No. 800,179. PATENTED SEPT. 26, 1905.

H. W. SOUDER.

ELECTRIC SIGNALING SYSTEM.

APPLICATION FILED JAN. 27, 1905.

3 SHEETS—SHEET 1.

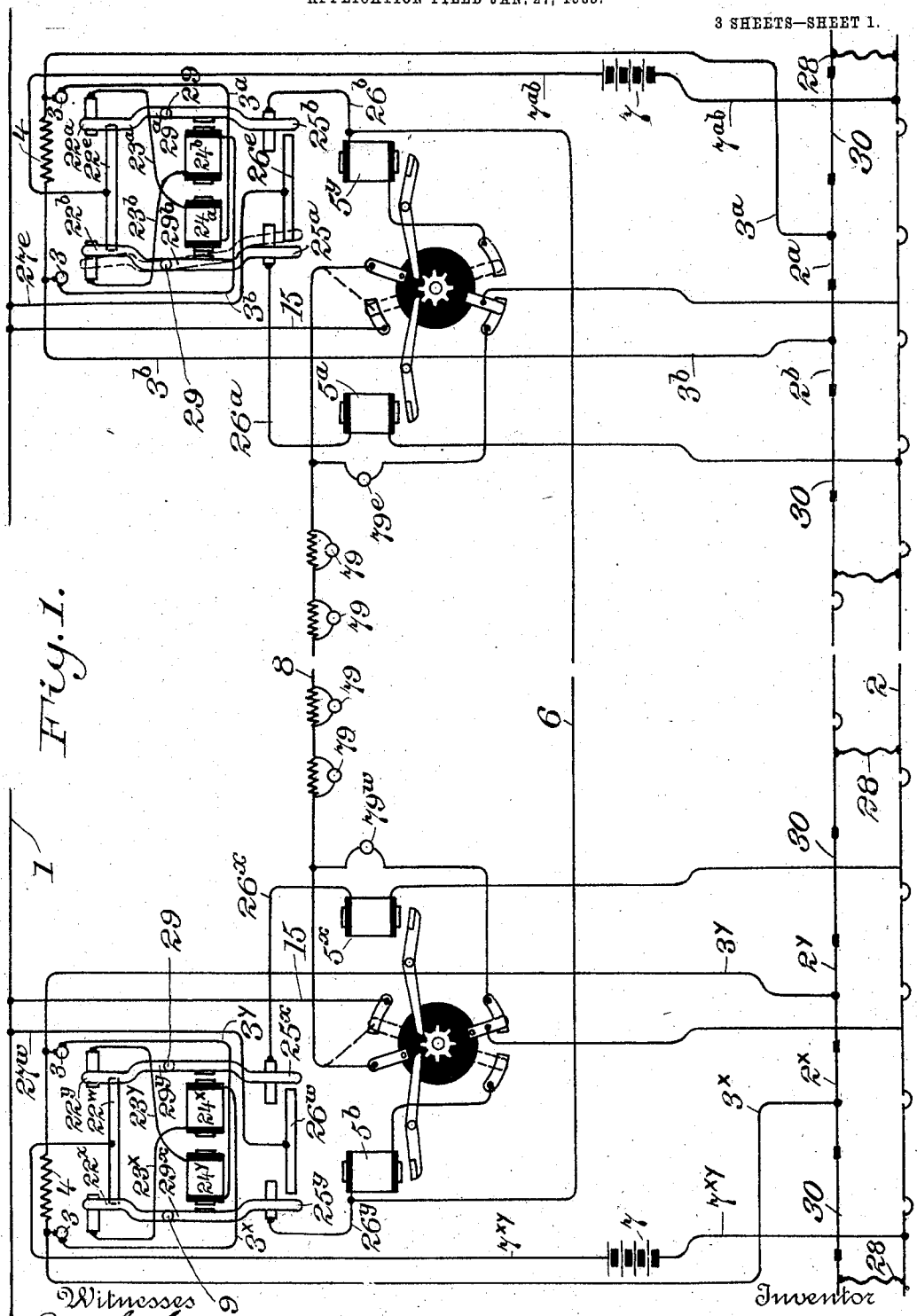

Fig. 1.

