J. S. HOLLIDAY.

RAILWAY SIGNALING.

APPLICATION FILED MAY 8, 1912.

1,039,744.

Patented Oct. 1, 1912.

4 SHEETS—SHEET 1.

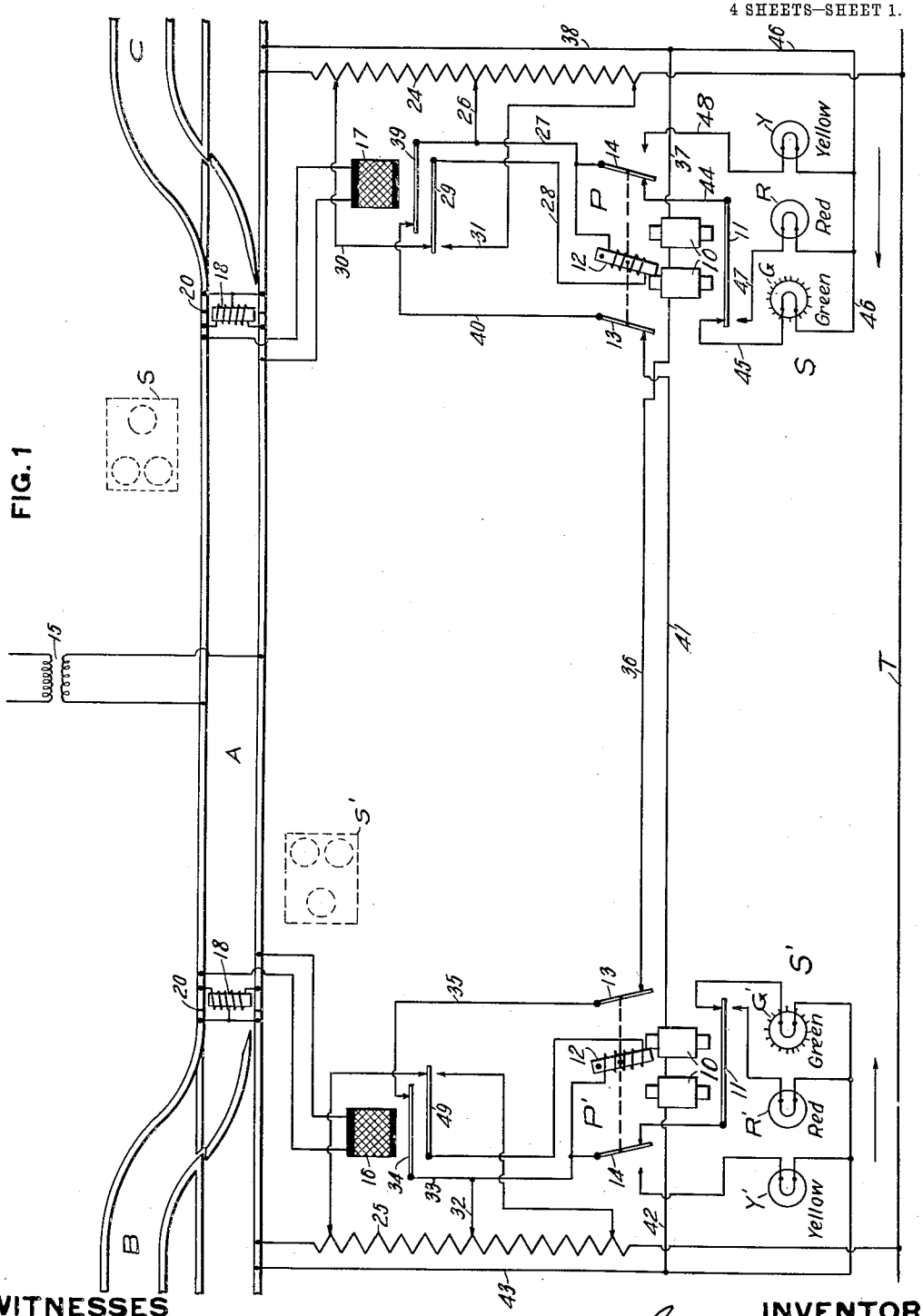

