No. 685,008. Patented Oct. 22, 1901.

J. J. RUDDICK.

ELECTRIC SIGNALING SYSTEM.

(Application filed June 20, 1899.)

(No Model.)

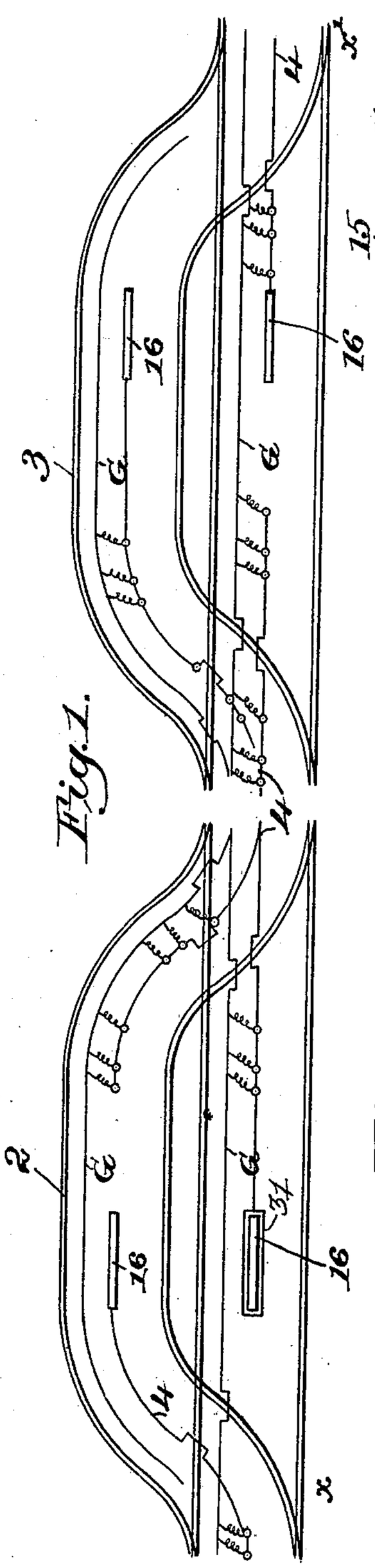

Fig. 1.

