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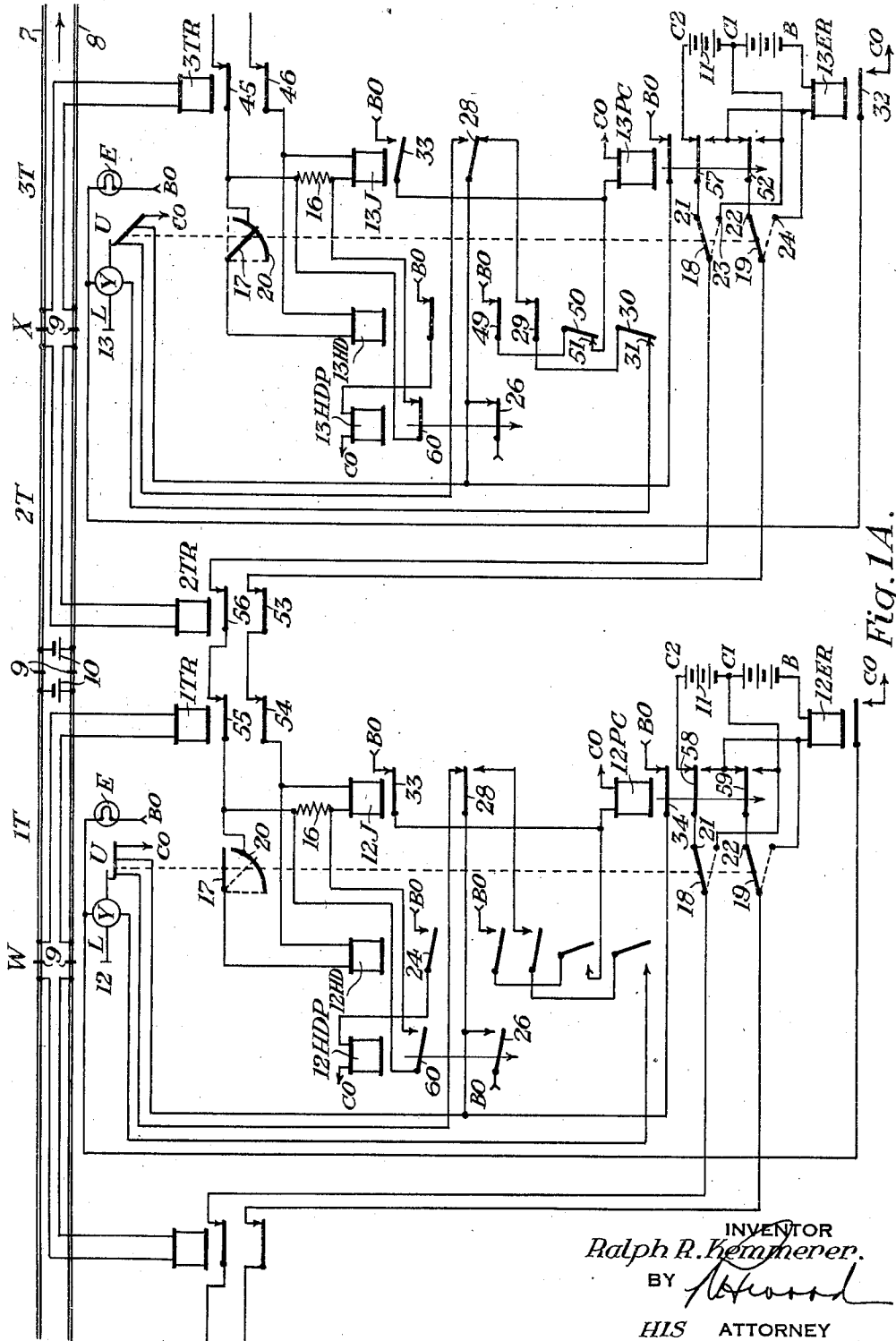
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2,107,679

RAILWAY SIGNALING

Filed Sept. 18, 1936

3 Sheets-Sheet 1



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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