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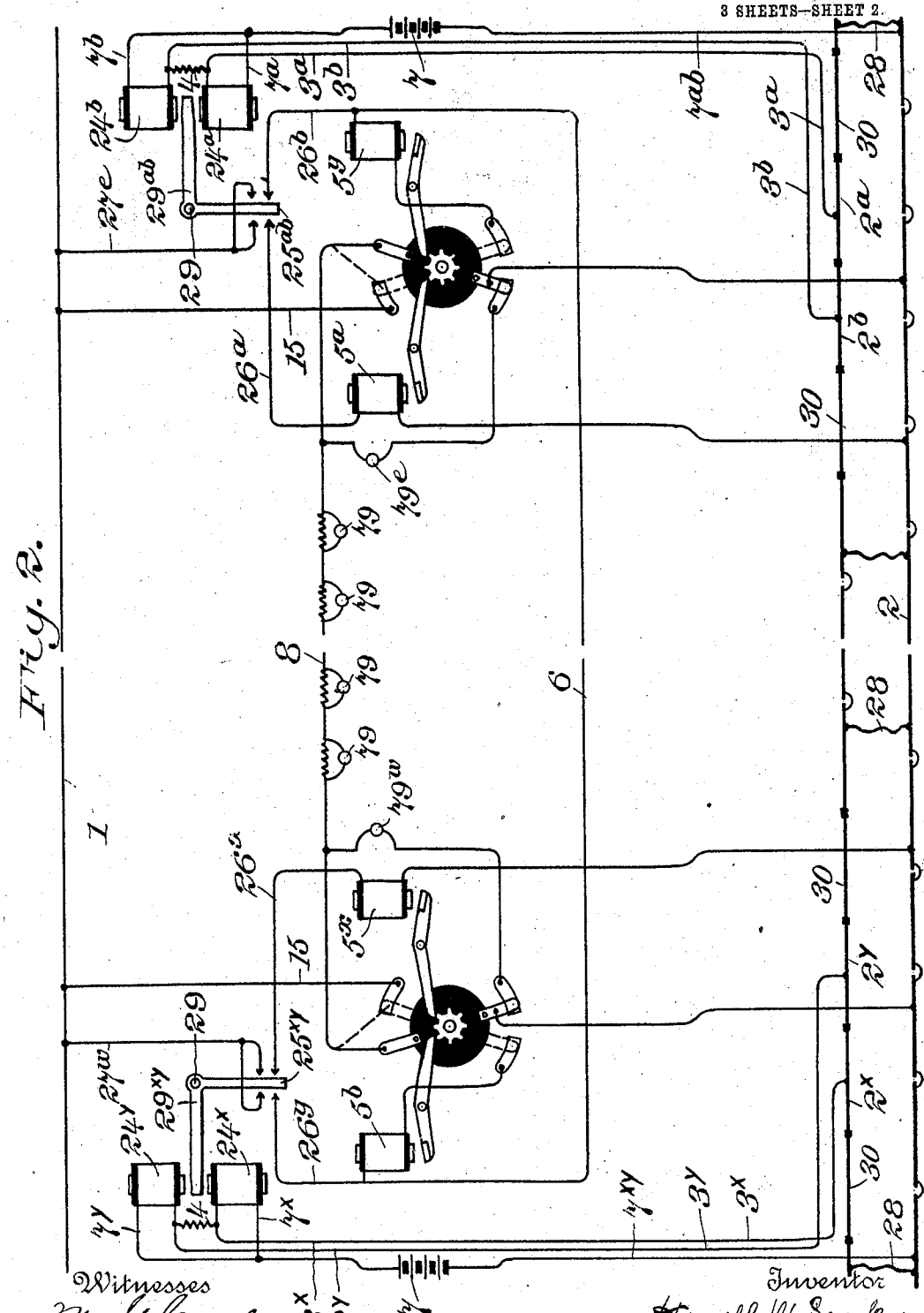

