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RAILWAY TRAFFIC CONTROLLING APPARATUS

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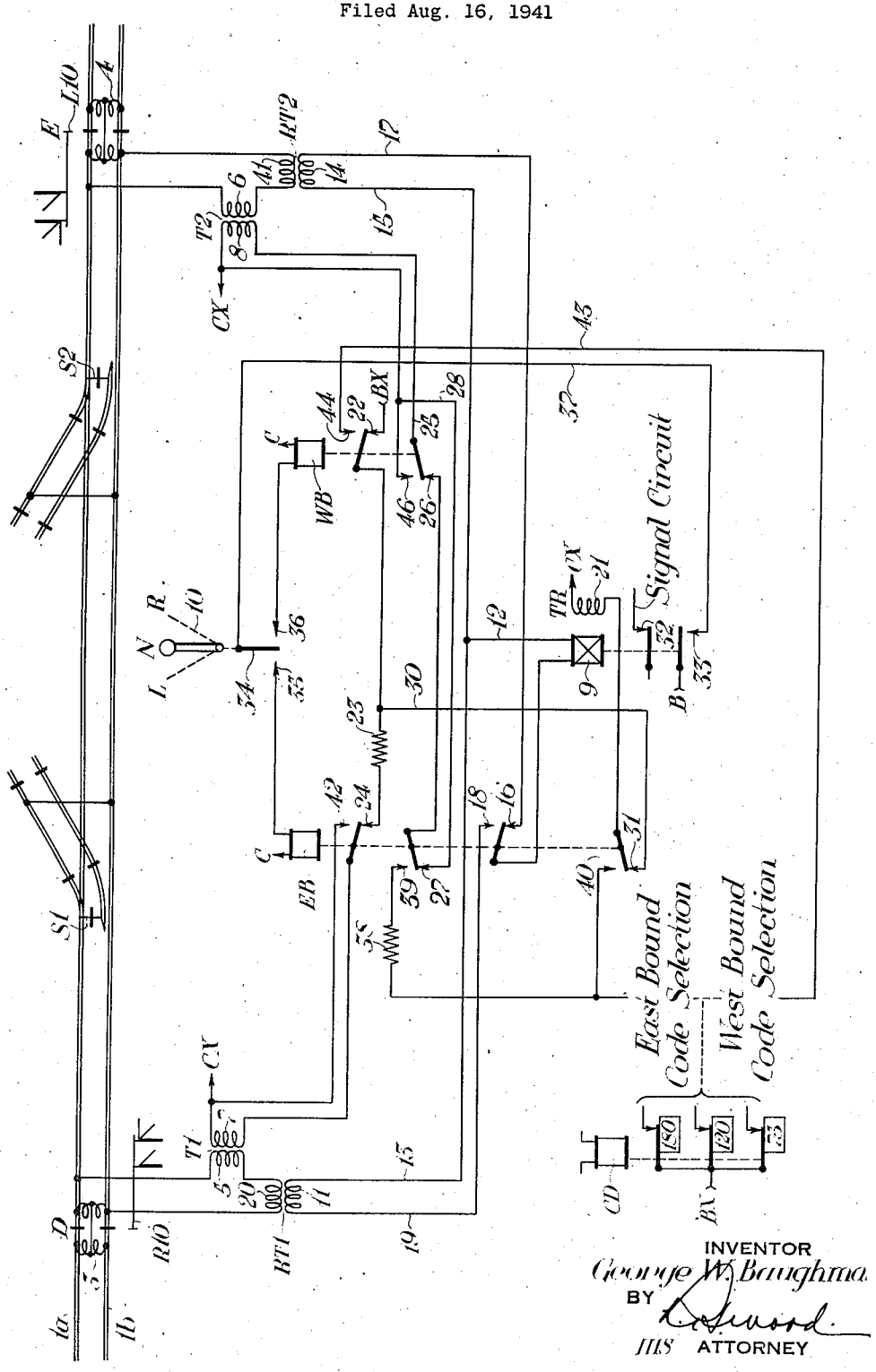

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RAILWAY TRAFFIC CONTROLLING APPARATUS

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8 Claims. (Cl. 246—22)

My invention relates to railway traffic controlling apparatus, and more particularly to apparatus for supplying coded energy to a track section over which traffic may move in either direction.

