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H. A. WALLACE

RAILWAY TRAFFIC CONTROLLING APPARATUS

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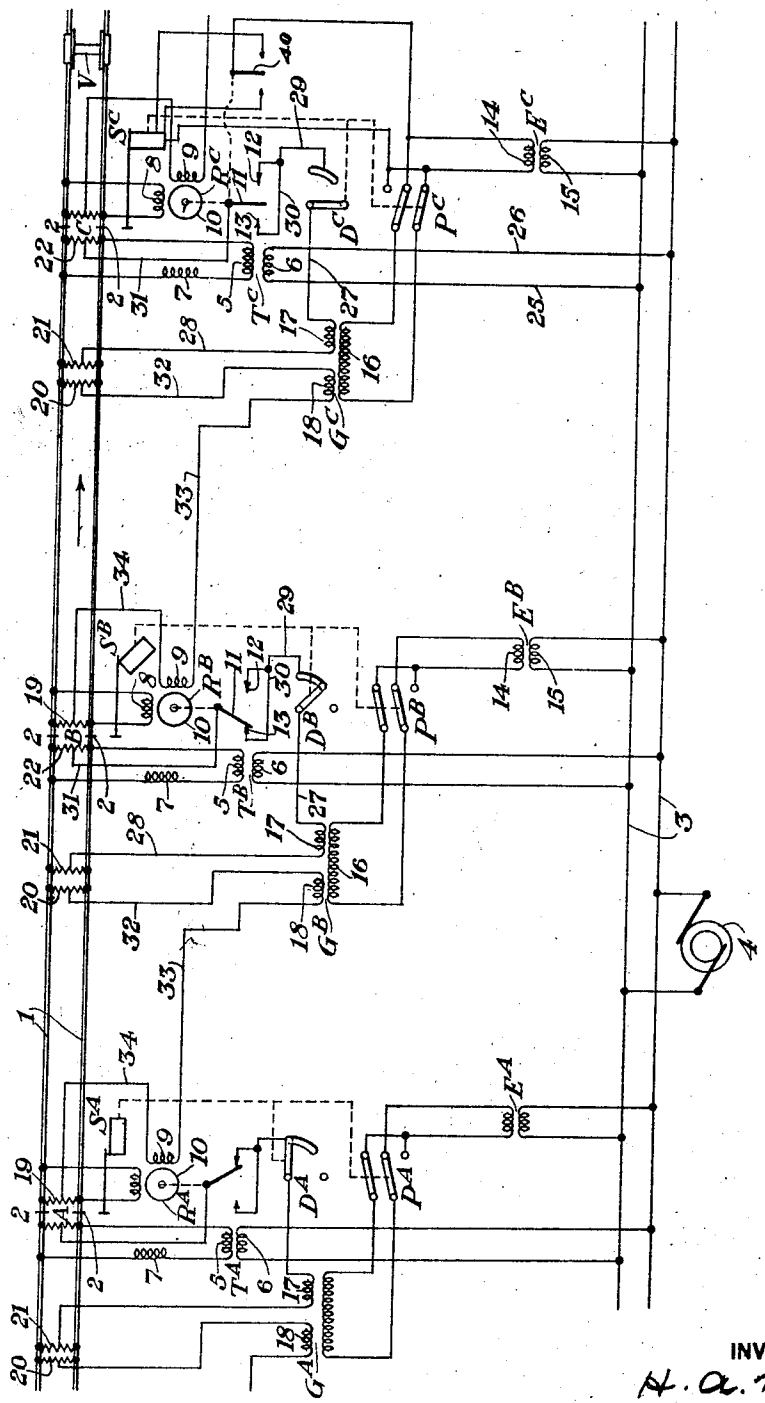

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RAILWAY-TRAFFIC-CONTROLLING APPARATUS.

Application filed December 4, 1922. Serial No. 604,662.

To all whom it may concern:

Be it known that I, HERBERT A. WALLACE, citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Railway-Traffic-Controlling Apparatus, of which the following is a specification.

My invention relates to railway traffic controlling apparatus, and particularly to apparatus of the type wherein governing mechanism on the cars or trains is controlled by energy received from the trackway. More specifically, the present invention relates to the trackway portion of such apparatus.