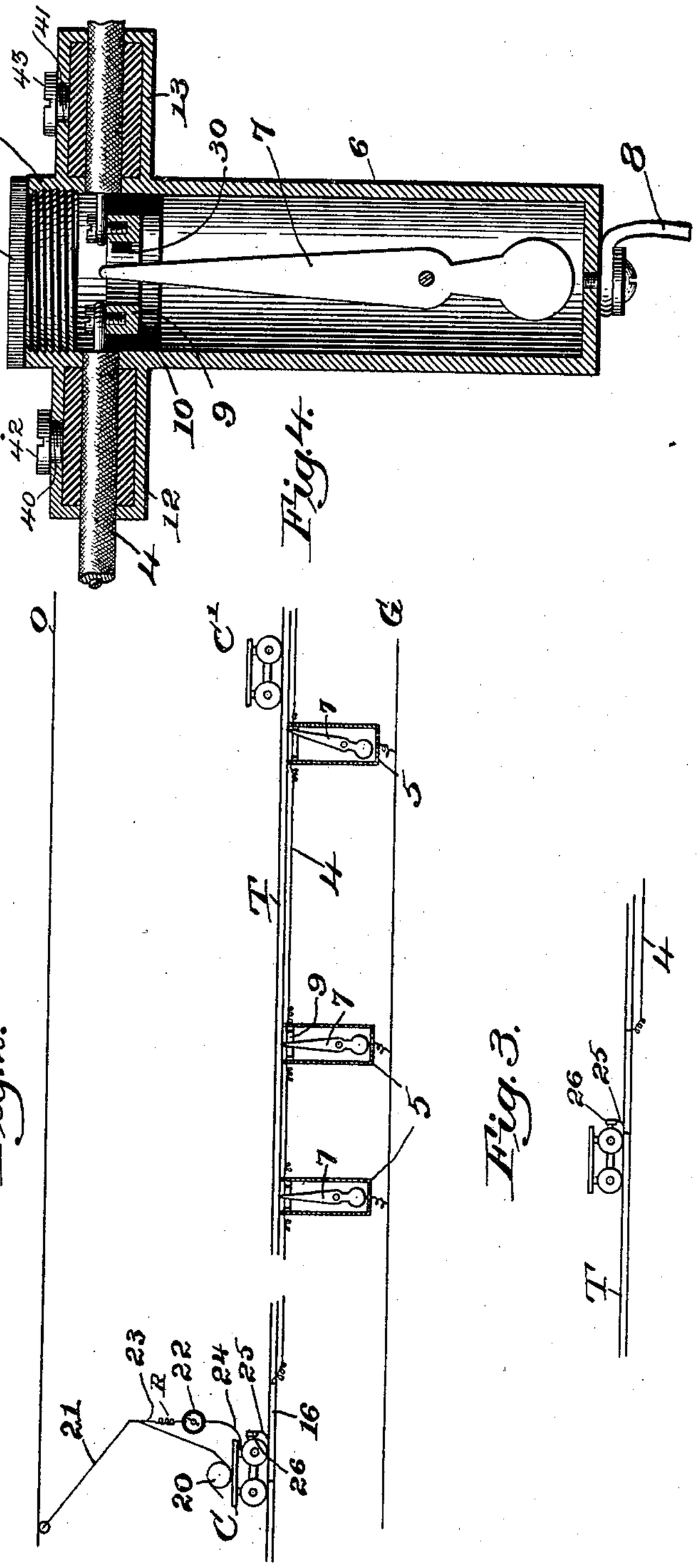

Fig. 4.

Fig. 2.

Fig. 3.

Witnesses.
Thomas J. Drummond.
Fred S. Grundorf.

Inventor:
John J. Ruddick.
by Lemby Gregory
Atty's.

UNITED STATES PATENT OFFICE.

JOHN J. RUDDICK, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO UNITED STATES ELECTRIC SIGNAL COMPANY, OF PORTLAND, MAINE, AND NEWTON HIGHLANDS, MASSACHUSETTS.

ELECTRIC SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 685,008, dated October 22, 1901.

Application filed June 20, 1899. Serial No. 721,198. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. RUDDICK, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Electric Signaling Systems, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to an electric signaling system, and though capable of various uses it is of peculiar adaptation to single-track electric railways, and in such an employment the object is to accurately announce to a person in charge of one car the presence of another car in a block, so that one of them can run his car onto a siding or turnout, and as a means for obtaining cheapness and simplicity in the system I prefer to use a part of the current derived from the motive source or electric power to control the different signals.

The system is illustrated in connection with an electric railway, and in the operation of the system the line of railway will be divided into successive blocks and each block will have extending the length thereof a branch circuit connected with the motive-power circuit or that which furnishes power for operating the motor upon a car, the branch circuits of successive blocks being independent from each other. Each branch circuit includes a series of circuit-controlling devices which are adapted to be operated by a car passing over the same, the said circuit-controlling devices when thus operated making indication of such fact by means of a suitable signal upon any car which may be situated at the entrance of the block.

Figure 1 is a diagrammatic plan view of a signaling system organized in accordance with my invention. Fig. 2 is a diagrammatic side view of the same, certain of the parts being represented upon an exaggerated scale for the purpose of indicating the nature of the system. Fig. 3 is a detail view showing the manner of connecting a circuit-controller to a car. Fig. 4 is an enlarged sectional detail view of the magnetically-operative circuit-controlling devices.

