No. 648,432.

Patented May 1, 1900.

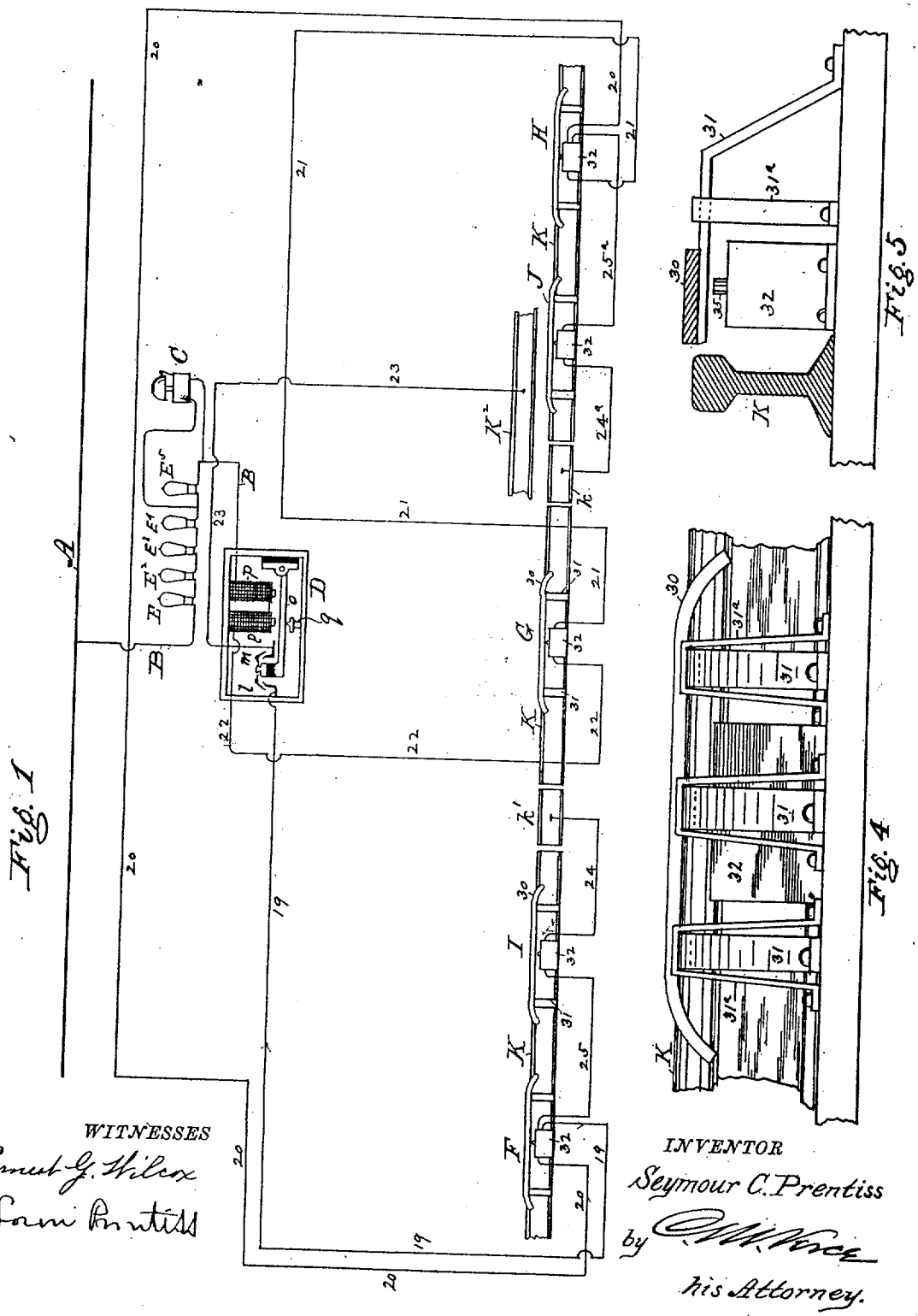
S. C. PRENTISS.

RAILWAY SIGNAL.

(No Model.)

(Application filed June 10, 1898.)

