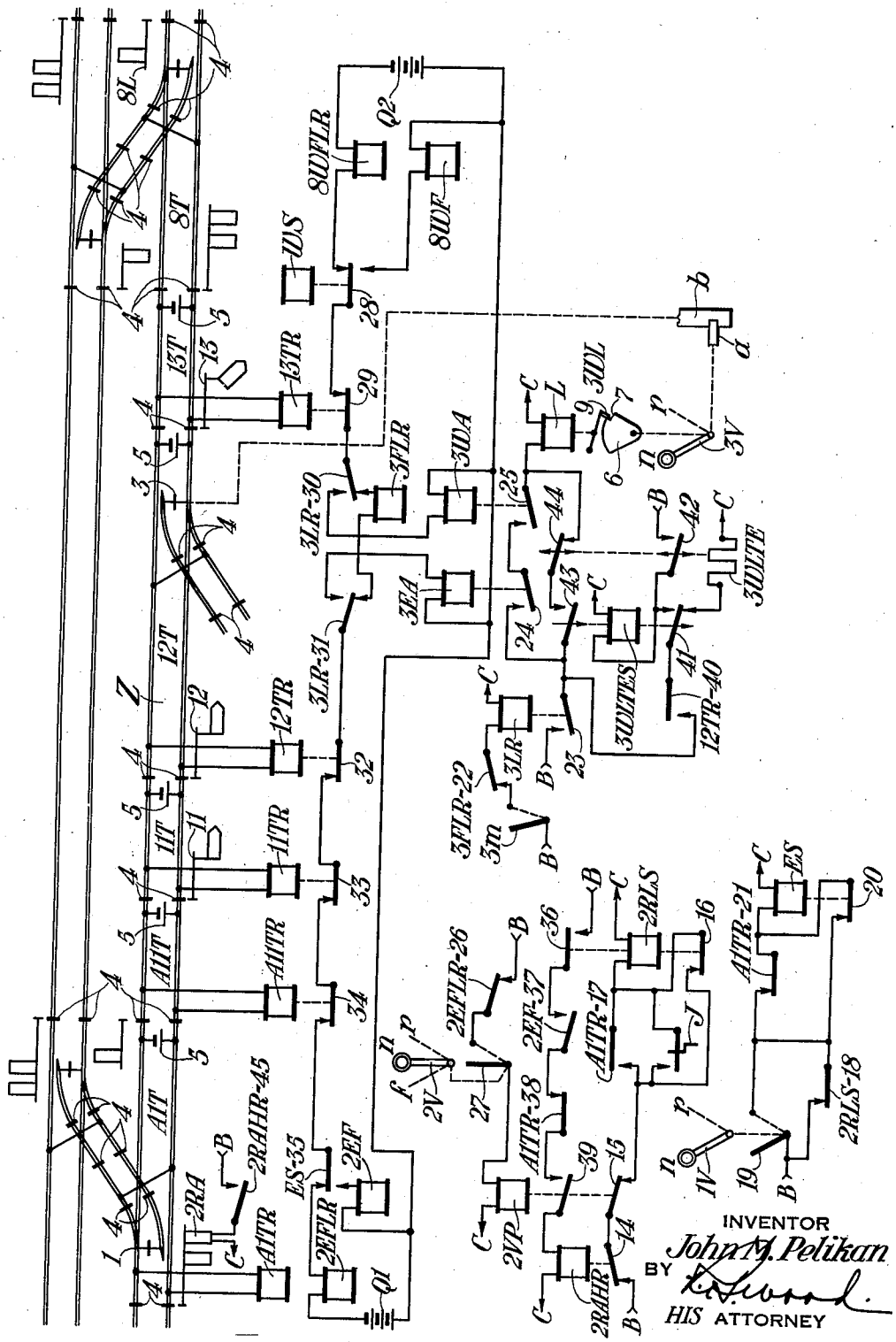
May 13, 1941. J. M. PELIKAN 2,241,614

RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed Aug. 27, 1940



Patented May 13, 1941

2,241,614

UNITED STATES PATENT OFFICE

2,241,614

RAILWAY TRAFFIC CONTROLLING APPARATUS

John M. Pelikan, Pittsburgh, Pa., assignor to The Union Switch & Signal Company, Swissvale, Pa., a corporation of Pennsylvania

Application August 27, 1940, Serial No. 354,353

8 Claims. (Cl. 246—219)

My invention relates to railway traffic controlling apparatus, and particularly to the type known as traffic locking apparatus, embodying a traffic control circuit for each direction of traffic movements over a given stretch of railway track, each including a source of energy at its end adjacent the leaving end of the stretch for the corresponding direction of traffic movements.

