Jan. 11, 1938. G. R. PFLASTERER 2,105,260

RAILWAY SIGNALING

Filed Sept. 15, 1936 2 Sheets-Sheet 1

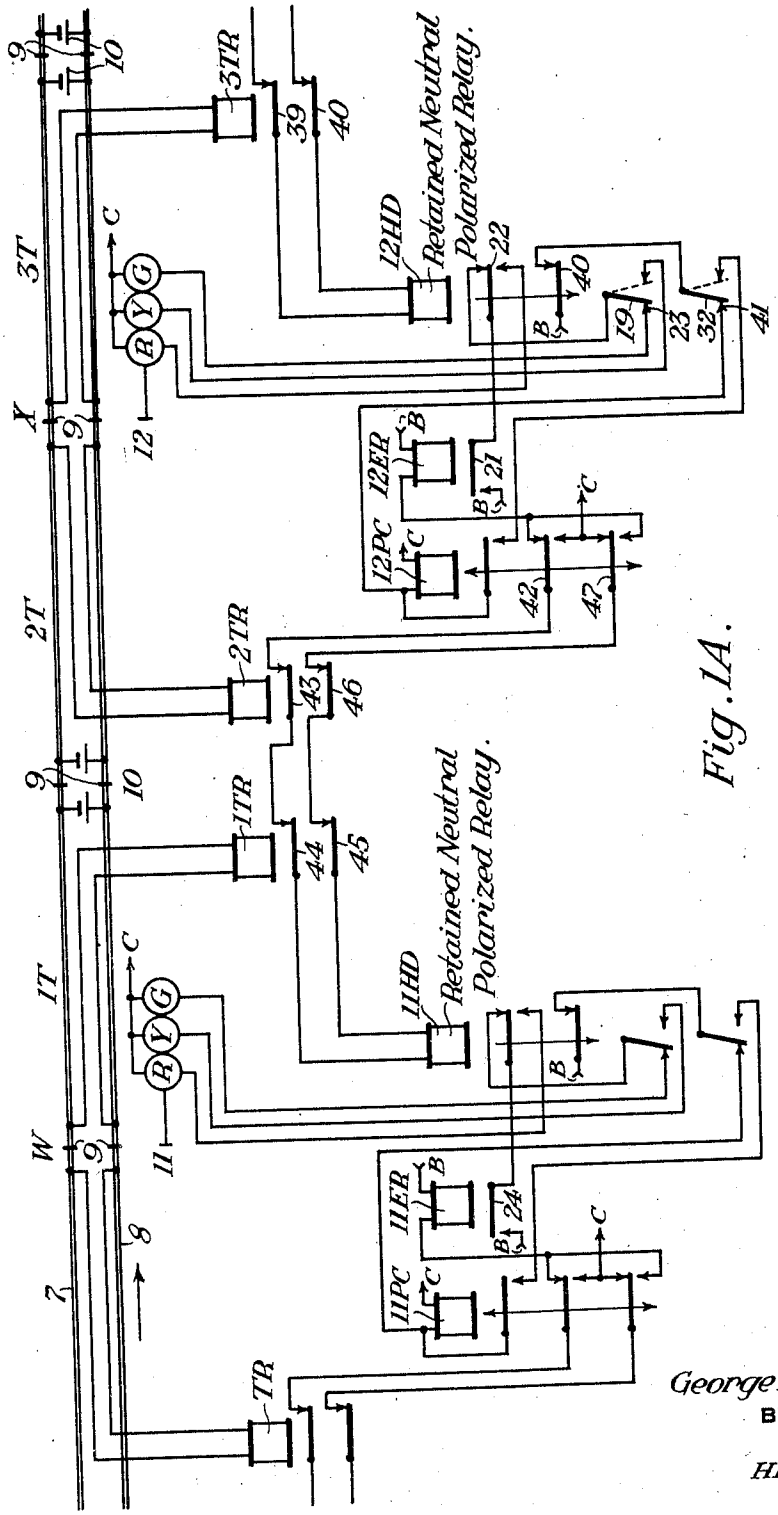


Fig. 1A.