3 Sheets—Sheet 1.



WITNESSES

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3 Sheets—Sheet 2.

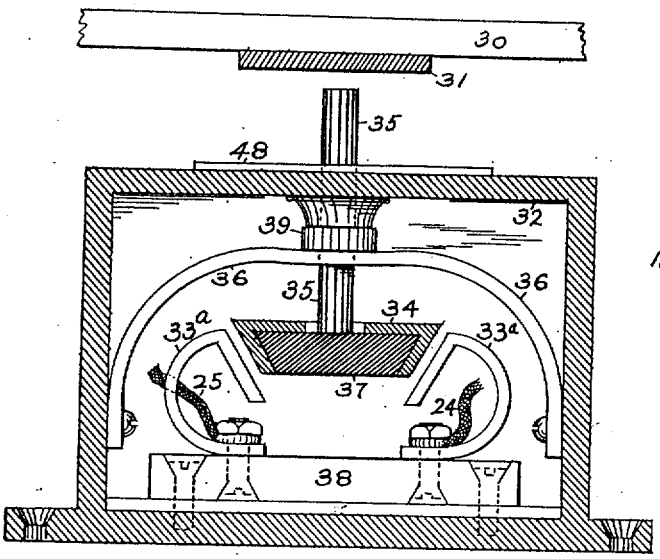

Fig. 6

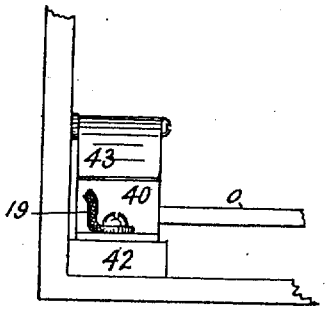

Fig. 2

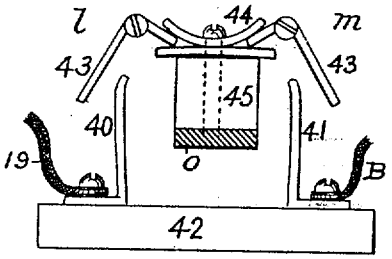

Fig. 3

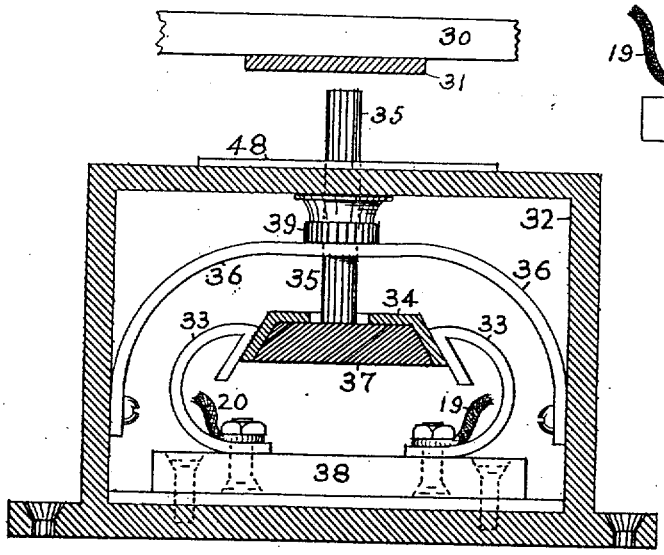

Fig. 7

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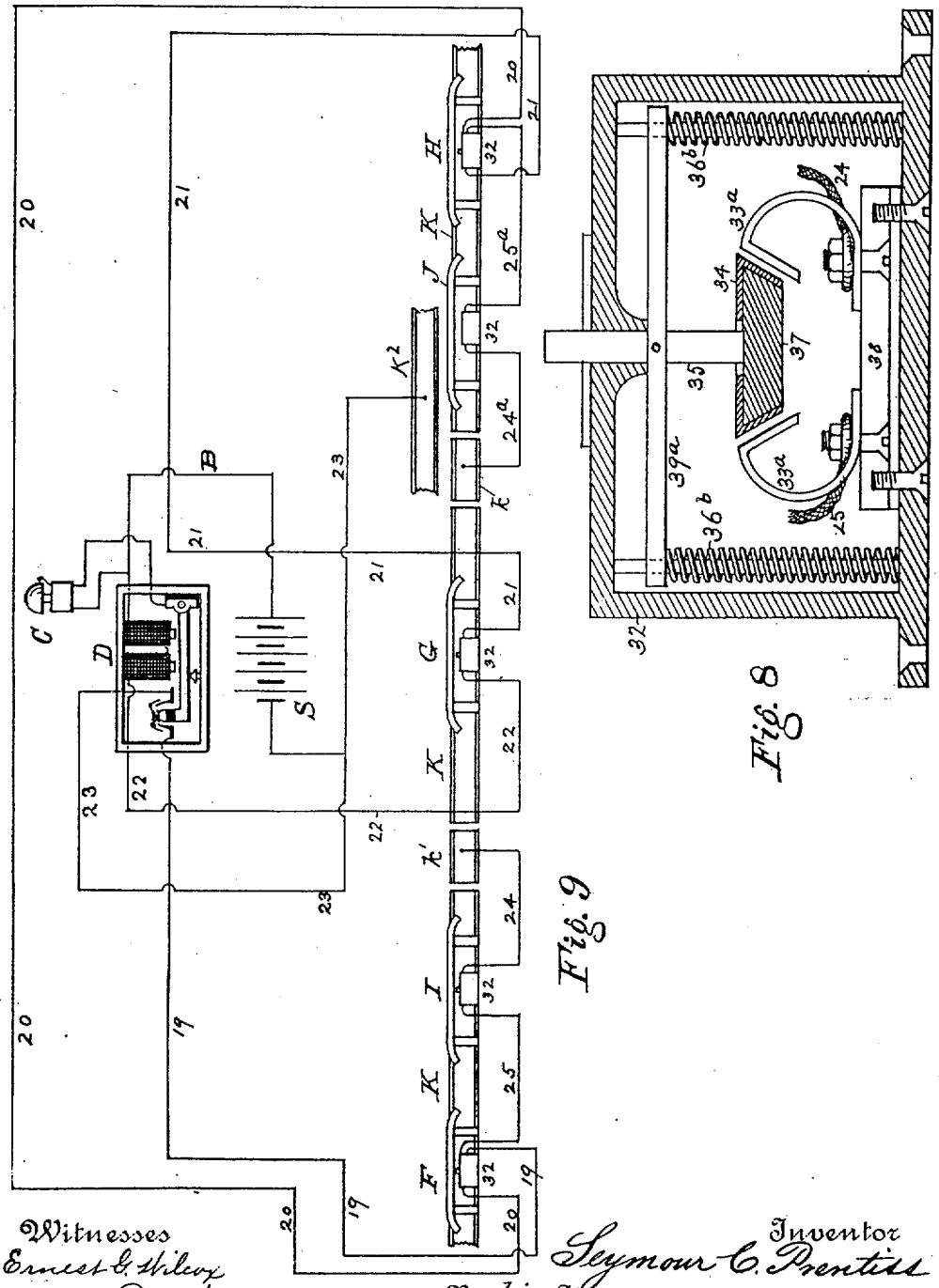

Fig. 8

Fig. 9

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UNITED STATES PATENT OFFICE.

SEYMOUR C. PRENTISS, OF DETROIT, MICHIGAN.

RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 648,432, dated May 1, 1900.

Application filed June 10, 1898. Serial No. 683,152. (No model.)

To all whom it may concern.

Be it known that I, SEYMOUR C. PRENTISS, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Railway-Signals; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to electric railway-signals.

The object of the invention is to simplify and improve the construction and increase the efficiency of the apparatus; and it consists in the novel features of construction, arrangement, and combination of the parts, as hereinafter fully described, and specifically pointed out in the claims.

