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RAILWAY TRAFFIC CONTROLLING APPARATUS

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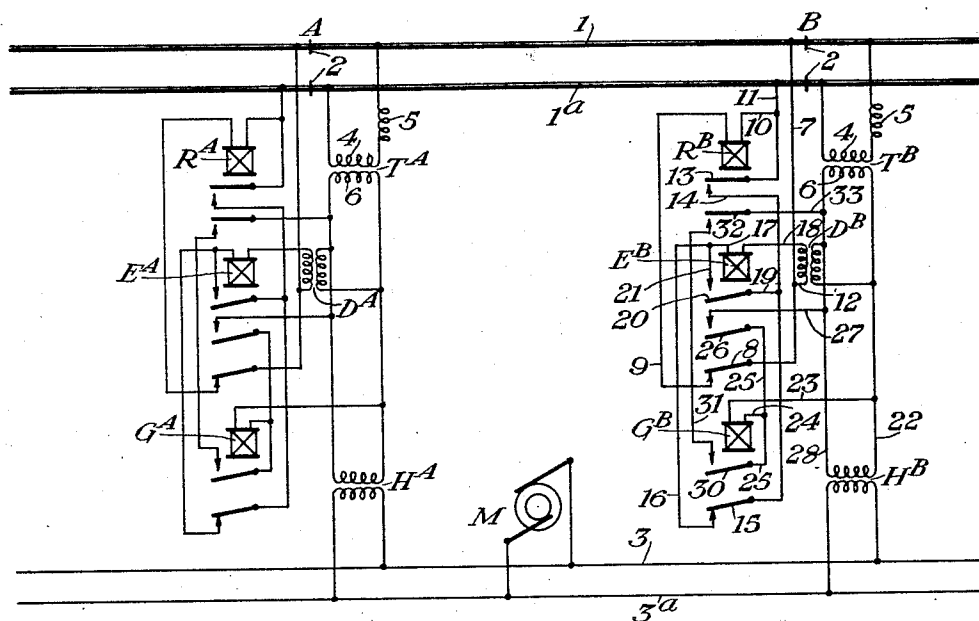


Fig. 1.

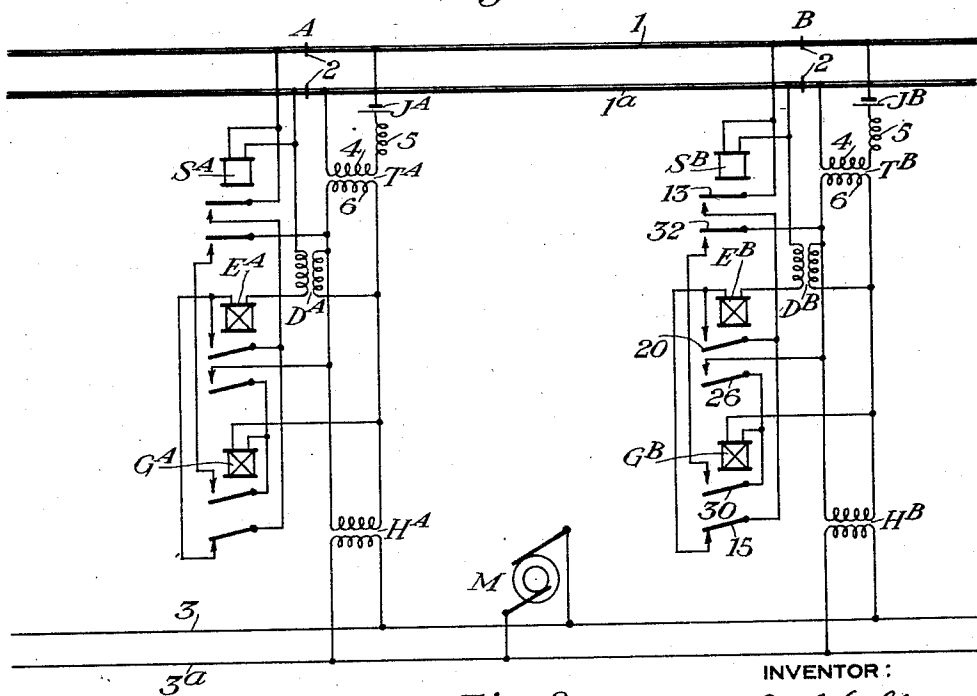


Fig. 2.

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RAILWAY-TRAFFIC-CONTROLLING APPARATUS.

