(No Model.) 4 Sheets—Sheet 1.

G. D. BURTON.

ELECTRIC UNDERGROUND TROLLEY RAILROAD.

No. 556,321. Patented Mar. 10, 1896.

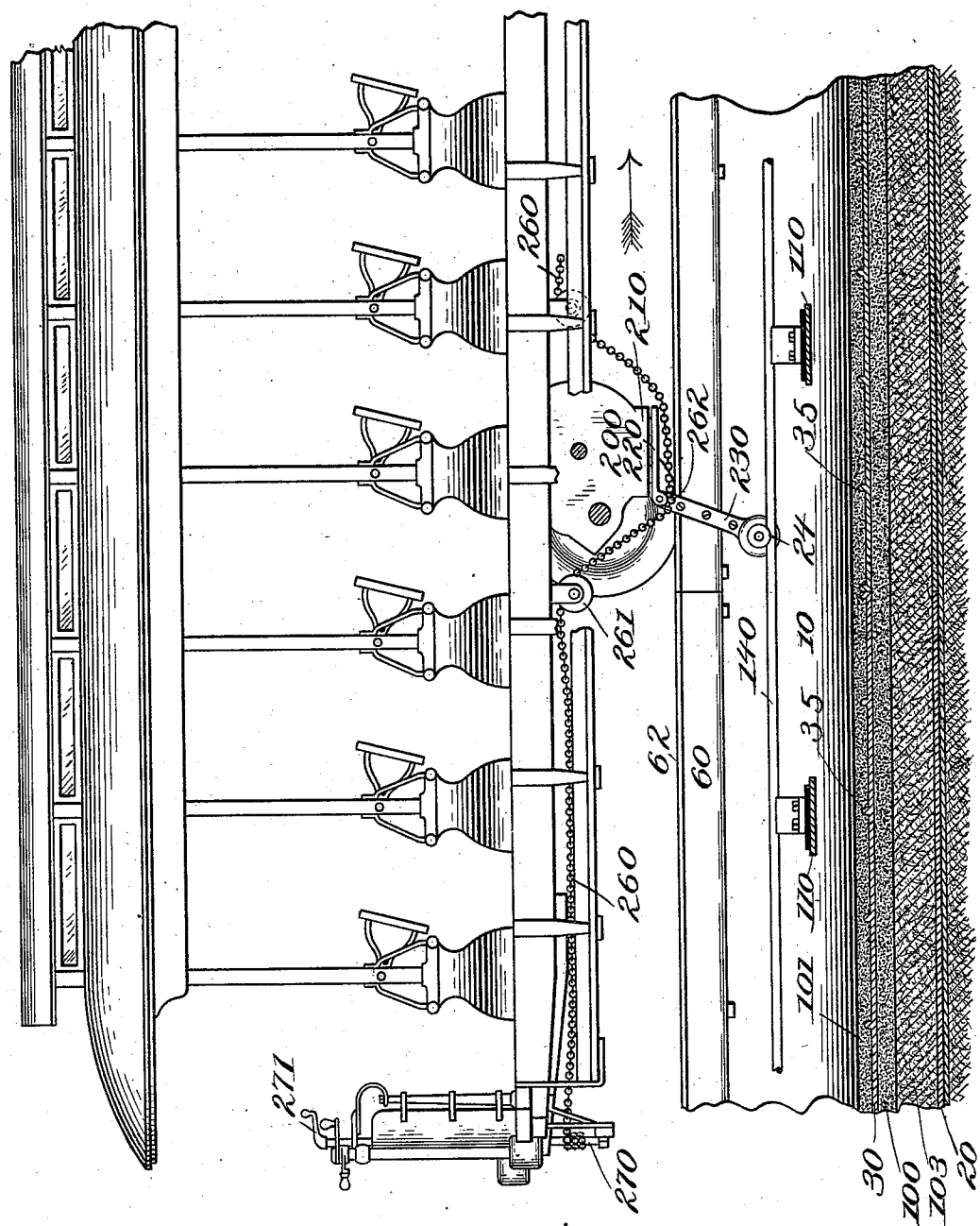

FIG. 1.