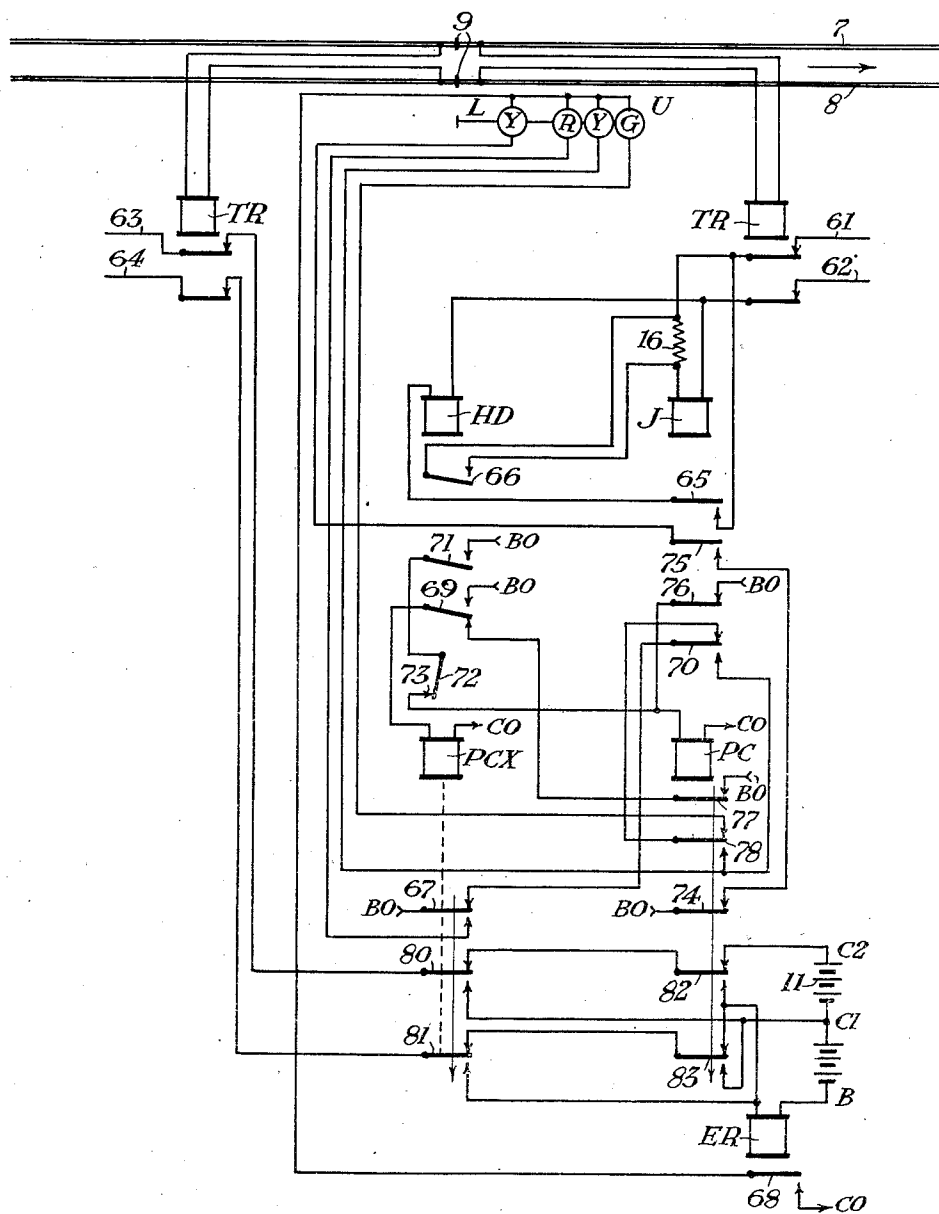


Fig. 2.

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UNITED STATES PATENT OFFICE

2,107,679

RAILWAY SIGNALING

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Application September 18, 1936, Serial No. 101,468

16 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.

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

The present invention is an improvement on the apparatus disclosed and claimed in applica-
15 tion, Serial No. 101,467, for Letters Patent of the United States, filed September 18, 1936, by Howard A. Thompson, for Railway signaling.

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

20 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 apparatus embodying my invention. Fig. 2 is a diagrammatic view illustrating a modification of a portion of the apparatus shown in Fig. 1A and
25 also embodying my invention.

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

30 Referring to the drawings, 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. These rails are divided by insulated joints 9 into a plu-
35 rality of track sections W—X, X—Y, and Y—Z.

As here shown, each track section is divided by insulated joints 9 into at least two subsections 1T, 2T, 3T, 4T, etc. Each subsection is provided with a track circuit which includes a track battery 10
40 connected across the rails at one end of the subsection and a track relay, designated by the reference character TR with a prefix the same as the numerical prefix in the reference character of the associated subsection, connected across the
45 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 provided for each track section. Each of these
50 signals includes an upper unit U and a lower unit L. These units may take any one of several forms of signal mechanism such as semaphore, color light, search-light, or position light. As here shown, each upper unit U is a semaphore
55 arm capable of assuming a horizontal or "stop"

position, a 45° or "caution" position, and a vertical or "proceed" position; and each lower unit L is a caution lamp Y capable of displaying a yellow light.

