

Oct. 18, 1938.

G. R. PFLASTERER

2,133,306

RAILWAY SIGNALING

Filed Aug. 21, 1937

4 Sheets-Sheet 1

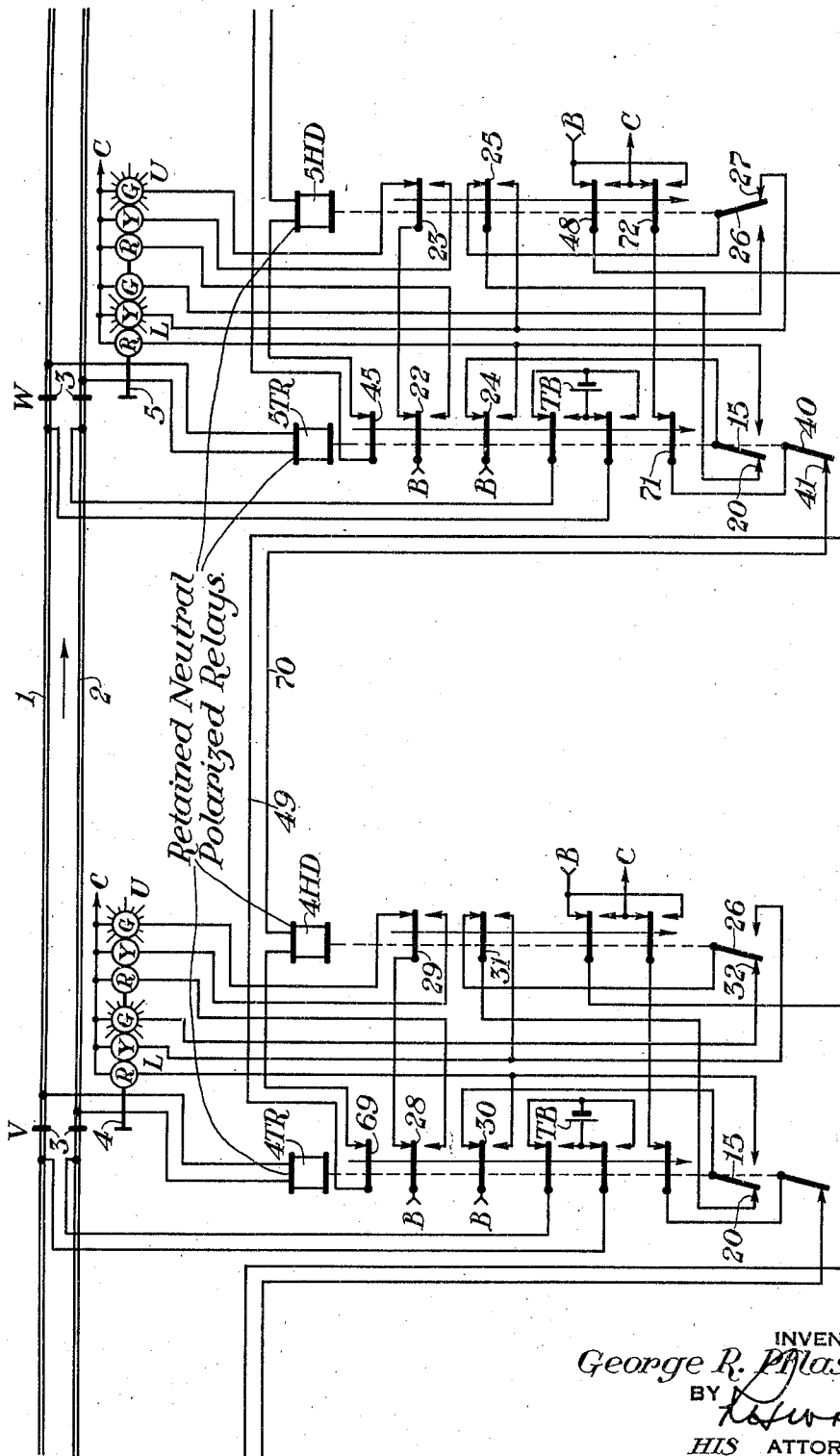


Fig. 1A.