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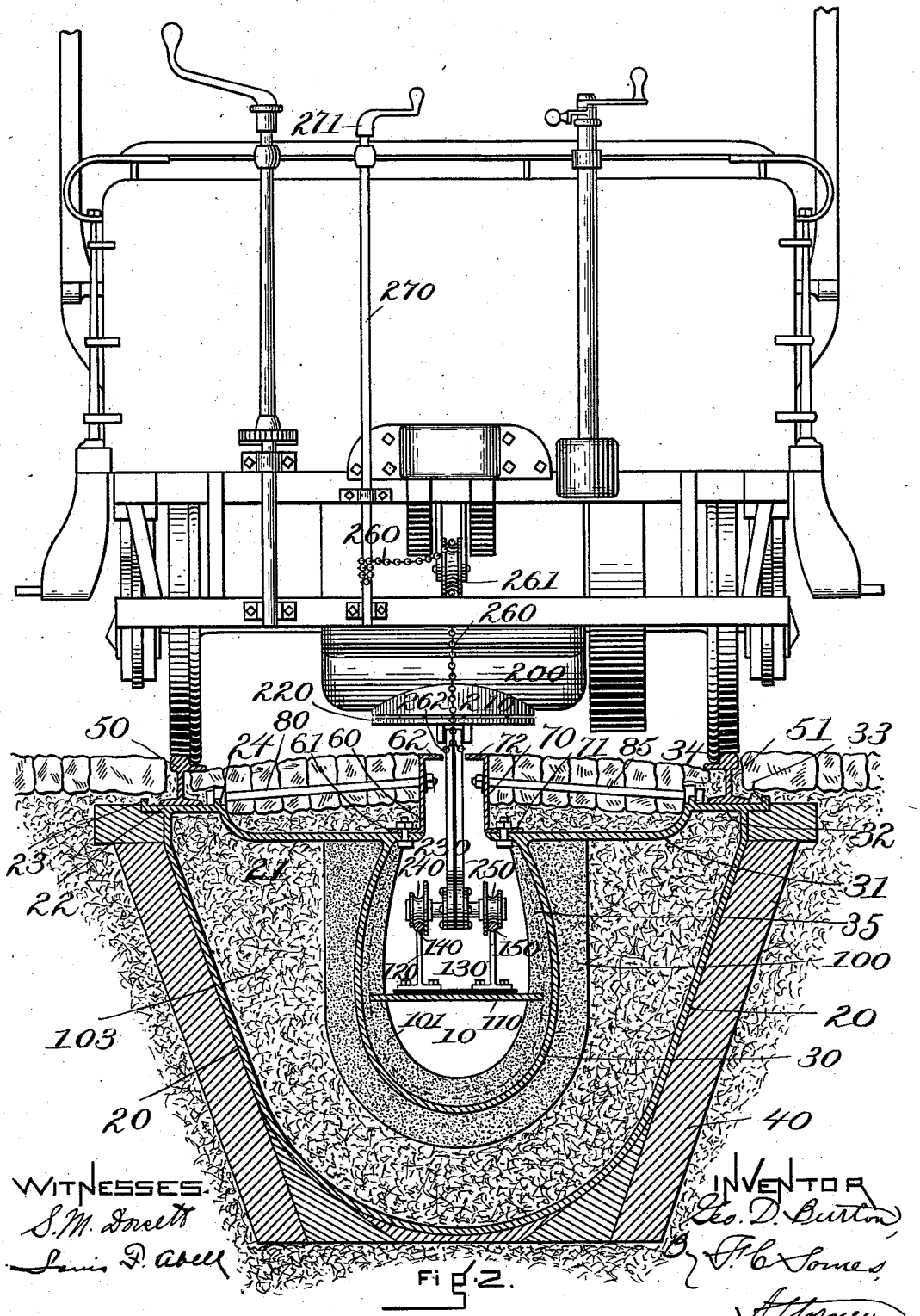

Fig. 2.