FIG. 1

WITNESSES

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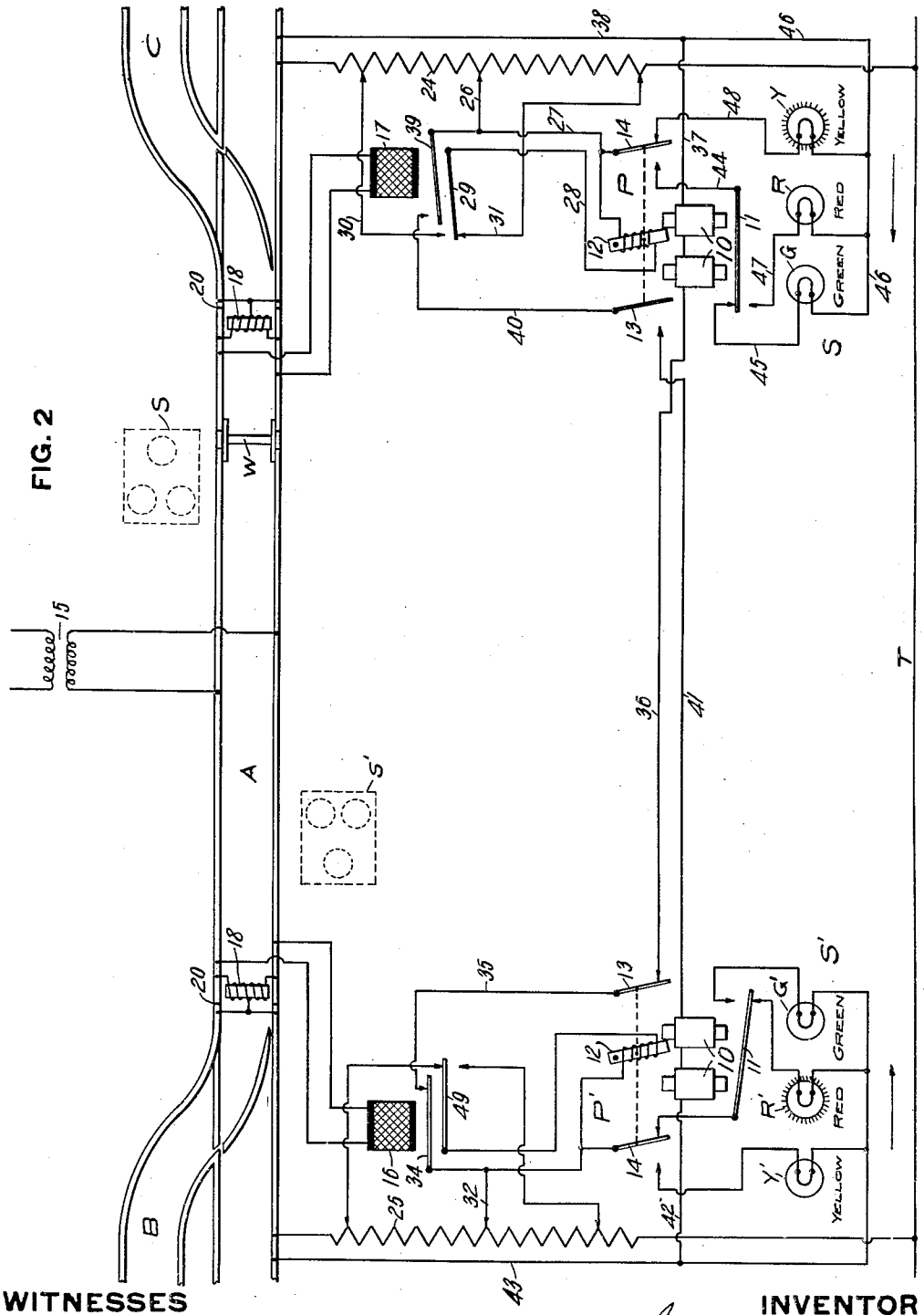
4 SHEETS—SHEET 2.

