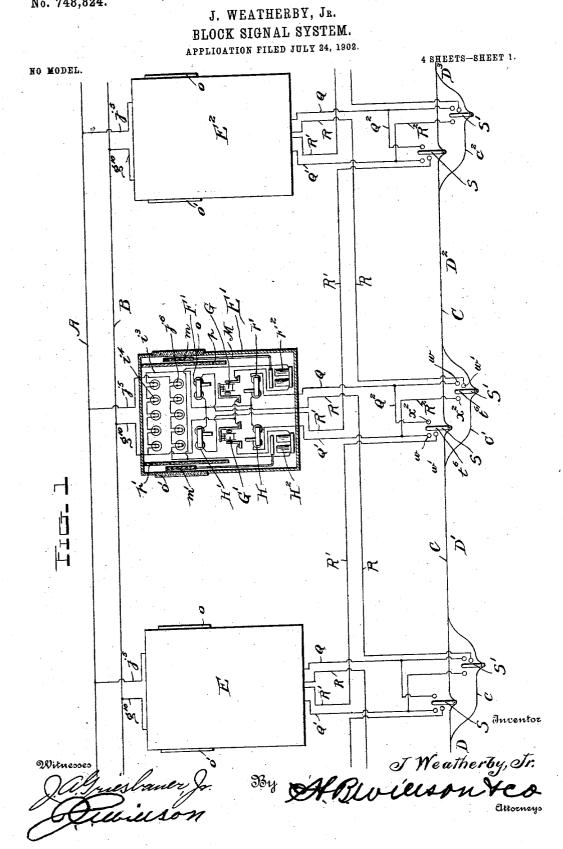
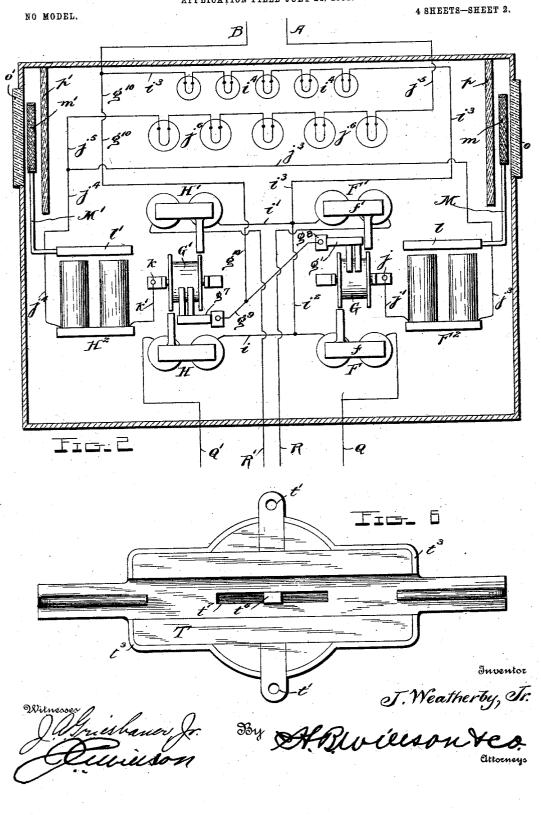
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No. 748,824.

J. WEATHERBY, JR. BLOCK SIGNAL SYSTEM. APPLICATION FILED JULY 24, 1992.



THE NORRIS PETERS CO., PROTO-LITHO., WASHINGTON, D. C.

PATENTED JAN. 5, 1904.

No. 748,824.



NO MODEL:

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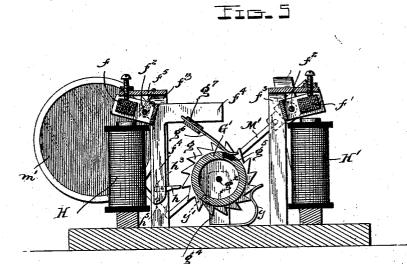
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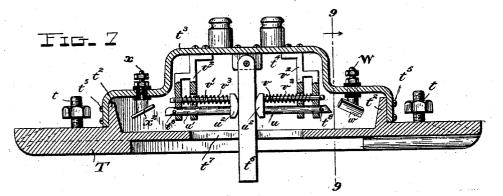
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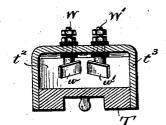
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NO MODEL.