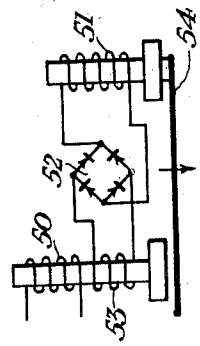


Fig. 2

INVENTOR
George R. Pflasterer.
BY
HIS ATTORNEY

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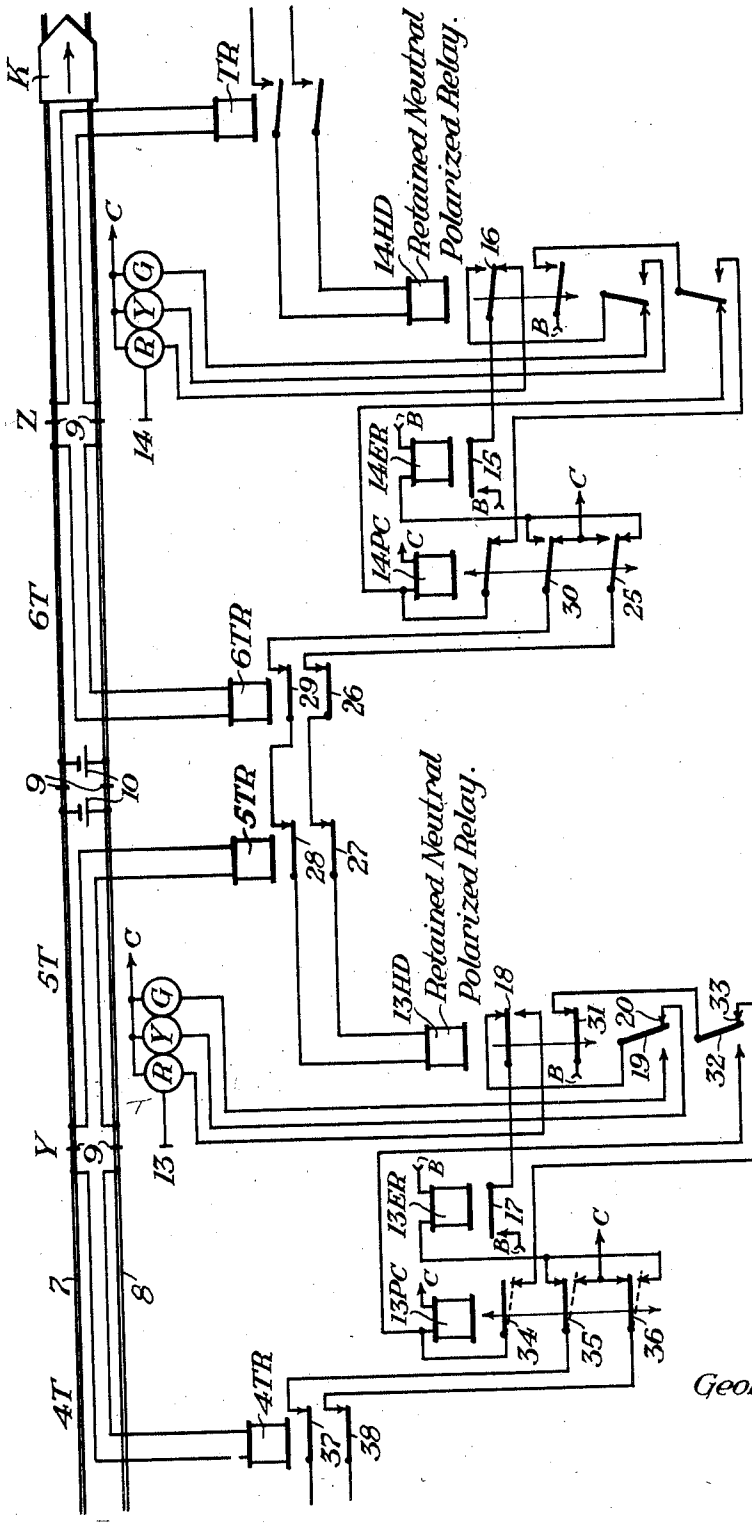


Fig. 1B.

INVENTOR
George R. Pflasterer.
BY
HIS ATTORNEY

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RAILWAY SIGNALING

George R. Pflasterer, Swissvale, Pa., assignor to The Union Switch & Signal Company, Swissvale, Pa., a corporation of Pennsylvania

Application September 15, 1936, Serial No. 100,852

13 Claims. (Cl. 246—50)

My invention relates to railway signaling, and particularly to signaling involving wayside signals located along a trackway for governing the passage of trains.