A track circuit for railway signaling ordinarily includes a source of current and a track relay connected across the rails at the opposite ends of the associated section. Where cab signals responsive to coded track circuit energy are provided, the source of such energy is connected across the rails at the exit end of the section to influence an inductor mounted on the train ahead of the leading wheels of the train. It is customary to provide non-coded or steady state energy for such track circuit for energizing the track relay when the section is unoccupied and to apply the coded energy by approach control means governed by a train entering the section. A track section which is signaled for movements of traffic in either direction must have associated therewith directional means by which a source of coded energy is connected to the rails at the exit end of the section corresponding to the direction of movement of the train, the track relay being also switched to a connection across the rails at the entrance end of the section for the corresponding direction of traffic.

Directional control schemes of such character are in use but the schemes heretofore provided may not be satisfactory at locations where a train may enter a track circuit over a turnout or crossover, and especially is this true at interlockings where there are two track switches facing in opposite directions in the same track circuit. Under such circumstances, the train-carried inductor mounted ahead of the leading locomotive wheels may be without energy or may be subject to both coded and non-coded energy when the locomotive is moving over the crossover with the result that there may be a loss of cab signal control for a short period, that is, a so-called "cab signal flip" may occur.

With these and other considerations in mind, a feature of my invention is the provision of railway traffic controlling apparatus incorporating novel and improved means for applying coded energy to a track circuit of a section over which traffic may move in either direction.

Another feature of my invention is the provision of railway traffic controlling apparatus of the type here contemplated incorporating novel directional switching means to interchange the relay and current source ends of a track circuit.

Again, a feature of my invention is the provision of railway traffic controlling apparatus incorporating novel and improved means for supplying energy to the rails at the opposite ends of a section according to the direction of traffic when there are one or more switches in the section, the energy supplied to the rails being coded or non-coded according as the section is occupied or unoccupied.

Other features, objects and advantages of my invention will appear as the specification progresses.

The above features, objects and advantages embodying my invention I attain by providing a track section with two sources of current, a coding means, a track relay, and a directional controlling means which governs the active and inactive conditions of the sources of current and the connection of the track relay to the rails. The two sources of current are connected one across the rails at one end of the section and the other across the rails at the other end of the section and are associated, one with each direction of traffic over the section. The coding of the current supplied by either current source is controlled according to traffic conditions in advance of the section for the corresponding direction of traffic. The track relay is of the type that can be effectively picked up by coded energy as well as by non-coded energy.

The directional means comprises two directional relays, one for each direction of traffic, and a directional controlling device operable to different positions for causing different conditions of the directional relays. That is, the direction controlling device is operated to three different positions for creating three different conditions of the directional relays. When the directional controlling device is set at a normal position, both directional relays are released, causing a preselected one of the sources to be active, the other source to be inactive, and the track relay to be connected to the rails at the same end as the inactive source of current and energized by current supplied to the rails by the active source of current. The current supplied under this normal condition is non-coded. If traffic is to move through the section in a first direction, the directional controlling device is set at a position corresponding to such first direction of traffic and a circuit is prepared to approach control the corresponding first directional relay. When the first directional relay is picked up in response to a train entering the section to shunt the track relay, the current source associated with the same corresponding direction of

traffic is made active to supply current through the coding means, the other source is rendered ineffective, and the track relay is switched to a connection to the rails at the end adjacent the non-effective source of current. The active source of current is of course the one connected to the rails at the exit end for the first direction of traffic. When this train vacates the section the track relay is picked up by the coded energy and the track relay on picking up restores the apparatus to the normal condition. In case traffic is to move in the opposite or second direction of traffic, the directional controlling device is set at a corresponding position to prepare a circuit by which the other or second directional relay is approach energized and picked up when the train enters the section. The second directional relay when picked up renders the source of current associated with the second direction of traffic active to supply coded energy and the other source ineffective, and the track relay is switched to a connection to the rails at the same end of the section as the ineffective source. When the track relay is picked up subsequent to this train vacating the section, the apparatus is again restored to its normal condition.

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 when used with a track section having two switches facing in opposite directions located therein.

It will be understood, of course, that my invention is not limited to this one track layout or arrangement of a track section, but such arrangement of a track section will serve to illustrate the principle of the invention.