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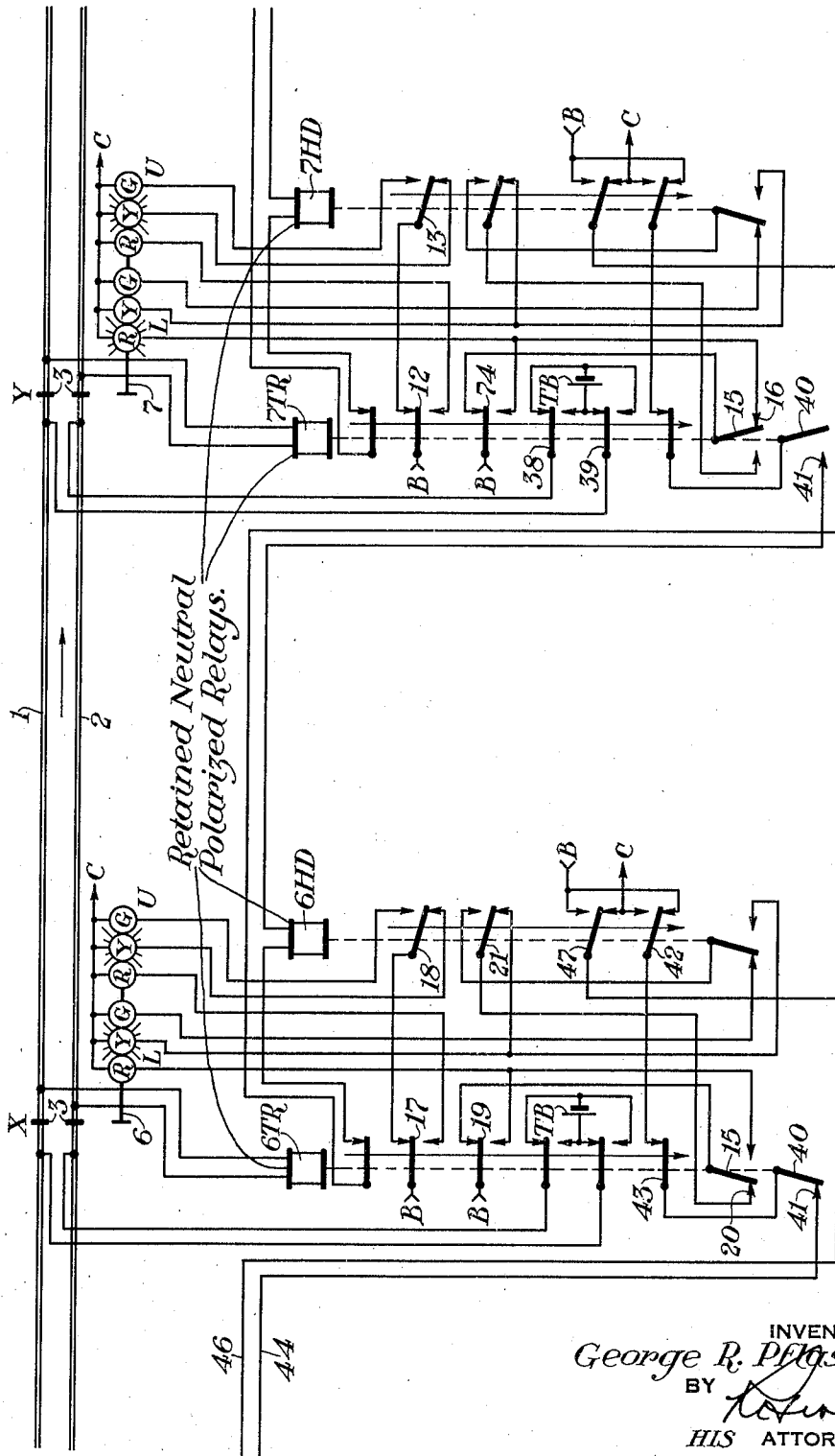


Fig. 1B.

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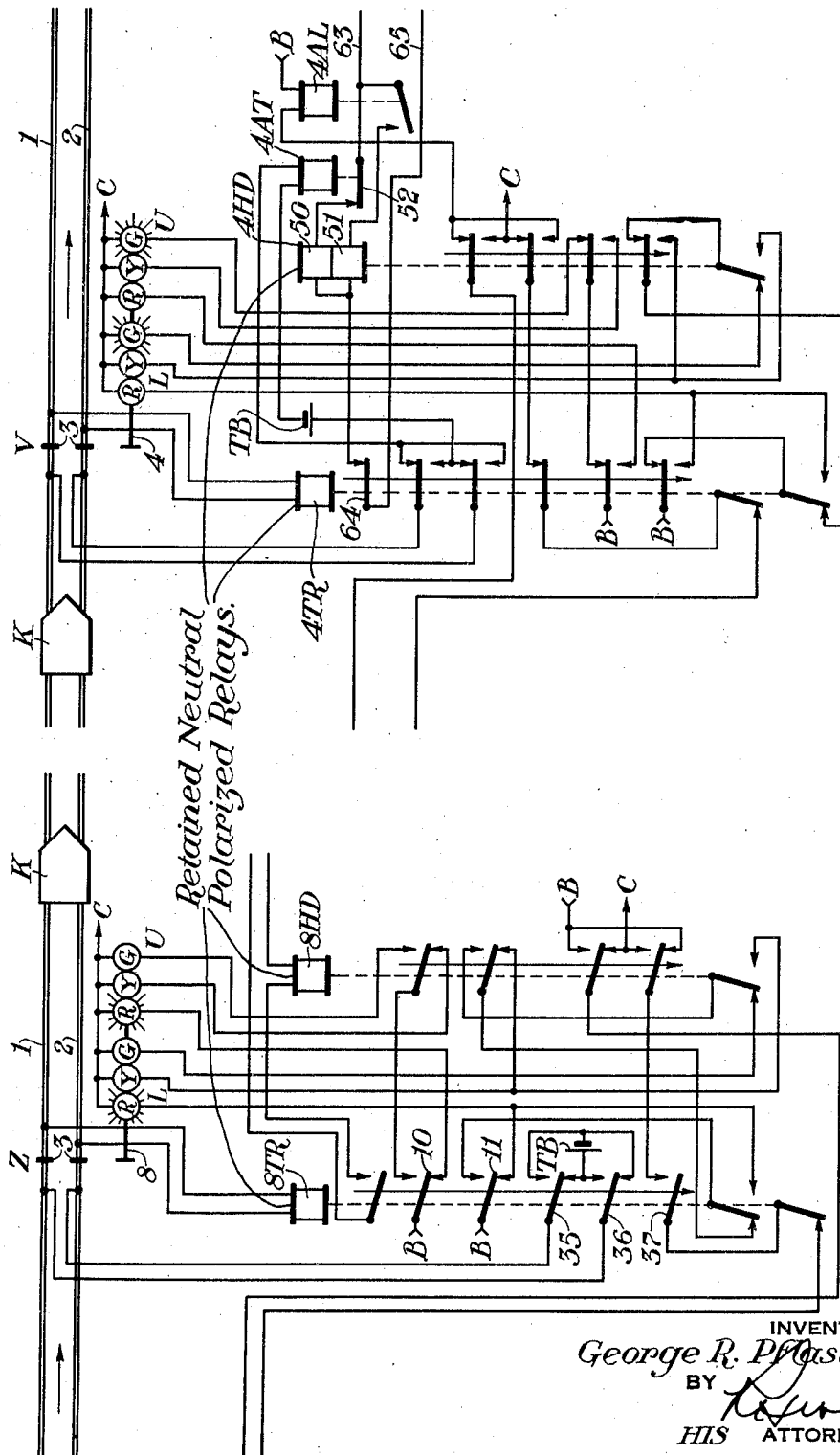