In the drawings, Figure 1 exhibits diagrammatically the relative arrangement of the several parts of the apparatus. Fig. 2 is a side elevation of my novel form of relay and circuit-closing terminals. Fig. 3 is a sectional view through the terminals and the relay circuit-closer. Fig. 4 is a side view in elevation of my improved track instrument. Fig. 5 is an end view thereof, partially in section. Figs. 6 and 7 are sectional details of the circuit-closing and circuit-breaking track instruments, respectively. Fig. 8 is a like sectional detail showing a modified or alternative construction of parts of the instrument, and Fig 9 is a diagrammatic representation of an arrangement of the apparatus applicable to non-electric railways or where a battery is used instead of current from a dynamo.

A represents the feed-wire of an electric railway. B represents the signal-wire; C, the signal or alarm; D, the relay; E E^2 E^3, &c., lamps interposed as a resistance between the feed-wire and the relay.

F G H represent normally-closed circuit-breaking track instruments and I J represent normally-open circuit-closing track instruments.

K represents the track, and *k k'* blocked or insulated portions thereof to which the instruments I J are electrically connected.

By the terms "blocked" and "insulated" is meant not in electrical connection, normally, with any other structure or device otherwise than by the signal connections herein described.

The track instruments are arranged beside the rails in the following manner: One of the instruments F G H is located at or near the crossing or other point to be protected and the other two at suitable distances, one in each direction, therefrom. The signal and alarm is located at or near the crossing or other desired point which is to be protected. One of the track instruments I J is located near each of the distant instruments F H, but in the direction of the crossing therefrom, and the blocked or insulated rails *k k'* are each located near one of the instruments I J, and preferably in the direction of the crossing therefrom, although obviously it might be located in the other direction. The blocked or insulated rails are preferably placed at a distance from the instruments I or J equal to or not exceeding that between the two axles of a car.

Two separated circuit-terminals *l m* are so arranged with reference to the armature *o* of the relay D that when the magnet-coils *p p* are energized the movement of the armature will close circuit between the terminals *l m*, as hereinafter more particularly described, and complete a circuit through them.

The electrical circuits are run as follows: The signal-wire B connects the feed-wire with one terminal of the magnet-coils *p p* and has the lamps E E^2 E^3, &c., connected in series thereon and the alarm C connected in a shunt around one of the lamps, as E^5. From one of the circuit-terminals, as *l*, a circuit extends to and through the track instruments F, H, and G to the other terminal of the magnet-coils, and from the other circuit-terminal *m* a wire 23 is run to the track or ground, and if to the track is preferably run to the line of rails K opposite that in which the blocked rails *k k* are located. This circuit includes the wires 19 20 21 22 23, and it is obvious that when circuit is closed at the terminals *l m* the current will pass from the feed-wire through the wire B, the lamps, the alarm, the magnet-coils, the instruments G, H, and F, the terminals *l m*, and wire 23 to the track or ground, thus keeping the relay energized, the circuit closed, and the alarm in action until the circuit is broken at one of the instruments F, G, or H.

Each of the circuit-closing instruments I J is connected on one side to the insulated rail *k* or *k'* nearest it and on the other side to the

instrument F or H beyond it, as by the wires 24 24ª 25 25ª. The result of this is that when a car has passed over either of the instruments I or J in the direction of the crossing until its forward wheels rest on the blocked rail *k* or *k'*, while its hinder wheel is on the instrument I or J, a circuit will be closed from the feed-wire to the grounded rail K^2 through the magnet-coils, wire 22, instrument G, wire 21, instrument H, wire 25ª, instrument J, wire 24ª, rail *k*, and through the wheels and axle to rail K^2, (or from instrument H through wire 20, instrument F, wire 25, instrument I, wire 24, and rail *k'* in the other case.) The closing of either of these circuits thus energizes the relay D and causes the armature *o* to engage and close circuit through the terminals *l m*, and thus complete the first-described circuit, causing the lamps to burn and the alarm to sound until the circuit is broken, which is done as soon as the car passes over the middle instrument G.