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

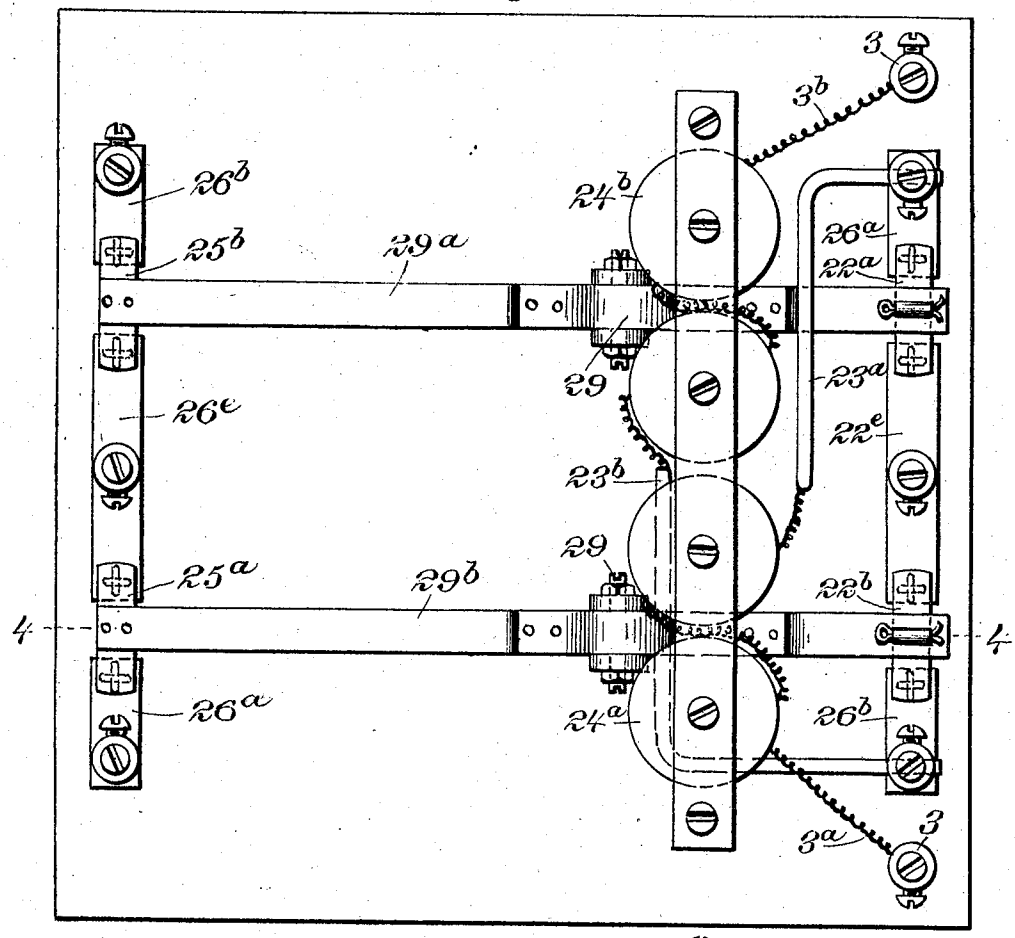
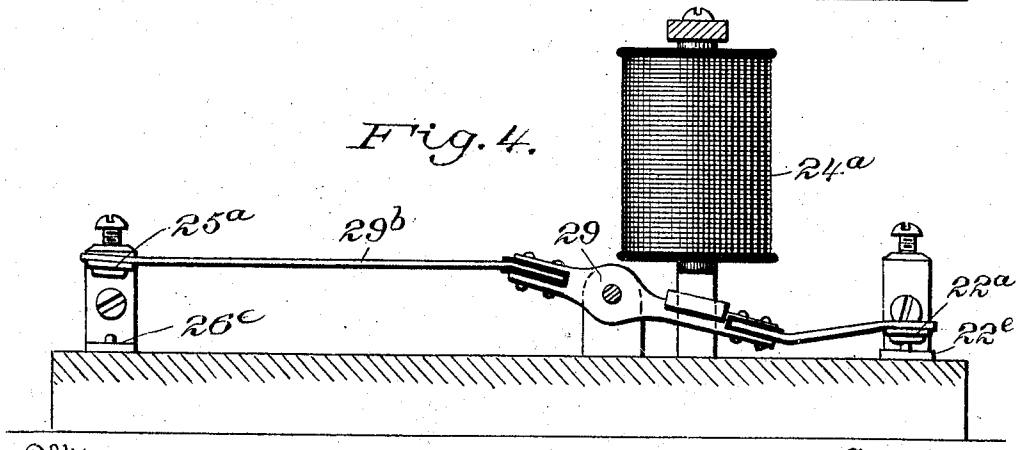


Fig. 4.