In the drawings, Figs. 1 and 2, I have shown a portion of what is familiarly known as an "overhead-trolley system," and it is of the single-track type, the track being denoted by T and having at certain intervals along the same turnouts or sidings, as 2 and 3, upon one of which a car can pass from the track T to permit another car to travel by said siding thus occupied. The distances between the successive sidings are designated "blocks," and each block has extending the length of the same an auxiliary or branch circuit, which is connected with the main circuit, preferably with the ground or return wire of said circuit, by means of a series of circuit-controlling devices adapted to be operated by a car passing over the same. The branch or auxiliary circuits for the successive blocks are independent of each other, and the terminal of each branch circuit at the entering end of the block is provided with a contact-plate adapted to have brought in contact therewith a brush or other trailing contact attached to a car. The trailing or brush contact on the car is in circuit with a signal upon the car, and when a car is about to enter a block it is stopped with its brush or trailing contact in contact with the contact-pieces at the entering end of the block. If a car is on the block, the operation of the circuit-closing devices will cause the signal on the car at the entering end of the block to be operated, thus indicating to such car the presence of the other car.

The overhead wire or conductor is denoted by O and the return or ground wire by G, and each block has the branch wire 4 extending the length thereof and connected at intervals with the ground-wire G by means of a series of connecting devices 5, constituting circuit-controllers. At the entering end of the block is situated a contact-piece 16, which is connected with the branch wire 4, as seen in Fig. 1, there being a contact-piece 16 at each end of each block, one contact-piece being situated in the main line and the other in the turnout 3, so that a car traveling in either direction may be brought into communication with the branch circuit 4. Each contact-piece 16 consists, preferably, of metallic strips connected electrically with the branch con-

ductor 4 and embedded in suitable carriers, as 31, of non-conducting material, said carriers being placed along the tracks substantially midway between the rails.

The circuit-controlling devices which connect the branch circuit 4 to the ground-wire G are preferably magnetic devices, and each comprises a magnetic needle which is attracted either by the car-wheels or a car moving over the same, and is thereby vibrated, the vibration of the needle closing or completing the branch or auxiliary circuit and indicating to any car at either end of the block the presence of the first-mentioned car. The connecting or circuit-controlling devices 5 are represented in detail in Fig. 4, and each of them includes a case, as 6, consisting, preferably, of a brass cylinder having a needle 7 oscillatory therein, the centers of gravity of the several needles being located below their centers of oscillation, whereby each of said needles will when not oscillated by magnetic influence occupy a substantially vertical position, as represented in said figure. The cylinders 6 are electrically connected with the ground-wire G by means of short or branch wires 8, fixed to the respective parts, and the branch wire 4 is intersected at suitable intervals and the ends of said wire where they are intersected are connected to the rings 9, which are inclosed in the upper end of the case or cylinder 6 and which are insulated therefrom, as at 10. It will therefore be understood that the rings 9 (see Figs. 2 and 3) constitute, in effect, a part of the branch conductor 4. The ends of the conductor 4 are laid in parallel offsets 12 and 13, extended oppositely from the upper end of the cylinder 6, and these offsets are adapted to receive suitable insulating material which may be poured thereinto through the openings 40 and 41, covered by the screw closures 42 and 43, respectively. The extension 14 at the upper end of the case 6 is internally threaded to receive the threaded plug 15, which may be removed to obtain access to the interior of the case.

Each car will have thereon a suitable signal device 22, (see the left-hand end of Fig. 2,) said signal device being connected to the trolley-arm 21 by means of the wire 23, and to said contact-arm or brush 25 by means of the wire 24, said brush or contact-arm generally being made of resilient material and being suitably secured to one of the timbers, as 26, of the car and adapted to travel against the contact-pieces 16. The motor 20 of each car is adapted to receive its current from the trolley-arm by a circuit independent from the circuit including the indicator or signal 22, whereby the motor may be shut off without in any way interfering with the operation of the signal.