A few features of my invention are the provision, in traffic locking apparatus for a stretch of railway track containing a switch, of a switch lockout relay connected in the traffic control circuits at a point adjacent the switch; a manually controlled switch control relay for opening the traffic control circuits adjacent the switch lockout relay and for connecting an approach control relay for each direction of traffic movements across the energy end of the traffic control circuit for the opposite direction of traffic movements; and an electric lock which normally locks the switch, but which releases the switch when the manually controlled switch control relay and both approach control relays are energized, or when a time element device is energized for a measured period of time after the manually controlled switch control relay becomes energized while there is a train on the stretch of track adjacent the switch.

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

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

Referring to the drawing, the contacts operated by the various relays or other devices are identified by numbers, such numbers having distinguishing prefixes from which they are separated by a dash when the contacts are shown apart from the devices by which they are operated. The prefix for each of these contact numbers comprises the reference character for the respective device by which the associated contact is operated. For example, contact 2RAHR—45 shown in the operating circuit for signal 2RA in the upper left-hand corner of the drawing is identified by the number 45 separated by a dash from the prefix 2RAHR, which is the reference character for relay 2RAHR by which this contact is operated.

As shown in the drawing, a stretch of railway track Z, constituting the lower track of a double track railway and including a switch 3, is arranged for traffic to normally move from left to right, which I shall assume is the eastbound direction. Provision is also made for traffic to move at times over track Z in the opposite or westbound direction.

Track Z is divided by insulated joints 4 into sections, including sections A1T, A11T, 11T, 12T, 13T and 8T. Each of these sections is provided with a track circuit including a battery 5 connected across the rails adjacent one end of the section, and a track relay designated by the reference character R preceded by the reference character for the associated section connected across the rails adjacent the opposite end of the section.

Signals designated by the reference characters 2RA, 11, 12 and 13 are located adjacent the west end of sections A1T, 11T, 12T and 13T, respectively, for governing eastbound traffic movements over track Z. A signal designated by the reference character 8L is located adjacent the east end of section 8T for at times governing westbound traffic movements over track Z. As shown in the drawing, these signals are of the semaphore type, but may be of any other suitable design.

The eastbound traffic control circuit includes a source of current shown as a battery Q2 and a westbound traffic lockout relay 8WFLR at its east end and an eastbound traffic control relay 2EF at its west end. The westbound traffic control circuit similarly includes a battery Q1 and an eastbound traffic lockout relay 2EFLR at its west end and a westbound traffic control relay 8WF at its east end. These two traffic control circuits include a circuit portion in common which contains a switch lockout relay 3FLR, back contacts of switch control relay 3LR and front contacts of track section relays. The eastbound traffic control circuit also includes the back point of a contact ES—35 of an eastbound stick relay ES and the front point of contact 28 of a westbound stick relay WS. The westbound traffic control circuit similarly includes the back point of contact 28 of westbound stick relay WS and the front point of contact ES—35 of eastbound stick relay ES.

A signal and traffic lever 2V has a normal position *n* and reverse positions *f* and *r* to the left and right, respectively, of position *n*. A lever repeater relay 2VP is controlled by lever 2V in its *r* position and by back contact 2EFLR—26 of the eastbound traffic lockout relay 2EFLR. Signal control relay 2RAHR is controlled by front contacts of relays 2VP, A1TR and 2EF, and by back contacts of a stick locking relay 2RLS. Relay 2RLS is controlled by back contacts of

relays 2RAHR and 2VP and relay A1TR, and also by a time element device J which may be of the well-known clockwork release type.

A switch control lever designated by the reference character 1V has a normal position *n* and a reverse position *r* for controlling operations of a switch 1 to normal and reverse positions, respectively. Eastbound stick relay ES is controlled by lever 1V in the *r* position and by relays 2RLS and A1TR.

