

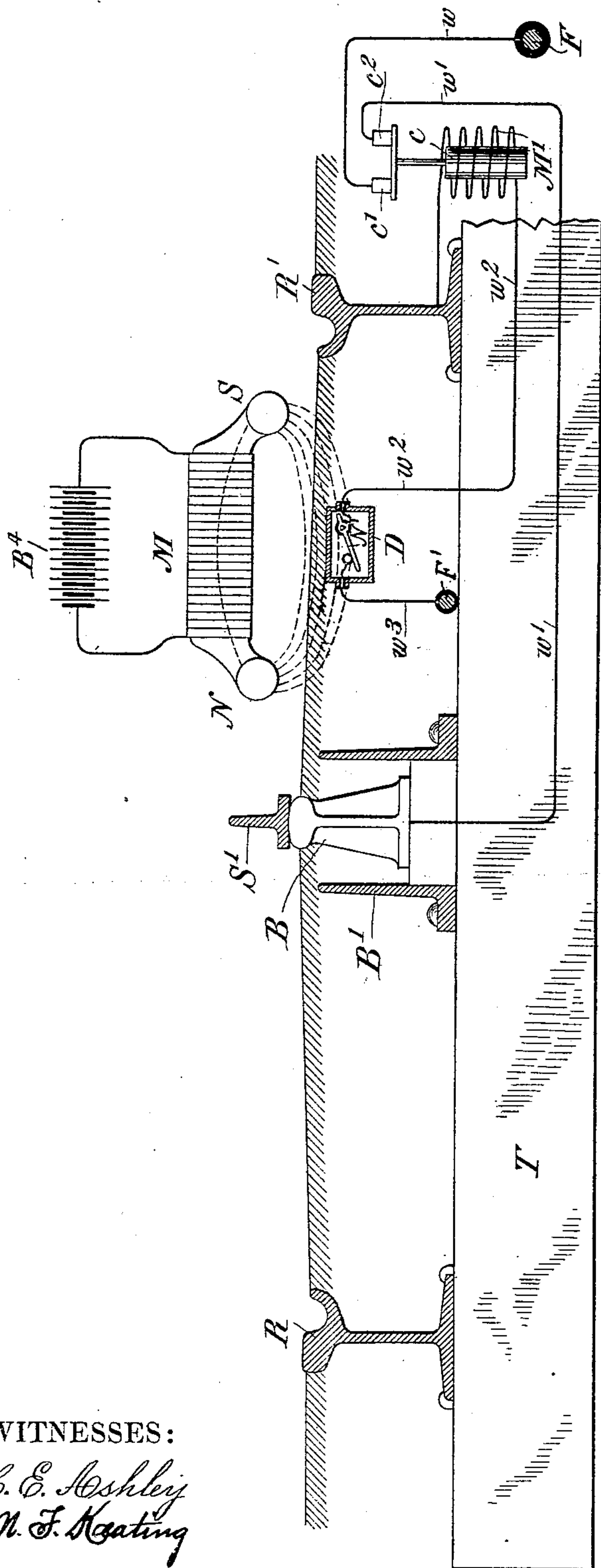
No. 625,512.

Patented May 23, 1899.

R. LUNDELL.
ELECTRIC RAILWAY.

(Application filed Apr. 5, 1898.)

(No Model.)



WITNESSES:

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UNITED STATES PATENT OFFICE.

ROBERT LUNDELL, OF NEW YORK, N. Y., ASSIGNOR TO THE JOHNSON-LUNDELL ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 625,512, dated May 23, 1899.

Application filed April 5, 1898. Serial No. 676,562. (No model.)

To all whom it may concern:

Be it known that I, ROBERT LUNDELL, a citizen of the United States, residing at New York, in the county of New York and State

5 of New York, have made a new and useful Invention in Electric Railways, of which the following is a specification.