Inventor

T J. Weatherby, Jr. 334 A.B.Willsonteo, Attorneys

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 748,824.

Patented January 5, 1904.

UNITED STATES PATENT OFFICE.

JOSEPH WEATHERBY, JR., OF WILMINGTON, DELAWARE.

BLOCK-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 748,824, dated January 5, 1904.

Application filed July 24, 1902. Serial No. 116,811. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH WEATHERBY, Jr., a citizen of the United States, residing at Wilmington, in the county of Newcastle and 5 State of Delaware, have invented certain new and useful Improvements in Block-Signal Systems; and I do declare the following to be a full, clear, and exact description of the inven-

tion, such as will enable others skilled in the 10 art to which it appertains to make and use the same.

This invention relates to block-signal systems for single or double track railways; and it pertains particularly to that class of appa-15 ratus in which a signal or indicator is oper-

ated by a moving car to show whether or not the block is clear.

The objects of the invention are, first, to provide means for operating a signal and 20 maintaining the signal at the danger-point as long as any one of a number of cars are on the block; second, to reverse the signal to indicate a clear block only when the last of a number of cars on a block passes off the block;

- 25 third, to provide an apparatus which insures absolute safety even in the event of the simultaneous operation of the signal setting and releasing devices by cars at opposite ends. of a block; fourth, to provide signal mech-
- 30 anism operable in connection with either hand or automatic switches, and, finally, to generally simplify and improve the construction and increase the practical efficiency of signal systems of this character.
- With these objects in view the invention 35 consists in certain features of construction and combination of parts, which will be hereinafter fully set forth.
- In the accompanying drawings, Figure 1 is 40 a diagrammatic view showing several blocks of a signal system embodying my invention. Fig. 2 is an enlarged diagrammatic view showing the signal devices at one of the signalstations. Fig. 3 is a top plan view of the 45 electromagnets and circuit-closing devices at a station, showing also the circuit closers and connections. Fig. 4 is a side elevation of the same. Fig. 5 is a longitudinal section through one set of magnets and the coöperating cir-50 cuit-closer. Fig. 6 is a bottom plan view of

of the same. Fig. 8 is a cross-section of the switch on line 9 9 of Fig. 8.

Referring now more particularly to the drawings, the letter A represents the trolley 55 feed-wire; B, the track; C, the trolley-wire or conductor provided with turnouts $c c' c^2$. &c., located at the junction of the blocks D $D' D^2 D^3$, &c., and E E', &c., are signal-boxes also located at said junctions and containing 60 the electromechanical devices for operating the signals.

In the present instance I have shown the application of the signal system solely to a single-track railway provided with turnouts; 65 but it will of course be understood that I do not limit the invention thereto, as the same signal mechanism with slight changes in the construction or arrangement of the parts may be employed for a double-track railway and 70 for general use where an electromechanical signal is required.

Arranged within each signal-box E are two sets of devices for setting and retracting the signals, each set consisting of a pair of elec- 75 tromagnets, a circuit-closer coöperating therewith, and a signal set and retracted by energizing and deënergizing the electromagnets.

F and F' are the electromagnets of one set, provided (see Fig. 5) with the armatures ff', 80 each of which is pivotally mounted upon a shaft f^2 , supported by a bracket f^3 and normally held in an inclined position by the gravitative action of two arms f^4 and a spring f^5 , coiled about the shaft f^2 and having one 85 end secured to the bracket f^3 and the other end to the armature. Between the electromagnets is a circuit-closer comprising a wheel or drum G, provided with two ratchet-toothed flanges g and g', which are respectively en- 9c gaged by pivoted pawls h and h' upon the arms f^4 of the armatures when the electromagnets are energized, each of said pawls being limited in its downward movement by a stop-pin h^3 and each arm f^4 having a pin h^5 95 to engage a ratchet-tooth to lock the drum against movement beyond the extent of one tooth. The drum is rigidly mounted upon a shaft g^2 , turning in bearing-brackets g^3 , and has a smooth cylindrical contact-surface g^4 100 between the flanges, which is broken at one the switch. Fig. 7 is a longitudinal section point by an insulating strip g^5 . With this