A westbound stick relay WS for the east end of the stretch of track Z is controlled by apparatus which is similar to that described for controlling relay ES at the west end of the stretch of track Z.

A switch control relay 3LR is controlled by a manually controllable contact 3*m* and by a back contact of switch lockout relay 3FLR. Relay 3LR, upon becoming energized, opens the circuit portion which is common to the two traffic control circuits on each side of switch lockout relay 3FLR, and connects an eastbound approach control relay 3EA across the energy end of the westbound traffic control circuit, and also connects a westbound approach control relay 3WA across the east end of the eastbound traffic control circuit.

A lock bar *b* is rigidly secured to switch 3 for engagement by a dog *a* by means of which the switch may be locked in its normal position. Dog *a* is actuated by a manually operable switch lever 3V which may be moved between normal and reverse positions *n* and *r*, respectively, so that when switch lever 3V is in its *n* position dog *a* is in the position shown for preventing movement of lock bar *b*, and when lever 3V is in its *r* position, dog *a* is withdrawn from lock bar *b* to permit manual operation of switch 3.

Movement of lever 3V is controlled by an electric switch lock 3WL. Lock 3WL comprises a locking segment 6, operated by lever 3V, which is formed with a notch 7 for engagement by a latch 9. The latch 9 is controlled by a lock magnet L so that when magnet L is deenergized while lever 3V is in the *n* position, latch 9 is dropped down into notch 7, thereby locking lever 3V in the *n* position, which, in turn, locks switch 3 in its normal position. When magnet L is energized, latch 9 is lifted out of engagement with segment 6 to permit operation of lever 3V to move dog *a* out of engagement with lock bar *b*.

Lock magnet L can be energized either if relays 3LR, 3EA and 3WA are all energized, or if relay 3LR is energized and a time element device 3WLTE, which may be of the thermal type, has been energized a measured period of time, causing a time element stick relay 3WLTES to become energized.

Under normal conditions, the various parts of the apparatus are as shown in the accompanying drawing, that is, track Z is unoccupied and hence all its track relays are energized; signals 2RA and 8L are indicating stop, signal 13 is indicating caution, and signals 12 and 11 are indicating proceed; levers 1V, 2V and 3V and contact 3*m* are in the normal position; time element device J is in its normal position; time element device 3WLTE is deenergized; and relays ES, WS and 2RLS and a corresponding relay for the east end of the stretch of track Z are energized: and relays 2EF, 8WF, 2EFLR, 8WFLR, 3FLR, 3WA, 3EA, 2VP and a corresponding relay for the east end of the stretch of track Z, 2RAHR and a corresponding relay for signal 8L, relays 3LR and 3WLTES, and magnet L are all deenergized. With magnet L deenergized, lever 3V is locked in its *n* position, and hence switch 3 is locked in its normal position.

With relays ES and WS both energized, both of the traffic control circuits are open and batteries Q1 and Q2 are connected in opposition to each other, so that although relays 2EFLR, 3FLR and 8WFLR are connected in series with batteries Q1 and Q2, no current flows through these relays.

The circuit by which relay 2RLS is energized is a stick circuit passing from terminal B of a suitable source of current, not shown in the drawing, through contact 14 of relay 2RAHR, contact 15 of relay 2VP, contact 16 of relay 2RLS, and the winding of relay 2RLS to terminal C of the same source of current.

Both a pick-up circuit and a stick circuit are closed for energizing relay ES, the pick-up circuit passing from terminal B, through contacts 2RLS—18 and A1TR—21, and the winding of relay ES to terminal C. The stick circuit passes from terminal B, through contact 2RLS—18, contact 20 of relay ES, and the winding of relay ES to terminal C.

I shall assume that with all parts of the apparatus thus in the normal condition, it is desired that a train shall move onto track Z over switch 3 in the reverse position. A trainman or a leverman will therefore close contact 3*m*, completing a circuit for energizing switch control relay 3LR, this circuit passing from terminal B, through contacts 3*m* and 3FLR—22, and the winding of relay 3LR to terminal C.