Fig. 2A.

Fig. 1C.

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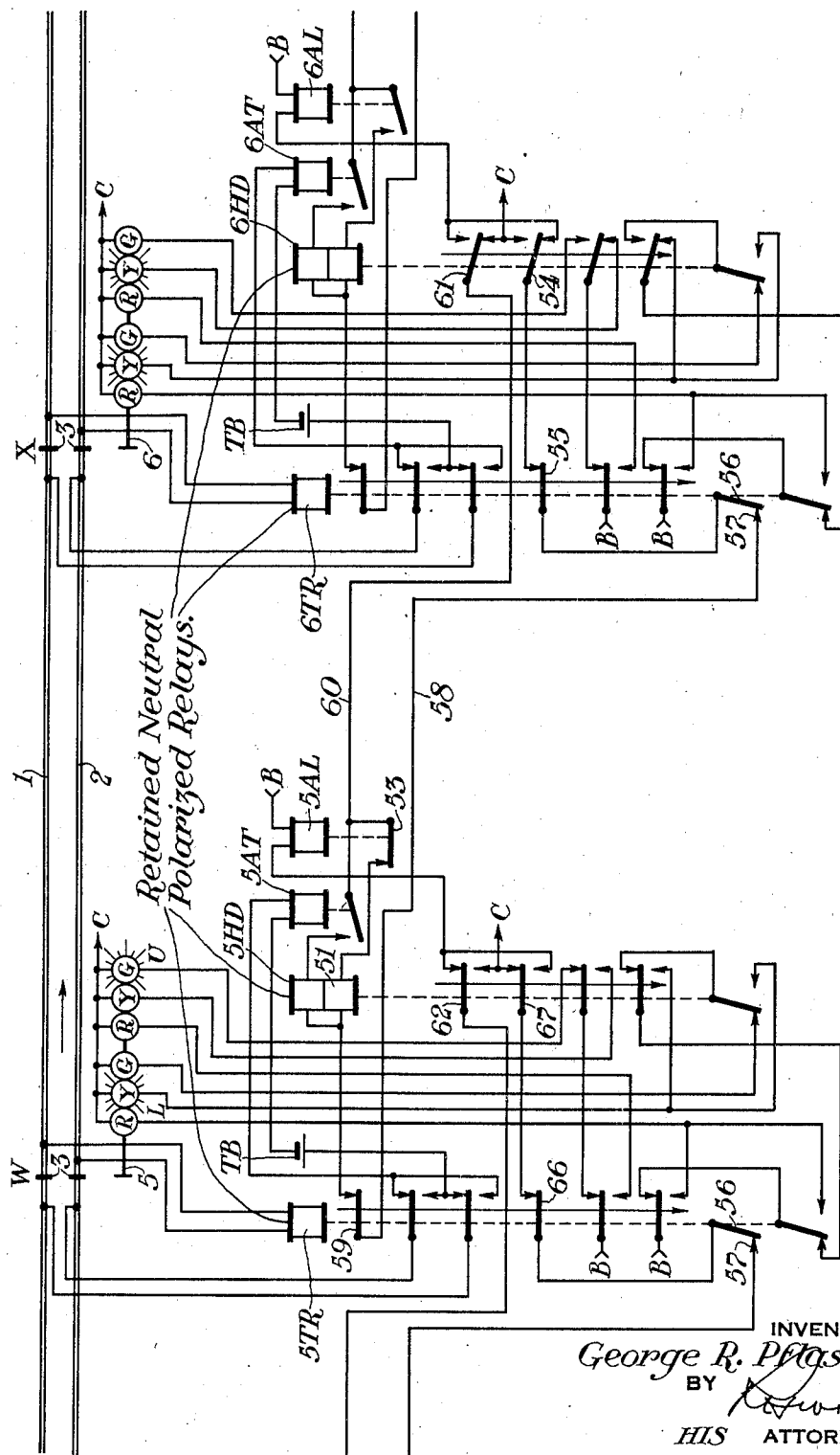
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RAILWAY SIGNALING