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ELECTRIC SIGNALING SYSTEM.

No. 800,179. Specification of Letters Patent. Patented Sept. 26, 1905.

Application filed January 27, 1905. Serial No. 242,851.

To all whom it may concern:

Be it known that I, HOWELL W. SOUDER, a citizen of the United States of America, and a resident of Tamaqua, county of Schuylkill, and State of Pennsylvania, have invented certain new and useful Improvements in Electric Signaling Systems, of which the following is a specification.

My invention relates to the controlling of electric circuits generally; and, more specifically, it consists of an improved apparatus for manipulating the circuits and operating the apparatus in electric signaling systems primarily designed for use in electric trolley-roads operated upon the block system.

My invention finds its most useful application in connection with the system of electric railroad-signals shown in my Patent No. 735,416, dated August 4, 1903, and subsequent modifications thereof. As shown in my before-mentioned patent, it has been customary to secure the distinct and separate action of various portions of the signaling system by cars going in different directions through the agency of a set of frogs and short turnouts inserted in the trolley-wire and acting to throw the trolley-wheel always to the right when looking in the direction in which the car is moving. These frogs and turnouts are, however, a somewhat costly element in this system and have to be installed with the greatest nicety or they interfere with the successful operation of the system, and even when constructed and installed with the utmost care they have heretofore remained and still are the weakest and most vulnerable point of my system. In my application, Serial No. 209,987, filed May 26, 1904, I disclosed a system of electric signaling designed to do away with the frogs and turnouts; but in the apparatus therein disclosed a contact-maker coöperating with the trolley-wheel is still employed. I have found that in roads operating cars at a very high speed it is difficult to obtain a sufficient contact by means of any contact-maker coöperating with the trolley-wheel, for the reason that the period of contact with a device of ordinary length is not sufficiently long to insure a proper working of the signals and that the construction and maintenance of a very long contact-making device is costly and troublesome. My present invention is designed to overcome these difficulties by providing a convenient arrangement of circuits which may be operated by the passage of a car over insulated lengths of rail, though the particular arrangement of circuits therein shown might also, if desired, be operated by a sectional contact-maker coöperating with the trolley-wheel.

The preferred form of apparatus embodying my present invention and certain modifications thereof are illustrated in the accompanying three sheets of drawings, in which—

Figure 1 is a diagrammatic view of my improved system in its preferred form. Fig. 2 is a diagrammatic view of a modification thereof. Fig. 3 is a plan view, and Fig. 4 a vertical section taken on line 4 4 of Fig. 3, showing an actual form of magnet-circuit controller employed in connection with my system.

Throughout the drawings like reference-figures indicate like parts.

The arrangement of signal-circuits and signal-circuit controllers is similar to that described in my before-mentioned patent, No. 735,416, and will not be further described at this point. The invention here disclosed has to do with the proper energizing of the controller-magnets 5^a, 5^b, 5^x, and 5^y, and such energizing is produced through the flow of current from the trolley-wire 1 through the wires 27^e or 27^w to whichever of said controller-magnets is thrown into connection. The connecting of said magnets with the trolley-current is effected through the connections 26^a, 26^b, 26^x, and 26^y and switches 25^a, 25^b, 25^x, and 25^y, throwing the same, respectively, into circuit with the terminal contact-pieces 26^e or 26^w, to which the wires 27^e and 27^w, respectively, are connected. The switches 25^a, 25^b, 25^x, and 25^y are operated through the magnets 24^a, 24^b, 24^x, and 24^y, said switches being mounted upon levers 29^a, 29^b, 29^x, and 29^y, &c. At the other end of the pivoted levers 29^a, 29^b, 29^x, and 29^y are switches 22^a, 22^b, 22^x, and 22^y, which control the circuits to the magnets 24^a, 24^b, 24^x, and 24^y by connecting the same, respectively, through the connections 23^a, 23^b, 23^x, and 23^y to the contact-pieces 22^e or 22^w, to which the common return-wires 7^{ab} and 7^{xy} are connected. These common return-wires extend to the bonded rail 2 of the railroad-track and have connected in series with them electric batteries 7 7 or other sources of electric-current supply. The other ends of the coils of the magnets 24^a, 24^b, 24^x, and 24^y are