Relay 3LR, upon becoming energized, completes a circuit for energizing eastbound approach control relay 3EA, this circuit passing from battery Q1, through the winding of relay 2EFLR, front point of contact ES—35, contacts 34, 33 and 32 of relays A1TR, 11TR and 12TR, respectively, front point of contact 3LR—31, and the winding of relay 3EA, back to battery Q1. Relay 3LR, upon becoming energized, also completes a circuit for energizing the westbound approach control relay 3WA, this circuit passing from battery Q2, through the winding of relay 8WFLR, front point of contact 28 of relay WS, contact 29 of relay 13TR, front point of contact 3LR—30, and the winding of relay 3WA, back to battery Q2.

With relays 3LR, 3EA and 3WA energized, lock magnet L will become energized by a circuit passing from terminal B, through contact 23 of relay 3LR, contact 24 of relay 3EA, contact 25 of relay 3WA, and the winding of magnet L to terminal C. Magnet L, upon becoming energized, lifts latch 9 out of notch 7, thereby releasing lever 3V.

A trainman will now move lever 3V to the *r* position, thereby withdrawing dog *a* from lock bar *b*. The trainman will then manually move switch 3 to the reverse position by suitable means not shown in the drawing, permitting the train to enter track Z. When the train has passed over switch 3, the trainman will return switch 3 to the normal position in which it is shown in the drawing.

I shall now assume that all parts of the apparatus are again in the normal condition, and that an eastbound train is to move over the stretch of track Z. A leverman will therefore move lever 2V to the *r* position, completing a circuit for energizing lever repeater relay 2VP, passing from terminal B, through contact 2EFLR—26, contact 27 of lever 2V, and the winding of relay 2VP to terminal C. Relay 2VP, upon becoming energized, opens its contact 15 in the stick circuit previously traced for relay 2RLS, causing relay 2RLS to become deenergized. With lever 1V in the *n* position in which it is shown in the drawing, its contact 19 is open, and hence when relay 2RLS

becomes deenergized, causing its contact 2RLS—18 to open the pick-up and stick circuits previously traced for relay ES, relay ES will become deenergized.

Relay ES, upon becoming deenergized, completes the eastbound traffic control circuit passing from battery Q2, through the winding of relay 8WFLR, front point of contact 28 of relay WS, contact 29 of relay 13TR, back point of contact 3LR—30, winding of relay 3FLR, back point of contact 3LR—31, contacts 32, 33 and 34 of relays 12TR, 11TR and A11TR, respectively, back point of contact ES—35, and the winding of relay 2EF, back to battery Q2. Relays 2EF, 3FLR and 8WFLR are therefore now all energized.

Relay 2EF, upon becoming energized, completes a circuit for energizing signal control relay 2RAHR, this circuit passing from terminal B, through contact 36 of relay 2RLS, contacts 2EF—37 and A1TR—38, contact 39 of relay 2VP, and the winding of relay 2RAHR to terminal C. Relay 2RAHR, upon becoming energized, completes a circuit for operating signal 2RA to the proceed position, this circuit passing from terminal B, through contact 2RAHR—45, and the mechanism of signal 2RA to terminal C.

With relay 3WFLR energized, the lever repeater relay for the east end of track Z corresponding to lever repeater relay 2VP at the west end cannot become energized by operation of a signal and traffic lever corresponding to lever 2V at the west end.

With relay 3FLR energized, relay 3LR cannot become energized even if contact 3*m* becomes closed. With relay 3LR deenergized, relays 3EA and 3WA cannot become energized, and also, with relay 3LR deenergized, lock magnet L cannot become energized, and hence switch 3 remains locked in the normal position.

I shall further assume that the eastbound train passes signal 2RA, causing relay A1TR to become deenergized and open its contact A1TR—38, which causes relay 2RAHR to become deenergized. Relay 2RAHR, upon becoming deenergized, opens the circuit traced for the mechanism of signal 2RA, causing signal 2RA to move to the stop position. When the train enters section A11T, contact 34 of relay A11TR will open the circuit for relay 2EF, causing relay 2EF to become deenergized. Relay 2EF, upon becoming deenergized, opens its contact 2EF—37 in the circuit for relay 2RAHR, which is, however, already open at contact A1TR—38. If the leverman returns lever 2V to the *n* position while the train occupies section A1T, relay 2RLS will become energized by a pick-up circuit passing from terminal B, through contacts 14 and 15 of relays 2RAHR and 2VP, respectively, contact A1TR—17, and the winding of relay 2RLS to terminal C.