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 showing the trackway apparatus of one form of railway traffic controlling apparatus embodying my invention.

Referring to the drawing, the reference character 1 designates the track rails of a railroad over which traffic normally moves in the direction indicated by the arrow. These rails are divided, by means of insulated joints 2, into a plurality of insulated track sections A—B, B—C, etc. Each of these sections is provided with a source of track circuit current which, as shown in the drawing, is the secondary winding 5 of a track transformer designated by the reference character T with an exponent corresponding to the location. This secondary winding is connected across the rails adjacent the exit end of the section. Interposed between one terminal of this secondary 5 and the upper rail of each section is an impedance 7, one object of which is to limit the output of the transformer to a safe value when its associated section is occupied by a train. The primary winding 6 of each transformer T is constantly supplied with alternating current from line wires 3 fed by a generator 4. Each track section is also provided with a track relay, designated by the reference character R with an exponent corresponding to the location, and having a track winding 8 and a local winding 9. The track winding 8 is connected across the rails adjacent the entrance end of the section. Thus each track section is provided with a track circuit which includes a secondary winding 5 on a transformer T, an impedance 7, the rails of the section in series and winding 8 of a track relay R. Each track relay is also provided with a rotor element 10 and a movable contact finger 11 operated by this rotor. When winding 8 is energized and winding 9 is energized with current of what I shall call normal relative polarity this contact finger is swung to the right so that normal contact 11—12 is closed. When winding 8 is energized and winding 9 is supplied with current of what I shall call reverse relative polarity, the contact finger 11 is swung to the left and reverse contact 11—13 is closed. When the supply of current to either winding 8 or winding 9 is discontinued the movable contact finger 11 assumes an intermediate position and opens both the normal and reverse contacts.

Each track section is provided with a resistance 19 connected across the rails adjacent the entrance end of the section, a similar resistance 22 connected across the rails adjacent the exit end of the section, and two additional resistances 20 and 21 connected across the rails at an intermediate point in the section.

Each track section is also provided with a signal, here shown as a three-position semaphore signal, and designated by the reference character S with an exponent corresponding to the location. Each signal S is controlled in the usual manner by the associated track relay, the circuits for such control being omitted for all signals except S^c for the sake of simplicity. Referring particularly to signal S^c it will be plain that the operating mechanism of this signal is supplied with current from transformer E^c and controlled by contact 40 of relay R^c so that when relay R^c is energized in the normal direction signal S^c indicates proceed, when relay R^c is energized in the reverse direction signal S^c indicates caution, and when relay R^c is deenergized signal S^c indicates stop. Each signal is provided with a circuit controller D which is closed when the signal is in the proceed or the caution position as well as any position between the two but which is open when the signal indicates stop. Each signal is also provided with a pole changer P which operates in the usual and well known manner when the signal indi-

cation changes from caution to stop or vice versa.

Each track section is also provided with a line transformer E, and a local transformer G. Referring particularly to section A—B, the transformer G^B for this section is provided with two secondary windings 18 and 17. The winding 18 is provided with a circuit which passes from its left hand terminal through wire 33, winding 9 of relay R^A, wire 34, resistance 19, through the rails of the section A—B in parallel to resistance 20 thence by wire 32 back to the right hand terminal of winding 18 on transformer G^B. The current which is supplied to the rails of the section in multiple I will hereinafter term "local current" as distinguished from the current which is supplied to the rails of the section in series and which I will call "track circuit current." The winding 17 of transformer G^B is provided with a circuit which passes from its left hand terminal through wire 28, resistance 21, through both rails of section A—B in parallel to resistance 22, thence through wire 31, normal contact 11—12 of relay R^B, wire 29, signal circuit controller D^B and wire 27 back to the right hand terminal of winding 17 of transformer G^C. This circuit is provided with a branch which passes from wire 31 through reverse contact 11—13 of relay R^C and wire 30 back to wire 29. Thus it is evident that local current will be supplied to the rails of the section A—B between the resistances 21 and 22 as long as signal S^B is at caution or proceed and the relay R is energized in either direction. The primary winding 16 of transformer G^B is supplied from secondary winding 14 of transformer E^B with alternating current of normal relative polarity when the pole changer P^B is in the position corresponding to the caution and proceed indication of the signal S^B, and of reverse relative polarity when this pole-changer is in the position corresponding to stop indication of the signal S^B. The primary winding 15 of transformer E^B is constantly supplied with alternating current from the line wires 3.