Assuming now that two cars are traveling upon the single-track road in opposite directions—that is, in the directions indicated by the arrows x and x' on Fig. 1—the car traveling in the direction of the arrow x' will of course turn upon the siding 3 and into the main track again. If after the said car has passed through the siding 3 onto the main track a car traveling in the direction of the arrow x comes to the entering end of the block between the sidings 2 and 3, the said car will pass over the contact-plate 16 opposite the siding 2 and stop with its trailing contact-arm 25 engaging or contacting with the contact-piece 16. The car moving in the direction of the arrow x', or toward the left, will as it passes over the circuit-controlling devices close the contacts successively in the branch circuit 4, for as the car moves over each controlling device the forward end of the magnetic needle will follow the movement of the car, owing to the magnetic attraction between the mass of iron in the car and the needle, and such swinging movement of the needle will bring it in contact with the ring 9, thus completing the branch circuit. Where the cars are moving rapidly each circuit-controlling device will vibrate but once or will close the circuit but once as the car passes over the same, for the needle will merely follow the motion of the car, as stated above, until contact is made with the ring 9, and such contact will continue until the car has passed so far beyond the controlling device as to cease to influence the needle, when said needle will vibrate back to its vertical position. If the car is moving slowly, the needle may be vibrated toward the car as the said car approaches the needle, as shown in Fig. 2, and as the car passes over the needle and beyond the same the needle will follow the car, as above explained, thus making two contacts with the ring 9. In either event whenever the needle is vibrated to come in contact with the ring 9, and thus close the branch circuit, indication will be made of such fact upon the signal 2, for as soon as any of the contacts are closed the current will pass from the trolley-arm 21 through the wire 23, indicator 22, wire 24, trailing arm 25, contact-piece 16, and branch wire 4 to the particular circuit-controlling device which is operated through the said circuit-controlling device to the return-wire G. If the car entering the left-hand end of the block, Fig. 1, receives indication of the fact that a car is on the block moving toward the left, Fig. 1, the first-mentioned car will delay entering the block until the car which has given the signal and which is moving toward the left has passed onto the siding 2. If, then, the car which is moving to the right receives no further indication, the operator of said car will know that the block is free, when he will drive his car forward. Let it be assumed that as soon as the car moving toward the right has entered the block another car moving toward the left comes to the right-hand entrance of the block, such car will of course pass upon the siding 3 and stop over the contact-piece 16 in the said siding 3 with its trailing arm 25 in contact with

the said contacting piece. The car moving toward the right will operate the circuit-controlling devices in succession, and thus indicate to the car on the siding 3 that the block is occupied, and the car on the siding 3, therefore, will remain on the siding until the block is free or until the car moving toward the right has passed off the block. It will thus be seen that I have provided mechanism for indicating to a car passing in either direction whether the block which the car is about to enter is occupied or not.

It will be noticed that the various circuit-controlling devices in the branch circuit are arranged in groups, and the circuit-controlling devices in each group are so arranged that a car over the contact-piece 16 can tell in which direction the car occupying the block is moving. For instance, supposing a car be over the contact-piece 16, opposite the turnout 2, and a car occupying the block ahead is moving toward the left, it will be seen that as the moving car passes over the various groups of circuit-controlling devices the indicator or signal on the car opposite the siding 2 will be operated once, and after a short pause twice in quick succession, and then after a longer pause this operation of the signal will be repeated, thus indicating that the car is moving toward the left. If, however, the car in the block ahead is moving to the right, the order of the signals given will be reversed—that is, two signals in quick succession and after a short pause a third signal.

For the purpose of further positively showing the direction in which a car occupying the block is traveling I limit the oscillatory or pendulous movement of the magnet 7 in one direction while permitting the full stroke of the same in the opposite direction, and for this purpose I may secure inside of the several rings 9 pads of rubber or similar material 30, disposed in the path of the points of the magnets, certain of said strips being located upon one side of certain of the magnets, while the other strips are located upon the opposite side of the magnets, and irregular vibrations will be announced upon the indicator of a car for the purpose of showing the course followed by a car.

When the pads of rubber or similar insulating material 30 are used on that side of the ring toward which the car on the track is moving, such pad 30 will prevent the closing of the contact, for as the needle follows the movement of the car the upper end thereof will contact with the pad 30 instead of with the ring, and the branch circuit will not be closed. It will be seen that by arranging the pads 30 differently in the different circuit-closing devices the direction of movement of the car may be more surely indicated.

It should be understood that the invention is in no wise limited to the arrangement and character of parts hereinbefore set forth, for these can be variously altered without departing from the scope of the appended claims.

In practice each of the cars will be provided with an indicator and with a trailing contact-arm 25, and each of course serves to attract the magnets 7, which are in the nature of circuit-closing devices; but only one of the cars is represented as carrying an indicator.