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4 Sheets-Sheet 4



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2,133,306

RAILWAY SIGNALING

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Application August 21, 1937, Serial No. 160,296

17 Claims. (Cl. 246—46)

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 four track sections in the rear of an occupied section. Each distinctive control is effective to cause a corresponding aspect of the wayside signals, whereby there is produced a four-block, five-indication system of signaling. A further feature of my invention is the provision of apparatus for controlling wayside signals in such a manner that trains are kept moving by a two-block, three-indication signaling system in the event of broken line wires. Other features and advantages of my invention will appear as the specification progresses.

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

In the accompanying drawings, Figs. 1A, 1B, and 1C are diagrammatic views which, when placed end to end in the order named, illustrate one form of apparatus embodying my invention. Figs. 2A and 2B are diagrammatic views which, when placed end to end in the order named, illustrate a modification of a portion of the apparatus shown in Figs. 1A and 1B and also embodying my invention.

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

Referring first to Figs. 1A, 1B, and 1C, the reference characters 1 and 2 designate the rails of a stretch of railway track along which traffic normally moves in the direction indicated by the arrows. These rails are divided by the usual insulated joints 3 into a plurality of track sections V—W, W—X, X—Y, Y—Z, etc. 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 of each track section. Each of these signals comprises an upper indication unit U and a lower indication unit L. These indication units may take any one of several forms of signal mechanism such as semaphore, color light, searchlight, or position light. As here shown, each indication unit 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.

Each section is provided with a reversible track

circuit and with a reversible line circuit. Each track circuit includes the track rails and a polarized track relay, preferably of the retained neutral type, designated by the reference character TR with a prefix the same as the reference character of the associated signal. Each track circuit is also provided with a source of track circuit energy, here shown as a battery TB, which is connected across the rails of the section in one direction or the other according as the track relay for the section next in advance is energized or deenergized. Each line circuit includes a polarized line relay, preferably of the retained neutral type, designated by the reference character HD with a prefix the same as the reference character of the associated signal. Each line circuit includes a pair of line conductors which extend to the signal in advance and is supplied with energy in one direction or the other from a suitable source of line circuit energy, the terminals of which are designated by the reference characters B and C, according as the line relay for the section in advance is energized or deenergized, provided, however, that the track relay for such advance section is energized in a particular direction.

The relays TR and HD control the signals in the following manner. When relay 8TR is released (see signal 8), the stop lamp R of the upper indication unit U of that signal is energized over back point of contact 10 of relay 8TR and the stop lamp R of the lower indication unit L is energized over the back point of contact 11 of relay 8TR so that signal 8 is caused to display a red light above a red light to indicate "stop". When relay 7TR is energized in the reverse direction and relay 7HD is deenergized (see signal 7), the caution lamp Y of the upper indication unit U and the stop lamp R of the lower indication unit L are energized to cause signal 7 to display a yellow light above a red light to indicate "approach next signal prepared to stop". The circuit for lamp Y may be traced over a path which passes from terminal B through front point of contact 12 of relay 7TR, back point of contact 13 of relay 7HD, and lamp Y to terminal C. The circuit for lamp R may be traced over a path which passes from terminal B through front point of contact 14 of relay 7TR, reverse polar contact 15—16 of relay 7TR, and lamp R to terminal C. When relay 6TR is energized in the normal direction and relay 6HD is deenergized (see signal 6), lamp Y of upper indication unit U is energized and lamp Y of lower indication until L is also energized so that signal

6 is caused to display a yellow light above a yellow light to indicate "proceed at medium speed". The circuit for lamp Y of the upper indication unit U may be traced over a path which passes from terminal B through front point of contact 17 of relay 6TR, back point of contact 18 of relay 6HD, and lamp Y to terminal C. The circuit for lamp Y of lower indication unit L may be traced over a path which passes from terminal B through front point of contact 19 of relay 6TR, normal polar contact 15—20 of relay 6TR, back point of contact 21 of relay 6HD, and lamp Y to terminal C. When relay 5TR is energized in the normal direction and relay 5HD is energized in the reverse direction (see signal 5), the lamp G of upper indication unit U is energized and the lamp Y of lower indication unit L is also energized so that signal 5 is caused to display a green light above a yellow light to indicate "approach next signal at restricted speed". The circuit for lamp G may be traced over a path which passes from terminal B through front point of contact 22 of relay 5TR, front point of contact 23 of relay 5HD, and lamp G to terminal C. The circuit for lamp Y of lower indication unit L may be traced over a path which passes from terminal B through front point of contact 24 of relay 5TR, normal polar contact 15—20 of relay 5TR, front point of contact 25 of relay 5HD, reverse polar contact 26—27 of relay 5HD, and lamp Y to terminal C. When both relays 4TR and 4HD are energized in the normal direction (see signal 4), the lamp G of the upper indication unit U and the lamp G of the lower indication unit L are both energized so that signal 4 is caused to display a green light above a green light to indicate "proceed at normal speed". The circuit for lamp G of upper indication unit U may be traced from a path which passes from terminal B through front point of contact 28 of relay 4TR, front point of contact 29 of relay 4HD, and lamp G to terminal C. The circuit for lamp G of lower indication unit L may be traced over a path which passes from terminal B through front point of contact 30 of relay 4TR, normal polar contact 15—20 of relay 4TR, front point of contact 31 of relay 4HD, normal polar contact 26—32 of relay 4HD, and lamp G to terminal C.