Before explaining the operation of the system as a whole it should be pointed out that the trackway apparatus here shown is intended for co-operation with train carried governing apparatus which operates in the following manner: When the train occupies a portion of track which is supplied with track circuit current and also with local current of normal relative polarity, the governing apparatus permits the train to proceed at a high speed such as 65 miles per hour. When the track is supplied with track circuit current and with local current of reverse relative polarity the governing apparatus prevents the train from proceeding at speeds above an intermediate speed as 35 miles per hour. But when the train occupies a portion of track from which the supply of either track circuit current or local current is discontinued, the governing apparatus prevents the train from proceeding at speeds in excess of a low speed as 15 miles per hour. One form of governing apparatus which will co-operate in this manner with the trackway apparatus herein shown, is illustrated and described in United States Letters Patent No. 1,351,771, issued to Lloyd V. Lewis on Sept. 20, 1920.

The operation of the entire apparatus is as follows: As shown in the drawing, a train V occupies the section to the right of C. This de-energizes the relay R^C and causes the signal S^C to display a stop indication. As a result local current of reverse relative polarity is supplied to winding 9 of relay R^B and to the rails of the section B—C between resistances 19 and 20, but no local current is supplied to the rails of this section between resistances 21 and 22. Track circuit current is supplied to the rails of the section B—C. The relay R^B is consequently energized in the reverse direction, the signal S^B is at caution, and local current of normal relative polarity is supplied to winding 9 of relay R^A and to the rails of section A—B throughout its length. Track circuit current is also supplied to the rails of this section and the signal S^A is at proceed. If a train were proceeding in the direction of the arrow it would be able to move at high speed through section A—B. At the resistance 19 in section B—C however the reversed local current would cause the governing apparatus to reduce its speed to 35 miles per hour but it could not pass beyond resistance 21 in section B—C at speeds in excess of 15 miles per hour due to the interruption of local current. Beyond the point C its speed will be restricted to 15 miles per hour because of the interruption of track circuit current due to the short circuiting of the corresponding track transformer by the wheels and axles of the train V.

One feature of my invention is the provision of means for supplying winding 9 of track relay R with current from the circuit which supplies local current to the track rails.

Another feature of my invention resides in combining in one circuit two functions heretofore separated, i. e.—(1) the control of the relative polarity of the track and local currents for the purpose of energizing the train control relay in one direction or the other, and (2) the supply of current to one of the two co-operating windings of the track relay so as to polarize this relay for the usual purpose of causing the two signal indications "caution" and "proceed." These two functions have previously re-

quired two separate line circuits, and hence by virtue of my present invention I am enabled to eliminate at least one line wire from each track on which the system is installed.

Although I have herein shown and described only one form and arrangement 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 railway track divided into sections, a source of alternating current connected across the rails of each section, a relay for each section having two windings the first of which is connected across the rails of the section, said relay being responsive to reversals of the instantaneous relative polarity of the current supplied to its second winding, a transformer for each section having one secondary for supplying current to the second winding of the relay for such section, and to the rails of the section in multiple from the entrance end of the section to an intermediate point therein, said transformer having an additional secondary for supplying current to the rails of the section in multiple from said intermediate point to the exit end of the section, and means controlled by each relay for supplying alternating current of one instantaneous relative polarity or the other to the primary of the transformer for the section in the rear and for at times interrupting the supply of current to the rails from the additional secondary of the transformer for such section in the rear.

2. In combination, a railway track divided into sections, a source of alternating current connected across the rails of each section, a relay for each section having two windings the first of which is connected across the rails of the section, said relay being responsive to reversals of the instantaneous relative polarity of the current supplied to its second winding, and means in each section controlled by traffic conditions in advance for supplying alternating current of one instantaneous relative polarity or the other to the track rails of the section in multiple and to the second winding of the associated relay.