Operatively connected with each semaphore
5 arm U is a contact 17 and a pair of pole changing contacts 18 and 19. Contact 17 is in engagement with contact 20 at all times except when the semaphore arm is in the vertical position. Pole changing contacts 18 and 19 are in engage-
10 ment with contacts 21 and 22, respectively, whenever the semaphore arm is in its 45° position or in its vertical position or at any point between these two positions, and are in engagement with con-
15 tacts 23 and 24, respectively, whenever the semaphore arm is at any point below the 45° position.

Each semaphore arm U is provided with a lamp E which when lighted provides supplementary color light indications corresponding to the posi-
20 tions of the associated semaphore arm.

For controlling the associated signal, each section is provided with a polarized signal control relay, a neutral signal control relay, and an auxiliary relay designated by the reference characters HD, J, and HDP, respectively, each with a
25 prefix the same as the reference character of the associated signal.

For controlling the associated relays HD and J, each section is provided with a pair of conductors each of which extends to the signal next in ad-
30 vance and each of which includes a front contact of each of the associated track relays.

Each section is provided with an operating battery the terminals of which are designated by the reference characters B3 and C9 and each section is provided with a line battery designated by the reference character 11. Each line battery 11
35 is provided with a low voltage negative terminal, a high voltage negative terminal, and a positive terminal designated by the reference characters C1, C2, and B, respectively.

Each relay HD is connected to the associated pair of conductors by signal contact 17—20 of the associated signal. Each relay J is connected to the associated pair of conductors through a
45 resistor 16 in multiple with a front contact of the associated relay HDP. Each relay HDP is governed by the associated relay HD. For example, relay 12HDP is governed by a circuit which includes front contact 24 of relay 12HD, so that
50 relay 12HDP will be energized or deenergized when relay 12HD is energized or deenergized. As will be explained more in detail hereinafter, the pair of conductors for each section is at times supplied with energy of a relatively low value and
55

at other times is supplied with energy of a relatively high value. The pickup value of the relays HD is such that these relays will become picked up upon receiving energy of either value whereas the pickup value of the relays J is such that these relays will become picked up only upon receiving energy of the higher value.

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. Each relay PC is energized whenever the associated relay HD is energized in the normal direction or whenever the associated relay J is energized.

The signal pole changing contacts 18 and 19 and the relays PC control the magnitude and direction of the energy supplied to the line conductors for the section next in the rear.

For controlling the signal lamps E and Y, 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. The relays ER are connected in series with the line conductors for the section next in rear and therefore are energized at all times except when that line circuit is open. That is, the approach lighting relays ER become released to energize the associated lamp E and the control circuit for the associated lamp Y only when the section immediately to the rear of the signal with which such lamps are associated becomes occupied by a train.

The relays HD, J, HDP, and PC control the upper unit U and the lower unit L of the associated signal in the following manner: When these relays are deenergized (see signal 15), both semaphore arm U and lamp Y are deenergized so that signal 15 is displaying its semaphore arm in the horizontal position to indicate "stop". When the relay HD is energized in the reverse direction (see signal 14), relay 14HDP also is energized so that a caution circuit for the semaphore arm U of that signal is closed over a path which passes from terminal B0 over front contact 26 of relay 14HDP and semaphore arm U to terminal C0. Semaphore arm U of signal 14 therefore is in the caution position to indicate "approach next signal prepared to stop". When relay HD is energized in the normal direction (see signal 13), relay 13HDP also is energized so that the caution circuit for semaphore arm U remains closed over front contact 26 of relay 13HDP and a circuit is established for the lamp Y of the lower unit L of that signal. This circuit passes from terminal B0 over front contact 26 of relay 13HDP, back point of contact 28 of relay 13J, front contact 29 of relay 13HD, normal polar contact 30-31 of relay 13HD, lamp Y, and back contact 32 of relay 13ER to terminal C0. Signal 13, therefore, is displaying its upper semaphore arm U in the caution position and a circuit for lamp Y is established so that when relay 13ER becomes released by a train approaching signal 13 in section W-X, this signal will display its semaphore arm in the caution position over a yellow light to indicate "approach next signal at medium speed". When both relay HD and relay J are energized (see signal 12), relay 12HDP also is energized so that the caution circuit for the upper semaphore arm U will remain closed over front contact 26 of relay 12HDP and a proceed circuit for the semaphore arm U will be closed over a path which passes from terminal B0 over front contact 26 of relay 12HDP, front point of contact 28 of relay 12J, and sema-

phore arm U to terminal C0. Signal 12 therefore is displaying its semaphore arm in the vertical position to indicate "proceed at normal speed". When the semaphore arm U of signal 12 attained its proceed position, signal contact 17-20 became opened so that relay 12HD, and consequently relay 12HDP are both released. In the meantime, however, relay 12PC has become energized over front contact 33 of relay 12J so that another proceed circuit for semaphore arm U is closed over a path which passes from terminal B0 over front contact 34 of relay 12PC, front point of contact 28 of relay 12J, and semaphore arm U to terminal C0. Signal 12, therefore, continues to display the semaphore arm U in the proceed position.