A feature of my invention is the provision of novel and improved apparatus for establishing a distinctive control for each of three track sections in the rear of an occupied section. Each distinctive control is effective to cause a corresponding aspect of the associated wayside signal, whereby there is produced a three-block, four-indication, system of signaling.

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

In the accompanying drawings, Figs. 1A and 1B are diagrammatic views which, when placed end to end in the order named, illustrate one form of three-block, four-indication, signaling system embodying my invention. Fig. 2 is a diagrammatic view illustrating a modification of a portion of one of the relays shown in Figs. 1A and 1B, and also embodying my invention.

Referring first to Figs. 1A and 1B, the reference characters 7 and 8 designate the rails of a stretch of railway track along which traffic normally moves in the direction indicated by the arrows. The rails 7 and 8 are divided by insulated joints 9 into track sections W—X, X—Y, and Y—Z. As here shown, each track section is divided into two subsections 1T, 2T, 3T, 4T, etc.

Each subsection is provided with a track battery 10 connected across the rails at one end of the subsection and with a track relay, designated by the reference character TR with a prefix the same as the numerical prefix of the associated subsection, connected across the rails at the other end of the subsection.

To govern the passage of trains through the stretch of railway, a wayside signal, designated by a suitable distinguishing reference character, is located at the entrance to each track section. As here shown, each signal is a color light signal comprising a proceed lamp G capable of displaying a green light, a caution lamp Y capable of displaying a yellow light, and a stop lamp R capable of displaying a red light.

For controlling the signals, each section is provided with a polarized signal control relay designated by the reference character HD with a prefix the same as the reference character of the associated signal.

Each relay HD is connected to a pair of line conductors each of which extends through the associated section to the signal next in advance and each of which includes a front contact of each of the associated track relays.

Also for controlling the signals, each section is provided with an approach lighting relay designated by the reference character ER with a prefix the same as the reference character of the associated signal. Each relay ER is connected in series with the line circuit for the section next in rear and becomes deenergized to supply energy to the lamp circuits of the associated signal only when the section next in rear is occupied by a train.

For controlling the polarity of the line circuit for the section next in rear, each section is provided with a pole changing relay designated by the reference character PC with a prefix the same as the reference character of the associated signal. That is, the line circuits to the rear are supplied with energy in the normal direction or in the reverse direction according as the relay PC for the section in advance is energized or deenergized, respectively.

Each of the color light signals is controlled by the associated relay HD in the following manner: When relay HD is deenergized (see signal 14), a circuit is established for the stop lamp R of that signal so that, when relay 14ER becomes released, the signal will display a red light to indicate "stop". This circuit may be traced from terminal B of any suitable source of energy through back contact 15 of relay 14ER, back point of contact 16 of relay 14HD, and lamp R of signal 14 to terminal C of the same source of energy. When relay HD is energized in the reverse direction (see signal 13), a circuit is established for the caution lamp Y of that signal so that, when relay 13ER becomes released, the signal will display a yellow light to indicate "prepare to stop at next signal". This circuit may be traced from terminal B through back contact 17 of relay 13ER, front point of contact 18 of relay 13HD, reverse polar contact 19—20 of relay 13HD, and lamp Y of signal 13 to terminal C. When relay HD is alternately energized in the normal and reverse directions (see signal 12), the circuits for the proceed lamp G and caution lamp Y of signal 12 will be alternately established so that, when relay 12ER becomes released, the signal will display an alternate green and yellow light to indicate "approach next signal at medium speed". The circuit for the caution lamp Y will be similar to that just traced for signal 13 and the circuit for the proceed lamp G may be traced from terminal B through back contact 21 of relay 12ER, front point of contact 22 of relay 12HD,

normal polar contact 13—23 of relay HD, and lamp G of signal 12 to terminal C. When relay HD is constantly energized in the normal direction (see signal 11), a circuit similar to that traced for the proceed lamp G of signal 12 will be established so that, when relay 11ER becomes released to close its back contact 24, signal 11 will be caused to display a green light to indicate "proceed at normal speed".

As here shown, a train K is indicated diagrammatically in the section immediately to the right of location Z so that relay 14HD is deenergized with the result that relay 14PC also is deenergized.

Since relay 14PC is deenergized, relay 13HD is constantly energized in the reverse direction over a path which passes from terminal B through relay 14ER, back point of contact 25 of relay 14PC, front contact 26 of relay 6TR, front contact 27 of relay 5TR, relay 13HD, front contact 28 of relay 5TR, front contact 29 of relay 6TR, and back point of contact 30 of relay 14PC to terminal C.