connected, by wires 3^a, 3^b, 3^x, and 3^y, to the insulated rail-sections 2^a, 2^b, 2^x, and 2^y of the railroad-track, the other or bonded rail 2 of which is connected to the return-wires 7^{ab} and 7^{xy}. Resistance-coils 4 4 are bridged across the supply connections 3^a and 3^b and across supply connections 3^x and 3^y at some convenient point, as across the binding-posts 3 3 of each magnet-circuit controller. Such being the arrangement of circuits, the operation of the same is as follows: Normally the parts are in the position shown in full lines in Fig. 1. The supply connection to the signal-circuit is cut out at each end and the ground connection is cut in. The circuit through the batteries 7 7 is broken by reason of the insulation of the rail-sections 2^a, 2^b, 2^x, and 2^y. The circuits to the controller-magnets 5^a, 5^b, 5^x, and 5^y are all broken at the switches 25^a, 25^b, 25^x, and 25^y. If now a car enters the block at the east end, when its wheels pass over the insulated rail-section 2^a circuit is established through said wheels from the bonded rail 2 and through the current-supplying circuit 3^a, magnet 24^a, wire 23^a, switch 22^a, contact-piece 22^e, common return-wire 7^{ab}, and battery 7 back to the bonded rail. This enables the battery-current to energize the magnet 24^a and attract the swinging lever 29^b into dotted-line position. This closes the switch 25^a and sends current from the trolley-wire 1 through the wire 27^e, contact-piece 26^e, wire 26^a, and magnet 5^a to the ground, thereby operating the east circuit-controller in the manner described in my previous patent and here indicated in dotted lines to cut in the current through wire 15 to the signal-circuit 8. When the wheels of the car pass over onto the insulated rail-section 2^b, the battery-current cannot pass through the wire 3^b and magnet 24^b, because the switch 22^b has been previously opened at the time the switch 25^a was closed. Consequently a portion of this current is forced through the bridged resistance 4 to the circuit 3^a and continues to pass through the magnet 24^a in sufficient quantity to hold the lever 29^b in position and maintain the circuits in their initial and hereinbefore-described condition, so that the signal-circuit controllers are not disturbed. It is evident, of course, that when the initial contact is made with the insulated rail-section 2^a, a small fraction of the battery-current will be shunted through the resistance 4 and over onto the circuit 3^b and through the magnet 24^b before the switch 22^b can be opened; but this will be too weak to attract the swinging lever 29^a, the latter being withdrawn some distance from the magnet, and the prompt action of the magnet 24^a, which gets the full current, instantly opens switch 22^b, cutting out magnet 24^b completely. When the car goes out of the block at the west end, it first strikes the insulated rail-section 2^y, with the result that battery-current goes through the wire 3^y, magnet 24^y, wire 23^y, switch 22^y, contact-piece 22^w, common return-wire 7^{xy} to the bonded rail. This closes the switch 25^y and sends trolley-current through the wire 27^w, contact-piece 26^w, wire 26^y, and resetting-wire 6 back to magnet 5^y, the magnet 5^b having no ground connection at the time, all in the manner described in my previous patent. This resets the east signal-circuit controller. When the car gets onto the section 2^x, no battery-current can reach the magnet 24^x for the reason that the switch 22^x has been opened when the switch 25^y was closed, and so much of the current as can get through the resistance 4, bridged across the binding-posts, passes through the magnet 24^y and holds the parts in their initial position before described. A car traveling in the opposite direction produces the reverse series of operations, with the result that whenever a car enters either end of the block it sends current through all the signal-lamps 79 79, extended along the block and through the red-signal lamp 79^e or 79^w at the opposite end of the block.