As here shown, a train K is indicated diagrammatically in the section immediately to the right of location Z so that the signal 15 and associated relays are all deenergized.

When signal 15 and associated apparatus is in this condition, relay 14HD is energized in the reverse direction by energy of a relatively low value over a circuit which passes from terminal B of battery 11 at signal 15, through relay 15ER, contact 19-24 of signal 15, front contact 35 of relay 6TR, front contact 36 of relay 5TR, relay 14HD, contact 17-20 of signal 14, front contact 37 of relay 5TR, front contact 38 of relay 6TR, and contact 18-23 of signal 15 to terminal C1.

When relay 14HD is energized in the reverse direction, so that semaphore arm U of signal 14 is in the caution position, relay 13HD is energized in the normal direction by energy of relatively low value over a path which passes from terminal B of battery 11 at signal 14, through relay 14ER, back point of contact 42 of relay 14PC, contact 18-21 of signal 14, front contact 44 of relay 4TR, front contact 45 of relay 3TR, contact 17-20 of signal 13, relay 13HD, front contact 46 of relay 3TR, front contact 47 of relay 4TR, contact 19-22 of signal 14, and back point of contact 48 of relay 14PC to terminal C1.

When relay 13HD is energized in the normal direction so that the semaphore arm U remains in its caution position and relay 13PC becomes energized, both relays 12HD and 12J are energized in the reverse direction by energy of relatively high value. The circuit for relay 13PC may be traced over a path which passes from terminal B0 through front contact 49 and normal polar contact 50-51 both of relay 13HD, and relay 13PC to terminal C0. The circuit for relay 12HD may be traced over a path which passes from terminal B of battery 11 at signal 13, through relay 13ER, front point of contact 52 of relay 13PC, contact 19-22 of signal 13, front contact 53 of relay 2TR, front contact 54 of relay 1TR, relay 12HD, contact 17-20 of signal 12, front contact 55 of relay 1TR, front contact 56 of relay 2TR, contact 18-21 of signal 13, and front point of contact 57 of relay 13PC to terminal C2. The circuit for relay 12J may be traced over the same path as just described for the relay 12HD except that front contact 56 of relay 12HDP and relay 12J should be substituted for relay 12HD and contact 17-20.

When relay 12J is energized, relay 12PC remains energized over front contact 33 of relay 12J so that the line conductors for the section next in rear of location W are supplied with energy in the reverse direction of relatively high value over front points of contacts 58 and 59 of relay 12PC and signal contacts 16-21 and 19-22 so that the signal (not shown) associated with

such conductors will be in position to display the normal proceed indication.

The resistors 16, connected in series with the relay J, are of such value that the normal current flowing in such relays is just sufficient to hold the relays picked up. The relays J, therefore, will be certain to become released when the energization of the associated line conductors is changed from the high value to the low value. A shunt path including a front contact 60 of the associated relay HDP is provided around the corresponding resistor 16 in order that the relay J, when the energization of its line circuit is changed from the low value to the high value, will receive sufficient energy for pickup. While the resistors 16 are here shown external to the associated relay J, these resistors may, if desired, be included as a portion of the relay windings.

Furthermore, when the energization of the line conductors is changed from the high value to the low value of the same direction to provide a more restrictive indication, the energization of such line conductors is momentarily reversed so that the associated relay J will be even more certain to release. For example, if signal 13 is caused to assume the "stop" position by a train entering section X—Y at location Y so that the direction of energization of the line conductors for the section W—X is changed from the high value to the low value in the same direction, relay 13PC will become deenergized to close the back points of contacts 52 and 57 before contacts 18—23 and 19—24 of signal 13 become closed. Consequently, the line conductors for the section W—X will be momentarily energized in the normal direction so that relay 12J will be more certain to release.

The relays HDP are provided with a slow release characteristic in order that the caution circuit for the associated semaphore arm U will remain closed during periods of change in the direction of energization of the associated relay HD. For example, when the train K vacates the section immediately to the right of location Z so that relay 14HD becomes energized in the normal direction instead of the reverse direction, front contact 24 of relay 14HD will become momentarily opened to disconnect energy from relay 14HDP. Due to the slow releasing characteristic of the relay 14HDP, however, front contact 26 of this relay will remain closed during this interval so that energization of the caution circuit for semaphore arm U will not be disturbed.

