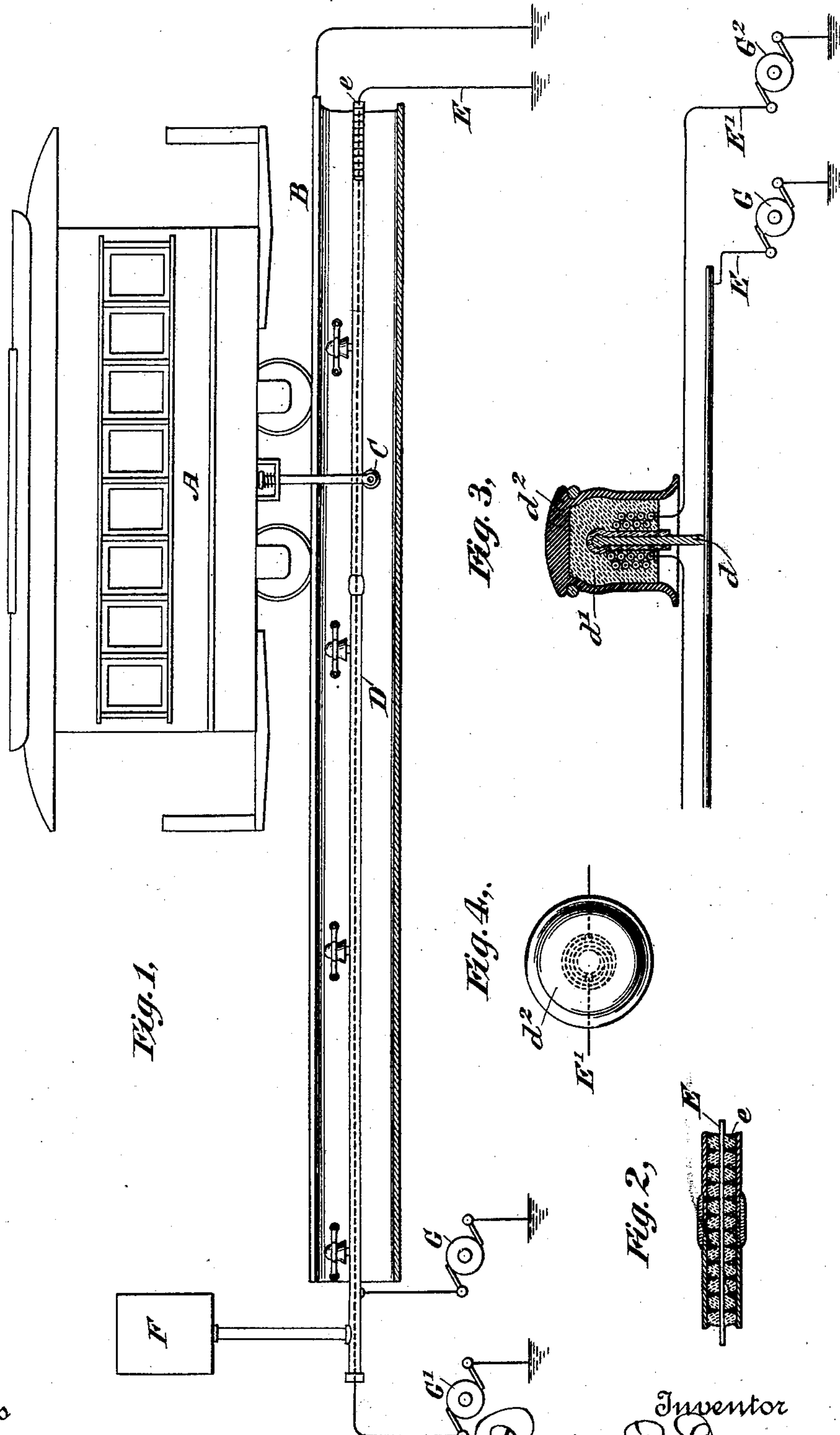


(No Model.)

P. B. DELANY.
ELECTRIC RAILWAY.

No. 557,258.

Patented Mar. 31, 1896.



Witnesses
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UNITED STATES PATENT OFFICE.

PATRICK B. DELANY, OF SOUTH ORANGE, NEW JERSEY.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 557,258, dated March 31, 1896.

Application filed October 10, 1892. Serial No. 448,312. (No model.)