3. In combination, a railway track divided into sections, a source of alternating current connected across the rails of each section, a relay for each section having two windings the first of which is connected across the rails of the section, said relay being responsive to reversals of the instantaneous relative polarity of the current supplied to its second winding, a circuit for the second winding of each relay including the rails of the associated section in multiple and a source of current, and means for each section governed by traffic conditions in advance for varying the relative instantaneous polarity of the current from said second source.

4. In combination, a railway track divided into sections, a source of alternating current connected across the rails of each section, a relay for each section having two windings the first of which is connected across the rails of the section, said relay being responsive to reversals of the instantaneous relative polarity of the current supplied to one of its windings, a circuit for said second winding of each relay including the rails of the associated track section in multiple and a source of alternating current, and means for each section governed by traffic conditions in advance for reversing the instantaneous relative polarity of one of the currents supplied to the track rails of the section.

5. In combination, a railway track divided into a plurality of insulated sections, means for supplying an alternating current to the rails of each section in series, a relay for each section having two windings, a signal for each section controlled by traffic conditions in advance, a pole changer and a signal circuit controller for each signal, means controlled by each pole changer for supplying alternating current to one of the windings of the relay of the section next in rear and to the rails of that section in multiple between the entrance end and an intermediate point in the section, and means controlled in part by each signal circuit controller for supplying alternating current to the rails of the section next in rear in multiple between the exit end and an intermediate point in the section.

6. In combination, a railway track divided into a plurality of insulated sections, means for supplying an alternating current to the rails of each section in series, a relay for each section having two windings, a signal for each section controlled by traffic conditions in advance, a pole-changer and a signal circuit controller for each signal, means controlled by each pole-changer for supplying alternating current to one of the windings of the relay of the section next in rear and to the rails of that section in multiple between the entrance end and an intermediate point in the section, and means controlled by each signal circuit controller and its associated relay for supplying alternating current to the rails of the section next in rear in multiple between the exit end and an intermediate point in the section.

7. In combination, a railway track divided into a plurality of insulated sections, means for supplying an alternating current to the rails of each section in series, a relay

for each section controlled in part by said current, a transformer for each section having a primary winding and two secondary windings, a signal for each section controlled by traffic conditions in advance and having a pole-changer and a signal circuit controller operated thereby; a circuit for one of the said secondary windings, including a winding on said relay for the section next in rear and the track rails in parallel between the entrance and an intermediate point in said section; a circuit for said second transformer secondary including the track rails in parallel between the exit end and an intermediate point in said section and the associated signal circuit controller; and means controlled by the associated pole-changer for supplying alternating current to the primary of each said transformer.

8. In combination, a section of railway track, a track relay comprising two co-operating windings, a track circuit for said section including one of said windings, means for supplying alternating current to said track circuit, a local circuit including the remaining winding of said relay and at least one rail of said section, means for supplying said local circuit with alternating current of one instantaneous relative polarity or the other, and trackway governing means controlled by said track relay in accordance with the relative polarity of the currents supplied to the two windings thereof.

9. In combination, a section of railway track, a track relay comprising two co-operating windings, a track circuit for said section including one of said windings, means for supplying alternating current to said track circuit, a local circuit including the remaining winding of said relay and at least one rail of said section, means for supplying said local circuit with alternating current of one instantaneous relative polarity or the other, and a trackway signal for said section controlled by said relay and arranged to indicate caution or proceed according to the relative polarity of the current supplied to the second winding of said relay.

10. In combination, a plurality of sections of railway track, a track relay for each section, comprising two co-operating windings, a track circuit for each section including a source of alternating current and one winding of said relay, a first local circuit for each section including the remaining winding of the associated track relay and at least one rail of the associated section, means for supplying each such local circuit with alternating current of one relative polarity or the other, a trackway signal for said section controlled by said relay and arranged to indicate caution or proceed according to the relative polarity of the current supplied to the second winding of said relay, and a second local circuit for each section including at least one rail of the associated section and controlled by said relay.

In testimony whereof I affix my signature.

HERBERT A. WALLACE.