The relays PC are provided with a slow release characteristic so that, when these relays are being transferred from control by the associated relay HD to control by the associated relay J, or vice versa, the energization of the line circuit to the rear will not be disturbed. For example, when the train K vacates the section immediately to the right of location Z so that the energization of the line circuit for the section X—Y is changed from the low value in the normal direction to the high value in the reverse direction to cause signal 13 to display the normal proceed indication, relay 13PC will become deenergized upon the opening of front neutral contact 49 of relay 13HD and will remain deenergized until such time as front contact 33 of relay 13J becomes closed. Due to the slow releasing characteristic of relay 13PC, however, front contacts 52 and 57 of this relay will remain closed during this period so that the energization of the line circuit for section W—X will not be disturbed.

Referring next to Fig. 2, I have shown herein one signal and associated apparatus which, when

included in a system with conductors 61 and 62 at the right connected to conductors 63 and 64, respectively, at the left, will provide three-block, four-indication, signaling similar to that described for the system illustrated in Figs. 1A and 1B. The principal difference between the apparatus illustrated in Fig. 2 and that illustrated in Figs. 1A and 1B is that the latter shows signals of the semaphore type and the former shows signals of the color light type.

As here shown, each signal comprises an upper unit U which includes 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, and a lower unit L which includes a caution lamp Y capable of displaying a yellow light.

The usual polarized relay HD responsive either to energy of low value or to energy of high value and the usual neutral relay J responsive only to energy of high value are provided. The relay HD is connected to the associated line conductors over a back contact 65 of the relay J and the relay J is connected to the associated line conductors over a front contact 66 of the relay HD. The usual resistor 16 is provided to limit the normal current flow in the relay J so that this relay will be more certain to release. It will be apparent from the foregoing, that the relay HD can be picked up only if the relay J is released and that the relay J will receive sufficient energy for pickup only if the relay HD is picked up so that the shunt path, including front contact 66 of relay HD, around resistor 16 is closed.

The usual relay PC, which becomes energized whenever the relay HD is energized in the normal direction or whenever the relay J is energized, is provided for controlling the signal as well as for controlling the energy supplied to the line conductors for the rear section.

The usual approach lighting relay ER, connected in series with the line conductors for the rear section, is also provided for controlling the signal lamp circuits.

The reference character PCX designates an auxiliary relay which is energized whenever the relay HD is energized or whenever the relay PC is energized provided the relay HD is deenergized and which is provided for controlling the signal as well as for controlling the energy supplied to the line conductors for the rear section.

The relays HD, J, PC, and PCX control the signal in the following manner: When the forward section is occupied so that energy is disconnected from the line conductors for that section to deenergize all relays, a circuit will be established for the lamp R over back point of contact 67 of relay PCX so that, when relay ER becomes released to close back contact 68, the signal will display a single red light to indicate "stop". When the line conductors are supplied with energy of relatively low value in the reverse direction so that relay HD becomes energized in that direction, relay PCX also will become energized over front point of contact 69 of relay HD to establish a circuit for the caution lamp Y of upper unit U, so that when relay ER becomes released, the signal will display a single yellow light to indicate "approach next signal prepared to stop". The circuit for the caution lamp Y may be traced from terminal B0 over front point of contact 67 of relay PCX, back point of contact 70 of relay J, lamp Y, and back contact 68 of relay ER to terminal C0. When the line conductors for the forward section are energized with

energy of low value in the normal direction so that relay HD becomes energized in that direction, relay PCX will remain energized over front point of contact 69 of relay HD and relay PC will become energized over front contact 71 and normal polar contact 72-73 both of relay HD. With relays PC and PCX in this condition, the circuit for the caution lamp Y of the upper unit U will remain established and a circuit for the caution lamp Y of the lower unit L will become established so that, when relay ER becomes released, the signal will display a yellow light above a yellow light to indicate "approach next signal at medium speed". The circuit for the caution lamp Y of the lower unit L may be traced over a path which passes from terminal B0 over front contact 74 of relay PC, back contact 75 of relay J, lamp Y, and back contact 68 of relay ER to terminal C0. When the line conductors for the forward section are supplied with energy of high value in the reverse direction, relay J will become energized so that relay HD will become released. Relay PC will remain in its energized condition due to front contact 76 of relay J becoming closed and relay PCX will remain in its energized condition because the closing of back point of contact 69 of relay HD will complete a circuit for relay PCX which circuit includes front contact 77 of relay PC. With relays J, PC, and PCX in this condition, a circuit will be established for the proceed lamp G so that, when relay ER becomes released, the signal will display a single green light to indicate "proceed at normal speed". The circuit for the proceed lamp G may be traced over a path which passes from terminal B0 over front point of contact 67 of relay PCX, front point of contact 70 of relay J, front point of contact 78 of relay PC, lamp G, and back contact 68 of relay ER.

