locking relays one for each signal, means for causing the approach locking relay associated with each signal to become deenergized when that signal is caused to indicate proceed, means for disabling the control of one signal when the approach locking relay associated with the other signal is deenergized, and means for energizing each approach locking relay when the associated signal indicates stop effective when a train enters the detector section and leaves the approach section of the stretch associated with that signal.

7. In combination, two intersecting railway tracks each including an approach section and a detector section each such section having a track circuit including a track relay, two signals, one for each track for governing traffic over the intersection, means for at times causing one of said signals to indicate proceed when the track relay for the associated approach section is deenergized by a train provided the other signal is indicating stop and provided the track relays for both detector sections are energized, two normally energized stick relays one for each track and each such stick relay effective when deenergized to prevent the clearing of the signal for the other track, a pickup circuit for each stick relay including a front contact of the track relay and a back contact of the track relay for the approach and detector sections respectively of the track associ-

ated with such stick relay, and a stick circuit for each stick relay including a contact closed only when the signal for the associated track indicates stop.

8. In combination, a stretch of railway track divided into an approach section and a detector section each having a track circuit including a track relay, a signal for said stretch at times automatically controlled by the track relay for the approach section, a normally energized approach locking relay, means for deenergizing said approach locking relay when said signal indicates proceed, a circuit for energizing said approach locking relay including a front contact of the track relay for the approach section and a back contact of the track relay for the detector section, and a traffic controlling device for an intersecting track controlled by another circuit including a front contact of the track relay for the detector section and a front contact of said approach locking relay whereby said other circuit for the control of said traffic controlling device will not become effective during a momentary loss of shunt by a train occupying said approach section.

9. In combination, a stretch of railway track including an approach section and a detector section, a signal at the junction of said sections, means for at times causing said signal to indicate proceed effective only if said approach section is then occupied by a train, locking means having an initial condition and a locking condition, means for causing said locking means to assume its locking condition when said signal is caused to indicate proceed, means effective to cause said locking means to assume its initial condition when said signal is caused to indicate stop by the train in the detector section provided the approach section is then unoccupied, other means for also causing said locking means to assume its initial condition when said signal is caused to indicate stop when the train vacates the approach section without entering the detector section, said other means being effective only upon the expiration of a given time interval after the train vacated the approach section, and traffic controlling means governed by said locking means.

10. In combination, a stretch of railway track including an approach section and a detector section each provided with a track circuit including a track relay, a signal at the junction of said sections, means for at times causing said signal to indicate proceed effective only if the track relay for the approach section is then released, locking means having an initial condition and a locking condition, means for causing said locking means to assume its locking condition when said signal is caused to indicate proceed, means effective to restore said locking means to its initial condition when said signal is caused to indicate stop by the releasing of the track relay for the detector section provided the track relay for the approach section is then picked up, other means for also restoring said locking means to its initial condition when said signal is caused to indicate stop by the picking up of the track relay for the approach section, said other means being effective only upon the expiration of a given time interval after the track relay for the approach section becomes picked up, and traffic controlling means governed by said locking means.

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