Relay 13HD being constantly energized in the reverse direction, relay 13PC is energized over its own back contact so that this relay is periodically energized and deenergized. The circuit for relay 13PC may be traced from terminal B through front contact 31 of relay 13HD, reverse polar contact 32—33 of relay HD, back contact 34 of relay 13PC, and relay 13PC to terminal C.

Since relay 13PC is being periodically energized and deenergized, the direction of energization of relay 12HD is periodically reversed over an easily traced path which includes relay 13ER, contacts 35 and 36 of relay 13PC, contacts 37 and 38 of relay 4TR, and contacts 39 and 40 of relay 3TR. Although the energization of relay 13ER is periodically interrupted, it will be understood that relays ER of the usual construction will be sufficiently slow in releasing to bridge the open circuit periods.

The direction of energization of relay 12HD being periodically reversed, relay 12PC is energized over a path which passes from terminal B through front contact 40 of relay 12HD, normal polar contact 32—41 of relay 12HD, and relay 12PC to terminal C. Although relay 12PC is being periodically energized, the slow releasing characteristic of this relay will hold its front contacts closed during the open circuit periods so that the energization of the line circuit for the section W—X is not disturbed.

Since relay 12PC is in its picked up condition, relay 11HD is constantly energized in the normal direction over a path which passes from terminal B through relay 12ER, front point of contact 42 of relay 12PC, front contact 43 of relay 2TR, front contact 44 of relay 1TR, relay 11HD, front contact 45 of relay 1TR, front contact 46 of relay 2TR, and front point of contact 47 of relay 12PC to terminal C.

The slow pickup feature of the relays PC in combination with the slow releasing feature provides a time spaced interval between each change in polarity so that the polarized relays HD may respond properly to the periodic reversals of polarity.

The retained neutral feature of the polarized relays HD is provided to prevent the momentary establishment of the red lamp circuit during periods of change in polarity. For example, when the direction of energization of the relay 12HD is being periodically reversed, the neutral contact 22 does not become released to establish the red lamp circuit for signal 12.

Referring next to Fig. 2 which illustrates diagrammatically a modification of a portion of the retained neutral polarized relays HD, the reference character 50 designates the relay operating winding which is connected to the line conductors and the reference character 51 designates a retaining winding inductively coupled to operating winding 50 by asymmetric unit 52 and auxiliary winding 53. The purpose of the retaining winding, of course, is to prevent, during pole changing periods, the release of neutral armature 54. This arrangement may be found to be desirable to maintain the energization of retaining winding 51 in one direction in the event that neutral armature 54, in relays of the usual construction, shows a tendency to release during the periodic reversals of polarity in the energy supplied to operating winding 50. It is understood that armature 54 operably governs the neutral contacts of the relays HD.

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

Having thus described my invention, what I claim is:

1. In combination, a section of railway track, a pair of conductors for said section, means governed in accordance with traffic conditions in advance of said section for supplying said conductors with unidirectional current or with alternating current, a signal for said section including a pair of lamps, and means controlled by said pair of conductors for governing said pair of lamps whereby one of said lamps is constantly energized if unidirectional current is supplied to said conductors or said pair of lamps is energized alternately if alternating current is supplied to said pair of conductors.

2. In combination, a section of railway track, a signal for said section including a stop and a caution as well as a proceed lamp, means for energizing said stop lamp when said section is occupied, and means effective when said section is unoccupied for energizing said caution lamp constantly or said proceed lamp constantly or said proceed and caution lamps alternately in accordance with traffic conditions in advance of said section.

3. In combination, a section of railway track, a signal for said section including a pair of lamps, a polarized signal control relay, means governed in accordance with traffic conditions in advance of said section for energizing said relay constantly in one direction or constantly in the other direction or alternately in said two directions, and means governed by said relay for controlling said lamps whereby said signal is caused to display at least three proceed indications.

4. In combination, a section of railway track, a signal for said section including a pair of lamps, a polarized signal control relay, means governed in accordance with traffic conditions in advance of said section for energizing said relay constantly in the normal direction or constantly in the reverse direction or alternately in said two directions, a circuit for one of said lamps including a normal polar contact of said relay, and a circuit for the other lamp including a reverse polar contact of said relay.