FIG. 2



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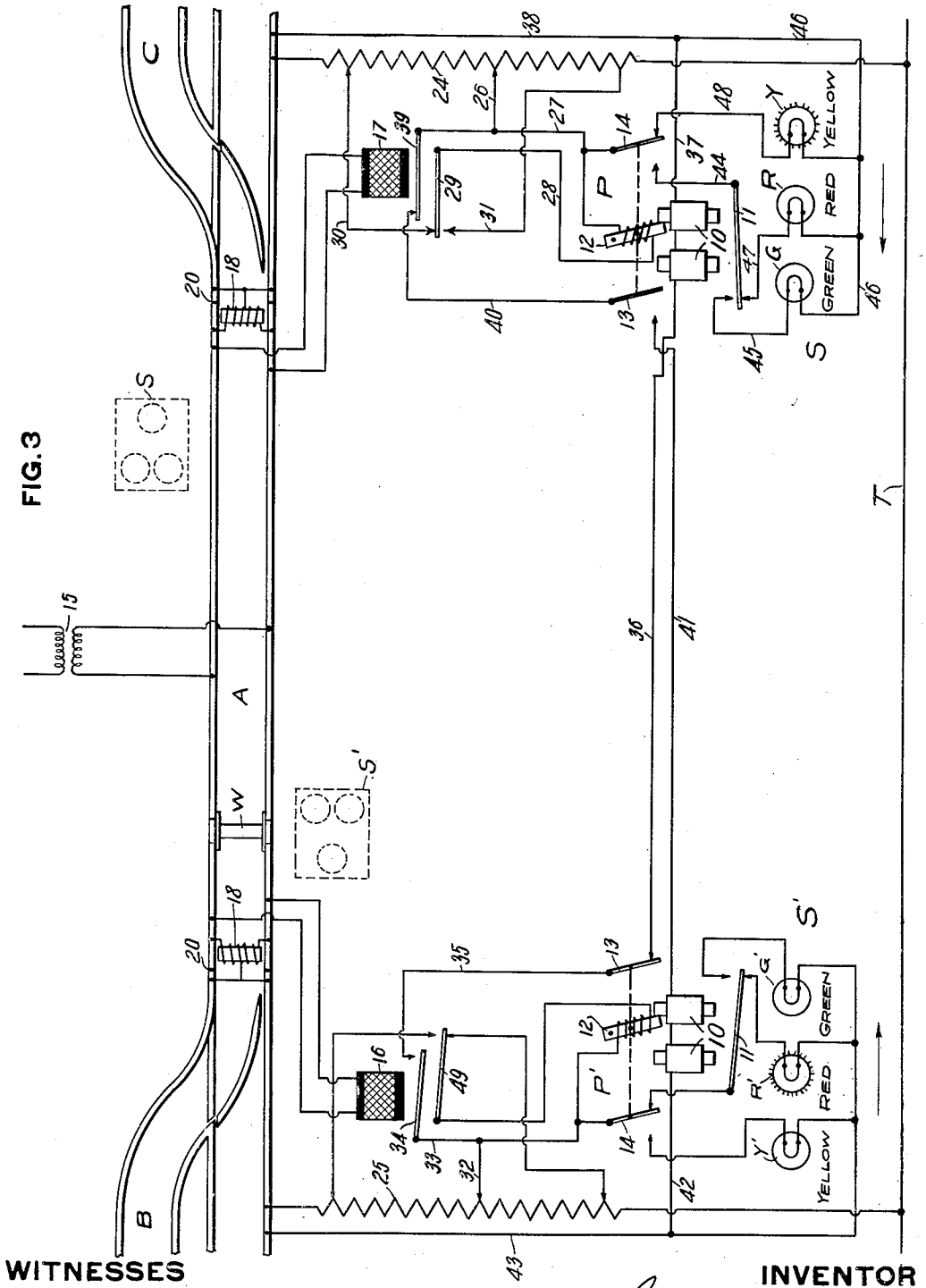
4 SHEETS—SHEET 3.