The track instruments F G H are constructed as follows: A curved bar 30 is supported on springs 31 close beside but not touching the track K, guards 31ª being preferably arranged to limit the lift of the springs 31. A closed case 32 is set beneath the bar 30, and within this case spring-contacts 33, insulated from the case 32 and arranged to be normally in contact with a conducting-plate 34, supported by but isolated from a pin 35, which protrudes through the top of case 32 sufficiently to be engaged and forced downward by the bar 30 when the latter is depressed by the passage of the car-wheel over the same. The pin 35 is so supported by any suitable spring or springs, as 36 or its equivalent, that the conducting-plate 34 is kept normally in engagement with the contacts 33, to which the circuit-wires, as 19 20, are connected, so as to normally maintain the circuit complete through the instrument, but to break circuit with the least amount of movement and without friction on the contacts.

The track instruments I J differ from the instruments F G H only in that the contacts 33ª are so formed and the conducting-plate 34ª is so supported that they are normally out of contact, but are forced into contact by the depression of the bar 30. In all of the instruments 38 represents insulating material upon which the contacts are supported. 37 is insulating material insulating the plate 34 from the pin 35, and 48 represents soft-rubber packing secured to the top of case 32 and through which the pin 35 passes with so close a fit as to exclude dirt and moisture. As shown in Figs. 6 and 7, the spring 36, which upholds the pin 35, bears directly against a collar 39, secured to the pin 35, to which collar the spring 36 may, if preferred, be fastened, or the collar 39 may with advantage be extended into or replaced by a bar 39ª, rigidly secured to the pin 35 and supported at each end by a spring 36ª, as shown in Fig. 8, which will more effectually guide the plunger in a direct line and enable a simpler form of spring to be used.

The circuit-terminals *l m* comprise the fixed contact-pieces 40 41, insulated from each other, as by being mounted on a base 42 of insulating material, and preferably having a certain degree of springiness, and the pivoted lever-pieces 43, which engage at one end the conducting-piece 44, carried by the free end of the armature *o*, but insulated therefrom, as by the insulation 45. The circuit-wires, as 19 and 23, are secured to the respective terminals *l m* at the contact-pieces 40 41. When the relay-magnets are deenergized, the armature O falls by its own weight against the adjustable stop *q*, and the lever-pieces 43 have their free ends lifted out of contact with the fixed contacts 40 41, thus positively keeping the circuit open. When the magnets are energized, the armature is lifted, and in rising it throws the free ends of the lever-pieces 43 into contact with the fixed springy contacts 40 41 and holds them firmly in contact, thus keeping the circuit closed until it is broken as hereinbefore described. The springy contacts 40 41, in conjunction with the broad surface of the lever-pieces 43, which are also slightly springy, give a firm and effective contact, without friction, and effect a quicker and more reliable connection by a slight movement of the armature than if either of the contacting parts were rigid.

Heretofore very great difficulty has been experienced in electric signaling apparatus in preventing the accidental grounding of the track instruments by snow, water, ice, dirt and other causes and in obtaining a sufficiently certain and flexible contact arrangement for the circuit-terminals; but by my hereinabove-described improvements I have overcome these difficulties and am enabled to wholly prevent the accidental grounding of the instruments and to obtain a certain and positive make and break of circuit at the terminals, which by means of the adjustable stop *q* I am able to regulate at will.

While I have described my invention as applied to electric railways, it must be understood that it is equally applicable to steam-railroads by merely substituting a battery for the electric current derived from the feed-wire A, which could be done by connecting the battery to the signal-wire B on one side and to the ground-wire 23 on the other, omitting wire A and the lamps, of course, and connecting the alarm-circuit from wire B to the armature *o* or to terminal *l*, so that when the terminals *l m* are closed by the relay, current will pass from the battery by way of wire B through the alarm C and through the armature or terminal *l* to and through terminal *m* and wire 23 back to the battery S, as shown in Fig. 9, or by other obvious connections, and such use of the apparatus is entirely within my invention and its contemplated use.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In electrical signal apparatus the combination with a track having blocked rails, normally-closed circuit-breaking track instruments, normally-open circuit-closing track instruments, a signal, a pair of normally-open circuit-terminals, and a relay having an armature adapted to close circuit between said terminals, of a source of electric energy, a connection therefrom to one terminal of the relay-magnet coils and a connection to the signal, a connection from the other terminal of the magnet-coils through the circuit-breaking instruments to one of the circuit-terminals, a connection from the other circuit-terminal to the ground or grounded track, connections from each circuit-closing instrument to a circuit-breaking instrument, and from each blocked rail to a circuit-closing instrument, and a connection from the signal to the ground-wire, which connection is normally open at the circuit-terminals, substantially as described.