Referring to the drawing the reference characters *1a* and *1b* designate the track rails of a stretch of railway which is formed by the usual insulated rail joints with a track section D—E and which section is signalled for traffic to move over the section in either direction, signals R10 and L10 being located at the opposite ends of the section for governing traffic in opposite directions through the section. Track section D—E includes switches S1 and S2, of which switch S1 may be one switch of a first crossover and switch S2 one switch of a second crossover. As viewed in the drawing the track switches S1 and S2 face in opposite directions. The track rails of section D—E are bonded to be included in a track circuit and each track switch S1 and S2 would be insulated and provided with the usual insulated rail joints and cross bonds to include a portion of the rails of the associated crossover in the track circuit of section D—E. As here shown the usual impedance bonds 3 and 4 are connected around the insulated rail joints at locations D and E, respectively, so that the track rails may be used as part of the return circuit of propulsion current. Other impedance bonds would be provided as required.

The track circuit for section D—E includes a first and a second source of current associated with first end D and second end E, respectively, of the section together with a track relay adaptable of being connected to the rails at either end of the section and of being effectively energized by the current supplied by such current sources. In the present embodiment of the invention, alternating current is used for the track circuit and the two sources of current comprise a first transformer T1 and a second transformer T2, secondary windings 5 and 6 of transformers T1 and T2, respectively, being connected across the rails at the ends D and E, respectively, as will be readily understood by an inspection of the drawing. The primary winding 7 of transformer T1 and primary winding 8 of transformer T2 are connected to any suitable source of alternating current such as a generator, not shown, through the medium of the usual line transformer and transmission line. In the drawing the two terminals of the line transformer from which the track transformers T1 and T2 are supplied with current as well as other circuits of the apparatus are indicated by the reference characters BX and CX. In accordance with standard practice, the alternating current of the track circuit would preferably be of a frequency of the order of 100 cycles per second, but current of some other frequency may be used if desired. The track relay TR is an alternating current relay preferably of the two-element type, a first winding 9 of one element of which is connected to the rails either at the end D or E of the track section through relay transformers RT1 and RT2, while a second winding 21 of the other element of track relay TR is connected by a local circuit to the BX and CX terminals of the source of alternating current. The right-hand terminal of winding 9 as viewed in the drawing is connected to the right-hand terminal of secondary winding 11 of transformer RT1 over wires 12 and 13 and to the left-hand terminal of secondary winding 14 of transformer RT2 over wires 12 and 15. The left-hand terminal of winding 9 of relay TR is connected to the right-hand terminal of secondary winding 14 of transformer RT2 over back contact 16 of a relay EB, to be referred to later, and wire 17; and is connected to the left-hand terminal of secondary winding 11 of transformer RT1 over front contact 18 of relay EB and wire 19. Primary winding 20 of transformer RT1 is interposed in the connection of the secondary winding 5 of transformer T1 to the rails, and primary winding 41 of transformer RT2 is interposed in the connection of secondary winding 6 of transformer T2 across the rails. It is to be seen therefore that winding 9 of relay TR is conditioned to receive energy from the rails at end E of the section when relay EB is released and to receive energy from the rails at end D of the section when relay EB is picked up. The circuits by which the second winding 21 of track relay TR is supplied with current will appear when the operation of the apparatus is described.

The directional means comprises a manually operable lever 10 and a first and a second directional relay EB and WB, respectively. The first directional relay EB is associated with the first or eastbound direction of traffic over section D—E and the second directional relay WB is associated with the second or westbound direction of traffic.

Lever 10 is manually operable to three different positions N, L and R for actuating a contact member 34 to three corresponding positions. The right-hand position R of lever 10 corresponds to the first or eastbound direction of traffic over section D—E, the left-hand position L of the lever corresponds to the second or westbound direction of traffic, and mid position N is the normal position of the lever. Contact member 34 engages contacts 35 and 36, respectively at the R and L positions of lever 10 and is out of engagement with such contacts at the normal position N. Lever 10 may be the usual signal

control lever of an interlocking machine used for controlling signals R10 and L10, contact member 34 being operatively attached to such signal lever. Contact member 34 is used to control the circuits for directional relays EB and WB, an energizing circuit for relay EB being prepared when contact 34—35 is closed and a circuit for relay WB being prepared when contact 34—36 is closed. To be explicit, the circuit for relay EB includes terminal B of any convenient source of current, such as a battery not shown, back contact 33 of track relay TR, wire 37, lever contact 34—35, winding of relay EB and terminal C of the same source of current; and the circuit for relay WB is the same up to wire 37 and thence over contact 34—36 and winding of relay WB to terminal C.