It will be noted that the caution lamp Y of the upper unit U is provided with another circuit which includes front point of contact 67 of relay PCX, front point of contact 70 of relay J, and back point of contact 78 of relay PC. This circuit insures that, when the signal and associated apparatus is changed from the condition to display the "approach" indication directly to the condition to display the "proceed" indication, the circuit for the caution lamp Y will be maintained until such time as the circuit for the proceed lamp G becomes established. When the signal is in the former condition, both relays J and PC are deenergized whereas under the latter condition, relay J first becomes energized and then relay PC a short time thereafter. During this short time interval, the additional circuit described for the caution lamp remains established over the front point of contact 70 of relay J and back point of contact 78 of relay PC until such time as front point of contact 78 of relay PC becomes closed to establish the circuit for the proceed lamp G thereby avoiding the possibility of a momentary dark signal.

When the signal and associated apparatus is in condition to display the "stop" indication, that is, when all relays are deenergized, the line conductors for the rear section will be connected in the reverse direction to low voltage terminals B and C1 of battery 11 over back points of contacts 80 and 81 of relay PCX. When the signal and associated apparatus is in condition to display the "approach next signal prepared to stop" indication, that is, when relay PCX is energized and relay PC is deenergized, the line conductors for the rear section will be connected

in the normal direction to low voltage terminals B and C1 of battery 11 over back points of contacts 82 and 83 of relay PC and front points of contacts 80 and 81 of relay PCX. When the signal and associated apparatus is in condition to display the "approach next signal at medium speed" indication or is in condition to display the "proceed at normal speed" indication, that is, when both relays PC and PCX are energized, as shown in the drawings, the line conductors for the rear section will be connected in the reverse direction to high voltage terminals B and C2 of battery 11 over front points of contacts 80 and 81 of relay PCX and front points of contacts 82 and 83 of relay PC.

The relays PC and PCX are each provided with a slow releasing characteristic so that these relays will not become released to disturb the energization of the line circuit to the rear during the periods when these relays are being transferred from control by one circuit to control by another circuit. For example, when the relay PCX is being transferred from the control of the front point of contact 69 of relay HD to control by the back point of contact 69 of relay HD and front contact 77 of relay PC, relay PCX will not become released during the momentary opening of its control circuits.

Although I have herein shown and described only a few 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 pair of conductors for the section governed by traffic conditions in said section, means for supplying said pair of conductors with energy of a particular value in the reverse direction or with energy of such particular value in the normal direction or with energy of a higher value in accordance with traffic conditions in advance of said section, a polarized relay responsive to energy of either value receiving current from said conductors, a neutral relay responsive only to energy of said higher value also receiving energy from said conductors, a repeating relay which is energized or deenergized according as said polarized relay is energized or deenergized, a signal for said section comprising a first indication unit and a second indication unit, said first indication unit being a semaphore arm capable of assuming a stop and a caution as well as a proceed position and said second indication unit being a lamp, a caution circuit for said semaphore arm including a front contact of said repeating relay, a proceed circuit for said semaphore arm including a front contact of said repeating relay as well as a front contact of said neutral relay, and a circuit for said lamp including a front contact of said repeating relay and a back contact of said neutral relay as well as a normal polar contact and a front neutral contact unit of said polarized relay.

2. In combination, a forward and a rear section of railway track, a polarized relay and a neutral relay for said forward section, means effective when the forward section is unoccupied to energize only said polarized relay in the reverse direction or only said polarized relay in the normal direction or both said relays in accordance with traffic conditions in advance of said

forward section, a pair of conductors for the rear section controlled by traffic conditions in that section, means effective to supply said conductors with energy of a relatively low value in the reverse direction when both said relays are de-energized, means effective to supply said conductors with energy of said low value in the normal direction when said polarized relay only is energized in the reverse direction, and means effective to supply said conductors with energy of a relatively high value in the reverse direction when said polarized relay only is energized in the normal direction or when both said relays are energized.

