No. 712,138. Patented Oct. 28, 1902.

E. P. JESSOP.

SYSTEM OF ELECTRIC RAILWAY SIGNALS.

(Application filed Mar. 15, 1902.)

(No Model.)

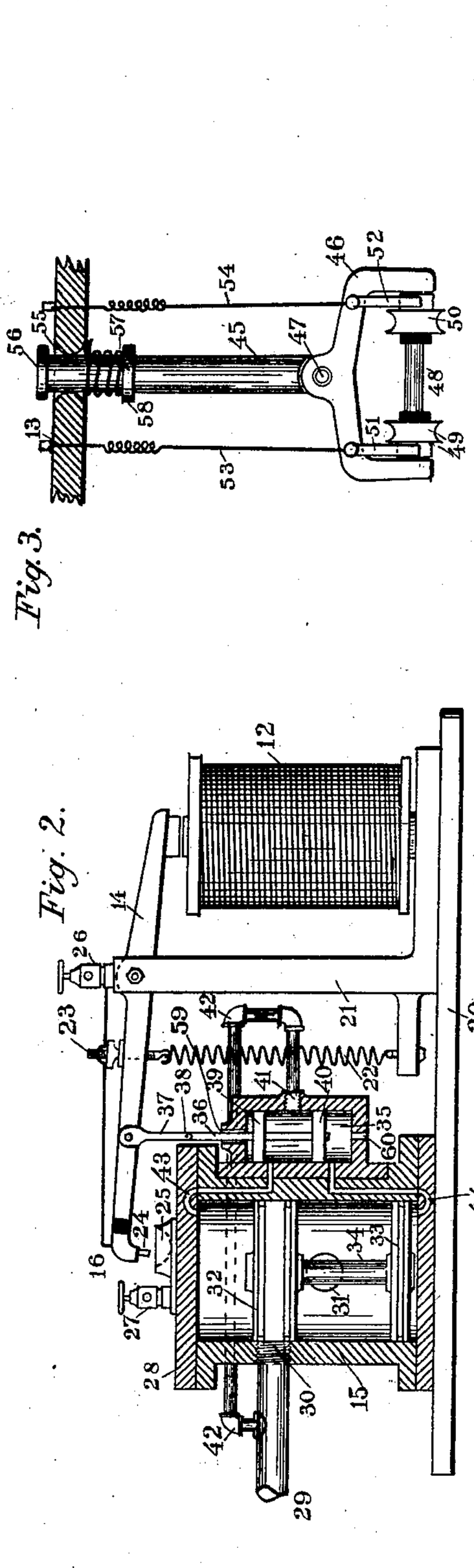

Fig. 3.

Fig. 2.