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My invention relates to railway traffic controlling apparatus, and is particularly well adapted for, though in no way limited to, automatic train controlling systems embodying train carried governing means controlled by energy received from the trackway.

I will describe two forms of apparatus embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a diagrammatic view showing one form of apparatus embodying my invention. Fig. 2 is a view showing a modification of the apparatus illustrated in Fig. 1 and also embodying my invention.

Similar reference characters refer to similar parts in each of the views.

Referring first to Fig. 1, the reference characters 1 and 1^a designate the track rails of a railway over which traffic normally moves in both directions. These track rails are divided by means of insulated joints 2 into a plurality of successive track sections of which only one complete section A—B is shown in the drawing.

Each track section is provided with a source of track circuit current which comprises as here shown a track transformer designated by the reference character T with an exponent corresponding to the location and having its secondary winding 4 constantly connected across the rails adjacent the left hand end of the section. Interposed between one rail 1 of each section and the secondary 4 of the associated track transformer is an impedance 5, one function of which is to limit the output of the transformer when its terminals are short-circuited by the wheels and axles of a train occupying the section. The primary 6 of each track transformer is constantly supplied with alternating current from the secondary of a line transformer associated therewith and designated by the reference character H with an exponent corresponding to the location. The primary of each such line transformer is constantly supplied with alternating current from a suitable source of energy, such as a generator M, over line wires 3 and 3^a. Each section is also provided with a track relay, a cut-out relay and an auxiliary relay designated by the reference characters R, E

and G, respectively, with exponents corresponding to the location. Each track relay R is normally connected across the track rails adjacent the right hand end of the associated section. Referring particularly to relay R^B, the relay is provided with a circuit which passes from rail 1 of section A—B, through wire 7, back contact 8 of cut-out relay E^B, wire 9, winding of track relay R^B, and wires 10 and 11 back to rail 1^a of section A—B. It will be seen that this circuit is closed only when relay E^B is de-energized, under which condition, assuming section A—B to be unoccupied, relay R^B is energized by current supplied to the track rails by secondary 4 of track transformer T^A.

The trackway apparatus herein shown and described is intended for co-operation with train carried governing means responsive to current flowing in the track rails. In at least one form of apparatus designed to cooperate in this manner the track circuit current in the track rails influences the governing means through the medium of receiving appliances located on the front of the train. It is clear that in apparatus of this nature the trackway apparatus must be so arranged that the source of track circuit current is at all times connected with the rails in advance of the train. In Fig. 1 it will be seen that for traffic moving from right to left the transformers T are always in advance of the trains, and in order to provide a source of energy connected in advance of trains moving in the opposite direction, namely, from left to right, I provide an auxiliary track transformer located adjacent the right hand end of each section and here designated by the reference character D with a suitable exponent. The primary of each such transformer D is constantly supplied with alternating current from the secondary of the associated line transformer H. Referring particularly now to section A—B, a train entering the section and moving from left to right de-energizes relay R^B and the closing of the back contact of this relay closes a circuit for transformer D^B, current flowing from the secondary of transformer D^B, through wires 12 and 7, rail 1 of section A—B, the wheels and axles of the train occupying section A—B, rail 1^a, wire 11, back contact 13 of track relay R^B, wire 14,

back contact 15 of auxiliary relay G^B , wires 16 and 17, winding of relay E^B , and wire 18 back to the secondary of transformer D^B , thereby supplying track circuit current to section A—B, and simultaneously energizing relay E^B which relay thereupon closes its front contacts. The closing of relay E^B disconnects relay R^B from the track section A—B by opening back contact 8, and also closes a stick circuit for relay E^B which passes from the secondary of transformer D^B , through wires 12 and 7, rail 1 of section A—B, the wheels and axles of the train occupying section A—B, rail 1^a, wire 11, back contact 13 of track relay R^B , wires 14 and 19, front contact 20 of relay E^B , wires 21 and 17, winding of relay E^B , and wire 18 back to transformer D^B . It is clear therefore that relay E^B is energized only when relays R^B and G^B are de-energized, and is subsequently stuck or retained in its energized condition over its own front contact as long as relay R^B is de-energized even though relay G^B becomes energized. With this arrangement therefore, a train moving from left to right through the stretch of track shown in this drawing is supplied with track circuit current from a source connected with the rails in advance of the train. The closing of the front contacts of relay E^B completes a pick-up circuit for relay G^B which passes from the secondary of transformer H^B , through wires 22 and 23, winding of relay G^B , wires 24 and 25, front contact 26 of relay E^B , and wires 27 and 28 back to transformer H^B , thus energizing relay G^B . Relay G^B is also provided with a stick circuit which passes from the secondary of transformer H^B , through wires 22 and 23, winding of relay G^B , wires 24 and 25, front contact 30 of relay G^B , wire 31, back contact 32 of track relay R^B , and wires 33 and 28 back to transformer H^B . It is clear that when relay R^B is de-energized and relay G^B is energized, relay G^B is retained in its energized position over a circuit including its own front contact and a back contact of relay R^B but eliminating the front contact of relay E^B . After the train moves out of the section A—B, current from transformer D^B can only pass from rail 1 to rail 1^a through secondary 4 of transformer T^A . Since the voltage of this winding 4 is in opposition to that of transformer D^B , the current flowing through transformer D^B and hence through relay E^B is reduced to a value below the release point of this relay, which relay thereupon becomes de-energized, opening its front contacts and closing its back contacts, thereby connecting relay R^B with the rails of the section. This relay is therefore energized, and the opening of its back contact 13 disconnects transformer D^B from the rails of the section. The energization of relay R^B also opens, at its back contact