I shall also further assume that it is desired that the eastbound train shall enter a spur or siding track which is connected with track Z by means of switch 3. The train will therefore stop after passing switch 3, and a trainman or leverman will close contact 3*m*, causing relay 3LR to be energized as previously described. If the train now occupies section 12T, relay 3EA cannot become energized on account of relay 12TR being deenergized, and if the train also occupies section 13T, relay 3WA cannot become energized on account of relay 13TR being deenergized.

With relay 12TR deenergized, a circuit will be completed for energizing time element device 3WLTE, passing from terminal B, through contact 23 of relay 3LR, contact 12TR—40, back point of contact 41 of relay 3WLTES, and the control element of device 3WLTE to terminal C. Upon the lapse of a measured period of time, device 3WLTE will close its contact 42, thereby completing a circuit for energizing relay 3WLTES, passing from terminal B, through contact 42 of device 3WLTE, and the winding of relay 3WLTES to terminal C. Relay 3WLTES, which is of the slow release type, will open the circuit previously traced for device 3WLTE, and close its own stick circuit passing from terminal B, through contact 23 of relay 3LR, contact 12TR—40, front point of contact 41 of relay 3WLTES, and the winding of relay 3WLTES to terminal C. Device 3WLTE is of the slow release as well as slow pick-up type, and therefore its contact 44 will close only upon the lapse of a further measured period of time.

A circuit is thereby completed for energizing magnet L, passing from terminal B, through contact 23 of relay 3LR, contact 43 of relay 3WLTES, contact 44 of device 3WLTE, and magnet L to terminal C. Switch 3 can now be operated to the reverse position as previously described.

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 traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit for each direction of traffic movements over said stretch, each of said circuits for controlling signal means for governing traffic movements over said stretch in the corresponding direction, said circuits containing in common a given circuit portion passing through a plurality of contacts in series, and said contacts normally closed but becoming opened in response to a train occupying corresponding portions of said stretch of track; the combination comprising, a lookout relay connected in said given circuit portion at a point corresponding to the location of said switch in said stretch of track, a switch control relay, a circuit controlled by a back contact of said lockout relay and by manually controllable means for energizing said switch control relay, two back contacts of said switch control relay connected in said given circuit portion one on each side of said lockout relay, an approach control relay for each direction of traffic movements over said stretch each connected on a corresponding side of said lockout relay through a front contact of said switch control relay across a corresponding end of the traffic control circuit for the opposite direction of traffic movements over said stretch, an electric lock which when energized releases said switch for manual operation from the normal to the reverse position but which when deenergized locks said switch in the normal position, and means controlled by front contacts of said switch control relay and of both of said approach control relays for energizing said electric lock.

2. In traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit for each direction of traffic movements over said stretch, each of said circuits for controlling signal means

for governing traffic movements over said stretch in the corresponding direction, said circuits containing in common a given circuit portion passing through a plurality of contacts in series, and said contacts normally closed but becoming opened in response to a train occupying corresponding portions of said stretch of track; the combination comprising, a lockout relay connected in said given circuit portion at a point corresponding to the location of said switch in said stretch of track, a switch control relay, a circuit controlled by a back contact of said lockout relay and by manually controllable means for energizing said switch control relay, an approach control relay for each direction of traffic movements over said stretch, means controlled by said switch control relay in the energized condition for opening said given circuit portion on each side of said lockout relay and for connecting each of said approach control relays with a corresponding end of the traffic control circuit for the opposite direction of traffic movements over said stretch, an electric lock which when energized releases said switch for manual operation but which when deenergized prevents operation of said switch, and means controlled by front contacts of said switch control relay and of both of said approach control relays for energizing said electric lock.

3. In traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit extending along said stretch for each direction of traffic movements over said stretch, each of said circuits including a source of energy at one of its ends for controlling signal means adjacent its opposite end for governing traffic movements over said stretch in the corresponding direction, said circuits containing in common a given circuit portion passing through a plurality of contacts in series, and each of said contacts normally closed but becoming opened in response to a train occupying a corresponding portion of said stretch; the combination comprising, a lockout relay connected in said given circuit portion at a point adjacent said switch, a switch control relay, a circuit controlled by a back contact of said lockout relay and by manually controllable means for energizing said switch control relay, an approach control relay for each direction of traffic movements over said stretch, means controlled by said switch control relay in the energized condition for disconnecting said lockout relay from said given circuit portion and for connecting each of said approach control relays adjacent said lockout relay with the energy end of the traffic control circuit for the opposite direction of traffic movements over said stretch, and means controlled by said switch control relay and by both of said approach control relays for locking said switch if said switch control relay or either of said approach control relays is deenergized and for releasing said switch for manual operation if these same relays are all energized.