FIG. 3



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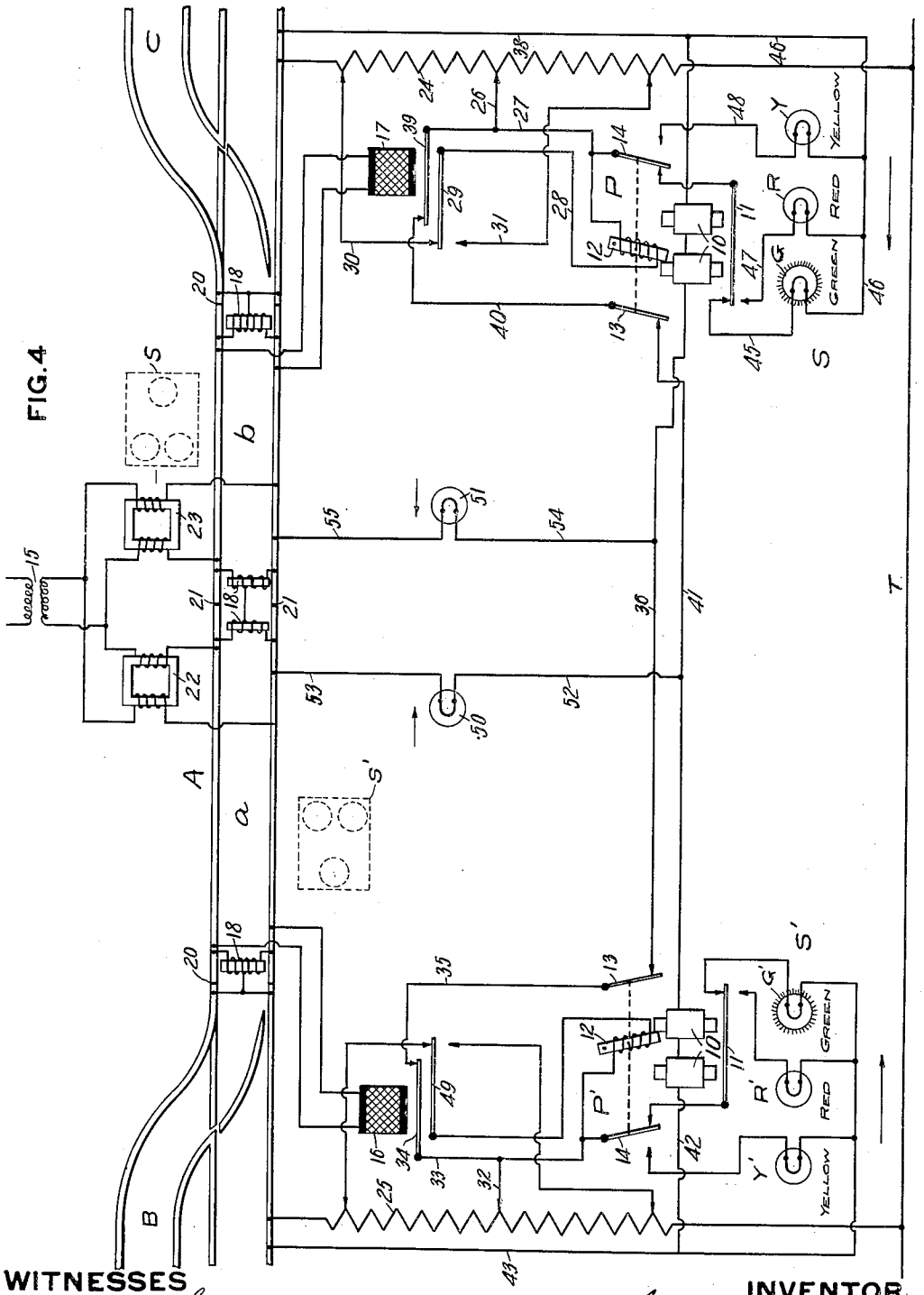
4 SHEETS—SHEET 4.

FIG. 4



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UNITED STATES PATENT OFFICE.

JOHN S. HOLLIDAY, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RAILWAY SIGNALING.

1,039,744. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed May 8, 1912. Serial No. 695,805.

To all whom it may concern:

Be it known that I, JOHN S. HOLLIDAY, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Railway Signaling, of which the following is a specification.

My invention relates to signaling for single track over which traffic moves in both directions; it is particularly adapted for signaling of stretches of single track between passing sidings, although it is not limited to this particular adaptation.

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

In the accompanying drawings Figure 1 is a diagrammatic view showing one form of signaling system embodying my invention. Figs. 2 and 3 are views similar to Fig. 1 but showing the changes due to the presence of a car or train at different points in the system. Fig. 4 is a view showing a modification of the system shown in the preceding views.

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

Referring to all of the views, A is a stretch of single track between two passing sidings B and C.

T is a trolley wire or third rail.

The stretch A is provided with at least two signaling devices S and S′, one adjacent each end of the stretch. Each of these signaling devices is adapted to indicate "stop," "caution" and "clear;" as here shown each device comprises three electric lamps, R, Y and G or R′, Y′ and G′, colored respectively red, yellow and green. I do not however wish to be limited to this particular form of signaling device, for it is understood that any form of device adapted to give the desired indications may be equally well employed. As indicated by the arrows, signal device S governs traffic into the stretch A from the siding C, and signal device S′ governs traffic into the stretch A from siding B. In the practice of my invention each signaling device is preferably located a short distance into the stretch from the adjacent passing siding, the locations being such for example as indicated by the boxes S and S′ shown in dot and dash lines in the drawings. The reason for such locations will appear hereinafter. It is understood that the three lamps G, R and Y and G′, R′ and Y′ of each signaling device will be located within the corresponding box, but I have shown them outside of the boxes to avoid confusion in the wiring. Signal device S is controlled by a signal relay P, and signal device S′ is controlled by a signal relay P′. As here shown, each of these relays comprises a field winding 10, a non-polarized armature 11, and an electrically polarized armature 12. The non-polarized armature 11 is responsive to the presence and absence of current in the field winding 10. The polarized armature 12 is responsive to the relative direction of currents in its own winding and in field winding 10. If both windings are deënergized it will remain in the position to which it was last moved. In the arrangement of wiring here shown, the current in field winding 10 is always in one direction whereas that in the armature winding is reversible, hence the position of the armature 12 actually depends upon the direction of the current flowing in the winding thereof. Two contacts 13 and 14 are operatively connected with armature 12.