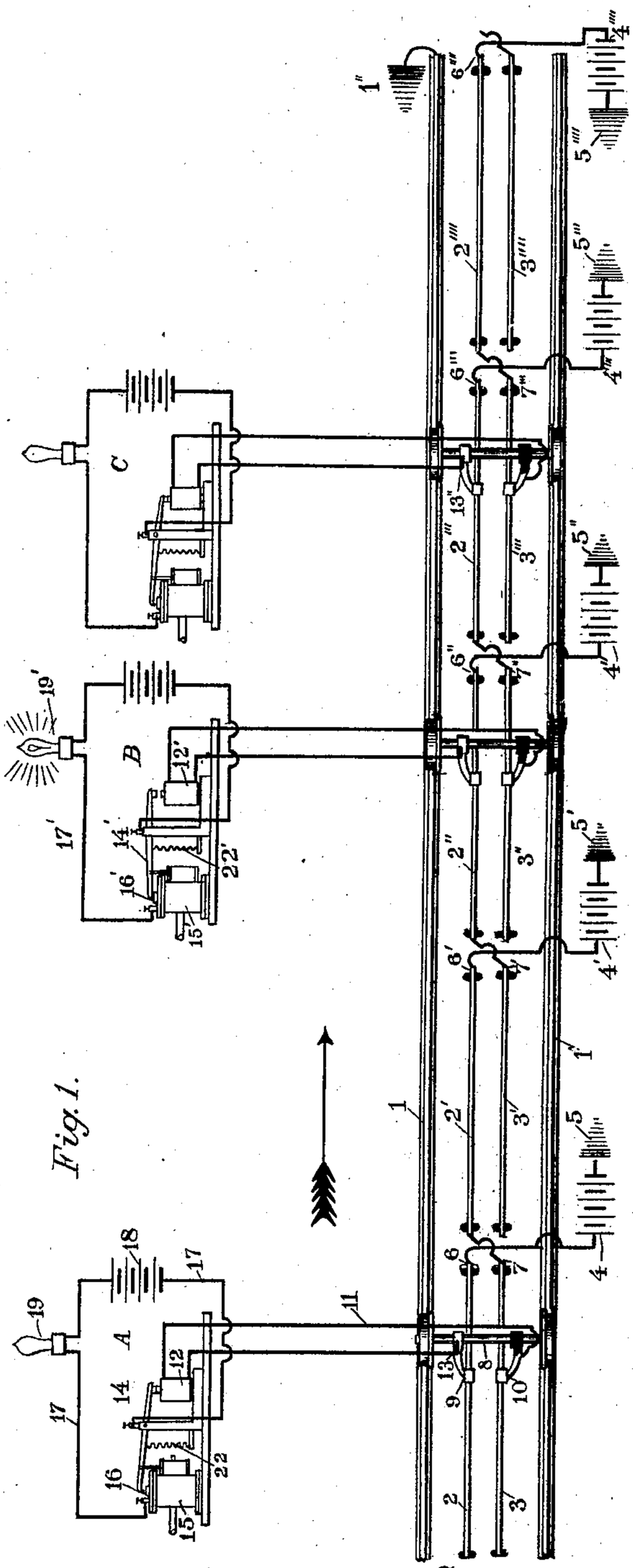

Fig. 1.

Witnesses
Frank S. Howell.
Chas. L. Howard.

Inventor
Earl P. Jessop.
by R. H. Dyer
Attorney

UNITED STATES PATENT OFFICE.

EARL P. JESSOP, OF THE UNITED STATES NAVY.

SYSTEM OF ELECTRIC RAILWAY-SIGNALS.

SPECIFICATION forming part of Letters Patent No. 712,138, dated October 28, 1902.

Application filed March 15, 1902. Serial No. 98,331. (No model.)

To all whom it may concern:

Be it known that I, EARL P. JESSOP, of the United States Navy, a citizen of the United States, have invented certain new and useful Improvements in a System of Electric Railway-Signals; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a system of electric signals for double-track railways; and it consists of a double conductor divided into suitable lengths to form blocks, with a source of electrical energy for one of the conductors in each block forming a circuit-embracing means for actuating the air-brake system of the train and operating a signal, the said means being controlled by a short circuit caused by the presence of an engine in the next block ahead. For the purpose of my invention one or both of the rails are grounded, and between the two is arranged a pair of insulated conductors, each pair being of a suitable length to form a block. Both conductors of each pair are interrupted at the same point. One of them is connected at its forward end with a suitable source of electrical energy and at its rear end with the conductor in the block next behind on the other side. Each locomotive is provided with two trolleys thereon insulated from each other, which are arranged to engage with the two conductors between the rails. The two trolleys connect with a circuit in the cab for actuating a magnet, while one of them is grounded, preferably by being connected with one of the axles of the locomotive. The armature of the magnet in the cab controls a switch in an independent circuit which includes a signal. This armature also serves to operate a relief-valve in the air-brake system. The cab-circuit is arranged to be broken and the valve to be closed when a circuit flows through the magnet; but upon the latter becoming de-energized, either by a break in the circuit or by a short circuit, the signal will be operated and the valve opened by means of the movement of the armature. The arrangement of the circuits through the conductors is such that a current passes through the magnet on the locomotive when the latter is over the second section of a conductor by means of the insulated trolley, the uninsulated one serving to ground the section that it is in contact with. If the block ahead of the locomotive is clear, the current from the battery therein will pass over its section of conductor to the section of conductor on the other side under the locomotive, passing up the insulated trolley to energize the magnet, and will be grounded through the other trolley. If the preceding block should be occupied by another locomotive, the current from the battery in that block will be short-circuited through the grounded trolley with which the conductor engages, which will have the effect of deënergizing the magnet and by the action of the spring-actuated armature will open the air-brake valve and move the switch to operate the signal.