5. In combination, a section of railway track, a signal for said section including a stop lamp as well as a caution lamp and a proceed lamp, a polarized signal control relay, means effective when said section is unoccupied to energize said relay constantly in one direction or constantly in the other direction or alternately in said two directions, and approach controlled means including contacts of said relay for governing said lamps whereby said signal is caused to display a stop indication and at least three different proceed indications.

6. In combination, a section of railway track, a pair of conductors for said section, a polarized relay connected to said pair of conductors, means governed in accordance with traffic conditions in advance of said section for supplying said conductors with unidirectional current in one direction or with unidirectional current in the other direction or with alternating current of a relatively low frequency whereby said polarized relay is caused to assume one condition or another condition or to alternate between said two conditions respectively, and a signal for said section capable of displaying at least three distinctive proceed indications to correspond to the conditions of said polarized relay.

7. In combination, a forward section and a rear section of railway track, a polarized relay for the forward section which becomes constantly energized in one direction or constantly energized in the other direction or alternately energized between said two directions in accordance with traffic conditions in advance, a pair of conductors for the rear section, and means for supplying said conductors with unidirectional current in one direction when said polarized relay is deenergized or with alternating current of relatively low frequency when said polarized relay is constantly energized in said one direction or with unidirectional current in the other direction when said polarized relay is alternately energized as well as when said polarized relay is constantly energized in said other direction.

8. In combination, a forward section and a rear section of railway track, a polarized relay for the forward section which becomes constantly energized in one direction or constantly energized in the other direction or alternately energized between said two directions in accordance with traffic conditions in advance, a pair of conductors for the rear section, a pole changing relay which becomes constantly energized when said polarized relay is alternately energized or is energized constantly in said other direction but which becomes periodically energized when said polarized relay is energized constantly in said one direction, and means including contacts of said pole changing relay for governing the energy supplied to said pair of conductors.

9. In combination, a forward section and a rear section of railway track, a polarized relay for the forward section which becomes constantly energized in one direction or constantly energized in the other direction or alternately energized between said two directions in accordance with traffic conditions in advance, a pair of conductors for the rear section, a pole changing relay having a slow pickup slow release characteristic for governing said pair of conductors, a circuit for said pole changing relay including a contact which is closed when said polarized relay is energized in said other direction, and another circuit for said pole changing relay including its own back contact and a contact which is closed when said polarized relay is energized in said one direction.

10. A railway signal system comprising a stretch of railway track divided into sections, a light signal for each section capable of displaying at least three indications each of a different color, means for each section for causing the associated signal to display an indication of a particular color when that section is occupied, and means effective when the associated section is unoccupied for causing each signal to display a constant indication of another color or a constant indication of still a different color or an indication comprising said last two mentioned colors displayed alternately in accordance with traffic conditions in advance of the associated section.

11. A railway signal system comprising a stretch of railway track divided into sections each provided with a track circuit including a track relay, a pair of conductors for each section each including a front contact of the associated track relay, means for each section supplying the conductors for the section next in rear with unidirectional current in one direction or with unidirectional current in the other direction or with alternating current of relatively low frequency, a polarized relay for each section connected to the associated conductors and thereby caused to assume three different conditions, and a signal for each section capable of displaying at least three different proceed indications governed by the associated polarized relay.

12. In combination, a stretch of railway track divided into sections, a pair of conductors for each section, means effective when one section is occupied to supply the conductors for the section next in rear of such occupied section with unidirectional current in one direction, means then effective to supply the conductors for the section second in rear of such occupied section with alternating current of relatively low frequency, means then effective to supply the conductors for the section third in rear of such occupied section with unidirectional current in the other direction, and a polarized relay for each section connected to the associated conductors and caused thereby to assume three different conditions respectively to correspond to the character of the current supplied to said conductors.

13. In combination, a stretch of railway track divided into sections, a pair of conductors for each section, means effective when one section is occupied to supply the conductors for the section next in rear of such occupied section with unidirectional current in one direction, means then effective to supply the conductors for the section second in rear of such occupied section with alternating current of relatively low frequency, means then effective to supply the conductors for the section third in rear of such occupied section with unidirectional current in the other direction, a polarized relay for each section connected to the associated conductors and caused thereby to assume three different conditions respectively to correspond to the character of the current supplied to said conductors, and a three-color light signal for each section governed by the associated polarized relay.

GEORGE R. PFLASTERER.