No. 690,386. Patented Jan. 7, 1902.

F. M. ASHLEY.

ELECTRIC RAILWAY.

(Application filed Feb. 26, 1898.)

(No Model.)

FIG. 2.

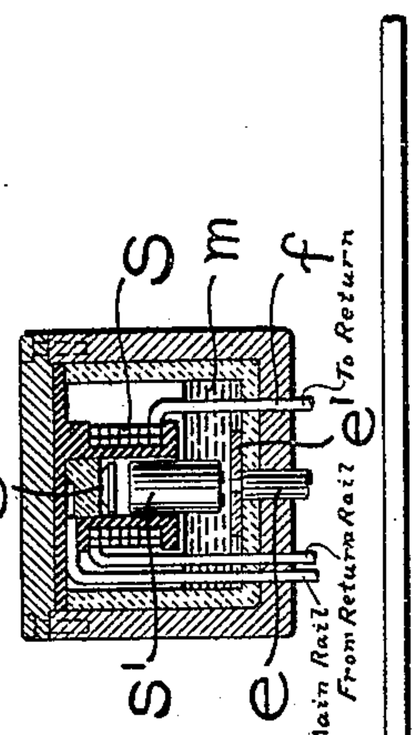
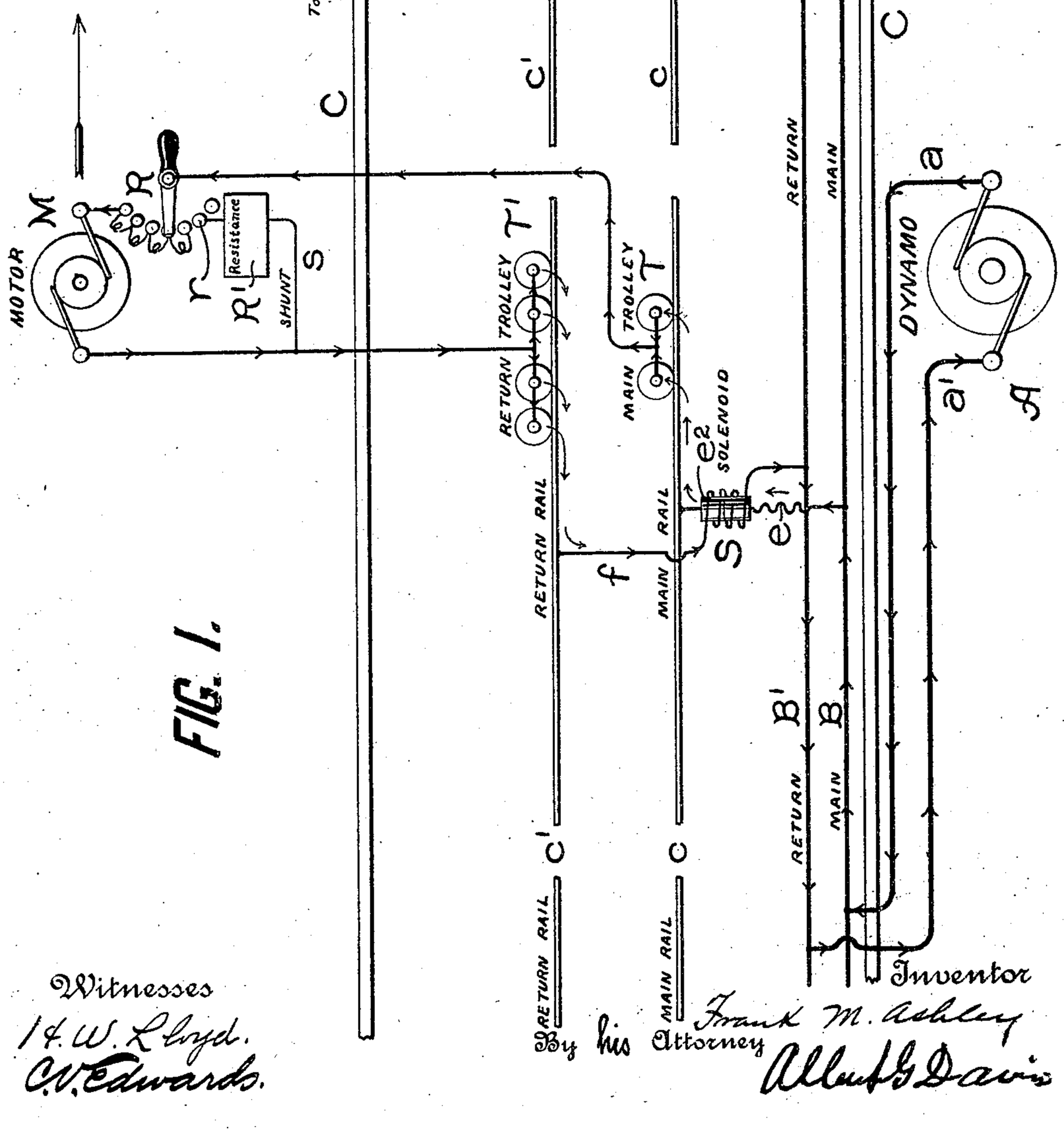


FIG. 1.



Witnesses
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UNITED STATES PATENT OFFICE.