drum contact brushes g^6 , supported by a bracket g^{7} , electrically connected with a binding-post g^8 . The other set of electromagnets $\mathbf{H} \ \mathbf{H}'$ is similarly constructed and coöperates 5 with a like drum G', and the brushes of this drum G' are also connected with the bindingpost g^8 through a conductor g^9 . From this post g^8 or the wire g^9 leads a wire g^{10} , leading to the track-rails B and forming a common 10 ground connection for both sets of brushes. A wire *i* connects the two electromagnets F H, and a wire i' connects the two electro-magnets F' H', and these wires i i' in turn connect with a bridge-wire i^2 and a wire i^3 , 15 connecting with the ground-wire g^{10} and containing a series of resistance-lamps i^4 . From binding - posts j k, in electrical connection with the two drums G G', lead wires j' k', which connect with electromagnets F^2 H^2 , 20 from which lead conductors $j^3 j^4$, which are in circuit with a feed-wire j^5 , leading from the trolley feed-wire A and containing a series of signal-lamps j^6 , which light up the interior of the signal-box E. The two electromagnets 25 F^2 H² are provided with armatures l l', carrying semaphore-arms M M', provided with red target-disks m m', which are thrown upward by the drawing down of the armatures when the magnets are energized and exposed 30 through clear-glass openings or bull's-eyes o o' in the sides of the box E and facing the adjacent blocks of the line. Supported in the box in rear of each opening o o' is a pane or panel p p' of white or frosted glass, which 35 transmits a pure white light through the opening when the semaphores are down. The red target-disks m m' are of smaller diameter than the openings o o' and are adapted to be moved up by the swing of the armatures l l'40 between said openings and the white panes or panels p p', so that the danger-light will show with a red body or center surrounded by a white ring or halo, the white background formed by the white pane or panel making 45 the red light show with great distinctness for a considerable distance from the box or station.

The magnets F F' are electrically connected with binding-posts q r, to which are connected 50 two conducting-wires Q R, while the magnets H H' are electrically connected with bindingposts q' r', to which are connected two conducting-wires Q' R'. As shown in Fig. 1, these wires cooperate with switches S S', ar-55 ranged, respectively, in the trolley-wire and turnout at each station. Referring to any particular station, it will be seen that the wires Q and R lead from the magnets F F' to the switches S' at said station and another sta-60 tion to the left, while the wires Q' and R' connect the electromagnets H H' with the switches S of adjacent stations. Extending from the wire Q is a branch wire Q^2 , which leads to the switch S, and extending from 65 the wire Q' is a wire R^2 , which leads to the

switch S'. Each switch S or S' comprises a support-

ing-bracket T, provided with binding-posts tat its ends for connection with the trolleywire and at its sides with eyes t' for connection 70 with suitable stay or guy wires. This bracket has an upwardly-projecting flange t^2 , about which fits a cap or cover t^3 , forming therewith a chamber t^4 and secured thereto by screws t^5 . Pivoted to this cover is a lever t^6 , whose lower 75 end projects to the exterior through and swings within a slot t^{7} , formed in the bracket. On opposite sides of the lever are contactrods u u', secured by heads u^2 to move in unison with guide-rods v v', and these rods slide 80 in suitable openings in guide-brackets v^2 , fixed to the cover t^3 . When the lever swings in one direction, it slides the rods u and voutwardly, and when it swings in the opposite direction it slides the rods u' and v' outwardly. 85 Each rod v v' carries a surrounding coiled spring v^3 , which returns said rod with the cooperating contact-rod and the lever to their normal positions. The inward movement of the rods is limited by stop-pins t^8 , which abut 90 against the brackets v^2 . The rod u is adapted to engage two contacts w w', carried by binding-posts W W', to which the wires Q and R in the case of the switch S' and wires Q' and R'in case of the switch S are connected, while 95 the rod u' is adapted to contact with a contact-piece x^2 , carried by a binding-post x, to which the wire R² in case of the switch S' or wire Q^2 in case of the switch S is attached. It will be noted that upon removing the cover 100 or cap t^3 all the elements of the switch may be detached therewith. The construction of the two switches S and S' is the same, the only difference being in the arrangement of the wires, as above explained. IC 5