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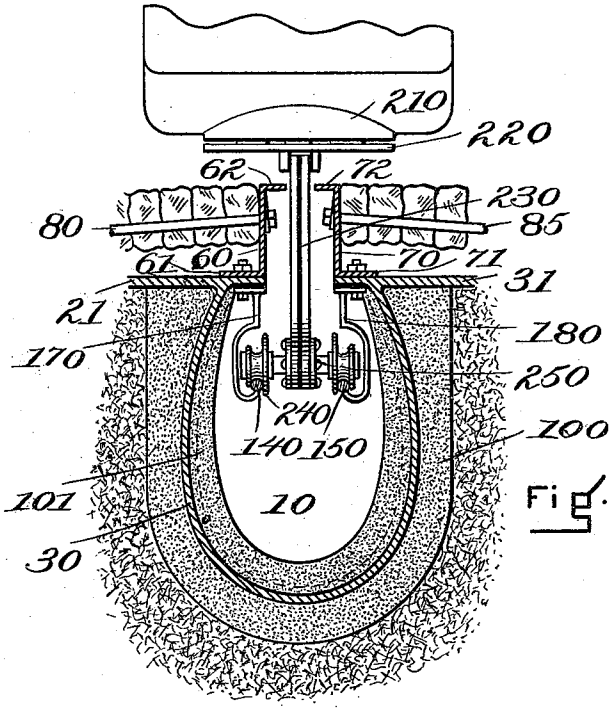

Fig. 3.

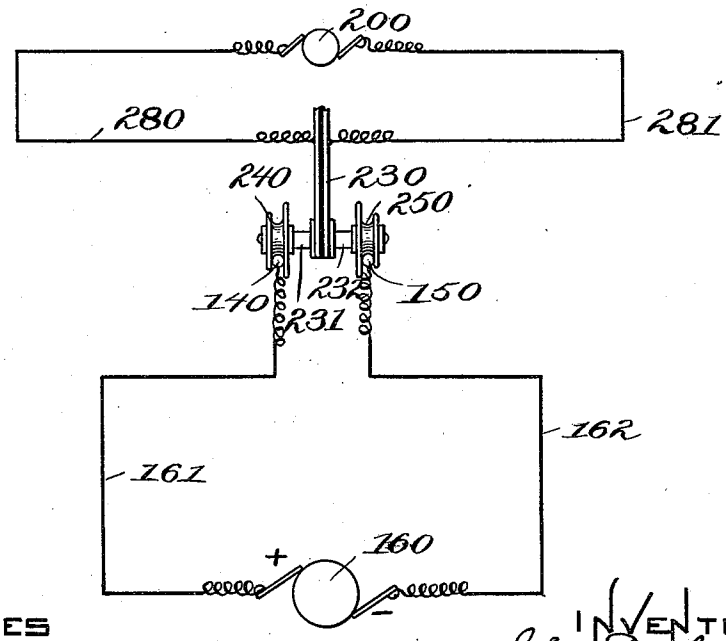

Fig. 4.

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ELECTRIC UNDERGROUND TROLLEY RAILROAD.

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Fig. 5.

