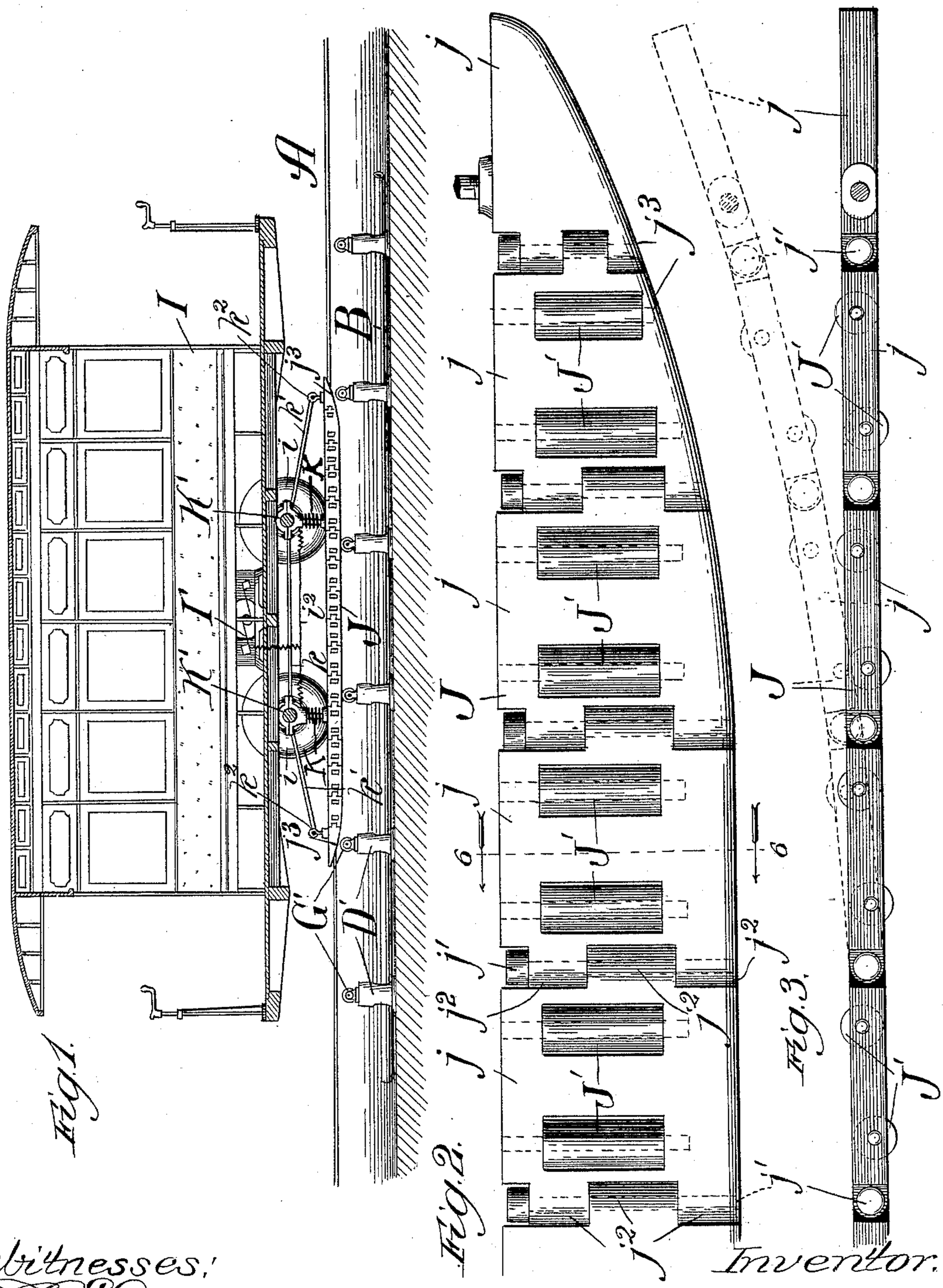
(No Model.) 2 Sheets—Sheet 1.

C. P. TATRO.

ELECTRIC RAILWAY.

No. 476,935. Patented June 14, 1892.



Witnesses:
Chas. E. Gaylord.
Louis W. T. Whitehead.