A train K, here shown diagrammatically, occupies the section immediately to the right of location Z so that track relay 8TR is released. As a result, the track circuit for section Y—Z is supplied with energy in the reverse direction over the back points of contacts 35 and 36 of relay 8TR but the line circuit for section Y—Z is deenergized because front contact 37 of track relay 8TR is opened.

Since relay 7TR is energized, the track circuit for section X—Y is supplied with energy in the normal direction over the front points of contacts 38 and 39 of relay 7TR. Each of the track circuits for the section to the rear is also energized in the normal direction because each track relay governing the supply of current to such track circuits is energized. Energy for the line circuit for section X—Y is, however, disconnected because normal polar contact 40—41 of relay 7TR is opened.

The relay 6TR being energized in the normal direction and relay 6HD being deenergized causes relay 5HD to be energized in the reverse direction. The circuit for energizing relay 5HD may be traced over a path which passes from terminal B through back point of contact 42 of

relay 6HD, front point of contact 43 of relay 6TR, normal polar contact 40—41 of relay 6TR, line conductor 44 of section W—X, relay 5HD, front contact 45 of relay 5TR, line conductor 46 of section W—X, and back point of contact 47 of relay 6HD to terminal C.

Since relay 5TR is energized in the normal direction and relay 5HD is also energized, relay 4HD is energized in the normal direction by a circuit which may be traced over a path which passes from terminal B through front point of contact 48 of relay 5HD, line conductor 49 of section V—W, front point of contact 50 of relay 4TR, relay 4HD, line conductor 70 of section V—W, normal polar contact 40—41 of relay 5TR, front contact 71 of relay 5TR, and front point of contact 72 of relay 5HD to terminal C.

Since both relays 4TR and 4HD are energized in the normal direction, it will be apparent that both the track circuit and the line circuit for the section immediately in the rear of location V are supplied with energy in the normal direction so that the signal (not shown) for such rear section is caused to display the normal proceed indication.

The retained neutral feature of the polarized track and line relays prevents signal flashing and tumbledown of the signal control circuits to the rear during pole changing periods. For example, when the train K vacates the section immediately to the right of location Z so that the energization of track relay 7TR is changed from the reverse direction to the normal direction, the front points of contacts 12, 14, 38, and 39 of this relay remain closed during the period of current reversal. Consequently, false signal flashing and disturbance to the energization of the track circuit to the rear is avoided. Likewise, when the direction of energization of the line relays HD is changed, the front points of the neutral contacts of these relays remain closed so that the line relays cannot cause signal flashing or disturbances in the energization of the line circuits to the rear.

It will be noted that the track relays alone control the stop and two most restrictive proceed indications. That is, the line relays HD are required to be energized only for the two least restrictive proceed indications. In the event of a broken line wire, therefore, the system will continue to function to keep trains moving by a two-block, three-indication signaling system. For example, if line conductor 44 for section W—X becomes opened so that line relay 5HD becomes released, signal 5 will assume the same condition as signal 6, that is, the condition for the display of a yellow light over a yellow light. It follows, therefore, that even if the line conductors were completely reversed the track relays alone would function to provide the three indications displayed by signals 6, 7, and 8, respectively.

In order to economize in the consumption of line circuit current, I provide a modification of my invention wherein the line relays HD are normally disconnected from the associated line conductors and become connected to such line conductors only when a train is approaching. One form of apparatus for accomplishing this result is shown in Figs. 2A and 2B. As here shown, the relays HD are provided with a low resistance winding 50 and a high resistance winding 51. For connecting the low resistance winding 50 to the associated line circuit, I provide an auxiliary track relay AT which is connected

in series with the source of track circuit energy for the section next in rear, and for connecting the high resistance winding 51 to the associated line circuit, I provide an auxiliary line relay AL which is connected in series with the line circuit for the section next in rear. As will be explained more in detail hereinafter, the relays AT and AL are normally released and have a relatively high pick-up value so that these relays do not become picked up except under certain specified conditions. That is, the relays AT become picked up only when the current flow therethrough is increased to a predetermined value due to the occupancy of the track circuit for the section next in rear, and the relays AL become picked up only when the associated line circuit is supplying energy to the low resistance winding of the relay HD connected thereto.