32, the stick circuit for relay G^B which relay becomes de-energized thus returning the apparatus to its normal condition.

When a train moving from right to left enters section A—B the operation of the apparatus is the same as just described for traffic from left to right but the train carried governing means are now supplied with alternating current from the transformer T^A connected across the rails in advance of the train and hence the operation of the apparatus located at point B does not affect the train. The purpose of back contact 8 of relay E^B in the circuit for relay R^B is to eliminate any possibility of uncertainty in the operation of relay R^B . In the absence of this contact, relay R^B might, under certain circumstances be intermittently energized and de-energized when a train occupies section A—B.

Referring now to Fig. 2 I show one arrangement of apparatus embodying my invention adapted for application to a signaling system comprising direct current track circuits. A direct current track relay, here designated by the reference character S with an exponent corresponding to the location is constantly connected across the rails adjacent the right hand end of each section, and the secondary 4 of each track transformer T is connected in series with a track battery designated by the reference character J with an exponent corresponding to the location. Relays E and G are controlled by the associated track relays over circuits similar in all respects to those described in connection with Fig. 1. The operation of the apparatus shown in Fig. 2 is as follows:

As shown in the drawing the parts are in the position corresponding to the normal or unoccupied condition of the portion of track shown. The secondary 4 of transformer T^A and the impedance 5 offer low resistance to the direct current from battery J^A , and track relay S^B is therefore energized by the direct current supplied to the rails at the opposite end of the section. Relays E^B and G^B are de-energized, and transformer D^B is disconnected from the track section. Under these conditions alternating track circuit current is supplied to the rails from the transformer T^A . Traffic moving from right to left is therefore supplied with alternating current from a source in advance of the train. If a train moving from left to right enters section A—B at point A, its wheels and axles will shunt the track circuit current supplied by battery J^A and transformer T^A . Relay S^B , no longer receiving direct current, will be de-energized. The closing of back contact 13 of relay S^B closes the circuit for transformer D^B and relay E^B , this relay therefore becoming energized, and closing its stick circuit over its own front contact 20. The closing of front contact 26 of relay E^B

completes the pick-up circuit for relay G^B which thereupon becomes energized and closes its stick circuit over its own front contact 30 and back contact 32 of track relay S^B.

It will be plain that under these conditions traffic moving from left to right through section A—B will be supplied with alternating track circuit current from transformer D^B connected with the rails of the section in advance of the train. After the train leaves the section at point B the current supplied by transformer D^B can pass from rail 1 to rail 1^A only through transformer T^A which is in voltage opposition. The current through transformer D^B and hence through relay E^B is considerably reduced therefore and this relay becomes de-energized. The opening of front contact 20 of relay E^B disconnects transformer D^B from the track rails. Direct current from battery J^A picks up relay S^B which opens, at its back contact 32, the stick circuit for relay G^B which thereupon becomes de-energized and returns the apparatus to normal condition.

Although I have herein shown and described only two forms 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 section of railway track, a source of alternating train governing energy constantly connected across the rails of said section, a second source of alternating train governing energy, and means for connecting said second source across the rails only when such section is occupied by a train.

2. In combination, a section of railway track, a source of alternating train governing energy constantly connected across the rails of said section, a second source of alternating train governing energy, and means normally ineffective but effective when said section is occupied by a train for connecting said second source across the rails of said section.