To all whom it may concern:

Be it known that I, PATRICK B. DELANY, a citizen of the United States, residing at South Orange, Essex county, State of New Jersey, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

My invention relates to that class of electric railways in which the current for the motor on the car is taken from a conductor located in a conduit beneath or between the tracks. Heretofore in electric railways of this class there has been great difficulty in properly insulating the conductor arranged within the conduit. This is on account of the moisture deposited on the conductor and upon its supports, either by condensation or from rain or snow. Various organizations have been devised to overcome this difficulty. For instance, it has been proposed to place the conductor within a sealed casing located within the underground conduit, and to place the motor on the car in electrical communication with the conductor by causing the car in its movements to depress electrical contacts that are thereby brought into communication with the conductor in the sealed casing. This system, however, has material objections, which it is unnecessary to recite in detail. It has also been suggested to avoid the difficulty in question by arranging a pipe containing a heating medium in suitable juxtaposition to the bare conductor within the conduit, the purpose being to cause such an elevation of the temperature as to dissipate or evaporate such moisture as may be present upon the conductor. This plan, however, is objectionable, in that it is only partly efficient and is wasteful of heat energy, and is therefore expensive. It has also been proposed to arrange a heating-pipe in the conduit in connection with the supports or insulators in such manner that the heating medium traversing the pipe system shall pass through the body of the insulator, the purpose being to dissipate the moisture that may be present upon the insulator; but this method is for some reasons more or less incomplete and unsatisfactory in its results.

My invention contemplates an improvement upon the heating systems above suggested, whereby the presence of any moisture

upon the conductor, as well as upon its supports, may effectually be prevented in an economical, practical, and efficient manner. To this end I employ a tubular or semitubular conductor or a conductor curved in cross-section, within the bore or curve of which is arranged an electrical heater composed of a wire or other suitable conductor or semiconductor charged with a current of sufficient volume to develop therein the heat requisite to raise the temperature of the conductor to such a degree as to dissipate the moisture thereon. This electrical heating-conductor may consist of a wire of iron or copper or other metal of a gage adapted to the heating-current to produce the desired temperature. In the event that a tubular conductor is employed the heating-conductor is passed through it, being suitably insulated therefrom.

The insulation that I prefer to employ for the heating-conductor consists of insulating-buttons that are fireproof, and are preferably made of vitreous material, such as porcelain, the buttons being strung upon the heating-wire. If the conductor be tubular, it may also be filled with a fluid insulating material, such as oil, that serves by conduction to convey the heat from the heating-wire to the enveloping tubular conductor. The oil is preferably maintained under pressure by the fall from a stand pipe or tank or by other suitable means, and, if desired, provision may be made for the circulation of the oil through the tubular conductor. In the event that the conductor is not tubular I prefer to form it partly or semitubular in cross-section, so that it shall partly envelop the heating-wire.

My invention also contemplates that the conductor may be of any other cross-section and may be arranged in suitable juxtaposition to an electric heating-wire insulated therefrom. By this organization the conductor, whatever its cross-section may be, will be raised to such a temperature as to prevent the condensation of moisture thereupon and effect the dissipation of any moisture that may be thrown upon it.

In connection with an organization such as above suggested I also purpose using an arrangement by which the insulators or supports of the conductor within the conduit may

be heated to dissipate moisture and to prevent leakage. This heating of the insulators may be and preferably is accomplished by a heating-wire that extends to the various insulators and is connected therewith.

On any given road the means adopted for heating the main conductor or heating the insulators need not extend from one heating plant over the entire road, but the heating system may be arranged in blocks, in number adapted to the length of the road, as may be expedient or necessary.

In the accompanying drawings, Figure 1 is a diagrammatic longitudinal sectional elevation illustrating my invention; Fig. 2, a detail sectional view of a tubular conductor having arranged therein a heat-wire with insulating-buttons strung thereon. Fig. 3 is a diagrammatic sectional view illustrating the manner of heating the insulators or supports, and Fig. 4 is a top view of a support or insulator.

The car A travels upon a track B, beneath which the conduit is arranged. The contact wheel or brush C, mounted upon a hanger depending from the car and entering the conduit, runs in contact with a tubular conductor D. This conductor may consist of a copper or iron pipe, and, if of iron, the surface against which the contact wheel or brush bears may be faced with copper. Within the tubular conductor is arranged a heating-wire E, having strung thereon insulating-buttons *e*, as seen in Fig. 2.