The stretch A is provided with one or more track circuits for the control of signal relays P and P′. In the arrangement shown in Figs. 1, 2 and 3 the stretch is provided with one track circuit comprising a source of current 15 connected with the track rails adjacent the middle of the stretch and two track relays 16 and 17 one connected with the track rails adjacent each end of the stretch. As here shown the source 15 is a transformer having one winding connected with the track rails and the other winding connected with a suitable source of alternating signaling current (not shown). The track relays 16 and 17 are of a type which will respond to the signaling current, and when propulsion current is employed they are preferably of a type which will not respond to the propulsion current. The limits of the track circuit are defined by insulations 20, 20, etc., in the track rails near the ends of sidings B and C. Since the motive power for the railway here shown is electricity, I provide inductive bonds 18, 18 of a usual and well-known type to conduct the propulsion current around the insulation points.

In the modification shown in Fig. 4, the

stretch A is provided with two separate track circuits *a* and *b*, separated by insulations 21, both of which track circuits are fed in parallel from transformer 15; a reactance 22 is included between the transformer and track circuit *a*, and a reactance 23 is included between the transformer and track circuit *b*, for reasons set forth in United States Letters Patent Number 1,016,922 granted to Lewis and Holliday on Feb. 6, 1912.

Suitable sources of current are provided for energizing the windings of relays P and P'. As here shown these sources are resistances 24 and 25 connected between the track rails and the trolley wire T, each resistance being provided with taps at such points as to give the desired voltages. Armature 12 of relay P is supplied with current from the adjacent resistance 24, the polarity of which current is controlled by an armature contact 29 of track relay 17. When this track relay is energized the circuit for armature 12 is from resistance 24 through wires 26 and 27, armature 12, wire 28, armature contact 29, wire 30 to resistance 24. When relay 17 is deënergized, the circuit is the same as that just traced up to contact 29, then through wire 31 to another point on resistance 24. Wires 30 and 31 connect with points on resistance 24 on opposite sides of the point of connection of wire 26, hence the polarity of current in armature 12 depends on the position of contact 29. Armature 12 of relay P' is supplied with current from resistance 25, and the polarity of the current is controlled by armature contact 49 of relay 16. The field winding 10 of relay P is supplied with current from resistance 25 through the following circuit:—from resistance 25 through wires 32 and 33, armature contact 34, wire 35, contact 13, wire 36, winding 10, wires 37 and 38 to track rails. Similarly winding 10 of relay P' is supplied with current which flows from resistance 24 through wire 26, armature contact 39, wire 40, contact 13, wire 41, winding 10, wires 42 and 43 to track rails.

I will now explain the control of the lamps R, Y, and G by relay P.

When armature contact 11 is closed and contact 14 is in the position shown in Fig. 1, lamp G is illuminated through the following circuit:—from resistance 24 through wires 26 and 27, contact 14, wire 44, contact 11, wire 45, lamp G, wires 46 and 38 to the track rails. When armature contact 11 is opened, due to the deënergization of field winding 10, and contact 14 remains in the position shown in Fig. 1, lamp R is illuminated through a circuit the same as just traced as far as contact 11, then through wire 47, lamp R to wires 46 and 38 and the track rails. When contact 14 is reversed in position, due to the reversal of armature 12, lamp Y is illuminated through the following circuit:—from the resistance 24 through wires 26 and 27, contact 14, wire 48, lamp Y, wires 46, and 38 to the track rails. The control of lamps R', Y', and G' by relay P' is exactly the same as just described for the corresponding parts of signal S, hence a detailed explanation is unnecessary.

