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G. T. & L. WOODS.

ELECTRIC RAILWAY.

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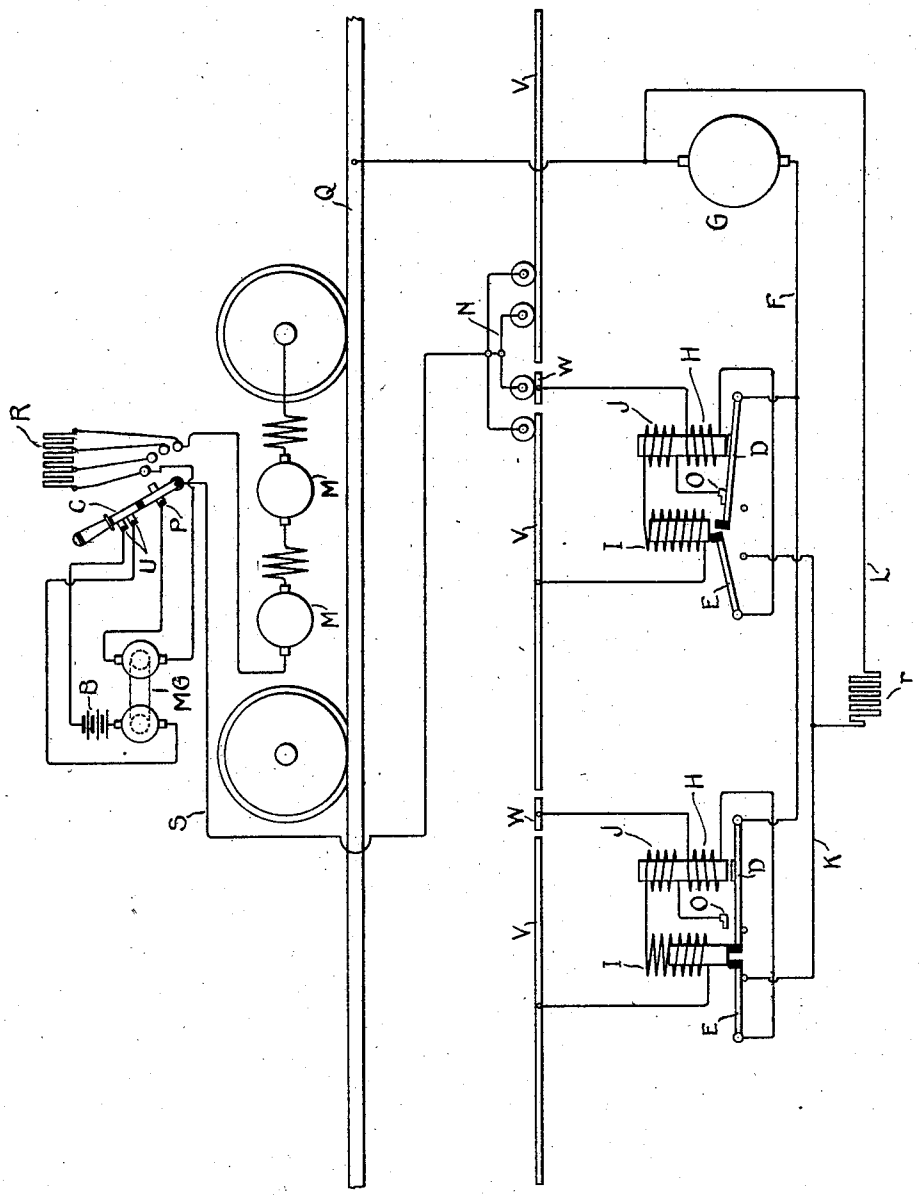
NO MODEL.



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No. 729,481. Patented May 26, 1903.

UNITED STATES PATENT OFFICE.

GRANVILLE T. WOODS AND LYATES WOODS, OF NEW YORK, N. Y., ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 729,481, dated May 26, 1903.

Application filed November 24, 1900. Serial No. 37,567. (No model.)