The invention also relates to details of construction of the switch-actuating mechanism for the signal and to the air-valve and its actuating mechanism. This mechanism is as follows: A single magnet moves a lever which carries one arm of the switch in the cab signal-circuit and also carries the movable portion of a pilot-valve, which latter serves to open and close the main relief-valve. A pilot-valve is employed, as the power of the magnet is necessarily limited and would not be sufficient to open or close a relief-valve against the usual air-pressure. The pilot-valve is combined with the relief-valve and is adapted to vary the direction of flow of a portion of the air from the train-pipe to actuate a piston which opens or closes the air-relief valve.

The invention further relates to improvements in the particular form of trolley adapted to be used with and forming a part of my device, so constructed that the two trolley-wheels may bear equally upon the two conductors, even if the latter be not both on the same horizontal plane.

In order to better understand the nature of my said invention, attention is called to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a diagrammatic view of my invention. Fig. 2 is a side view, partly in section, of the switch and air-relief valve; and Fig. 3 is a view of one form of a double trolley.

In all the several views like parts are designated by identical characters of reference.

In Fig. 1 the numerals 1 1′ represent the rails of a system upon which traffic always travels from the left to right—that is, in the direction indicated by the arrow. As shown in the drawings, the track 1 is grounded at 1″; but the other rail as well may be grounded, if desired. The double parallel conductors about to be described are preferably arranged between the two rails and are each of a length suitable to form a block, the ends of each pair being interrupted at the same point. They are suitably insulated. The conductors on the left side are indicated by the numerals 2 2′ 2″, &c., and on the right side by the numerals 3 3′ 3″, &c. A suitable source of electricity for each block—as, for instance, a battery (shown at 4 4′ 4″)—has one pole grounded at 5 5′ 5″ and the other connected to the forward edge 6 6′ 6″ of the left-hand conductors 2 2′ 2″. The rear ends of the left-hand conductors 2 2′ 2″, &c., are connected at 7 7′ 7″ to the forward ends of the right-hand conductors 3 3′ 3″. All the conductors are otherwise insulated.

The locomotive equipments represented by the letters A, B, and C are identical, and for convenience of reference but one will be described.

Upon a portion of the running-gear of a locomotive—as, for instance, the axle 8—are secured the two trolleys 9 and 10 or a double trolley, to be later described. The two trolleys connect with a circuit 11, in which is included a magnet 12. The trolley 10, which engages with the right-hand conductor, is carefully insulated; but the trolley 9, which engages with the left-hand conductor, is connected at 13 to a portion of the engine-frame or to the axle 8, thus forming a ground through the rail 1. The magnet 12 actuates an armature-lever 14 and moves it against the tension of a spring 22. An air-relief valve 15 and a switch 16 are both connected to and actuated by this lever. The switch 16 is embraced in a circuit 17, which includes a battery 18 or other source of electricity and a signal 19, a lamp being shown. The switch 16 is arranged to be open and the circuit 17 interrupted as long as the magnet 12 is energized. As soon as this magnet becomes deënergized in the manner about to be described the free end of the lever 14 will be depressed by the action of the spring 22, which action will open the valve 15 to apply the brakes and also close the switch 16 to operate the signal 19.