The operation of the system shown in Figs. 1 to 3 inclusive, is as follows:—When the stretch A is free from cars or trains, green lamps G and G' are both illuminated indicating to a car or train approaching the stretch from either siding B or C that the stretch A is clear and that it may therefore proceed through the stretch at full speed. Assume now that a car or train W enters the stretch A from siding C as indicated in Fig. 2. When it reaches the track circuit of the stretch A it deënergizes track relay 17, thereby reversing the polarity of current in armature 12 of signal relay P. This causes lamp G to be extinguished and yellow lamp Y to become illuminated. The deënergization of track relay 17 also opens the circuit including the field winding 10 of signal relay P' at armature contact 39, thereby opening contact 11 of relay P'; this extinguishes green lamp G' and illuminates red lamp R'. The display of the yellow light behind the car or train indicates to succeeding cars or trains approaching the stretch A from the siding C that they may proceed through the stretch under caution; the display of the red lamp R' at the other end of the stretch A indicates to cars or trains approaching the stretch from siding B to stop, for the reason that the stretch is already occupied by a car or train approaching the siding B. As the car or train W approaches the middle point of the stretch A it deënergizes track relay 16. (See Fig. 3.) The opening of armature contact 34 of this relay opens the circuit of field winding 10 of relay P thereby causing armature contact 11 of relay P to open but this has no effect on signal S because of the position of contact 14 of relay P. The opening of armature contact 49 of track relay 16 reverses the polarity of current through armature 12 of relay P' but this armature does not change position because the circuit of field winding 10 of this relay is opened at armature contact 39 of track relay 17 and also at contact 13 of relay P. As the car or train proceeds past the middle point of stretch A, track relay 17 again becomes energized, thereby reversing the polarity of current in armature 12 of relay P, but the position of this armature does not change because the circuit of field winding 10 of this relay is opened at contact 34 of track relay 16. Hence, the circuit of field winding 10 of relay P' is still held open at contact 13 of relay P. The parts of the system are now in the positions indicated in

Fig. 3, and it will be seen that the yellow lamp behind the car and the red lamp ahead of the car continue to be illuminated. As the car or train W passes out of the stretch A at siding B, track relay 16 becomes energized and the closing of the armature contact 34 closes the circuit of field winding 10 of relay P, thereby causing the armature 12 of this last mentioned relay to move back to the position shown in Fig. 1. This causes contact 13 to close the circuit of field winding 10 of relay P′ but the closing of contact 49 reverses the polarity of current in armature 12 of relay P′ hence, this armature does not change position. The parts of the system are now in the positions shown in Fig. 1.

Referring now to Fig. 4, I have here shown two additional lamps 50 and 51 located adjacent the middle of the stretch A. These lamps are for the following purpose:—When a car or train enters the stretch A from siding B or C and finds a yellow or caution signal indicating that a preceding car or train moving in the same direction occupies the stretch A, the succeeding car or train may follow into the stretch under caution. When it reaches the middle of the stretch if it finds a lamp 50 or 51 corresponding to its direction of travel illuminated, the driver of such car or train will then know that the preceding car has passed out of the stretch, and that he may therefore proceed through the remainder of the stretch at full speed. Lamp 50 is for the control of traffic in the direction indicated by the arrow adjacent that lamp, and lamp 51 is similarly for the control of traffic in the direction indicated by the arrow adjacent that lamp. When the stretch is free from cars or trains lamp 50 is illuminated by the following circuit:—from resistance 24 through wire 26, armature contact 39, wire 40, contact 13, wires 41 and 52, lamp 50, wire 53, to the track rails. It will be noted that when the portion of the stretch A adjacent siding C is occupied by a car or train, this lamp 50 is extinguished due to the fact that track relay 17 is deënergized. Similarly when the stretch A adjacent siding B is free from cars or trains, and the polarized armature 12 of relay P′ is in the position to close contact 13, lamp 51 will be illuminated through the following circuit:—from resistance 25 through wires 32 and 33, contact 34, wire 35, contact 13, wires 36 and 54, lamp 51, wire 55, to the track rails. When this portion of stretch A is occupied by a car or train, the lamp 51 is extinguished due to the fact that this circuit is open at contact 34.

In the practice of either modification of my invention here shown, the green lamps G and G′ may if desired, be omitted. In such case, when the stretch A is free from cars or trains, the fact will be indicated by the absence of any lights in signals S and S′. If desired the locations of signals S and S′ may in such case be indicated by markers of any suitable kind.