My invention is directed to improvements in that type of electric railways known as
10 "surface-contact systems," in which short sectional service-conductors or contact-pins located or secured in the road-bed surface are normally disconnected from the current feeder or main, but connected thereto in se-
15 quence as a car or vehicle passes over them; and its objects are, first, to provide a simple and efficient means for effecting the connection between the sectional service-conductors and the current feeder or main; second, to
20 wholly embed or secure the operative parts thereof in the road-bed, where they may not be tampered with by unauthorized persons and be rendered secure against dangerous accidents to general traffic, and, third, to avoid
25 any possibility of accidentally actuating the switching-electromagnets through leaking or escaping currents from the current-mains or the branch feeders and sectional service-conductors. These objects are effected by and
30 through the agency of a series of magnetically-controlled relays located in air and water tight switch-boxes embedded in the road-bed and adapted to control the current-flow from the current feeder or main to the branch
35 feeders and sectional service-conductors by electromagnetic switching devices actuated by a source of electrical energy located in a separate or independent circuit from the working circuit and preferably of low voltage,
40 the armatures or needles of the relays being controlled in their movements by a powerful magnetic field carried beneath the car and over the relays.

For a full and clear understanding of the
45 invention, such as will enable others skilled in the art to construct and use my improvement, reference is had to the accompanying drawing, which illustrates in cross-sectional view the road-bed of an electric-railway system embodying the details of the invention
50 diagrammatically illustrated, together with

means carried by a car for establishing or setting up a powerful magnetic field over the inclosed magnetic relays as the car or vehicle advances.

Referring now to the drawing in detail, R
and R' represent the tram-rails, which are bonded together in the usual way, so as to constitute the return-circuit for both the relay
55 and propelling currents, said rails being supported upon cross-ties T, as shown.

B represents one of a series of contact-buttons or sectional service-conductors secured within protecting cups or casings B', bolted
60 to the cross-ties T.

S' represents a contact skate or shoe carried by the car and connected to and through the propelling-motor and to the wheels of the car (not shown) in the usual manner.

F represents the high-voltage feeder or current-main of the working circuit, connected to the station-generator at the power-house, and
70 w and w' are branch feeders running from the current-main F to the contact-buttons or sectional service-conductors B.

c' and c² are switching-contacts in the branch feeder-circuits, and c switching solenoid cores or armatures controlled by coils M', located in independent branch feeders w² w³
75 of a low-potential feeder F', including in its circuit a source of electrical energy, preferably of much lower voltage than that of the power-generator included in the working circuit F.

D D are air and water tight switch-boxes
85 of non-magnetic material, located just beneath the road-bed surface and preferably near the center thereof. In each of these boxes is inclosed a magnetic relay, here shown as a pivoted magnetizable needle N', located
90 at right angles to the road-bed, with its free or contacting end or arm normally at its lowest position, so that the circuit through the relay-coil M' is normally open. It will be apparent that the stationary or magnetic relays
95 inclosed in the switch-boxes D are connected in series relation with the coils M' of the switch-controlling electromagnets.

Each car or vehicle carries beneath its floor and in close proximity to the road-bed a magnetic field composed of two long parallel iron
100 pole-pieces N and S, slightly shorter than the

car-body, said pole-pieces being connected together at two or more points by magnetic cores wound with energizing-coils M, connected in multiple with an electrical generator, preferably a storage battery B⁴, carried also by the car, the component parts being so proportioned with relation to the actual relay work to be done that a powerful magnetic field will be established between the poles N and S and magnetic lines of force caused to flow at right angles to the direction of motion of the car and in planes parallel with direction of movement of the relay needles or armatures.

The operation is as follows: When the circuit of battery B⁴ is closed through the coils of magnet or magnets M, a powerful magnetic field is established beneath the car by the long parallel bar pole-pieces N and S, and the lines of force flow at right angles to the direction of movement of the car. Consequently the magnetizable relay-needle N' in the switch-box D will tend to set itself in the plane of such lines of force, and hence close the relay-circuit, thereby conveying a low-potential current of reasonably small quantity—say one-half ampere—from the feeder F' through the coils M' of the electromagnetic switch C, thus causing its core c to be raised into operative relation with the carbon switching-contacts c' c² and effecting circuit connections between the high-voltage or working feeder F and branch feeder w w' to the sectional service-conductor B, thence by the shoe S' and conductors (not shown) through the motor on the car to the wheels and tram-rails R R' back to the generator, the same rails acting also as a return for the low-voltage current through the relay-circuit w² w³, as is obvious on inspection of the drawing. As the car advances the magnetic field between N and S is advanced and the magnetic relay needles or armatures N' are operated in sequence, and in like sequence they assume their normal or disconnected positions as said field moves from over them. It is apparent that by no possibility can any leakage of current from the working feeder or branch feeders effect the operation of the magnetic relays and that their operation can only be brought about by the action of the magnetic field itself and the low-voltage circuit.