The operation is as follows: Assuming that all the cars running along the track from right to left in Fig. 1 have the right of travel without turnout, while those traveling from left to right are compelled to run upon the 110 sidings or turnouts, and also that a car is traveling in the former direction along the block D^2 , it will be seen that when said car reaches the station between the two blocks $\mathrm{D}^{\mathbf{z}}$ D' the trolley-wheel of the car on striking the 145 lever-arm t⁶ of switch S will throw the contact-rod u into engagement with the two contacts w w', thereby closing the switch and connecting the trolley-wire with the wires Q' and R', whereupon an electric current will be 120 caused to pass along these two wires to the front signal mechanisms M' at the stations E' and E to release the signal at the former station and project that at the latter station. The current passing along wire Q' will ener- 125 gize the releasing-magnet H at E', thereby drawing down the armature f of said magnet and causing the pawl h thereof to engage the ratchet-wheel g of the drum G' to rotate said drum toward the magnet-primal H' the dis- 130 tance of one tooth. This action moves the insulation g^5 into engagement with the brushes g^6 and breaks the circuit, whereupon the auxiliary setting-magnet H² at E', which

5 time the transmission of a current over the wire \mathbf{R}' will set the front signal at station \mathbf{E} in the following manner: The current will pass from R' to the setting-magnet H' at said station E and draw down the armature f', to thereby causing pawl h' to engage ratchetflange g' and turn drum G' the distance of one tooth toward releasing magnet H, thereby moving the insulation g^5 out of contact with the brushes q^6 and closing the circuit, 15 and the current thence passes to the magnet H^2 , drawing down armature l' and setting the signal m', indicating that block D' is closed. When the car reaches station E, a current is in the same manner transmitted through the 20 wires Q' and R', leading to and from said station, to retract the signal previously set at E, and set the signal at a station to the left of E, indicating that block D is closed*i. e.*, occupied by a car. When a car travel-25 ing from left to right, and, say, from block D' to block D², passes out to the turnout c', the lever-arm t^6 of switch S' is moved in the reverse direction and engages contacts w w', connected with the wires Q and R, and a cur-30 rent is caused to pass through the releasingmagnet F to release and retract the signal mat station E, and at the same time a current is supplied to the setting-magnet F' at station E^2 to set signal *m*, indicating that block 35 D^2 is closed. It will thus be seen that each station is provided with two sets of magnets, circuit-closers, and signals, one set operating to set and retract the signals for cars going in one direction and the other set acting to 40 set and retract the signals for cars going in the opposite direction, and it will be understood that by simply separating these sets of

was previously energized to set the front [signal m', is deënergized, and the semaphore

M' drops down and retracts said signal, indi-

cating that block D^2 is clear. At the same

devices and applying them to different signalboxes at the stations the apparatus will be 45 made available for use in connection with double-track lines. One of the two sets of switches S S' is of course in this case applied to the trolley-wire above one track and the other set to the trolley-wire above the 50 other track.