In the apparatus shown in Figs. 3 and 4 the pivoted levers 29^a 29^b are so arranged as to make and break the connections by lifting alternately the bridging-pieces 25^a 25^b and 22^a 22^b. Otherwise the arrangement of circuits and the operating mechanism is the same as that previously described. Of course the resistance 4 should be bridged across the binding-posts 3 3; but such resistance is not shown in the drawings. Any ordinary resistance-coil could be employed. Figs. 3 and 4 merely show the magnet-circuit controller as a self-contained instrument by itself. The levers 29^a and 29^b are so constructed that the excess of weight is upon the right-hand side of the pivotal point 29 of each. Consequently the magnet-circuit switches 22^a and 22^b are normally closed and the work-circuit switches 25^a and 25^b are normally open, as indicated in Fig. 4.

In the modification shown in Fig. 2 the positive circuit-breaking switches of Fig. 1 are dispensed with for the purpose of cheapness and simplicity, and the two levers 29^a and 29^b are combined into one lever 29^{ab}, and the two levers 29^x and 29^y are combined into one lever 29^{xy}. In the same way the switches 25^a and 25^b are combined into one switch-lever 25^{ab}, which coöperates with opposing sets of contacts, and the switches 25^x and 25^y are combined into one switch-lever 25^{xy}, which coöperates with opposing sets of contacts. The supply-circuits 3^a 3^b 3^x 3^y are connected directly to their respective magnets 24^a 24^b 24^x 24^y, and the resistances 4 4 are bridged across them, as before. The common return-wire 7^{ab}, instead of extending to contact-piece 22^e, forming a part of the system of switches, is connected directly by branches 7^a and 7^b to the other ends of the magnet-coils. The same is true of the common return-wire 7^{xy} at the

other end of the block. The operation of this modification is similar to that previously described, except that while the car is on the second insulated rail-section the full battery-current is supplied to the magnet corresponding to said rail-section; but the smaller amount of current shunted through the resistance 4 to the other magnet is sufficient to hold the swinging-lever switch in position against the attraction of the other magnet—that is to say, when a car enters the block at the east end and passes over rail-section 2^a the full current goes through the wire 3^a and magnet 24^a back to the bonded rail, while only a small amount of current passes through the resistance 4 and magnet 24^b back to the bonded rail. The superior attraction of the magnet 24^a therefore pulls the pivoted lever 29^{ab} to it, with the result that trolley-current is sent through the wires 27^e 26^a to magnet 5^a, with the hereinbefore-described result. When the car passes onto insulated section 2^b, the major portion of the current is thrown into the magnet 24^b; but as a portion of the current still goes through the resistance 4 to magnet 24^a the latter magnet is sufficiently energized to hold the lever 29^{ab} in its position against the attraction of the more highly energized but more distant magnet 24^b. The operation of the other parts of the system is a repetition of the same series of steps and need not be set forth in full. 28 28 represent cross bonding-wires on the track.

The advantages of the invention comprise the simplicity of the apparatus, the positive nature of its action, and its capability of certain operation by cars moving at the highest rate of speed.

It is evident, of course, that various changes could be made in the arrangement of the circuit connections, the mechanical construction of the magnet circuit-controller, and in the other details without departing from the spirit and scope of my invention. It is also evident that while the simplest means of making and breaking the circuits is through the employment of the car-wheels and insulated rail-sections various other kinds of apparatus could be employed for supplying current to the circuits consecutively in the manner necessary to produce the sequence of operations hereinbefore described.

Parts marked 30 30 are additional sections of insulated rails arranged on either side of each group of signal-operating sections 2^a 2^b and 2^x 2^y to protect same from arcing and other electrical disturbances, which might occur if the car-wheels went at once from the bonded portion of the track to a signal-operating rail-section.