To all whom it may concern:

Be it known that we, GRANVILLE T. WOODS and LYATES WOODS, citizens of the United States, residing at New York, county of New York, State of New York, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

This invention relates to improvements in electric railways provided with normally dead sectional conductors.

The drawing is a diagrammatic illustration of a railway system embodying the invention.

The generator which supplies current to the system is represented by G, and from it extends a feeder F, which is adapted to be connected to service-conductor sections V by switches D. A collector N carried by the car provides a path for the current from the sections V, through the controller C, through the motors M and car-wheels to the track-rails Q as a return-circuit to the generator G.

Auxiliary or switch-energizing conductor-sections W are provided, and these may be arranged in line with the service-conductor sections V to form a single third rail, as shown, or may be arranged parallel to the sections V, as will be obvious to those skilled in the art. All the sections may consist of ordinary rails or may be in the form of studs or contacts in the roadway. The collector N engages also with these sections W to shunt the current from the motors to actuate the switches D.

The sections W are normally connected to ground through a coil H, which actuates the switch D. The two adjacent switches E in their closed positions are connected with a conductor K, which is connected to a return-circuit L through a resistance r, which is therefore common to the two switches. The collector N carried by the car is of sufficient length to bridge two adjacent sections V, which are separated by a section W. Assuming that the car is moving to the left and that the right-hand section W is connected with the feeder, current will flow in shunt to the motors through the coil H and switch E to ground through the conductor K and resistance r. The coil H will then raise the switch D, so that it engages with the contact O, whereby current flows through the advance portion of the collector to the car-motors from the feeder F. This energizing of the coil I raises the switch E to open the circuit of the coil H, but the coil J holds the switch D closed against the contact O.

The apparatus so far described would be subject to difficulties hitherto encountered in most systems of this type—namely, a sticking of the switch D in its closed position, owing to various causes, such as residual magnetism or leakage-currents. I therefore provide means for insuring the opening of the switch under all conditions, except short circuits. The core of the coil I is vertically movable and is of quite large mass, so that when the collector has passed from the section V, in case a small current due to leakage, &c., is flowing through the coil J which would be sufficient to hold the switch D closed, the core falls by gravity or equivalent force and impinges upon the switch D to force it away from the contact O and positively break the circuit of the coils I and J. The particular strength of current which will be insufficient to hold the core in its upper position may be determined by the number of turns of the coil I. In its descent the core also carries the switch E into its closed position, whereby the coil H is normally connected to ground through the resistance r. When the car is at a standstill, with the controller in its off position, the switches D are open and there is no means for energizing them, and hence it is necessary to provide an auxiliary source of current on the car. Hitherto it has been thought necessary to provide storage batteries on the car; but this is inadvisable on account of the extreme size and weight necessary to obtain sufficient current for this purpose. I therefore provide means whereby sufficient current is obtained from a small secondary battery B, which is connected with a motor-generator M G. This motor-generator is adapted to generate current of higher potential than that impressed upon it by the battery. When the controller C is moved to its first position, it closes the battery-circuit at the contacts U and connects the right-hand portion of the motor-generator with the collector-lead S at the contact P. Thus suffi-

cient current flows through the collector to the energizing-coil H to pick up the switch D, and if the controller C is held for a short interval in its first position the line-current will flow to the motor-generator, the right-hand portion being changed from a generator to a motor, and the battery will be recharged. Subsequently the controller may be moved to open the battery-circuit at the contacts U and off the contact P, cutting out the resistance R in the usual manner.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electric railway, the combination with the feeder, of service-conductor sections, switch-energizing conductor-sections, an electromagnetic switch for each service-conductor section, an electromagnetic switch for each switch-energizing conductor-section, a connection from each switch-energizing conductor-section to ground, including a coil for actuating the service-conductor switch, a connection from each service-conductor section to the feeder including coils for actuating the switch-energizing-conductor-section switch and for holding the service-conductor switch closed, and a plunger controlled by the latter connection which, when it falls, opens the service-conductor switch.