The toothed flanges of the drums G G' may embody any number of teeth-sixteen appearing in the present instance-of which one is made blank by the insulation-strip g^5 . 55 Thus the pawl operated by the setting-mag-

- net F' or H' may turn the drum G or G'fifteen times the space of one tooth, allowing a corresponding number of cars to enter a block without releasing the signal con-
- 60 trolling said block until the last car has cleared it, as the opposing releasing-magnet F or G, which controls the pawl operating the drum in the reverse direction, must turn the drum back a like distance before the insulat-
- 65 ing-strip g^5 again comes under the brushes and breaks the circuit, thereby allowing the signal controlling the block to retract and in- I switched in connection with the trolley-wire

dicate the block to be open. The number of teeth on the ratchet-wheels may be varied to permit any desired number of cars to enter 70 a block within reasonable limits. A springstrip y, acting in the nature of a pawl, cooperates with the ratchet-teeth g to hold the drum in set position against casual movement. Normally, however, this strip y per- 75 mits of the free movement of the drum under the action of the pawls. When the drum turns to the limit of its movement in either direction, a stop-pin y', carried thereby, engages the bracket and prevents further move- 80 ment of the drum in that direction. Should at any time two cars traveling in the same direction simultaneously enter and leave a block, the signals will not be affected in the way of indicating that a closed block is open, 85 as the car leaving the block will set the signal in the block ahead of it, and the car entering the block will release the signal at the station where it enters, while the signal at the station intermediate the two cars and con- 90 trolling the block on which the rear or second car is running will not be operated, as the currents transmitted to said intermediate station by the closing of the switches will counteract each other and lock the controlling mech- 95 anism, thus holding the signal set at "danger" at the station ahead of the second car. My construction also possesses the desirable feature of permitting a car traveling in either direction to turn back and still set the signals 10c properly. If, for instance, a car running on block D^2 toward station E' is to be reversed to run in the opposite direction, then by running the car on the turnout c' the switch S' will be closed by engagement of switch-lever 105 t^6 with contact x^2 to connect the wires \mathbf{R}^2 Q with the trolley-wire, and a current will pass through them and release the signal m' at station E'. Upon the trolley then being reversed and the car run back the switch S' will 110 be operated by engagement of switch-arm t^6 with contacts w w' to close the circuit through the wires Q and R, and the signal m at station E' will be unaffected, as it is at released position, and backward movement of the drum G 115 will be prevented by stop y'; but the magnet F' at station E^2 will be energized to set the signal m at said station, indicating to cars running in the opposite direction that block D^2 is closed. When the car is running from 120 left to right, the trolley is reversed at a station; but instead of running the car on a turnout it is run straight along the track to operateswitch S. Thus if a car is on block D' and is to be run back on said block the car is run past 125 the turnout c' and past switch S and sends a current through Q^2 and Q to release the signal *m* at station E'. Then upon a reversal of the trolley and movement of the car back along block D' the switch S will connect the 130 wires $Q' \mathbf{R}'$ with the trolley-wire, thus setting the signal m' at station E.

It will be seen that the signal-lamps j^5 are

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only when a signal is set, thus insuring economy in the use of the apparatus and that the circuit is completed in the operation of any of the magnets through the ground-wire g^{10} . 5 It is of course obvious that hand-switches may be used in place of the automatic switches

S S', if desired. From the foregoing description, taken in

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connection with the accompanying drawings, to the construction and mode of operation of the invention will be readily understood, and it will be seen that a simple and effective signaling system is provided.

Changes in the form, proportion, arrange-15 ment, and construction of the parts may be made within the scope of the invention without departing from the spirit or sacrificing any of the advantages thereof. For instance, I may employ a semaphore-arm mounted outside 20 the signal-box and having a red glass brought into coincidence with the opening o o' when the arm is tilted instead of the semaphore herein shown, and I may also employ an aural signal, such as a bell, in series with the 25 semaphore-magnet and sounded when the semaphore is operated. The use of the aural signal is deemed advantageous under certain conditions, as when the signals are arranged at a railway-crossing, bridge, or other point 30 of danger to give warning of the approach of a car. In some cases, also, the aural signal may be employed in place of the visual signal. This signal system may be used to indicate the approach of a car at curves or street-cor-

35 ners and for other similar purposes.