As mentioned hereinbefore, the signals S and S′ are preferably located a short distance into the stretch A from the respective ends, so that as a car or train enters the stretch from either siding the driver may see the change of indication caused by his car or train. If the signals were located at the ends of the stretch, two cars might enter the stretch from opposite ends at the same time and each would receive a clear signal. In case two cars should enter the stretch at the same moment, both red lamps R and R′ will be illuminated because the field windings 10 of both relays P and P′ will be deenergized by the opening of armature contacts 34 and 39 of track relays 16 and 17 respectively. With the signals located as shown and described, the drivers of both cars or trains will observe the red or stop signals and neither car or train will proceed into the stretch A.

Although I have herein shown and described only two forms of signaling system embodying my invention, it is understood that various changes and modifications may be made therein within the spirit and 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 stretch of single track over which traffic moves in both directions, signals adjacent each end of the stretch each adapted to indicate stop, caution and clear, a signal relay for the control of each signal each comprising a field winding, a non-polarized armature controlled by the field, and a polarized armature; circuits for the control of the clear and stop indications of each signal each including contacts controlled by the non-polarized armature of the corresponding signal relay, a circuit for the control of the caution indication of each signal each including a contact controlled by the polarized armature of the corresponding signal relay, and track relays for the control of the signal relays.

2. In combination, a stretch of single track over which traffic moves in both directions, signals adjacent each end of the stretch each adapted to indicate stop, caution and clear; a signal relay for the control of each signal each comprising a field winding, a non-polarized armature controlled by the field, and a polarized armature; circuits for the control of the clear and stop indications of each signal each including contacts controlled by the non-polarized armature of the corresponding signal relay, a circuit for the control of the caution indication of each signal each including a contact controlled by

the polarized armature of the corresponding signal relay, a circuit for the field winding of each signal relay each of which is controlled by a contact operated by the polarized armature of the other signal relay, and track relays for the control of the signal relays.

3. In combination, a stretch of single track over which traffic moves in both directions, signals adjacent each end of the stretch each adapted to indicate stop, caution and clear; a signal relay for each signal each comprising a field winding, a non-polarized armature and an electrically polarized armature; circuits for the control of the clear and stop indication of each signal each including a contact controlled by the non-polarized armature of the corresponding signal relay, a circuit for the control of the caution indication of each signal each including a contact controlled by the polarized armature of the corresponding signal relay, track relays one adjacent each end of the stretch, sources of current for the signal relays, contacts controlled by the armature of each track relay for energizing the polarized armature of the adjacent signal relay in one direction or the other according to whether the said track relay is open or closed, and a circuit for the field winding of each signal relay each controlled by a contact operated by the polarized armature of the other signal relay and also by a contact of the track relay at the other end of the stretch.

4. In combination, a stretch of single track over which traffic moves in both directions, a signaling device adjacent each end of the stretch each arranged to indicate stop, caution and clear; a relay for each signaling device each of which comprises a field winding, a non-polarized armature controlled by the field, and an electrically polarized armature, sources of current for the field winding and the polarized armature winding; circuits controlled by the non-polarized armature for governing the clear and stop indications, and a circuit controlled by the polarized armature for governing the caution indication, and means controlled by the entrance of a car or train upon the stretch at either end for reversing the current in the polarized armature of the relay at that end thereby causing the caution indication to be displayed at that end and for deënergizing the field winding of the relay at the other end thereby causing the stop indication to be displayed at that end.

5. In combination, a stretch of single track over which traffic moves in both directions, a signaling device adjacent each end of the stretch each arranged to indicate caution and stop; a relay for each signaling device comprising a field winding, a non-polarized armature responsive to the presence and absence of current in the field winding, and an electrically polarized armature; a circuit for the control of the caution indication and a circuit for the control of the stop indication which circuits are controlled respectively by the polarized and the non-polarized armatures of the corresponding relay, and means controlled by the entrance of a car or train upon the stretch at either end for reversing the current in the polarized armature of the relay at that end thereby causing the caution indication to be displayed at that end and for deënergizing the field winding of the relay at the other end thereby causing the stop indication to be displayed at that end.

