J. J. RUDDICK.

ELECTRIC RAILWAY SIGNAL SYSTEM.

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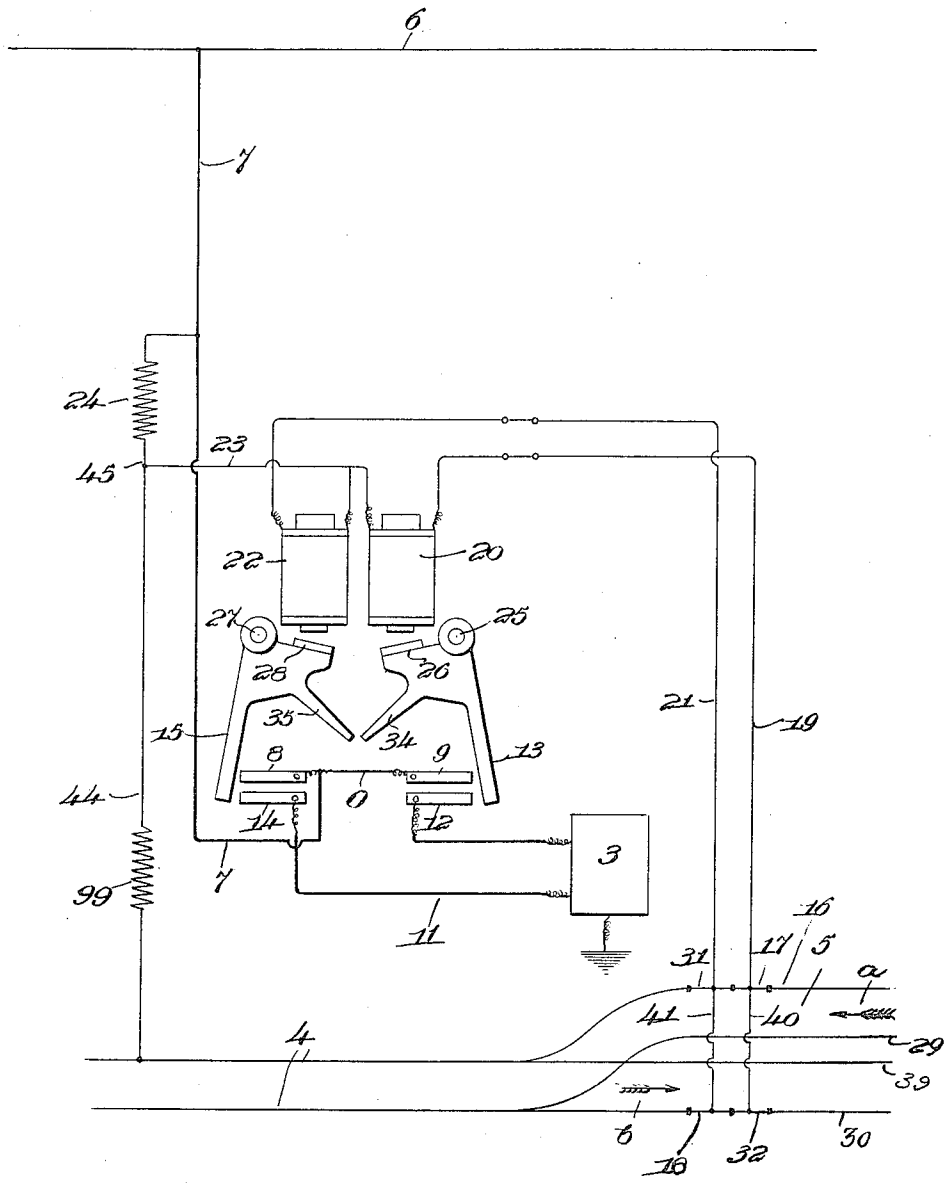
1,151,720. Patented Aug. 31, 1915.



Witnesses,
Edward F. Allen
Joseph M. Ward.

Inventor:
John J. Ruddick,
by Kenyon & Kenyon
Attys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN J. RUDDICK, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO UNITED STATES ELECTRIC SIGNAL COMPANY, OF WEST NEWTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

ELECTRIC RAILWAY SIGNAL SYSTEM.

1,151,720. Specification of Letters Patent. Patented Aug. 31, 1915.