Ordinarily I interpose in the signaling-circuit at some point beyond the dynamos, and preferably in proximity to the indicator, a resistance, as R, of suitable efficiency, which moderates the current to such an extent as to prevent injury to the several magnets and their connections.

From the preceding description it will be evident that my signaling system for electric railways comprises a motive-power circuit, a car having a motor receiving its current from said circuit, and a signaling-circuit connected electrically with the motive-power circuit but not with the motor, by reason of which the signals can be operated even though the car was stopped by shutting off the current from the motor, which, as is obvious, is a highly advantageous feature.

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

1. In a block-signal system for electric railways, a main circuit for furnishing power to the cars, a series of independent normally open branch circuits, each extending the length of a block, said branch circuits including a plurality of circuit-closing devices adapted to be operated by a car passing over the same, a contact-plate connected to each branch circuit at the entering end of the block, combined with cars each having a signal thereon electrically connected to the main circuit, and means for putting said signal in electrical connection with the contact-plate when the car enters the block, whereby any car occupying the block operates the circuit-closing device in said block and completes the branch circuit for said block, the completion of the circuit causing the signal on the car at the entering end of the block to be operated.

2. In a block-signal system for electric railways, a track divided into blocks, cars on said track, a main circuit for furnishing power to the cars, a normally open branch circuit extending the length of each block, said branch circuits being independent from each other, and each having a plurality of circuit-closing devices therein arranged in groups and adapted to be successively operated by a car moving on the track, each of said cars having a signal thereon, and means whereby the signal on any car entering the block may be electrically connected with the branch circuit, whereby the car occupying the block operates the circuit-closing devices successively, thus completing the branch circuit

and operating the signal on the car at the entering end of the block.

3. In a signaling system for railways, a track, vehicles on said track, a normally open electric circuit including an indicator on one of the vehicles, means to close the circuit, said means including an oscillatory magnetic needle adapted to be attracted by another vehicle.

4. A signaling system for railways including a track, vehicles on said track, an electric circuit including an indicator on one of the vehicles, and an oscillatory magnetic needle constituting a circuit-controller, said needle being adapted to be attracted by another vehicle, whereby the presence of the last-named vehicle may be indicated to the first vehicle.

5. A signaling system for railways, including a track, cars on said track, a normally open electric circuit including an indicator on one of the vehicles, and an oscillatory magnetic needle constituting a circuit-controller, said needle being adapted to be attracted by another of the cars, whereby the circuit is closed and the indicator operated, and means for limiting the oscillations of said needle in one direction.

6. An electric signaling system for railways, including a track, cars on said track, each of said cars having a signal, a normally open electric circuit, including contact-pieces disposed between the rails, and also including a case provided with a ring, a magnetic needle pivoted in said case, and constituting a circuit-controller, said needle being adapted to be operated by the car passing over the same, whereby when the signal on a car is electrically connected to one of the contact-pieces, another car passing over the circuit-controllers closes the circuit and causes the signal to operate.

7. In a signaling system for electric railways, means for communicating signals between two vehicles on the same track, said means comprising a main circuit for furnishing power to the vehicles, a normally open branch circuit, an indicator or signal carried by one vehicle and adapted to be connected with the branch circuit, and magnetic circuit-closing devices for the branch circuit, said circuit-closing devices being automatically operated by the other vehicle passing over the same, whereby the presence of the last-named vehicle may be indicated to the first vehicle.

8. In a block-signaling system for electric railways, a section of track, cars thereon, a main circuit for furnishing power to the cars, a normally open branch circuit extending the length of the track-section, said branch circuit having a circuit-closing device therein adapted to be operated by a car moving over the same, each of said cars having a signal thereon, and means whereby the signal on either car as it enters the block may be electrically connected with the branch circuit, whereby the car occupying the block operates a circuit-closing device, thus completing the branch circuit and operating the signal on the car at the entering end of the block.

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

JOHN J. RUDDICK.

Witnesses:

HEATH SUTHERLAND,

EMMA J. BENNETT.