6. In combination, a stretch of single track over which traffic moves in both directions, means for supplying signaling current to the track rails of the stretch, track relays one connected with the track rails adjacent each end of the stretch which relays are normally energized by the said signaling current, one of which relays is deënergized when a car or train enters the stretch at the corresponding end and the other of which relays is deënergized when the said car or train is in the other end of the stretch, a signaling device adjacent each end of the stretch each arranged to indicate caution and stop; a signal relay for each signaling device each comprising a field winding, an electrically polarized armature, and a non-polarized armature responsive to the presence and absence of current in the field winding; a circuit for the control of the caution indication of each signaling device and a circuit for the control of the stop indication of each signal device which circuits are controlled respectively by the polarized and the non-polarized armatures of the corresponding signal relay, means controlled by each track relay when deënergized by the entrance of a car or train upon the stretch at the corresponding end for reversing the current in the polarized armature of the signal relay at that end thereby causing the caution indication to be displayed at that end of the stretch, and means controlled by each track relay when deënergized by the entrance of a car or train upon the stretch from the corresponding end for deënergizing the field winding of the signal relay at the other end of the stretch thereby causing the stop indication to be displayed at that end, and means controlled by each polarized armature when in the reversed position for holding the field winding of the signal relay at the other end of the block deënergized.

7. In combination, a stretch of track over which traffic moves in both directions, a signaling device adjacent each end of the stretch each adapted to indicate caution and stop; a relay for each signaling device each comprising a field winding, a non-polarized armature responsive to the presence and absence of current in the field winding, and

an electrically polarized armature; a circuit for the control of the caution indication and a circuit for the control of the stop indication which circuits are controlled respectively by the polarized and the non-polarized armatures, means controlled by the entrance of a train upon the stretch at either end for reversing the current in the polarized armature of the relay at that end thereby causing the caution indication to be displayed at that end and for deënergizing the field winding of the relay at the other end thereby causing the stop indication to be displayed at that end, and means controlled by each polarized armature when in the reversed position for holding open the circuit of the field winding of the other relay.

8. In combination, a stretch of single track over which traffic moves in both directions, signals adjacent each end of the stretch each adapted to indicate caution and clear; a signal relay for each signal each comprising a field winding, a non-polarized armature controlled by the field for the control of the clear indication of the corresponding signal, and a polarized armature for the control of the caution indication of the corresponding signal; and track relays for the control of the signal relays.

9. In combination, a stretch of track over which traffic moves in both directions, a signal device adjacent each end of the stretch each adapted to indicate caution and clear; a signal relay for each signal device each comprising two members one of which is stationary and the other movable, a winding for each member, the movable member being responsive to the relative direction of currents in the two windings, and an armature responsive to the presence and absence of current in one of said windings; a circuit for the caution indication controlled by the said movable member and a circuit for the clear indication controlled by the said armature; and track relays connected with the stretch for the control of the signal relays.

10. In combination, a stretch of track over which traffic moves in both directions, a signaling device adjacent each end of the stretch each adapted to indicate caution and clear; a relay for each signaling device each comprising two members one of which is movable, a winding for each member, the movable member being responsive to the relative direction of current in the two windings, and an armature responsive to the presence and absence of current in one of said windings; a circuit for the caution indication controlled by the said movable member and a circuit for the clear indication controlled by the said armature; and means controlled by the entrance of a car or train upon the stretch at either end for reversing the current in one winding of the relay at that end thereby causing the caution indication to be displayed at that end, and for deënergizing the armature-controlling winding of the other relay thereby preventing the display of the clear indication at the other end of the stretch.

11. In combination, a stretch of track over which traffic moves in both directions, a signaling device adjacent each end of the stretch each adapted to indicate caution and clear; a relay for each signaling device each comprising two members one of which is movable, a winding for each member, the movable member being responsive to the relative direction of currents in the two windings, and an armature responsive to the presence and absence of current in one of said windings; a circuit for the caution indication controlled by the said movable member and a circuit for the clear indication controlled by the said armature; and means controlled by the entrance of a car or train upon the stretch at either end for reversing the current in one winding of the relay at that end thereby causing the caution indication to be displayed at that end, and for deënergizing the armature-controlling winding of the other relay thereby preventing the display of the clear indication at the other end of the stretch, and means controlled by the said movable member of each relay for controlling the circuit of the armature-controlling winding of the other relay.

12. In combination, a stretch of track over which traffic moves in both directions, a signal device adjacent each end of the stretch each adapted to indicate caution and clear; a signal relay for each signal device each comprising two members one of which is stationary and the other movable, a winding for each member, the movable member being responsive to the relative direction of currents in the two windings, and an armature responsive to the presence and absence of current in one of said windings; a circuit for the caution indication controlled by the said movable member and a circuit for the clear indication controlled by the said armature; auxiliary signals adjacent the middle of the stretch for governing traffic in each direction and each adapted to indicate caution and clear, and track relays connected with the stretch for the control of the signal relays and of the auxiliary signals.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN S. HOLLIDAY.

Witnesses:
W. L. McDaniel,
A. L. Vencill.