The coding means includes a coder CD. The type of coder is immaterial and it is sufficient for this application to point out that as shown in the drawing, coder CD is provided with three different code contact members 180, 120 and 75, the arrangement being such that these three code contact members are operated to periodically engage respective stationary contacts at the code rates of 180, 120 and 75 times per minute as long as the operating winding of the coder CD is supplied with current from any convenient source.

In describing the operation of the apparatus, I shall first consider the normal condition, that is, the condition when section D—E is unoccupied, lever 10 occupies its mid position N, and the two directional relays EB and WB are released. Under such normal condition, the first transformer T1 is active to supply non-coded current to the rails at the end D of the section and track relay TR is connected to receive current from the rails at end E of the section. Primary winding 7 of transformer T1 is energized over a circuit extending from terminal BX, back contact 22 of relay WB, resistor 23, back contact 24 of relay EB, primary winding 7 of transformer T1 and to terminal CX. With primary winding 7 thus energized, current is transferred to secondary winding 5 of the transformer and non-coded alternating current is supplied to the rails of the section D—E. The connection of winding 9 of track relay TR to secondary winding 14 of transformer RT2 is now completed at back contact 16 of directional relay EB, and winding 21 of relay TR is energized over a circuit including terminal BX, back contact 22 of relay WB, wire 30, back contact 31 of relay EB, winding 21 of relay TR and terminal CX. Consequently track relay TR is picked up due to the energization of both of its windings 9 and 21, and with relay TR picked up, front contact 32 is closed which is interposed in a signal circuit for controlling the associated signals or any other device desired.

I shall next consider that it is desired to establish eastbound direction of traffic and that lever 10 is moved to its R position to establish such direction of traffic. The placing of lever 10 at its R position causes contact member 34 to engage contact 35 and prepare the circuit for eastbound directional relay EB so that when an eastbound train enters section D—E and shunts track relay TR, the shunting of track relay TR closes back contact 33 to complete the circuit of relay EB and relay EB is energized and picked up. Directional relay EB when picked up renders transformer T1 inffective and transformer T2 effective, and transfers the connection of winding 9 of track relay TR to the rails to the end D which is the entrance end for eastbound traffic. Transformer T1 is made ineffective because the circuit for its primary winding 7 is opened at back contact 24 of relay EB, and transformer T2 is made effective because its primary winding 8 is energized over a circuit which can be traced from terminal BX through any one of the code contact members of coder CD, the eastbound code selection network governed by traffic conditions to the right of section D—E, resistor 38, front contact 39 of relay EB, back contact 26 of relay WB, primary winding 8 of transformer T2 and to terminal CX. Hence there is induced in secondary winding 6 of transformer T2 and supplied to the rails at end E of section D—E coded alternating current, such coded alternating current being effective to control the cab signal apparatus of the eastbound train. The connection of winding 9 of track relay TR to the rails now includes front contact 18 of relay EB and the winding 11 of relay transformer RT1. Winding 21 of track relay TR is supplied with coded alternating current from terminal BX over a code contact member of coder CD, the eastbound code selection network, front contact 40 of relay EB and winding 21 to terminal CX. Consequently when this eastbound train vacates section D—E, track relay TR is effectively energized and picked up during the on period of the coded alternating current, and track relay TR on picking up opens back contact 33 interposed in the circuit of directional relay EB causing relay EB to be released and the release of relay EB in turn causes the apparatus to be restored to its normal condition, it being assumed that the operator also moves lever 10 to its normal position N.