3. In combination, a forward and a rear section of railway track, a polarized relay and a neutral relay for said forward section, means effective when the forward section is unoccupied to energize only said polarized relay in the reverse direction or only said polarized relay in the normal direction or both said relays in accordance with traffic conditions in advance of the forward section, an auxiliary relay which is energized either when said neutral relay is energized or when said polarized relay is energized in the normal direction, a signal for the forward section governed by said auxiliary relay as well as by said neutral and by said polarized relays, a pair of conductors for the rear section controlled by traffic conditions in that section, means for supplying said pair of conductors with energy of a relatively low value in the reverse direction effective when said signal is in condition to display the stop indication, means for supplying said pair of conductors with energy of said low value in the normal direction effective when said auxiliary relay is deenergized provided said signal is then in condition to display a restrictive proceed indication, and means for supplying said pair of conductors with energy of a relatively high value in the reverse direction effective when said signal is in the condition for displaying said restrictive proceed indication provided said auxiliary relay is then energized.

4. In combination, a forward and a rear section of railway track, a polarized relay and a neutral relay for said forward section, means effective when the forward section is unoccupied to energize only said polarized relay in the reverse direction or only said polarized relay in the normal direction or both said relays in accordance with traffic conditions in advance of the forward section, an auxiliary relay which is energized either when said neutral relay is energized or when said polarized relay is energized in the normal direction, a signal for the forward section governed by said auxiliary relay as well as by said neutral and by said polarized relays, a pole changer having one contact which is closed when said signal is displaying the stop indication and another contact which is closed when said signal is displaying a proceed indication, a pair of conductors governed by traffic conditions in the rear section, means for supplying said conductors with energy of a relatively low value in the reverse direction including said one contact, means for supplying said conductors with energy of said low value in the normal direction including said other contact and a back contact of said auxiliary relay, and means for supplying said conductors with energy of a relatively high value including said other contact and a front contact of said auxiliary relay.

5. In combination, a section of railway track,

a pair of conductors controlled by traffic conditions in said section, means for supplying said conductors with energy of a relatively low value or with energy of a relatively high value in accordance with traffic conditions in advance of said section, a relay responsive to energy of either value receiving current from said conductors, another relay responsive only to energy of said high value also receiving current from said conductors, a signal controlled by said two relays and arranged to display a more restrictive indication or a less restrictive indication according as said one relay is energized or said other relay is energized respectively, and means governed by said signal effective when said signal is displaying said less restrictive indication to limit the current flowing in said other relay thereby causing said relay to be more sensitive in releasing.

6. In combination, a section of railway track, a pair of conductors controlled by traffic conditions in said section, means for supplying said conductors with energy of a relatively low value or with energy of a relatively high value in accordance with traffic conditions in advance of said section, a relay responsive to energy of either value receiving current from said conductors, another relay responsive only to energy of said high value also receiving current from said conductors, a signal controlled by said two relays and arranged to display a more restrictive indication or a less restrictive indication according as said first mentioned relay is energized or said other relay is energized respectively, a resistor for limiting the current flow in said other relay, and means governed by said signal for rendering said resistor effective when said signal is displaying said less restrictive indication.

7. In combination, a section of railway track, a pair of conductors controlled by traffic conditions in said section, means for supplying said conductors with energy of a relatively low value or with energy of a relatively high value in accordance with traffic conditions in advance of said section, a relay responsive to energy of either value receiving current from said conductors, another relay responsive only to energy of said high value also receiving current from said conductors, a signal controlled by said two relays and arranged to display a more restrictive indication or a less restrictive indication according as said first mentioned relay is energized or said other relay is energized respectively, a resistor for limiting the current flow in said other relay, an auxiliary relay which becomes released when said signal is displaying said less restrictive indication, and a shunt path around said resistor including a front contact of said auxiliary relay.

8. In combination, a section of railway track, a pair of conductors for said section, means for supplying said pair of conductors with energy in one direction of a particular magnitude or with energy in the same direction of a higher magnitude in accordance with traffic conditions in advance of said section, a relay responsive to energy of either magnitude receiving current from said conductors, another relay responsive only to energy of said higher magnitude also receiving current from said conductors, and means for momentarily reversing the direction of current flow in said conductors when the energy supplied to such conductors is changed from the higher magnitude to said particular magnitude thereby insuring a positive release of said other relay.