2. In electrical signal apparatus the combination with a track having blocked rails, normally-closed circuit-breaking track instruments, normally-open circuit-closing track instruments, a signal, a pair of normally-open circuit-terminals, and a relay having an armature adapted to close circuit between said terminals, of a source of electric energy, a connection therefrom to one terminal of the relay-magnet coils in which connection the signal is included, a connection from the other terminal of the magnet-coils through the circuit-breaking instruments to one of the circuit-terminals, a connection from the other circuit-terminal to the ground or grounded track, a connection from each circuit-closing instrument to a circuit-breaking instrument, and from each blocked rail to a circuit-closing instrument, substantially as described.

3. In electrical signal apparatus the combination with a track having blocked rails, normally-closed circuit-breaking track instruments, normally-open circuit-closing track instruments, a signal, a pair of normally-open circuit-terminals, and a relay having an armature adapted to close circuit between said terminals, of a source of electric energy, a connection therefrom to one terminal of the relay-magnet coils in which connection the signal and a resistance is included, a connection from the other terminal of the magnet-coils through the circuit-breaking instruments to one of the circuit-terminals, a connection from the other circuit-terminal to the ground or grounded track, a connection from each circuit-closing instrument to a circuit-breaking instrument, and from each blocked rail to a circuit-closing instrument, substantially as described.

4. In electrical signal apparatus, in combination with a track having blocked rails, spring-supported track-bars adjacent to the rails and adapted to contact with the car-wheels, a closed case secured beneath each track-bar and inclosing insulated spring-contacts and a spring-supported plunger which carries a transverse contact-piece between said contacts and has a stem protruding from said case and adapted to be depressed by the track-bar when the latter is depressed by the car-wheels, the cases in which the contact-piece is normally in contact with the spring-contacts constituting circuit-breaking instruments and those in which the contact-piece is normally out of contact with the spring-contacts constituting circuit-closing instruments, a signal, a pair of normally-open circuit-terminals, a relay having an armature adapted to close circuit between said terminals, a source of electric energy, a connection therefrom to one terminal of the relay-magnet coils and to the signal, a connection from the other terminal of the magnet-coils through the circuit-breaking instruments to one of the circuit-terminals, a connection from the other circuit-terminal to the ground or grounded track, a connection from each circuit-closing instrument to a circuit-breaking instrument and to a blocked rail, and a connection from the signal to the relay-armature, substantially as described.

5. In electrical signal apparatus, in combination with a track having insulated rails, five spring-supported track-bars adjacent to the rails and adapted to contact with the car-wheels, a closed case secured beneath each track-bar and inclosing insulated spring-contacts and a spring-supported plunger which carries a transverse contact-piece between said contacts and has a stem protruding from said case and adapted to be depressed by the track-bar when the latter is depressed by the car-wheels, the central and outer cases having their transverse contact-piece normally in contact with the spring-contacts and constituting circuit-breaking instruments, and the cases intermediate between the central and outer cases having their transverse contact-piece normally out of contact with the spring-contacts and constituting circuit-closing instruments, a signal, a pair of normally-open circuit-terminals, a relay having an armature adapted to close circuit between said terminals, a source of electric energy, a connection therefrom to one terminal of the relay-magnet coils and to the signal, a connection from the other terminal of the magnet-coils through the circuit-breaking instruments to one of the circuit-terminals, a connection from the other circuit-terminal to the ground or grounded track, connections from each circuit-closing instrument to a circuit-breaking instrument and to a blocked rail, and a connection from the signal to the relay-armature, substantially as described.

In testimony whereof I hereto affix my signature in presence of two witnesses.

SEYMOUR C. PRENTISS.

Witnesses:
FRANK S. NORTH, Jr.,
F. L. WISNER.