At one or more points the tubular conductor is connected with a tank or stand-pipe F containing oil, so that the tubular conductor is charged with the oil which serves to conduct the heat from the heating-wire to the inclosing conductor.

G represents the source of electrical energy, one pole of which is shown as grounded, the rails upon which the car runs being also grounded. Of course any other arrangement of circuits might be adopted.

G' represents a source of energy, one pole of which is connected with the heating-conductor and the other pole grounded, the opposite pole of the heating-conductor being connected to earth.

The oil may or may not be used in the organization described, and if employed it may be circulated between the tank F and some distant discharge-point. In the event that the oil is not employed it is of course obvious that the conductor D need not be a complete tube, but may be of any cross-section; but of course whatever its cross-section it will be arranged in such juxtaposition to the heat-wire as to be effectively heated thereby. The buttons *e*, as stated, are preferably of some vitreous material and they preferably have curved faces and are arranged in contact. They may, however, be placed at intervals instead of being placed in contact and need not have curved faces.

In a number of patents heretofore granted to me and to others various styles of insulat-

ing-buttons are described, some of which are threaded upon their conductor, as shown in the drawings, and others of which are so shaped as to be placed in position thereon laterally.

The conductor D is shown supported at suitable intervals by a post *d* embedded in a mass of insulating material *d'* inclosed in a cap *d*², the cap being strapped to the wall of the conduit, as shown, or otherwise supported. A heating-conductor E', connected with the source of electrical energy G², runs to each insulator and makes a suitable number of turns around the post *d*. The part of the wire surrounding each post is preferably provided with insulating-buttons, such as *e*, and is embedded in the insulating material *d'*. The entire length of the conductor E' may also be enveloped with insulating-buttons and is supported in the conduit by means of its connection with the insulating-post *d*.

In my application, Serial No. 448,311, I have shown and claimed an organization in which a wire or wires having insulating-buttons thereon are inclosed within a pipe through which a circulation of oil may be maintained. The purpose of such organization is to provide an effective insulation for the efficient conduction by the inclosed wire or wires of currents of high tension, and such organization is claimed by me in said application.

I claim as my invention—

1. The combination of a roadway, the conduit an electric heating-wire arranged therein and a conductor enveloping or partly enveloping the heating-wire.

2. The combination of a roadway a conduit, the electric heating-wire having insulating-buttons strung thereon, and the tubular conductor enveloping the heating-wire.

3. The combination of a roadway, the conduit the tubular conductor located therein, the insulated heating-wire arranged within the tubular conductor and means for charging the tubular conductor with oil.

4. The combination of a roadway, the conduit, the conductor located therein, and the electric heating-wire, arranged contiguous to said conductor.

5. The combination of a roadway, the conduit the tubular conductor located therein, its supports, and electric heating-wires for heating the conductor and its supports.

6. The combination of the conductor, its supports and an electric heating-wire surrounding the supports.

7. The combination of a conductor, its insulating supporting-post *d*, the heating-wire surrounding the post, the cap *d*², and the insulating material interposed between the post and the cap.

8. The combination with a source of electrical energy of a tubular conductor connected therewith and an insulated heating-wire arranged within the tubular conductor.

9. The combination of a roadway, the conduit, the conductor arranged in the conduit,

its insulating-supports, an electric heating-wire connected with the supports, and a source of electric energy with which the heating-wire is connected.

5 10. The method of preventing electric leakage from an electric conductor mounted on insulators, which consists in generating heat within the body of the insulators to prevent the condensation of moisture thereon.

10 11. The combination with an insulator for an electric conductor-body, of an electric heating-coil for heating the substance of the insulator, as set forth.

15 12. The combination with an insulator for an electric conductor of a separate electric heating-conductor embedded in the substance

of the insulator and adapted to impart heat thereto, as set forth.

13. The combination with an insulator for an electric conductor of an electric heating-coil, connected with a source of electric energy and adapted to impart heat to the substance of the insulator, as set forth. 20

14. An insulator for an electric conductor having embedded therein an electric heating-coil. 25

In testimony whereof I have hereunto subscribed my name.

PATRICK B. DELANY.

Witnesses:

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