2. In an electric railway, the combination with the feeder, of service-conductor sections, switch-energizing conductor-sections, an electromagnetic switch for each service-conductor section, a connection from each switch-energizing conductor-section including a coil for actuating the switch, a connection from each service-conductor section and including a coil for holding said switch closed, and a plunger controlled by the latter connection which, when it falls, opens the switch.

3. In an electric railway, the combination with the feeder, of service-conductor sections, electromagnetic switches between the feeder and said sections, switch-energizing conductor-sections, coils connected to the latter to actuate said switches, electromagnetic switches in circuit with said coils, and coils connected to the service-conductor sections for actuating the latter switches.

4. In an electric railway, the combination with the feeder, of service-conductor sections, electromagnetic switches between the feeder and said sections, switch-energizing conductor-sections, a coil connected to each of the latter to actuate one of said switches, electromagnetic switches in circuit with each of said coils, and a coil connected to each service-conductor section which controls the switch in its own circuit and the switch in the circuit of the coil connected with the switch-energizing conductor-section.

5. In an electric railway, the combination with the feeder, of service-conductor sections, electromagnetic switches between the feeder and said sections, switch-energizing conductor-sections, a coil connected to each of the latter to actuate one of said switches, electromagnetic switches in circuit with each of said coils, a coil connected to each service-conductor section which controls the switch in its own circuit and the switch in the circuit of the coil connected with the switch-energizing conductor-section, and a second coil in series with the coil connected to the service-conductor section and adapted to hold the switch in its own circuit closed.

6. In an electric railway, the combination with the feeder, of service-conductor sections, electromagnetic switches between the feeder and said sections, switch-energizing conductor-sections, coils connected with the latter sections for actuating said switches, a connection between a plurality of said coils, and a return connection from said connection which includes a resistance common to all of said coils which are connected together.

7. In an electric railway, the combination with the feeder, of service-conductor sections, switches for connecting the latter with the former, switch-energizing conductor-sections, coils connected between the latter and ground and in shunt to the car-motors, for actuating said switches, coils connected between the service-conductor sections and the feeder and in series with the car-motors, for holding said switches closed, and plungers controlled by said series connections which fall upon the switches to force them open.

8. In an electric railway, the combination with the feeder, of service-conductor sections, electromagnetic switches for connecting the latter with the former, a collector carried by the car, a motor-generator, a secondary battery connected therewith, car-motors, and a controller provided with contacts whereby in the first position of the controller, the battery-circuit is completed, and the collector and motor-generator are connected in circuit.

9. In an electric railway, the combination with the feeder, of service-conductor sections, switches for connecting the latter with the former, switch-energizing conductor-sections, coils connected between the latter and ground and in shunt to the car-motors, for actuating said switches, coils connected between the service-conductor sections and the feeder and in series with the car-motors, for holding said switches closed, switches in the circuits of the shunt-coils which are actuated when the circuits of the series coils are closed, and plungers controlled by the series coils and which fall upon the switches in both the series and shunt circuits, to open the latter and close the former.

10. The combination with a feeder, of conductor-sections, connections between the latter and the former, normally open switches in said feeder connections, shunt-circuits normally disconnected from said conductor-sections including magnet-coils for closing the feeder-switches, means carried by the car for connecting said shunt-circuits to said

conductor-sections, normally closed switches in said shunt-circuits, coils in the feeder connections for opening the shunt-circuits when the feeder-switches are closed, and coils in the feeder connections for holding the feeder-switches closed after the shunt-switches are opened.

11. In an electric railway, the combination with the feeder, of conductor-sections, electromagnetic switches for connecting the latter with the former, the coils of said switches being in branches around the car-motor circuit, a connection between a plurality of said coils, and a connection from such connection to the return and including a resistance common to all the coils which are thus connected together.

In witness whereof we have hereunto set our hands.

GRANVILLE T. WOODS.
LYATES WOODS.

Witnesses:
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E. P. PANE.