The train K, here shown diagrammatically, is occupying the section immediately to the left of location V so that the increased current flow through relay 4AT causes this relay to close its front contact 52 to connect low resistance winding 50 of relay 4HD to the line circuit for section V—W. The relatively heavy current flowing through relay 5AL causes this relay to close its front contact 53 so that the high resistance winding 51 of relay 5HD is connected to the line circuit for section W—X. Relay 6AL does not become picked up because the current supplied to the high resistance winding 51 of relay 5HD is not sufficient to operate relay 6AL. Under the conditions as shown in the drawings, high resistance winding 51 of relay 5HD is energized to pick up relay 5HD by a circuit which may be traced over a path which passes from terminal B at location X through relay 6AL, back point of contact 54 of relay 6HD, front point of contact 55 of relay 6TR, normal polar contact 56—57 of relay 6TR, line conductor 58 of section W—X, front contact 59 of relay 5TR, high resistance winding 51 of relay 5HD, front contact 53 of relay 5AL, line conductor 60 of section W—X, and back point of contact 61 of relay 6HD to terminal C. The circuit for energizing low resistance winding 50 of relay 4HD to cause this relay to be picked up may be traced over a path which passes from terminal B through relay 5AL, front point of contact 62 of relay 5HD, line conductor 63 of section V—W, front contact 52 of relay 4AT, low resistance winding 50 of relay 4HD, front contact 64 of relay 4TR, line conductor 65 of section V—W, normal polar contact 56—57 of relay 5TR, front contact 66 of relay 5TR, and front point of contact 67 of relay 5HD to terminal C.

From the foregoing description, it will be seen that, when one section is occupied by a train, the relays HD of the next two consecutive track sections in advance of the occupied section are energized so that the signals for such advance sections are conditioned for the display of the two least restrictive proceed indications. As the train progresses through the stretch, the signals and associated apparatus for other sections will be caused to assume the same condition as explained for the apparatus shown in Figs. 2A and 2B. Thus, it will be seen that the line circuits are normally deenergized and energy is supplied thereto only when traffic conditions are such that it is required. Otherwise, the apparatus operates in a manner similar to that described for the apparatus shown in Figs. 1A, 1B, and 1C.

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 polarized track relay receiving current from the rails of said section, a pair of line conductors for said section, a line relay receiving current from said pair of line conductors, means for reversibly supplying current to the rails of said section in accordance with traffic conditions in advance of the section, means for selectively supplying current to the pair of line conductors in accordance with other traffic conditions in advance of said section, a signal for said section capable of displaying a stop and three successively less restrictive proceed indications, means governed by said track relay for controlling the stop indication irrespective of the condition of said line relay, means governed by said track relay and effective when said line relay is deenergized to control the two most restrictive proceed indications, and means governed by said line relay and effective when said track relay is energized in a particular direction to control the least restrictive proceed indication.

2. In combination, a section of railway track, a polarized track relay receiving current from the rails of said section, a pair of line conductors for said section, a polarized line relay receiving current from said line conductors, means governed by traffic conditions in advance of said section for reversibly supplying current to the rails of said section, means governed by other traffic conditions in advance of said section for reversibly supplying current to said line conductors, a signal for said section capable of displaying a stop and four successively less restrictive proceed indications, means governed by said track relay for controlling said stop indication irrespective of the condition of said line relay, means governed by said track relay and effective when said line relay is deenergized to control the two most restrictive proceed indications, and means governed by said line relay and effective when said track relay is energized in a particular direction to control the two least restrictive indications.

3. In combination, a section of railway track, a polarized track relay receiving current from the rails of said section, a pair of line conductors for said section, a polarized line relay receiving current from said pair of line conductors, means governed by traffic conditions in advance of said section for supplying the rails of the section with current of normal or reverse polarity, means governed by other traffic conditions in advance of said section for supplying said pair of line conductors with current of normal or reverse polarity, a signal for said section comprising an upper and a lower indication unit each including a proceed lamp and a caution lamp as well as a stop lamp, a circuit for the proceed lamp of the upper unit including a front contact of said track relay and a front contact of said line relay, a circuit for the caution lamp of the upper unit including a front contact of said track relay and a back contact of said line relay, a circuit for the stop lamp of said upper unit including a back contact of said track relay, a circuit for the proceed lamp of the lower unit including a front contact and a normal polar contact of each of said track and line relays, a circuit for the caution lamp of the lower unit including a front contact and a normal polar contact of said track relay and a front

contact and a reverse polar contact of said line relay, another circuit for the caution lamp of the lower unit including a front contact of said track relay and a back contact of said line relay, a circuit for the stop lamp of the lower unit including a front contact and a reverse polar contact of said track relay, and another circuit for the stop lamp of the lower unit including a back contact of said track relay.

4. A railway signal system comprising, a stretch of railway track divided into sections, a track circuit for each section including the track rails, a line circuit for each section including a pair of line conductors, a polarized track relay connected to each track circuit, a polarized line relay connected to each line circuit, means for each section controlled by the associated track relay for reversibly supplying current to the track rails for the section next in rear, means for each section controlled by the associated line relay for reversibly supplying current to the line conductors for the section next in rear, and traffic governing means for each section controlled by the associated track and line relays.