FRANK M. ASHLEY, OF BROOKLYN, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 690,386, dated January 7, 1902.

Application filed February 26, 1898. Serial No. 671,790. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. ASHLEY, a citizen of the United States, residing at Brooklyn, county of Kings, 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 electric railways of that particular class in which are used main continuous insulated conductors in connection with sectional uninsulated working conductors, the sections of the latter being electrically connected with the main conductor by branch wires, the circuits through which are controlled by electromagnets.

The objects of this invention are to provide means for controlling the said electromagnets to prevent them from changing the condition of the circuits when the motorman stops or starts the car.

The invention consists in an arrangement of shunt-circuits whereby current is maintained at all times through the electromagnet controlling the section upon which the car stands, independent of whether the car is moving or stationary.

The invention also consists of the details of construction of the circuit-controlling mechanism.

In the accompanying drawings, Figure 1 represents a diagram of the circuits employed and conventionally the apparatus used. Fig. 2 is a section of the box containing the switch-controlling mechanism.

A represents the generator or generating-station of the system. Feeders *a* and *a'* lead from this to the main conductors B B'. The main conductors are supposed to be continuous and effectively insulated.

C C are the tracks upon which the vehicles run.

c and *c'* are respectively two sectional conductors fixed in any suitable manner along the roadway. The sections of these two conductors are connected with the two main conductors B B', respectively, by branch wires *e e e*, &c., and *f f f*, &c. The branches *f* are continuous; but the branches *e* have a break which is controlled electromagnetically, as hereinafter described.

The devices carried by the car consist of a trolley or other collecting device having two contact portions T and T', respectively making contact with the two sectional conductors. The portion T' is longer than the portion T, so as to overlap the latter both forward and behind. The car also carries the usual motor M and controlling-rheostat R. The contact-point of the rheostat, upon which the lever usually rests when the current is cut off from the motor and which is usually known as the "dead-point," is lettered *r* in the drawings and forms the terminal of a shunt-circuit *s* around both the rheostat and the motor and including a sufficient resistance R' to prevent injury.

The circuit-controlling mechanism for the sectional conductors is located in boxes along the roadway. The box contains a solenoid-magnet S, which is directly in the circuit of branch wire *f*. The solenoid is arranged in a vertical position, with its core *s'* normally resting upon the bottom of the box and immersed in a quantity of mercury *m*. In the bottom of the box is a plate *e'*, forming one terminal of a branch wire *e*, leading into the box. The other terminal of said wire is a contact-piece e^2, fixed inside of the solenoid at the upper end thereof and in a position to be struck by the upper end of the solenoid-core when it is lifted by the magnet. The upward stroke of the core is not sufficiently long to remove it from the mercury, and when the core is in contact with the point e^2 the circuit is complete through the wire *e*.

The operation is as follows: Suppose a car to be standing over the sectional conductor at the position indicated by the trolley T T'. The circuit will be from dynamo A by wire *a*, wire B, branch wire *e*, including the mercury, the solenoid-core, and the contact-point e^2, sectional rail or conductor *c*, trolley T, motor-controller R, motor M, trolley T', sectional conductor *c'*, branch wire *f*, including the coil of the solonoid, return-conductor B', and return-feeder *a'*. So long as current is passing through the motor the solenoid, which is included by a branch wire *f*, will be energized and its core will be held in contact with the point e^2; but with this construction in case the current from the motor is cut off by throwing the controlling-lever to the point *r*

to stop the car current will cease to flow through the branch *f*, and the magnet being deënergized its core falls and the circuit through *e* is interrupted. Consequently the car cannot again start. To provide against this difficulty, the shunt *s* is provided, so that when the lever of the controller is resting upon the point *r* the current continues to circulate through the car-circuit, but shunts the controller and the motor. The branch wire *f* therefore carries current whether the car be moving or still. The circuit through *e* therefore remains uninterrupted and the car is able to start whenever the motor is thrown into circuit. As the car moves along from one section to another it will be observed that the return-trolley T′ makes contact with the sections ahead before the main trolley does. Consequently the circuit through branches *e* of the sections ahead will close before trolley T reaches them. This insures a continuous flow of current and prevents sparking between the solenoid-core and the points e^2 when the core drops by a car leaving a section.

The function of the mercury in the switch-boxes is to take the place of a flexible conductor between the terminal *e*′ and the core. It permits the core to be lifted with less expenditure of power than when a flexible conductor is used.

Having thus described my invention, I claim—

1. A circuit-controlling device consisting of an insulating-receptacle containing mercury electrically connected to one terminal of a circuit, an electromagnet-coil vertically arranged in said receptacle above the mercury, a movable magnet member resting in the mercury and adapted to be raised by the coil, and a contact forming the other terminal fixed in the upward path of said movable magnet member.

2. In a circuit-controlling device for electric railways, the combination with two circuit-terminals, of an electromagnet-coil, a movable magnet member adapted to be drawn by said coil into contact with one terminal, and a conducting fluid for maintaining electrical connection between said movable magnet member and the other terminal.

In witness whereof I have hereunto set my hand this 13th day of November, 1897.

FRANK M. ASHLEY.

Witnesses:
WM. A. ROSENBAUM,
HARRY BAILEY.