For convenience of designation in the claims I will term the signal mechanisms M' the "front" or "outbound" signaling mechanisms and the signaling mechanisms M the 40 "rear" or "inbound" signaling mechanisms.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a signaling system of the character 45 described, signal-stations, signals at each of said stations controlling the movement of cars in both directions along the line, electromechanical devices at the stations for setting and releasing each signal, said devices in-50 cluding a circuit-closer and a setting and releasing magnet, in and out bound switches, two conducting-wires having contacts engaged by one of said switches and leading, respectively, to the releasing-magnet of the 55 front signal of the adjacent station and the setting-magnet of the front signal of the station next in advance along the line, two conductors having contacts engaged by the other switch and leading, respectively, to the re-60 leasing-magnet of the rear signal of the adjacent station and setting-magnet of the rear signal of the station next in advance in the opposite direction along the line, said contacts being engaged by the movement of the 65 switches by cars running in opposite directions, and branch wires having contacts en-

thereof, one of said wires adapted to connect the first-named switch with the conductor leading to the releasing-magnet of the rear 70 signal of the adjacent station and the other to connect the other switch with the conductor leading to the releasing-magnet of the front signal of the adjacent station, substantially as described. 75

2. In a signaling system of the character described, signal-stations, a conductor, in and out bound signals at each signal-station, setting mechanism at each station for each signal including a circuit-closer and setting and 80 releasing magnets, in and out bound switches, circuit connections whereby one movement of one of said switches will connect the conductor with the releasing and setting magnets of the outbound signals of the adjacent 85 station and next station in advance for an outbound car along the line, connections whereby a reverse movement of said switch will connect the conductor with the releasing-magnet of the inbound signal at the ad- 90 jacent station, connections whereby one movement of the other switch will respectively connect the conductor with the releasing and setting magnets of the inbound signals at the adjacent station and next station 95 in advance for an outbound car along the line and connections whereby a reverse movement of the latter-named rear inbound switch will connect the conductor with the releasingmagnet of the outbound signal of the adja- 100 cent station.

3. In a signaling system of the character described, signal-stations, in and out bound signals at each signal-station, in and out bound switches at each station, circuit connections 105 whereby one movement of the outbound switch will throw out of operation the outbound signal of the adjacent station and throw into operation the outbound signal at the next station in advance for an outbound 110 car along the line, connections whereby a reverse movement of said switch will throw out of operation the inbound signal at the adjacent station, connections whereby one movement of the inbound switch will respec- 115 tively throw out of operation the inbound signal at the adjacent station and operate the inbound signal at the next station in advance for an inbound car along the line and connections whereby a reverse movement of 120 said inbound switch will throw out of operation the outbound signal at the adjacent station, substantially as described.

4. In an electric signaling system, signals at the opposite ends of a block, a set of signal 125 switch and leading, respectively, to the releasing-magnet of the rear signal of the adjacent station and setting-magnet of the rear signal of the adjacent station next in advance in the opposite direction along the line, said contacts being engaged by the movement of the switches by cars running in opposite directions, and branch wires having contacts engaged by the switches on a reverse movement
4. In an electric signaling system, signals at the opposite ends of a block, a set of signal 125 setting and releasing mechanism at each end of the block, said mechanism being operable to permit a plurality of cars traveling in the same direction to enter the block, to maintain the advance signal at the danger-point 130 as long as any one of the number of cars are on the block, and to release the signal to indicate a clear block only when the last car has passed off the block, electric-circuit con-

releasing mechanisms, and a circuit-closing switch for each set of setting and closing mechanisms adapted when moved in one di-5 rection to complete a circuit through said