5. A railway signal system comprising, a stretch of railway track divided into sections, a track circuit for each section including the track rails, a line circuit for each section including a pair of line conductors, a polarized track relay connected to each track circuit, a polarized line relay connected to each line circuit, a pole changer for each section including contacts of the associated track relay for reversibly governing the supply of current to the track circuit for the section next in rear, a pole changer for each section including contacts of the associated line relay for reversibly governing the supply of current to the line circuit for the section next in rear, and traffic governing means for each section controlled by the associated track and line relays.

6. A railway signal system comprising, a stretch of railway track divided into sections, a track circuit for each section including the track rails, a line circuit for each section including a pair of line conductors, a polarized track relay connected to each track circuit, a polarized line relay connected to each line circuit, a first pole changer for each section including contacts of the associated track relay for reversibly governing the supply of current to the track circuit for the section next in rear, a second pole changer for each section including contacts of the associated line relay, means for each section including neutral and polar contacts of the associated track relay for connecting the associated second pole changer to the line circuit for the section next in rear, and traffic governing means for each section controlled by the associated track and line relays.

7. A railway signal system comprising a stretch of railway track divided into a plurality of successive track sections, a track circuit for each section including the rails of the section, a line circuit for each section including a pair of line conductors, a polarized track relay governed by each track circuit, a polarized line relay governed by each line circuit, and traffic governing means for each section controlled by the associated track and line relays, neutral contacts of each track relay adapted to pole change the track circuit for the section next in rear of the associated section, and neutral contacts of each line relay and a polar contact of each track relay adapted to pole change and open respectively the line circuit for the section next in rear of the associated section, whereby a distinctive control is effected for each of four consecutive track sections in the rear of an occupied section.

8. A railway signal system comprising a stretch of railway track divided into a plurality of successive track sections, a track circuit for each section including the rails of the section, a line circuit for each section including a pair of line conductors, a polarized track relay governed by each track circuit, a polarized line relay governed by each line circuit, and traffic governing means for each section controlled by the associated track and line relays, neutral contacts of each track relay adapted to pole change the track circuit for the section next in rear of the associated section, and neutral contacts of each line relay and a polar contact of each track relay adapted to pole change and open respectively the line circuit for the section next in rear of the associated section, whereby a distinctive control is effected for each of four consecutive track sections in the rear of an occupied section, said track and line relays being of the retained neutral type to avoid tumble-down of the circuits to the rear during pole changing periods.

9. A railway signal system comprising a stretch of railway track, a signal located at the entrance of the stretch to govern traffic entering therein, said signal being capable of displaying a stop indication and at least three different proceed indications having varying degrees of speed restrictions, a polarized track relay, a track circuit reversibly governed by the traffic conditions of the stretch for controlling said track relay, a line relay, means including a pair of line conductors controlled by other traffic conditions of the stretch for governing said line relay, and circuit means controlled jointly by said relays for selectively governing the indications of said signal, said circuit means being arranged in such a manner that the track relay is effective to control the stop and the two most restrictive proceed indications in the event of a broken line conductor.

10. In combination, a section of railway track provided with a track circuit including a polarized track relay, means for reversibly supplying energy to said track circuit in accordance with traffic conditions in advance of said section, a line circuit for said section, means for selectively energizing said line circuit in accordance with other traffic conditions in advance of said section, a line relay, means effective to connect said line relay to said line circuit when and only when a train is approaching said section provided said track relay is picked up, and a signal for said section controlled jointly by said track and line relays, said relays each selectively controlling the signal in accordance with the direction of the current supplied thereto.

11. In combination, a section of railway track provided with a track circuit including a polarized track relay, means for reversibly supplying energy to said track circuit in accordance with traffic conditions in advance of said section, a line circuit for said section, a polarized line relay, means effective to connect said line relay to said line circuit when and only when a train is approaching said section provided said track relay is picked up, means for reversibly supplying energy to said line circuit in accordance with other traffic conditions in advance of said section when said line relay is connected to said line circuit, and a signal for said section controlled jointly by said track and line relays, said relays each selectively controlling the signal in accordance

with the direction of the current supplied thereto.

12. A railway signal system comprising a stretch of railway track divided into a plurality of successive track sections, a track circuit for each section including a track relay and having connected thereto a source of track circuit energy, a line circuit for each section including a pair of line conductors and having connected thereto a source of line circuit energy provided the track relay for the section next in advance of the section with which the line circuit is associated is energized, a line relay for each section having a high resistance winding and a low resistance winding, a first auxiliary relay for each section included in the track circuit for the section next in rear of the section with which said relay is associated, means for each section including a contact for the first auxiliary relay for such section for connecting the low resistance winding of the line relay for such section to the corresponding line circuit, a second auxiliary relay for each section included in the line circuit for the section next in rear of the section with which said relay is associated, each said second auxiliary relay being operated only when the line circuit in which it is included is supplying energy to the low resistance winding of the line relay connected thereto, means for each section including a contact of the second auxiliary relay associated with said section for connecting the high resistance winding of the line relay associated with said section to the corresponding line circuit, and traffic governing means for each section controlled jointly by the track and line relays for such section.