It is to be pointed out that in the event switch S2 is reversed to permit an eastbound train to enter section D—E over the crossover of which switch S2 is a part, control lever 10 is moved to its position R to prepare the circuit for eastbound directional relay EB so that when the leading wheels pass the insulated joints of the crossover and enter the track circuit of section D—E shunting track relay TR, the release of relay TR causes the eastbound directional relay EB to be picked up to render transformer T1 ineffective and transformer T2 effective and to transfer the connection of winding 9 of relay TR to the end D of the section the same as previously described. It is clear from an inspection of the drawing that the coded current supplied to the rails through transformer T2 flows in the rails of the crossover due to the cross bond and is effective to control the cab signal equipment of the train moving over the crossover. Since the transformer T1 is ineffective and supplies no current to the rails at end D of the track section the cab signal equipment will not be adversely affected due to the presence of any non-coded current in the rails. Again, since winding 9 of track relay TR is connected to the rails at the end D of the section and winding 21 is energized by coded alternating current it follows that when this eastbound train entering the section over the crossover including switch S2 vacates the section, track relay TR is picked up and the apparatus restored to its normal condition.

Again, in case switch S1 is reversed and an eastbound train enters the section at end D and moves over the crossover of which switch S1 is a part, control lever 10 is moved to its R position to prepare the circuit for directional relay EB

and that relay is picked up when the track relay TR is shunted due to the leading pair of wheels passing the insulated joint at end D of the track section. The picking up of directional relay EB causes transformer T1 to be ineffective, transformer T2 effective for supplying coded alternating current to the rails, and winding 9 of relay TR to be transferred to the rails at end D through the transformer RT1 in the same manner as pointed out hereinbefore for the previous eastbound trains. The coded current applied to the rails through transformer T2 flows in the rails of the crossover of which switch S1 is a part due to the cross bond and hence the cab signal apparatus of the train is effectively controlled until the head end of the train moves beyond the insulated joints of the crossover. When this train vacates the section, the track relay TR is picked up by the coded alternating current and the apparatus is restored to its normal condition.

I shall next consider that it is desired to establish westbound direction of traffic to permit a westbound train to move through the section from end E to end D. Control lever 10 is now moved to its L position to prepare the circuit for westbound directional relay WB which circuit includes back contact 33 of track relay TR and lever contact 34—36. Hence when the leading pair of wheels of the westbound train passes the insulated joints at end E and track relay TR is shunted and released, directional relay WB is energized and picked up. The picking up of directional relay WB causes transformer T2 to be ineffective, transformer T1 to be effective for supplying coded current, and winding 9 of track relay TR to remain connected to the rails at end E through transformer RT2. Transformer T2 is ineffective because the circuit to its primary winding 8 is held open at back contact 26 of relay WB, and transformer T1 is effective to supply coded alternating current due to a circuit which can be traced from terminal BX over any one of the code contact members of coder CD, the westbound code selection network governed by traffic conditions to the left of the track section, wire 43, front contact 44 of relay WB, resistor 23, back contact 24 of relay EB, primary winding 7 and to terminal CX. The coded energy thus supplied from secondary winding 5 to the rails effectively controls the cab signal apparatus of the westbound train. Winding 21 of track relay TR is also energized by coded current over a circuit including terminal BX, a code contact member of coder CD, westbound code selection network, wire 43, front contact 44 of relay WB, wire 30, back contact 31 of relay EB, winding 21 and terminal CX, and it follows that when the westbound train vacates the section D—E the track relay is picked up during an on period of the coded current. The picking up of relay TR causes the westbound directional relay WB to be released with the result that the apparatus is restored to its normal condition, it being assumed that lever 10 is restored to its normal position N.

In case a westbound train is to enter the section over the crossover of which switch S1 is a part, control lever 10 is moved to its L position to prepare the circuit for westbound directional relay WB so that relay WB is picked up when the leading pair of wheels of this westbound train enters the section by moving across the insulated joints of the crossover and shunts the track relay TR. With westbound directional relay WB picked up, transformer T2 is ineffective and coded energy is supplied to the rails through transformer T1 over the same circuit traced hereinbefore. It is apparent that this coded current supplied to the rails through transformer T1 will flow in the rails of the crossover due to the cross bond and hence the cab signal apparatus on the train will be effectively energized. It is also clear that track relay TR is energized and picked up during the on period of the coded energy when this train vacates the section at end D and the picking up of track relay TR releases directional relay WB to cause the apparatus to be restored to its normal condition. In the event the westbound train is to leave the section over the crossover of which switch S2 is a part, the control lever 10 is moved to its L position to prepare the circuit for westbound directional relay WB and that relay is picked up when track relay TR is released due to the train entering the section at the end E. With directional relay WB picked up coded energy is supplied to the rails through transformer T1 and transformer T2 is rendered ineffective. It is apparent that the coded energy supplied to the rails through transformer T1 will control the cab signal apparatus until the head end of the train moves beyond the insulated joints of the crossover of which switch S2 is a part and that when the train vacates the section track relay TR will be picked up by the coded energy and directional relay WB will be released causing the apparatus to be restored to its normal condition.