9. In combination, a section of railway track,

a pair of conductors for the section governed by traffic conditions in said section, means for supplying said pair of conductors with energy of a particular value in the reverse direction or with energy of such particular value in the normal direction or with energy of a higher value in accordance with traffic conditions in advance of said section, a polarized relay responsive to energy of either value receiving current from said conductors, a neutral relay responsive only to energy of said higher value also receiving energy from said conductors, means for deenergizing said polarized relay when said neutral relay becomes energized, a first auxiliary relay which is energized when said neutral relay is energized as well as when said polarized relay is energized in the normal direction, a second auxiliary relay which is energized when the polarized relay is energized as well as when said first auxiliary relay is energized provided said polarized relay is deenergized, a signal for said section comprising a first indication unit and a second indication unit, said first indication unit including a proceed and a caution as well as a stop lamp and said second indication unit including a caution lamp, a circuit for said proceed lamp including a front contact of said second auxiliary relay and a front contact of said neutral relay as well as a front contact of said first auxiliary relay, one circuit for the caution lamp of said first unit including a front contact of said second auxiliary relay and a front contact of said neutral relay as well as a back contact of said first auxiliary relay, another circuit for the caution lamp of said first unit including a front contact of said second auxiliary relay and a back contact of said neutral relay, a circuit for said stop lamp including a back contact of said second auxiliary relay, and a circuit for the caution lamp of said second unit including a front contact of said first auxiliary relay and a back contact of said neutral relay.

10. In combination, a forward and a rear section of railway track, a polarized relay and a neutral relay for said forward section, means effective when the forward section is unoccupied to energize only said polarized relay in the reverse direction or only said polarized relay in the normal direction or only said neutral relay in accordance with traffic conditions in advance of said forward section, a first auxiliary relay which is energized when said neutral relay is energized as well as when said polarized relay is energized in the normal direction, a second auxiliary relay which is energized when the polarized relay is energized as well as when the first auxiliary relay is energized provided the polarized relay is then deenergized, a pair of conductors for the rear section controlled by traffic conditions in that section, a source of energy having a high voltage terminal and a low voltage terminal, means including a back contact of said second auxiliary relay for connecting said conductors in one direction to said low voltage terminal, means including a front contact of said second auxiliary relay and a back contact of said first auxiliary relay for connecting said conductors in the other direction to said low voltage terminal, and means including a front contact of said first auxiliary relay and a front contact of said second auxiliary relay for connecting said conductors to said high voltage terminal.

11. In combination, a section of railway track, a pair of conductors for said section, means for

actively low value or with energy of a relatively high value in accordance with traffic conditions in advance of said section, a relay responsive to energy of said low value receiving current from said conductors, another relay responsive only to energy of said high value also receiving current from said conductors, and means including a contact of said other relay for disconnecting said first mentioned relay from said conductors when the other relay is energized.

12. In combination, a section of railway track, a pair of conductors for said section, means for supplying said conductors with energy of a relatively low value or with energy of a relatively high value in accordance with traffic conditions in advance of said section, a relay responsive to energy of said low value receiving current from said conductors, another relay responsive only to energy of said high value also receiving current from said conductors, a resistor for limiting the current flowing in said other relay, a shunt path around said resistor including a front contact of said first mentioned relay, and means for deenergizing said first mentioned relay when said other relay is energized.

13. In combination, a section of railway track, a pair of conductors for said section, means for supplying said conductors with energy of a relatively low value or with energy of a relatively high value in accordance with traffic conditions in advance of said section, a relay responsive only to energy of said high value connected to said conductors, another relay responsive to energy of said low value also receiving energy from said conductors, and means including a back contact of said first mentioned relay for connecting said other relay to said conductors.

14. In combination, 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 effective when one section is occupied to supply the conductors for the section next in rear of such occupied section with energy of a relatively low value in one direction, means then effective to supply the conductors for the section second in rear of such occupied section with energy of said relatively low value in the other direction, and means then effective to supply the conductors for the section third in rear of such occupied section with energy of a relatively high value in said one direction.

15. A railway signal system comprising a stretch of track divided into sections, a track circuit including a track relay for each section, a pair of line conductors for each section each including a front contact of the associated track relay, means for each section for supplying the pair of conductors for the section next in rear with energy of relatively low value in one direction or with energy of said relatively low value in the other direction or with energy of relatively high value in said one direction in accordance with traffic conditions in advance, a polarized relay for each section responsive to energy of either value receiving current from the associated conductors, a neutral relay for each section responsive only to energy of said high value also receiving current from the associated conductors, and traffic governing means for each section controlled by the associated neutral and polarized relays.

16. A railway signal system comprising a stretch of track divided into sections, a track

circuit including a track relay for each section, a pair of line conductors for each section each including a front contact of the associated track relay, means for each section for supplying the
5 pair of conductors for the section next in rear with energy of relatively low value in one direction or with energy of said relatively low value in the other direction or with energy of relatively high value in said one direction in accordance
10 with traffic conditions in advance, a polarized

relay for each section responsive to energy of either value receiving current from the associated conductors, a neutral relay for each section responsive only to energy of said high value also receiving current from the associated conductors, 5 and a signal for each section governed by the associated relays, each said signal being capable of displaying at least three different proceed indications.

RALPH R. KEMMERER. 10