As shown in Fig. 1, the locomotive indicated by the letter A is upon a block, preceding which is another block, which is clear. The current from the battery 4 will pass along the conductor 2, up the trolley 9, and be grounded at 13, having no effect upon the magnet 12. The current from the battery 4′ after passing over the conductors 2′ and 3 will pass up the trolley 10, through the circuit 11, and will be grounded at 13, thus energizing the magnet 12 and moving the lever 14 to the position indicated, which will have the effect of interrupting the circuit 17 and closing the valve 15, thus indicating that the line is clear ahead.

If the locomotive be upon a block, as at B, with the block ahead closed by the locomotive C a change will occur in the circuits and in the position of the signaling apparatus. The current from the battery 4‴ will be short-circuited at 13″ on the locomotive C and will pass from the left-hand conductor 2‴ to the rail 1 and be grounded. This will short-circuit the battery 4 and will deënergize the magnet 12′ on the locomotive B, moving the lever 14′ by the action of the spring 22′ away from the magnet, closing the switch 16′, and opening the valve 15′. The action of closing the switch will complete the circuit 17′ and actuate the signal 19. At the same time the opening of the valve 15′ will apply the brakes and stop the train.

It will be understood that the magnets are energized only so long as the circuits are complete and the mechanism is in running order. If either one of the conductors should become grounded or anything should interrupt the current from any battery, the magnets will become deënergized and the signal actuated.

The particular switch and relief-valve which form a part of this invention illustrated in Fig. 2 are constructed as follows: The base 20 carries a standard or support 21, upon which is pivoted the lever 14. To one side of the standard 21 is arranged the magnet 12, and on the other side is the relief-valve 15, the latter carrying the switch 16. A spring 22 is used to draw away the lever 14 from the magnet and close the switch 16. A screw 23 is used to adjust the tension of the spring 22. The switch consists of the contacts 24 and 25, secured to the lever 14 and the valve-casing 28, respectively. 26 and 27 are binding-posts, to which the wires forming the circuit 17 17 are secured. The operation of the switch is obvious, as it is of a principle well known in the art.

The relief-valve 15 consists of a cylindrical casing 28, to which the train-pipe 29 or a branch therefrom is connected by a port 30. An exhaust-port 31 is located below the port 30. The port 30 is normally designed to be closed by means of a piston-valve 32, connected to a piston 33 by a rod or stem 34. This piston 33 and valve 32 are adapted to be moved by means of air taken from the train-pipe and admitted either above the valve 32 or below the piston 33 by means of a pilot-valve 35. The pilot-valve embraces a stem or piston 36, connected by a rod 37 to the lever 14, a joint 38 being provided to allow for the slight inequality of motion which necessarily results. The valves 39 and 40, carried upon the piston-rod 36, are on both sides of a port 41, to which air from the train-pipe 29 passes by means of a pipe 42. A port 43 serves as a means of com-

munication from the valve 35 to the upper part of the cylinder 28, while another port 44 connects the valve 35 with the lower part of the cylinder 28. 59 and 60 are exhaust-ports for the pilot-valve chest.

The operation of the valve is as follows: As shown in the drawings, the port 30 is closed by the valve 32, which is depressed by the pressure of the air from the port 43, which is opened by the valve 39. The valve 40 closes the port 44. An uninterrupted column of air from the train-pipe 29 therefore passes through the pipe 42, port 41, through the port 43, and presses upon the valve 32. If the valves 39 and 40 be now lowered by the action of the spring 22, the valve 40 will open the port 44, thus allowing the train-air to pass from the valve 35 through the port 44 to the lower part of the cylinder 28, engaging against the piston 33 and elevating it and the valve 32, thus opening communication between the ports 30 and 31. This action will allow free circulation of air from the train-pipe and will quickly reduce the pressure therein and apply the brakes.