It follows from the foregoing description that I have provided novel track circuit apparatus for applying coded energy to either end of track section which is signaled for traffic to move over the section in either direction, and which apparatus has a further advantage that loss of control of the cab signal is avoided when the train enters the section over a crossover.

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 combination, a section of railway track, a first and a second track transformer having their secondary windings connected across the rails at a first and a second end of said section respectively, a track relay, a source of coded alternating current, a first and a second directional relay, circuit means including contacts of said first and second directional relays to connect said coded alternating current source to the primary winding of said first transformer and the track relay across the rails at said second end of the section when said first directional relay is released and said second directional relay is picked up and to connect said coded alternating current source to the primary winding of said second transformer and said track relay across the rails at said first end of the section when the first directional relay is picked up and the second directional relay is released, and means including a back contact of said track relay and contacts of a multiple position circuit controller to energize either the first or the second directional relay.

2. In combination, a section of railway track, a first and a second track transformer having their secondary windings connected across the rails at a first and a second end respectively of said section, a track relay, a source of alternating current, coding means operative to code such al-

ternating current, a first and a second directional relay; circuit means including contacts of said directional relays to connect said current source to the primary winding of said first transformer and said track relay across the rails at said second end of the section when both directional relays are released, to connect said current source through the coding means to the primary winding of said second transformer and said track relay across the rails at said first end of the section when the first directional relay is picked up and the second directional relay is released, and to connect said current source through the coding means to the primary winding of said first transformer and said track relay across the rails at said second end of the section when the second directional relay is picked up and the first directional relay is released; and a manually operable means operable to a normal, a first direction and a second direction position for cooperating with a back contact of said track relay to cause the directional relays to be released at said normal position, the first directional relay picked up and the second directional relay released at said first direction position and the second directional relay to be picked up and the first directional relay released at said second direction position.

3. In combination, a section of railway track, a first and a second track transformer having their secondary windings connected across the rails at a first and a second end of the section respectively, a track relay, a source of alternating current, coding means to code said alternating current, a first and a second directional relay, circuit means including back contacts of said directional relays to connect said current source to the primary winding of said first transformer and said track relay across the rails at said second end of the section to energize said track relay by non-coded alternating current under a normal unoccupied condition of the section, other circuit means including a front contact of said first directional relay and a back contact of said second directional relay to connect said current source through said coding means to the primary winding of said second transformer and said track relay across the rails at the first end of the section for use in control of cab signals on a train moving from the first toward the second end of the section and to reenergize the track relay when that train vacates the section, a further circuit means including a front contact of said second directional relay and a back contact of said first directional relay to connect said current source through said coding means to the primary winding of said first transformer and said track relay across the rails at said second end of the section for use in control of cab signals on a train moving from the second toward the first end of the section and to reenergize the track relay when that train vacates the section, manually controlled means having a first and a second and a third position; means governed by the manually controlled means to cause said directional relays to be both released, the first directional relay to be picked up and the second directional relay to be released and the first directional relay to be released and the second directional relay to be picked up at said first, second and third positions respectively; and a back contact of said track relay interposed in the last mentioned means to delay the governing of said directional relays by said manually controlled means until a train enters the section and to restore the supply of non-coded alternating current when the train vacates the section.

4. In combination, a section of railway track a source of current, coding means operative to code such current, a track relay; directional means operable to a normal condition, a first direction condition and a second direction condition; circuit means controlled by said directional means to connect said current source and said track relay across the rails at a first and a second end respectively of the section under said normal condition, to connect said source through said coding means and said track relay across the rails at said second and first ends respectively of the section under said first direction condition and to connect said source through said coding means and said track relay across the rails at said first and second ends respectively under said second direction condition; circuit means to selectively govern the conditions of said directional means, and a back contact of said track relay interposed in said circuit means to delay the selection effected by the circuit means until a train enters the section.