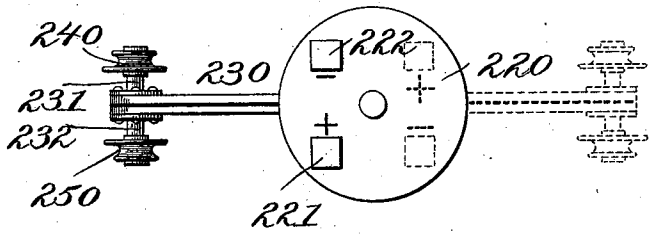
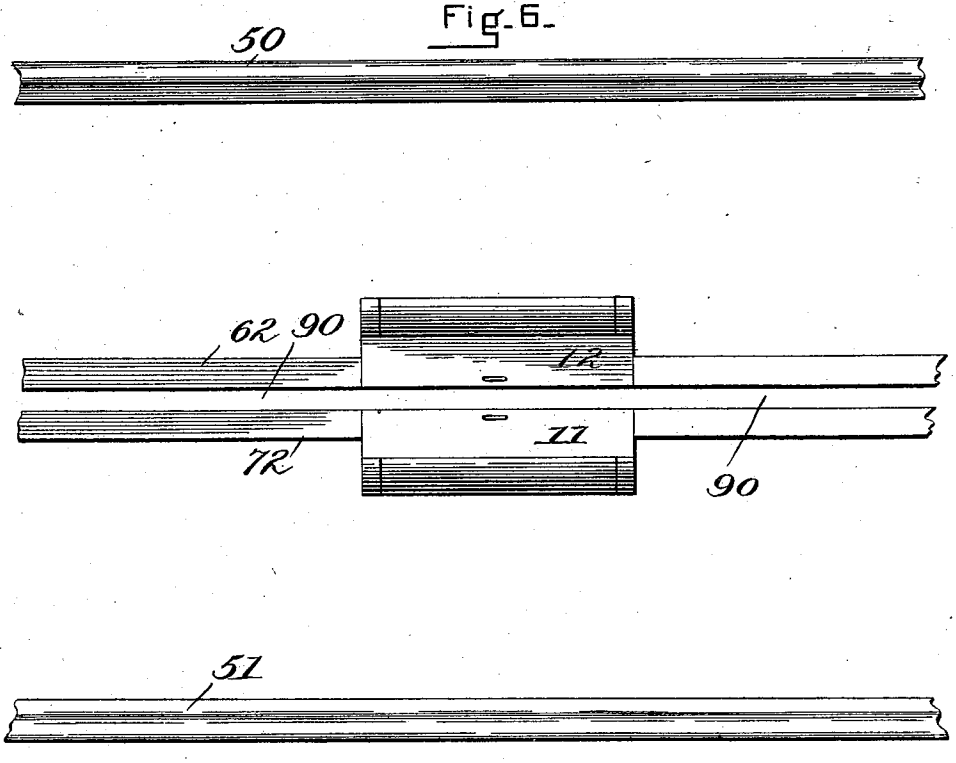


Fig. 6.



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UNITED STATES PATENT OFFICE.

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ELECTRIC UNDERGROUND-TROLLEY RAILROAD.

SPECIFICATION forming part of Letters Patent No. 556,321, dated March 10, 1896.

Application filed December 21, 1895. Serial No. 572,914. (No model.)

To all whom it may concern:

Be it known that I, GEORGE DEXTER BURTON, a citizen of the United States of America, residing at Boston, in the county of Suffolk, in the State of Massachusetts, have invented certain new and useful Improvements in Electric Underground-Trolley Railroads, of which the following is a specification.

This invention relates to an electric railroad in which the electric conductors are supported in underground conduits and the current conveyed to the motors of the cars through trolleys supported on dependent trolley-poles.

The objects of the invention are to provide a simple, convenient, and economical electric-conduit system which avoids the dangers and inconveniences incident to the overhead system.

The invention consists in the peculiar construction of the conduit whereby the conductors are thoroughly protected and insulated.

The invention consists, further, in the peculiar construction of the dependent trolley-pole suspended from the bottom of the car and extending into the conduit.