It will be noted that the air-pressure from the port 41 bears equally upon the valves 39 and 40, thus balancing them and reducing the effort required to move them. Furthermore, the ports 43 and 44 can be made very narrow, a construction that requires but a very slight movement of the valves 39 and 40. This will be an advantage by permitting a reduction of the size of the magnets and the batteries.

As shown in Fig. 3, a double trolley that I have designed for use in connection with this apparatus is composed of an arm 45, to which is pivoted a yoke 46 by means of a pin or bolt 47. This yoke carries upon a shaft 48 the two insulated grooved trolley-wheels 49 and 50, adapted to engage with the left and right conductors, respectively. Electrical connection is made with the trolleys by means of the brushes 51 and 52 in the well-known manner, which connect with the wires 53 and 54, the former being grounded at 13 to a portion of the frame 55 of the locomotive, the other wire, 54, being carefully insulated. To these two wires is connected the circuit 11, before described. The opening in the frame 55, through which the arm 45 passes, is sufficiently large to allow it some lateral movement to accommodate itself to the changes in relative position of the locomotive and conductors, as must occur in practice. An enlargement 56 will serve to support the arm when depressed, while a spring 57, located between the frame 55 and shoulder 58 on the arm, will serve to keep the trolley-wheels always in close engagement with the conductors. If the conductors should not be on the same horizontal plane, the yoke 46 may turn upon the pin 47 to accommodate itself to inequalities.

Having now particularly described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electrical signal device for railways, the combination with the grounded rail, of a double conductor arranged in sections, each the length of a block, a source of electricity for each block connected to one conductor at its forward end, a connection between the rear end of the same conductor with the front of the succeeding conductor on the opposite side, contacts on the locomotive engaging with said conductors, a circuit connected with the said contact embracing a magnet, a brake-controlling device actuated thereby, and a connection between one of the contacts and the grounded rail, substantially as and for the purposes specified.

2. In an electrical signal device for railways, the combination with the grounded rail, of a double conductor arranged in sections, each the length of a block, a source of electricity for each block connected to one conductor at its forward end, a connection between the rear end of the same conductor with the front of the succeeding conductor on the opposite side, contacts on the locomotive engaging with said conductors, a circuit connected with the said contact embracing a magnet, an armature-lever actuated thereby, and a pilot-valve thereon, the said pilot-valve being connected with and actuating the air-relief valve of the brake system, substantially as and for the purposes specified.

3. In an electrical signal device for railways, the combination with the grounded rail, of a double conductor arranged in sections, each the length of a block, a source of electricity for each block connected to one conductor at its forward end, a connection between the rear end of the same conductor with the front of the succeeding conductor on the opposite side, contacts on the locomotive engaging with said conductors, a circuit connected with the said contact embracing a magnet, an armature-lever actuated thereby, a switch, and a pilot-valve thereon, the said pilot-valve being connected with and actuating the air-relief valve of the brake system, substantially as and for the purposes specified.

4. In an electrical signal device for railways, a relief-valve for the brakes of a train, consisting of a main valve, a balanced pilot-valve connected thereto, and electrical connections for actuating said pilot-valve, substantially as and for the purposes specified.

5. In an electrical signal device for railways, the combination with a grounded rail, of a circuit, a magnet therein, an armature-lever actuated thereby, a balanced pilot-valve connected with said lever, a relief-valve, and connections between the two valves, substantially as and for the purposes specified.

6. In an electrical signal device for railways, a relief-valve for the brakes of a train, consisting of a main relief-valve communi-

cating with the train-pipe, a piston thereon, a balanced pilot-valve, ports connecting said pilot-valve with the relief-valve, a port connecting said pilot-valve with the train-pipe, and a magnetic connection for operating the said pilot-valve, substantially as and for the purposes specified.

This specification signed and witnessed this 6th day of March, 1902.

EARL P. JESSOP.

Witnesses:
CLARENCE A. HAMMETT,
WILLIAM H. WALCOTT.