5. In combination, a section of railway track including a track switch, a first and a second directional relay corresponding to eastbound and westbound traffic respectively in the section, a source of alternating current, coding means for coding such alternating current; a first and a second track transformer having their secondary windings connected across the rails at the west end and east end respectively of the section, a track relay, circuit means including a back contact of each of said directional relays to connect said alternating current source to the primary winding of said first transformer and to connect said track relay across the rails at the east end of the section for energizing the track relay with non-coded current when the section is unoccupied, another circuit means including front contacts of said first directional relay and a back contact of said second directional relay to connect said alternating current source through said coding means to the primary winding of said second transformer and said track relay across the rails at the west end of the section for use in control of cab signals of an eastbound train moving over said switch and for energizing the track relay when that train vacates the section, other circuit means including a front contact of said second directional relay and back contacts of said first directional relay to connect said alternating current source through the coding means to the primary winding of said first transformer and the track relay across the rails at the east end of the section for use in control of cab signals of a westbound train moving over said switch and for energizing the track relay when that train vacates the section, and manually controlled means for selectively controlling the positions of said directional relays.

6. In combination, a section of railway track, a first and a second directional relay corresponding to eastbound and westbound traffic respectively in the section, a source of coded alternating current, a first and a second track transformer having their secondary windings connected across the rails at the west end and east end respectively of the section, a two-winding track relay, circuit means including contacts of said directional relays to connect said coded current source to the primary winding of said second transformer and to one winding of said track relay and to connect the other winding of the track relay across the

rails at the west end of the section when the first directional relay is picked up and the second directional relay is released, other circuit means including contacts of said directional relays to connect said coded current source to the primary winding of said first transformer and to said one winding of the track relay and to connect said other winding of the track relay across the rails at the east end of the section when the second directional relay is picked up and the first directional relay is released, and circuit means including a contact of said track relay and contacts of a manually operable means for controlling the energization of said directional relays.

7. In combination, a section of railway track, a first and a second track transformer having their secondary windings connected across a first and a second end respectively of the section, a source of alternating current, coding means operative to code such current, a track relay, a control contact member operable to a normal, a first and a second position, means including back contacts of said directional relays to connect said current source to the primary winding of said first track transformer and said track relay across the rails at said second end of the section to energize the track relay when the section is unoccupied, a first circuit including a back contact of said track relay and the first position of said contact member to energize said first directional relay, means including front contacts of said first directional relay to connect said current source through the coding means to the primary winding of said second track transformer and said track relay across the rails at said first end of the section for cab signal control when the train moves in a first direction over the section and for picking up the track relay when that train vacates the section, a second circuit including a back contact of said track relay and the second position of said contact member to energize said second directional relay, and means including a front contact of said second directional relay to connect said current source through said coding means to the primary winding of said first track transformer and said track relay across the rails at said second end of the section for cab signal control when a train moves in a second direction over the section and for picking up the track relay when that train vacates the section.

8. In combination, a section of railway track and including a switch of a crossover, a track circuit for said section and including the rails of at least a portion of said crossover, a first and a second transformer for supplying current to said track circuit and said transformers having their secondary windings connected across the rails at a first and a second end respectively of the section, a source of alternating current, coding means operative to code such current, a track relay for said track circuit, a first and a second directional relay, circuit means including a back contact of each of said directional relays to connect said current source to the primary winding of said first transformer and said track relay to the rails at said second end to energize the track relay over said track circuit when the section is unoccupied, other circuit means including a front contact of the first directional relay to connect said current source through said coding means to the primary winding of said second transformer and the track relay across the rails at said first end for use in control of cab signals when a train moving in a first direction occupies said section and said portion of the crossover and to pick up said track relay when such train vacates the track circuit, other circuit means including a front contact of said second directional relay to connect said current source through said coding means to the primary winding of said first transformer and the track relay across the rails at said second end for use in control of cab signals when a train moving in a second direction occupies the section and said portion of the crossover and to pick up said track relay when such train vacates the track circuit, and means for selectively controlling said directional relays.

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