Figure 1 of the accompanying drawings represents a vertical longitudinal section of this underground conduit and a side elevation of a fragment of a car traveling on the track supported on the casing of the conduit. Fig. 2 represents a transverse section of the conduit and an end elevation of a car traveling on the track supported on the casing of the conduit. Fig. 3 represents a transverse section of the central portion of the conduit provided with a support for the conductors of a different form from those shown in Fig. 2. Fig. 4 represents a diagram of the path of the current through this conduit system. Fig. 5 represents a plan of a suitable switch-plate of the dependent trolley for cars of this system. Fig. 6 represents a plan of a fragment of the railroad-track provided with doors for opening the conduit for the removal or insertion of the trolley.

The same reference-numerals designate the same parts in all the figures.

The conduit is formed by a hollow metallic U-shaped casing sunk in the ground and preferably surrounded by a wooden frame 40. The hollow U-shaped casing comprises an outer shell, 20, and an inner shell, 30, the tops of these shells being connected by horizontal webs 21 and 31. The web 21 is provided with a flat plate 22, to which the rail 50 may be secured, and the web 31 is provided with a corresponding plate 32, to which the opposite rail 51 is secured. The plate 22 is preferably provided with upright flanges 23 and 24, and the corresponding plate 32 with upright flanges 33 and 34.

An upright side plate, 60, provided with an outward flange, 61, at its lower edge and with an inward flange, 62, at its upper edge, is bolted through its lower flange, 61, to the inner edge of the horizontal web 21, and a corresponding vertical side plate, 70, provided with similar flanges, 71 and 72, is bolted to the inner edge of the web 31. A connecting-rod 80 connects the side plate, 60, with the flange 24 of the web 21, and a similar rod 85 connects the right-hand vertical plate 70 with the flange 34 of the web 31. The inwardly-projecting flanges 62 and 72 at the upper edges of these vertical side plates project inward toward each other, leaving a space between them and forming the surface slot 90, through which the dependent trolley-pole extends into the conduit 10.

The outer face of the inner wall 30 of the U-shaped casing is surrounded by a layer 100 of a non-conductive composition, such as cement or asphalt, and the inner face of said wall is also provided with a non-conductive coating 101, which may be composed of cement, asphalt, or other suitable material and which forms the lining of the conduit. The inner wall, 30, is preferably provided with ribs 35, (shown in Fig. 1 and in dotted lines in Fig. 2,) which engage the inner layer of cement or asphalt or other non-conductive material. A filling 103 of any suitable material is disposed between the layer 100 and the outer wall of the casing.

Transverse bars 110 are disposed at intervals in the conduit 10, the ends of said bars being embedded in the inner non-conductive lining 101, or otherwise suitably supported. Two standards 120 and 130 are secured to each transverse bar 110, being insulated therefrom. A conductor 140 is supported on

the standards 120, and another conductor 150 is supported on the standards 130. The conductor 140 is connected with the positive pole of the electric source, as a dynamo 160, and the conductor 150 is connected with the negative pole of said source, or this arrangement may be reversed.

If desired, the conductors may be supported on dependent brackets 170 and 180, the former being secured at their upper ends to the under side of the plate 21 at the inner edge thereof, and the latter to the under side of the plate 31 at the inner edge thereof. In this case the transverse bars 110 and the standards 120 and 130 are dispensed with.

An electric motor 200 of any suitable construction is supported on the car which travels over the conduit. This motor is provided on its under side with a plate 210, which carries two sets of positive and negative contacts or studs connected with the opposite poles of the motor. A swiveling switch-plate 220 is pivoted to the fixed plate 210 and carries one set of contacts 221 and 222, which register respectively with either set of contacts on the fixed plate 210, according to the position of the plate 220.

A trolley-pole 230 is pivoted to the under side of the switch-plate 220. This trolley-pole is preferably composed of two conductive-plates insulated from each other, and conductive-studs 231 and 232 extend laterally from the lower end of said trolley-pole, being provided with flanges at their inner ends, whereby they are bolted to the respective insulated plates constituting said pole. A trolley 240 is adapted to turn on the outer end of the stud 231, and a trolley 250 is adapted to turn on the outer end of the stud 232. The trolley 240 travels on the conductor 140, and the trolley 250 travels on the conductor 150. Each of these trolleys is preferably grooved on its periphery and provided with a broad flange at the inner edge of the groove.