4. In traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit extending along said stretch for each direction of traffic movements over said stretch, each of said circuits including a source of energy at one of its ends for controlling signal means adjacent its opposite end for governing traffic movements over said stretch in the corresponding direction, said circuits containing a plurality of contacts in series spaced along said stretch, and each of said contacts normally closed but becoming opened in response to a train occupying a corresponding portion of said stretch; the combination comprising, a lockout relay energized by either of said traffic control circuits whenever such circuit is energized, a switch control relay, a circuit controlled by a back contact of said lockout relay and by manually controllable means for energizing said switch control relay, an approach control relay for each direction of traffic movements over said stretch, means controlled by said switch control relay in the energized condition for preventing energization of said lockout relay by said traffic control circuits and for connecting each of said approach control relays at a point adjacent said switch with the energy end of the traffic control circuit for the opposite direction of traffic movements over said stretch, and means normally locking said switch but which is controlled by said switch control relay and by said approach control relays for releasing said switch if these relays are all energized.

5. In traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit for each direction of traffic movements over said stretch, each of said circuits including a source of energy at one of its ends and means for closing the circuit for controlling signal means adjacent its opposite end for governing traffic movements over said stretch in the corresponding direction; the combination comprising, a lockout relay energized by either of said traffic control circuits whenever such circuit is energized, a switch control relay, a circuit controlled by a back contact of said lockout relay and by manually controllable means for energizing said switch control relay, means controlled by said switch control relay in the energized condition for preventing energization of said lockout relay by said traffic control circuits, and means normally locking said switch but which is controllled by a front contact of said switch control relay for releasing said switch upon the lapse of a measured period of time after a train arrives on said stretch of track adjacent said switch.

6. In traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit for each direction of traffic movements over said stretch, each of said circuits including a source of energy at one of its ends and means for closing the circuit for controlling signal means adjacent its opposite end for governing traffic movements over said stretch in the corresponding direction; the combination comprising, a lockout relay energized by either of said traffic control circuits whenever such circuit is energized, a switch control relay, a circuit controlled by a back contact of said lockout relay and by manually controllable means for energizing said switch control relay, means controlled by said switch control relay in the energized condition for preventing energization of said lockout relay by said traffic control circuits, an approach control relay for each direction of traffic movements over said stretch, an energizing circuit for each of said approach control relays controlled by contacts which are normally closed but which become opened in response to a train on said stretch approaching said switch in the corresponding direction, and means normally locking said switch but controlled by front contacts of said switch control relay and of both of said approach control relays for releasing said switch.

7. In traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit for each direction of traffic movements over said stretch, each of said circuits including a source of energy at one of its ends and including contact means between its energy end and said switch normally closed but becoming opened in response to a train on a corresponding portion of said stretch for controlling signal means adjacent its opposite end for governing traffic movements over said stretch in the corresponding direction; the combination comprising, an approach control relay for each direction of traffic movements over said stretch, manually controllable means for opening said traffic control circuits adjacent said switch and for connecting each of said approach control relays with the energy end of the traffic control circuit for the opposite direction of traffic movements over said stretch, and means normally locking said switch but controlled by means including front contacts of said approach control relays for releasing said switch.

8. In traffic controlling apparatus for a stretch of railway track containing a switch, embodying a traffic control circuit for each direction of traffic movements over said stretch, each of said circuits including a source of energy at one of its ends for controlling signal means adjacent the opposite end for governing traffic movements over said stretch in the corresponding direction; the combination comprising, a switch lockout relay included in said traffic control circuits adjacent said switch, a switch control relay, a circuit controlled by a back contact of said switch lockout relay and by manually controllable means for energizing said switch control relay, means controlled by said switch control relay when energized for opening said traffic control circuits, and means normally locking said switch but controlled by means including a front contact of said switch control relay for releasing said switch.

JOHN M. PELIKAN.