- connections to simultaneously release the signal at one end of the block and set the signal at the opposite end of the block, and branch connections controlled by a reverse 10 movement of the switch to reverse the sig-
- nals when a car traveling in either direction is turned back along the line, thereby setting the signal previously released and releasing the signal previously set, substantially as 15 described.
- 5. In an electric signaling system of the character described, a series of stations provided with signals, magnets for operating the signals, a main electric conductor provided 20 with a controlling-switch for each station, a signal setting and releasing device at each station comprising a circuit-closer and set-
- ting and releasing electromagnets adapted to operate said circuit-closer to energize and
- 25 deënergize the signal-operating magnets, said circuit-closer and setting and releasing magnets coöperating to permit a plurality of cars traveling in the same direction to enter a block, to maintain the advance signal at the
- 30 danger-point as long as any one of a number of cars are on the block, and to release the signal to indicate a clear block only when the last car has passed off the block, connections between the main conductor and the several
- 35 stations for supplying a current for setting a signal at one station and releasing a signal at another station, said connections being so related to the several parts that the controllingswitch at either station when moved in one
- 40 direction is adapted to simultaneously release the signal at said station and set the signal at the advance station, and means whereby when a car traveling in either direction is reversed to run in the opposite direction, the switch
- 45 will be operated to retract the advance signal previously set and to set the previously-retracted advance signal in the opposite direction, substantially as described.

6. In a signaling system of the character de-50 scribed, a conductor provided with turnouts, a signal-station at each turnout, signals at each of said stations controlling the movement of cars in both directions along the line, electromechanical devices at the stations for 55 setting and releasing each signal, said devices including a circuit-closer and a setting and releasing magnet, said magnets operating said circuit-closer in opposite directions to make and break the circuit, switches in the 60 main conductor and turnouts, two conducting-wires having contacts engaged by the switch in the main circuit and leading respec-

signal of the adjacent station and the setting-65 magnet of the front signal of the station next

tively to the releasing-magnet of the front

nections between the two sets of setting and I having contacts engaged by the switch in the turnout and leading respectively to the releasing-magnet of the rear signal of the adjacent station and setting-magnet of the rear 70 signal of the station next in advance in the opposite direction along the line, said contacts being engaged by the movement of the switches by cars running in opposite directions, and current-controlling connections co- 75 acting with said conductors and switches for reversing the signal when a car is turned back on either the main line or a turnout, substantially as described.

7. In a signaling system of the character de- 80 scribed, a conductor provided with turnouts, a signal-station at each turnout, signals at each of said stations controlling the movement of cars in both directions along the line, electromechanical devices at the stations for 85 setting and releasing each signal, said devices including a circuit-closer and a setting and releasing magnet, switches in the main conductor and turnouts, two conducting-wires having contacts engaged by the switch in the 90 main circuit and leading respectively to the releasing-magnet of the front signal of the adjacent station and the setting-magnet of the front signal of the station next in advance along the line, two conductors having con- 95 tacts engaged by the switch in the turnout and leading respectively to the releasing-magnet of the rear signal of the adjacent station and setting-magnet of the rear signal of the station next in advance in the opposite direc- 100 tion along the line, said contacts being engaged by the movement of the switches by cars running in opposite directions, and branch wires having contacts engaged by the switches on a reverse movement thereof, one 105 of said wires adapted to connect the main switch with the conductor leading to the releasing-magnet of the rear signal of the adjacent station and the other to connect the turnout-switch with the conductor leading to 110 the releasing-magnet of the front signal of the adjacent station, substantially as described.

8. In a signaling system of the character described, a main conductor provided with turnouts, a signal-station at each turnout, con- 115 trolling-switches in the conductor and turnout, in and out bound signals at each signalstation, setting mechanism at each station for each signal including a circuit-closer and setting and releasing magnets, circuit con- 120 nections whereby one movement of the main switch will connect the conductor with the releasing and setting magnets of the outbound signals of the adjacent station, and next station in advance for an outbound car 125 along the line, connections whereby a reverse movement of said switch will connect the conductor with the releasing-magnet of the inbound signal at the adjacent station, connections whereby one movement of the turn- 130 out-switch will respectively connect the conin advance along the line, two conductors I ductor with the releasing and setting magnets of the inbound signals at the adjacent station and next station in advance for an inbound car along the line, and connections whereby a reverse movement of said turnout-5 switch will connect the conductor with the relocation means of the cuthound signal of the

leasing-magnet of the outbound signal of the adjacent station, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH WEATHERBY, JR. Witnesses:

J. C. WILLSON, BENJ. G. COWL.