A chain 260 is supported on pulleys 261, which turn in brackets attached to the under side of the car-body. One end of this chain is connected to and adapted to be wound upon a vertical rod 270, which is adapted to turn in suitable supports at one end of the car, being provided at its upper end with a handle 271. The opposite end of this chain is connected to and adapted to be wound upon a corresponding rod at the other end of the car. This chain is provided with an eye 262, through which the trolley-pole 230 extends. The trolleys may be raised out of contact with the conductors, as shown in Fig. 1, by turning the handle 271 and winding the chain 260 on the rod 270. When the car is traveling in the opposite direction the trolleys are lifted from the conductors by winding the chain on the corresponding rod at the opposite end of the car.

The conduit is provided at the terminus of the route and, if desired, at suitable intervals with doors, as 11 and 12, which may be hinged, if desired. These doors enable the trolley-pole to be raised out of the conduit when the direction of the car is to be reversed or for other purpose.

The operation is as follows: Electricity generated at the power-station (indicated by the dynamo 160) is conveyed from the positive pole of said electric source over the wire 161 (see Fig. 4) to the positive pole 140 and from the negative conductor 150, through the wire 162, to the negative pole of said source. The cars traveling over the route form multiple-arc circuits connecting said positive and negative conductors 140 and 150. When the car is traveling in the direction of the arrow in Fig. 1, the trolley-pole depends at a rearward incline, and its two trolleys form contact respectively with said conductors. The current then passes from the conductor 140 through the trolley 240, through the stud 231, through the left-hand conductive-plate of the trolley-pole 230, thence by a suitable conductor, as 280, to the motor 200, thence over the wire 281 to the opposite conductive-plate of the trolley-pole 230, thence through the stud 232, thence through the trolley 250 to the negative conductor 150.

When it is desired to reverse the direction of the car, the trolley-pole 230 is raised through one of the openings in the conduit, and the switch-plate 220, to which said trolley-pole is pivoted, is turned a half-revolution, and then the trolley-pole is lowered again into the conduit and inclines in the reverse direction. Then the trolley 240 forms contact with the conductor 150 and the trolley 250 forms contact with the conductor 140. The electric connections of the motor are arranged so that the polarity of the current passing through the motor remains the same as that described when traveling in the direction of the arrow in Fig. 1. This is accomplished by any well-known means.

This system provides an efficient and effective trolley-contact and affords ample protection against loss of current through the earth.

I claim as my invention—

1. A casing for an electric conduit comprising an inner and an outer shell, the inner shell being provided with a lining of non-conductive material, and a non-conductive filling between said shells.

2. An underground conduit for an electric-trolley railroad comprising a hollow U-shaped casing composed of an inner and an outer shell, and webs connecting the upper edges of said shells, said webs having flat bearing-plates for the rails, and said casing being filled with insulating material.

3. An underground conduit for an electric-trolley railroad comprising a shell having an inner lining of an insulating material, transverse bars embedded at their ends in said insulating material, standards supported on said bars, and conductors supported on said standards.

4. The combination of a railway-track, a wheeled vehicle adapted to travel thereon, an electric motor disposed on said vehicle, and provided with a swiveled plate, a dependent trolley-pole pivoted to said swiveled plate, and provided with lateral studs, trolleys on said studs, and an underground conduit provided with conductors with which said trolleys form contact.

5. The combination of a railway-track, a wheeled vehicle adapted to travel thereon, an electric motor disposed on said vehicle, and provided with a swiveled plate, a dependent trolley-pole pivoted to said swiveled plate, and provided with lateral studs, trolleys on said studs, an underground conduit provided with conductors with which said trolleys form contact, and means for raising said trolley-pole.

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