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To all whom it may concern:

Be it known that I, JOHN J. RUDDICK, a citizen of the United States, residing at Newton, county of Middlesex, and State of Massachusetts, have invented an Improvement in Electric Railway Signal Systems, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to electric railway block signal systems and especially to that type of signal system wherein the signal-setting and signal-restoring circuits are connected to insulated sections of the rails and are closed to operate the signal by the passage of a car over such insulated sections. One advantage of signal systems of this type is that the signal-setting and signal-restoring circuits can be completed without the use of trolley switches or other devices connected with the trolley wire and operated by the trolley wheel; but when signal systems of this type are so arranged that the signal-setting and signal-restoring circuits carry the full voltage of the trolley wire or main conductor, it is practically impossible to so insulate the insulated track sections from the remainder of the track as to prevent an appreciable leakage of the current through the insulation, and as a result there is a continuous loss of current and the system is rendered unreliable because the current leakage may be sufficient to cause the signal to be operated without the presence of a car on the insulated section.

The principal object of my invention is to provide a novel block signal system of the above-mentioned type wherein the circuits which are connected to the insulated track sections carry current of a comparatively small voltage, thus making it possible to so insulate the insulated track sections as to prevent any detrimental leakage of current.

Other objects of my invention will be more fully hereinafter described and the novel features of the invention will then be pointed out in the appended claim.

In the drawing I have shown diagrammatically a sufficient portion of a block signal system to illustrate the operation of my invention.

My invention is adapted for use in connection with almost any type of electrically-operated block signal and therefore I have not deemed it necessary to illustrate herein any particular signal in detail.

I have shown at 3 a signal box which may contain the usual signal or signals indicating danger or safety, which signals may be operated by any appropriate mechanism, not shown. It is customary to place the signal box at the end of the block whether the latter is a section of one of the tracks of a double-track railway, or a section of a single-track railway.

For the sake of illustrating the invention, I have herein shown a portion of a block comprising a section 4 of a single track which has at one end a turn-out 5 to permit the cars to pass. The current for operating or restoring the signal in the box 3 is taken from the main conductor or trolley wire 6 through a circuit 7 which connects with a signal setting circuit 10 and a signal-restoring circuit 11, both of which lead to the signal box. Each of said circuits has therein a switch of some suitable construction by which it is open or closed. The switch in the signal-setting circuit 10 is shown as comprising the two contacts 9 and 12 adapted to be closed by the switch blade 13. The switch in the signal-restoring circuit 11 is shown as comprising two contacts 8 and 14 that are adapted to be connected by the switch blade 15. When the branch circuit 10 is closed, the current from the trolley wire 6 will pass into the signal box 3 and set the signal, while when the circuit 11 is closed, the current passing into the signal box will restore the signal to its normal position.

Inasmuch as the invention does not relate to the particular form of signal in the signal box, I have not deemed it necessary to further illustrate the device.

The switch blade 13 is operated to close the signal-setting circuit 10 by means of a signal-setting magnet 20, and the switch blade 15 is operated to close the signal-restoring circuit 11 by means of a signal-restoring magnet 22. These signal-setting and signal-restoring magnets are controlled by the current in two signal-initiating circuits 19 and 21, the circuit 19 being connected to an insulated rail section 17 in one rail 16 of the turn-out 5, and the circuit 21 being connected to an insulated rail section 18 in

the rail 30, and in the embodiment of the invention shown this control is secured by placing the coils of the signal-setting and signal-restoring magnets 20 and 22 in the circuits 19 and 21 respectively. The insulated rail section 17 is shown as connected by a wire 40 with an insulated section 32 in the rail 30, and the insulated rail section 18 is connected by a wire 41 with the insulated rail section 31 in the rail 16.

The switch blade 13 is shown as pivotally hung to a suitable support at 25 and has associated therewith an armature 26 which is attracted by the magnet 20 when the latter is energized. Similarly, the switch blade 15 is shown as pivotally mounted at 27 and as having associated therewith the armature 28 for the magnet 22. When either of the magnets 20 or 22 are energized, therefore, the corresponding switch blades are swung into position to close one or the other of the branch circuits 10 or 11.