I do not limit myself to the special details of construction herein shown and described. I believe it is broadly new with me to effect the closure of the circuit between the working or propelling current-feeder of an electric railway and exposed sectional service-conductors through the agency of electromagnetic switching devices controlled in their operation by circuit-closing devices located in circuit with an independent source of electrical energy and feeder, whether the same be effected through the agency of a magnetic relay, such as I have shown and described, or any means, mechanical or otherwise, controlled by the movement of the car, the es-

sence of my invention lying in the utilization of an independent current for operating the switching-magnets of an electric-railway system where relatively high potential currents are utilized for operating the propelling-motors carried by the cars.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an electric railway a current feeder or main including a source of electrical energy, together with sectional service-conductors and electromagnetic switching devices for operatively connecting said sectional service-conductors in sequence to the current feeder or main; in combination with stationary relays for operating said electromagnetic switching devices, said relays being included in a circuit with a separate or independent source of electrical energy, substantially as described.

2. In an electric railway a current feeder or main including a source of electrical energy, together with sectional service-conductors and electromagnetic switching devices for operatively connecting said sectional service-conductors in sequence to the current feeder or main; in combination with stationary relays for operating said electromagnetic switching devices, said relays being included in circuit with a separate or independent source of electrical energy of lower potential than the first-named source of electrical energy, substantially as described.

3. In an electric railway a current feeder or main including a source of electrical energy, sectional service-conductors and electromagnetic switching devices for operatively connecting said sectional service-conductors in sequence to the current feeder or main; in combination with stationary relays for operating said electromagnetic switching devices, said relays being included in circuit with a separate or independent source of electrical energy, together with means carried by the car for actuating said stationary relays, substantially as described.

4. In an electric railway the combination of a current feeder or main including a source of electrical energy, sectional service-conductors and electromagnetic switching devices for connecting the same to the current feeder or main; the coils of said electromagnetic switching devices being included in circuit with stationary relays electrically connected to an independent current feeder or main including a separate or independent source of electrical energy, together with a magnetic field carried by the car and adapted to actuate the movable parts of said relays, substantially as described.

5. In an electric railway the combination of a current feeder or main including a source of electrical energy, sectional service-conductors and electromagnetic switching devices operatively connected to the movable parts of stationary relays, said movable parts being

included in circuit with an independent source of electrical energy, together with a moving vehicle provided with means for establishing or setting up magnetic lines of force, extending in a direction crosswise to the direction of movement of the vehicle, substantially as described.

6. In an electric railway a current feeder or main adapted to convey or carry the working or propelling current; a series of normally open branch feeders connected thereto and to a series of sectional service-conductors; an independent feeder or main provided with normally open branch feeders operatively connected with electromagnetic switching devices adapted to close the first-named branch feeders, together with magnetic relays adapted to control the current-flow through the coils of said switching devices and means carried by the car for controlling the operation of said relays, substantially as described.

7. In an electric railway a current feeder or main adapted to convey or carry the working or propelling current; a series of normally open branch feeders connected to said current-main and to sectional service-conductors; a series of electromagnetic switching devices, one for each branch feeder; an

independent current feeder or main provided with normally open branch feeders including in circuit the coils of the electromagnetic switching devices, together with relays located in said branch feeders, magnetic means carried by a car or moving vehicle and adapted to actuate said relays in sequence, substantially as described.

8. In an electric railway a current feeder or main adapted to convey or carry the working or propelling current; a series of normally open branch feeders connected thereto and to a series of sectional service-conductors; a series of electromagnetic switching devices, one for each branch feeder, an independent current feeder or main provided with branch feeders including in circuit the coils of said electromagnetic switching devices, together with circuit-closing devices located in the road-bed, and means carried by the car for controlling the operation of said circuit-closing devices, substantially as described.

In testimony whereof I have hereunto subscribed my name this 4th day of April, 1898.

ROBERT LUNDELL.

Witnesses:

C. J. KINTNER,
W. P. BISCHOFF.