It is evident that the same underlying principle of operation exists in the forms of apparatus shown in Figs. 1 and 2 as well as in those shown in my applications, Serial No. 209,987, filed May 26, 1904, and Serial No. 226,228, filed September 27, 1904. In all cases the signals along the block are thrown in by one of a pair of magnets and thrown out by another. In all cases the current is supplied to one or the other of these magnets by a switching system which is magnetically controlled by the current supplied by one or the other of two normally open circuits. Each of these circuits has a circuit-closing device adapted to be operated by a passing car either through the agency of the car-wheels or of the trolley-wheel. These circuit-closers are operated consecutively by the passing car. The one initially operated determines the direction in which the switch system is thrown and throws it that way. When the switch is so thrown, the apparatus merely causes the current sent through the other circuit-closer to hold the switching apparatus in its initial position during the closure of the second circuit-closer.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. A magnet circuit-controller for use in electric signaling systems for railroads which comprises the combination of a pair of independent electromagnets, separate current-supplying circuits therefor, means operated by a passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits.

2. A magnet circuit-controller for use in electric signaling systems for railroads which comprises the combination of a pair of independent electromagnets, separate current-supplying circuits therefor, a common return-conductor, means operated by a passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits.

3. A magnet circuit-controller for use in electric signaling systems for railroads which comprises the combination of a pair of independent electromagnets, separate current-supplying circuits therefor, a common return-conductor, means operated by a passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits, said means for supplying current comprising a track provided upon one side with two insulated rail-sections to each of which one feed-circuit is connected, and bonded rails upon the other side to which the return-circuit is connected.

4. A magnet circuit-controller for use in electric signaling systems for railroads which comprises the combination of a pair of independent electromagnets, separate current-supplying circuits therefor, means operated by a

passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits, said switching apparatus comprising two switches each of which is operated by the energizing of one magnet to cut out the feed-circuit of the other magnet.

5. A magnet circuit-controller for use in electric signaling systems for railroads which comprises the combination of a pair of independent electromagnets, separate current-supplying circuits therefor, means operated by a passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits, said switching apparatus comprising two normally closed switches either of which is opened by the energizing of the other magnet.

6. In a signaling system for railroads, the combination of a magnet circuit-controller which comprises a pair of independent electromagnets, separate current-supplying circuits therefor, means operated by a passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits, together with a signal-circuit controller, two current-supplying circuits therefor, and a normally open switch in each circuit which switch is closed simultaneously with the opening of the feed-circuit switch of the corresponding above-described magnet.

7. A current-controller comprising in combination, two electromagnets, a pivoted lever controlled by each, bridging members on the ends of said levers, and separate current-supplying circuits to said magnets, the circuit of each magnet having a break controlled by the bridging member on one end of the lever controlled by the other magnet.

8. A current-controller comprising in combination, two electromagnets, a pivoted lever controlled by each, bridging members on each end of each lever, and separate current-supplying circuits to said magnets, the circuit of each magnet having a break controlled by the bridging member on one end of the lever controlled by the other magnet, together with two separate work-circuits, each of which has a break controlled by the bridging member on the other end of one of the levers.

9. A magnet circuit-controller for use in electric signaling systems for railroads which comprises the combination of a pair of independent electromagnets, separate current-supplying circuits therefor, a common return-conductor, means operated by a passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits, together with a source of electric current in series in said common return-circuit.

10. A magnet circuit-controller for use in electric signaling systems for railroads which comprises the combination of a pair of independent electromagnets, separate current-supplying circuits therefor, a common return-conductor, means operated by a passing car for supplying current to said circuits consecutively, a switching apparatus located within the fields of force of said magnets, and a resistance bridged across said supply-circuits, said means for supplying current comprising a track provided upon one side with two insulated rail-sections to each of which one feed-circuit is connected, and bonded rails upon the other side to which the return-circuit is connected, together with an electric battery in series in said common return-circuit.

11. In an electric signaling system for railroads, the combination with a system of circuits of an insulated rail-section operatively connected thereto, and additional insulated rail-sections located on either side of the operating-section, for protection thereof.

12. In a signal system for railroads, the combination of a signal-circuit-controlling apparatus comprising pairs of magnets, the members of each pair being adapted to alternately throw in and throw out the signals, a switching apparatus controlling the feed-circuits to the magnets, two circuits each provided with a circuit-closer adapted to be operated consecutively by a passing car, and means operated by said circuits to throw the switching apparatus in a direction determined by the initially-operated circuit-closer and to hold it in the position so assumed during the closure of the second circuit-closer.

Signed at Lansford, Pennsylvania, this 24th day of January, 1905.

HOWELL W. SOUDER.

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