13. A railway signal system comprising a stretch of railway track divided into a plurality of successive track sections, a track circuit for each section including a polarized relay and a source of track circuit energy, means for each section governed by the track relay for the section next in advance for reversibly connecting the source of track circuit energy to the corresponding track circuit, a line circuit for each section including a pair of line conductors and having connected thereto a source of line circuit energy provided the track relay for the section next in advance of the section with which said line circuit is associated is energized in a particular direction, a line relay for each section having a high resistance winding and a low resistance winding, a first auxiliary relay for each section included in the track circuit for the section next in rear of the section with which said relay is associated, means for each section including a contact of the first auxiliary relay for such section for connecting the low resistance winding of the line relay for such section to the corresponding line circuit, a second auxiliary relay for each section included in the line circuit for the section next in rear of the section with which said relay is associated, each said second auxiliary relay being operated only when the line circuit in which it is included is supplying energy to the low resistance winding of the line relay connected thereto, means for each section including a contact of the second auxiliary relay associated with such section for connecting the high resistance winding of the line relay for such section to the corresponding line circuit, and traffic governing means for each section controlled jointly by the track and line relays for such section.

14. A railway signal system comprising a stretch of railway track divided into a plurality of successive track sections, a track circuit for

each section including a track relay and having connected thereto a source of track circuit energy, a line circuit for each section including a pair of line conductors and a source of line circuit energy, means for each section governed by the line relay for the section next in advance of the section with which said line circuit is associated for reversibly connecting the source of line circuit energy to the corresponding line circuit provided the track relay for such advance section is energized in a particular direction, a polarized line relay for each section having a high resistance winding and a low resistance winding, a first auxiliary relay for each section included in the track circuit for the section next in rear of the section with which said relay is associated, means for each section including a contact of the first auxiliary relay for such section for connecting the low resistance winding of the line relay for such section to the corresponding line circuit, a second auxiliary relay for each section included in the line circuit for the section next in rear of the section with which said relay is associated, each said second auxiliary relay being operated only when the line circuit in which it is included is supplying energy to the low resistance winding of the line relay connected thereto, means for each section including a contact of the second auxiliary relay for such section for connecting the high resistance winding of the line relay for such section to the corresponding line circuit, and traffic governing means for each section controlled jointly by the track and line relays for said section.

15. A railway signal system comprising a stretch of railway track divided into a plurality of successive track sections, a track circuit for each section including a polarized relay and a source of track circuit energy, means for each section governed by the track relay for the section next in advance for reversibly connecting the source of track circuit energy to the corresponding track circuit, a line circuit for each section including a pair of line conductors and a source of line circuit energy, means for each section governed by the line relay for the section next in advance of the section with which the line relay is associated for reversibly connecting the source of line circuit energy to the corresponding line circuit provided the track relay for such advance section is energized in a particular direction, a polarized line relay for each section having a high resistance winding and a low resistance winding, a first auxiliary relay for each section included in the track circuit for the section next in rear of the section with which said relay is associated, means for each section including a contact of the first auxiliary relay for such section for connecting the low resistance winding of the line relay for such section to the corresponding line circuit, a second auxiliary relay for each section included in the line circuit for the section next in rear of the section with which said relay is associated, each said second auxiliary relay being operated only when the line circuit in which it is included is supplying energy to the low resistance winding of the line relay connected thereto, means for each section including a contact of the second auxiliary relay for such section for connecting the high resistance winding of the line relay for such section to the corresponding line circuit, and traffic governing means for each section controlled jointly by the track and line relays for such section.

16. A railway signal system comprising a

stretch of railway track divided into a plurality of block sections each having a first circuit and a second circuit governed by traffic conditions in said section, the first circuit for each section 5 having a relay energized therefrom and the second circuit for each section having a polarized relay energized therefrom, one of the relays for each section controlling the supply of current to both the first and second circuits for the adjacent 10 block section in the rear of the section with which said relay is associated, the other relay for each section reversibly controlling the supply of current to the second circuit for the adjacent block section in the rear of the section with which said 15 relay is associated, and traffic governing means for each section governed by the relays for such section.

17. A railway signal system comprising a stretch of railway track divided into a plurality 20 of successive block sections, a track circuit for each section including a track relay and having connected thereto a source of track circuit energy, a line circuit for each section including a pair of line conductors and having connected thereto 25 a source of line circuit energy provided the track relay for the section next in advance of the section with which the line circuit is associated is energized, a line relay for each section, said line

relay being adapted to be energized by way of a circuit of high resistance or by way of a circuit of low resistance from the line circuit for the section with which said relay is associated, a first 5 auxiliary relay for each section included in the track circuit for the section next in the rear of the section with which said relay is associated, means for each section including a contact of the first auxiliary relay for such section for effecting energization of the line relay for such 10 section from the line circuit for such section by way of the circuit of low resistance, a second auxiliary relay for each section included in the line circuit for the section next in the rear of the section with which said relay is associated, each 15 said second auxiliary relay being operated only when the line circuit in which it is included is supplying energy through the circuit of low resistance to the line relay connected thereto, means for each section including a contact of the second 20 auxiliary relay for such section for effecting energization of the line relay for such section from the line circuit for such section through the circuit of high resistance, and traffic governing means for each section controlled jointly by the 25 track and line relays for such section.

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