3. In combination, a section of railway track, a source of energy connected with the rails adjacent one end of said section, a track relay connected with the rails adjacent the other end of said section and responsive to energy from said source, a cut-out relay associated with said track relay, a second source of energy, an auxiliary relay, means controlled by said track relay and said auxiliary relay for supplying current to the rails of said section and to said cut-out relay, means subsequently controlled by said track relay and said cut-out relay for supplying current to the rails of said section and to said cut-out relay, means controlled by said

cut-out relay for energizing said auxiliary relay, and means controlled by said track relay for subsequently maintaining said auxiliary relay in such energized condition until the track relay becomes energized.

4. In combination, a section of railway track, a cut-out relay for said section, an auxiliary relay controlled by said cut-out relay, and means controlled by said auxiliary relay and by traffic conditions in said section for supplying current to the rails of said section and to said cut-out relay in series.

5. In combination, a section of railway track, a cut-out relay for said section, an auxiliary relay controlled by said cut-out relay, means controlled by said auxiliary relay and by traffic conditions in said section for supplying current to the rails of said section and to said cut-out relay in series, and means controlled only by traffic conditions in said section for subsequently supplying current to the rails of said section and to said cut-out relay.

6. In combination, a section of railway track, means for supplying current to said section, and means effective upon a substantial decrease in the strength of such current for interrupting said supply.

7. In combination, a section of railway track, a relay associated with said section, means controlled by said relay for supplying current to said section, and means responsive to the strength of said current for interrupting said supply and for controlling said relay.

8. In combination, a section of railway track, a relay associated with said section, means controlled by said relay and by traffic conditions in said section for supplying current to said section, and means responsive to the strength of said current for at times removing said relay from the control of such current and at other times for interrupting such current.

9. In combination, a section of railway track, a track relay for said section, a second relay for said section, means controlled by said two relays for supplying current to said section, and means responsive to the strength of said current for at times removing said second relay from the control of such current.

10. In combination, a section of railway track, a track relay for said section, a second relay for said section, means controlled by said two relays for supplying current to said section, means responsive to the strength of said current for at times removing said second relay from the control of such current, a pick-up circuit for said second relay including a contact controlled by said last mentioned means, and a stick or retaining circuit for said second relay including a contact controlled by said track relay.

11. In combination, a stretch of railway track, means for supplying trains moving in one direction through such stretch with alternating track circuit current from a source of energy constantly connected across the rails in advance of the train, a second energy source, and means for connecting said second source across the rails in advance of traffic moving in the opposite direction and for disconnecting said second source when traffic passes the point where said second source is connected with said stretch.

12. Railway traffic controlling apparatus comprising a section of railway track, a source of track circuit current constantly connected with one end of the section, a second source of energy for the section; a track relay, a cut-out relay and an auxiliary relay for the section; means controlled by the track relay and cut-out relay for operating the said auxiliary relay; a circuit including the said second source, the cut-out relay, a contact operated by the track relay, a contact operated by the auxiliary relay, and the rails of the section in series; and a second circuit including the said second source, the cut-out relay, a contact operated by the cut-out relay, a contact operated by the track relay and the rails of the section in series.

13. Railway traffic controlling apparatus comprising a section of railway track, a source of track circuit current constantly connected with one end of such section, a second source of energy for said section; a track relay, a cut-out relay and an auxiliary relay for said section; means controlled by the track relay and cut-out relay for operating the auxiliary relay; a circuit for said section including the said second source, the cut-out relay, a contact operated by the track

relay, a contact operated by the auxiliary relay, and the rails of the section in series; a second circuit for said section including the said second source, the cut-out relay, a contact operated by such cut-out relay, a contact operated by the track relay and the rails of the section in series; and means for preventing the over-energization of said track relay by the said second source.

14. Railway traffic controlling apparatus comprising a section of railway track, a source of track circuit current constantly connected with one end of such section, a second source of energy for the section; a track relay, a cut-out relay and an auxiliary relay for said section; means controlled by the track relay and cut-out relay for operating said auxiliary relay; a circuit for each section including the said second source, the cut-out relay, a contact operated by the track relay, a contact operated by the auxiliary relay, and the rails of the section in series; a second circuit for each section including the said source, the cut-out relay, a contact operated by the cut-out relay, a contact operated by the track relay and the rails of the section in series; and means controlled by said cut-out relay for at times disconnecting the track relay from the section.

15. In combination, a section of railway track, a source of energy constantly connected across the rails of said section, a track relay normally connected across the rails of the section, a second source of energy, and means for at times connecting said second source across the rails of said section and disconnecting said relay from said section.

In testimony whereof I affix my signature.
HERBERT A. WALLACE.