When a car in traveling in the direction of the arrow *a* on the branch track 5 reaches the insulated track section 17, said section 17 will be connected electrically with the rail 29 of the track 5 through the car trucks, and thus the circuit 19 controlling the magnet 20 will be closed, thus energizing the magnet and closing the signal-setting circuit 10. Similarly, when a car in traveling in the direction of the arrow *b* on the main track reaches the insulated track section 18, said track section will be electrically connected through the truck with the rail 39, thus closing the circuit 21 through the magnet 22 and causing the switch blade 15 to be operated to close the circuit 11, thus restoring the signal to its normal or safety position.

Since the signal-setting and signal-restoring mechanisms are set in operation by the closing of the circuits 19 and 21, I have herein chosen to designate said circuits as "initiating circuits." If these signal-initiating circuits are connected to the main conductor in such a way as to receive the full voltage therefrom, (in electric railway systems the main conductor usually carries a current of about 500 volts,) the voltage in said circuits will be so great that it will be practically impossible to insulate the track sections 17, 18, 31 and 32 sufficiently to prevent the leakage of current through the insulation, and when there is such a leakage of current the signal system is apt to be unreliable in its operation. It is, therefore, a desideratum that the circuits which are connected to the insulated track sections should carry a comparatively small voltage; in fact, experiments which I have made have demonstrated that the best results can be secured by using a current of only one or two volts in the circuits which connect with the insulated rail sections. In order to get this low voltage current in the circuits it has been proposed to supply them with current from a battery, but this method has many objections.

My invention aims to provide a construction whereby this low voltage current in the circuits 19 and 21 can be supplied from the trolley wire 6, thus obviating the use of batteries or other auxiliary current-producing devices. In order to secure this end, I connect the trolley wire 6 with the return rails of the track by a circuit 44 which has therein a high resistance 24 of say several thousand ohms, and then I connect the circuits 19 and 21 by a wire 23 with the circuit 44 on the return side of the resistance, as at 45. I find when the connections are made in this way, that while the shunt circuit 44 will have a high voltage since it is connected to the trolley wire 6, yet the circuits 19 and 21 which are in the nature of shunt circuits between the circuit 44 and the tracks will carry a current of comparatively small voltage, in fact of only one or two volts, this being due to the fact that the difference in potential between the point 45 and the return is comparatively small. This arrangement, therefore, provides low voltage circuits 19, 21 which are connected to the insulated rail sections, but which take their current from the high voltage circuit. By this arrangement the amount of current which flows in the signal-initiating circuits 19, 21 is also comparatively small, although sufficient to operate the magnets 20 and 22. The use of the low voltage in the circuits 19, 21 makes it perfectly feasible to completely insulate the rail sections from the return and thus prevent any leakage of current in the signal-initiating circuits.

The switch 13 has rigid therewith an arm 34 and the switch 15 has rigid therewith an arm 35. The purpose of these arms is to make the switch non-interfering.

When the car travels in the direction of the arrow *a* and comes onto the insulated track section 17, the magnet 20 will be energized as above described, thus closing the circuit 10, and as the car passes onto the insulated track section 31, the magnet 22 will be energized and the arm 35 will be swung down onto the arm 34, thus holding the switch 13 closed until the car has passed off from both insulated sections. Similarly, if a car is traveling in the direction of the arrow *b* and the circuit 21 is closed by the passage of the car onto the insulated section 18 thereby energizing the magnet 22 and then subsequently passes onto the insulated track section 32, the closing of the circuit 19 will swing the arm 34 down onto the arm 35 and will thus hold the switch 15 in engagement with the contacts 8 and 14 while preventing the switch 13 from closing the circuit 10.

I prefer to use a small resistance 99 of say four or five ohms in the circuit 44 between the point 45 and the rail as better results are secured thereby.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

In a block signal system, the combination with a main conductor carrying a working current, of a track constituting the return and provided with an insulated rail section, a normally-open signal-actuating circuit connected to the main conductor, a circuit taking current from the main conductor and connected with the return, a potential reducing resistance in said latter circuit which gives a potential drop in said circuit sufficient so that the potential on the return side of the resistance is only slightly greater than that of the return, a signal-initiating circuit connected at one end to the insulated rail section and at the other end to the second-named circuit on the return side of said resistance, a magnet in said latter circuit, and a switch for the normally-open signal-actuating circuit controlled by said magnet.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOHN J. RUDDICK.

Witnesses:
JULIA P. GLAZIER,
ALFRED E. THAYER.