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By Dayton Cooke & Brown
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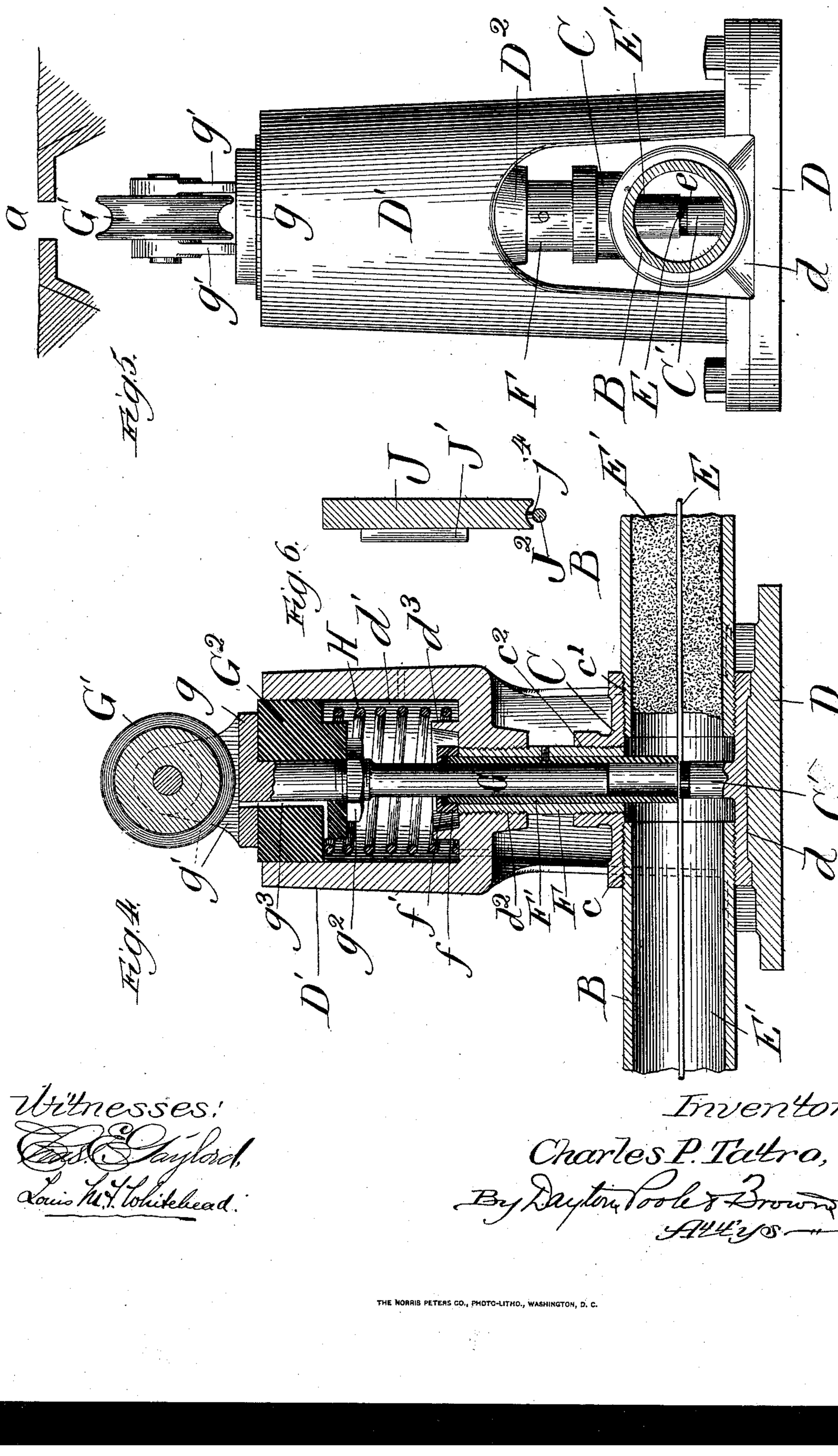

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Inventor:
Charles P. Tatro,
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UNITED STATES PATENT OFFICE.

CHARLES P. TATRO, OF SPOKANE, WASHINGTON, ASSIGNOR OF THREE-FIFTHS TO JOSEPH HANAUER, OF SAME PLACE, AND J. E. MONTGOMERY AND JAMES MONTGOMERY, OF CHICAGO, ILLINOIS.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 476,935, dated June 14, 1892.

Application filed July 14, 1891. Serial No. 399,453. (No model.)

To all whom it may concern:

Be it known that I, CHARLES P. TATRO, of Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Electric Railways; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to electric railways of that class in which the current is supplied to a motor on the car from a line-wire by means of contact devices. The particular subdivision of this class to which my invention more particularly relates is that in which the line-wire is located in an underground conduit or subway, the especial object in view being to provide a construction whereby cable roads may readily be converted into electric roads it being of course understood that the invention is not limited to this particular application, as some of the novel features thereof may be embodied in electric railways of other classes than that just mentioned. In this latter connection one of the objects of the invention, among others, is to provided a construction whereby more thorough insulation of the line-wire may be obtained, thus preventing waste of the current through leakage, and at the same time insuring a higher degree of safety.

To these and other ends the invention consists in certain novel features, which I will now proceed to describe, and will then particularly point out in the appended claims.

In the accompanying drawings, Figure 1 is an elevation of a structure embodying my invention, the car and conduit being shown in section. Fig. 2 is an enlarged detail elevation of one end of the shoe. Fig. 3 is a plan view of the same. Fig. 4 is an enlarged detail longitudinal section through one of the standards. Fig. 5 is an enlarged detail transverse sectional view of the conduit. Fig. 6 is a detail sectional view of a modified form of shoe, taken on a line corresponding with the line 6 6 of Fig. 2.

In the said drawings, A represents a conduit, which in the construction shown is the ordinary and well-known conduit used in cable roads, the same being provided with a slot or continuous opening *a* at its upper portion. Within the conduit A is arranged a pipe B, located, preferably, at or near the bottom of the said conduit and composed of a plurality of sections, threaded at their ends and united by T-couplings C, so as to form a continuous pipe or conduit. At each point of junction of the several sections of the pipe B there is secured to the bottom of the conduit a base-plate D, which is provided with a seat *d*, adapted to receive the corresponding T-coupling C. This base-plate also serves to support a standard D′, the lower portion of which is arched, as shown in Figs. 4 and 5, for the accommodation of the T-coupling C, while its upper portion is cylindrical and is provided with a chamber *d′*, for the purpose hereinafter described. Each T-coupling C has opposite openings *c c′*, adapted to receive the ends of the adjacent pipe-sections B, while its third opening c^2 is directed vertically upward, as shown. Opposite this latter opening there arises from the bottom of the interior of the coupling a post or support C′, which may be composed of or suitably faced with insulating material and which is adapted to hold and support the line-wire E, being provided with a groove or notch *e* for this purpose. The line-wire E is arranged centrally within the pipe B, being supported therein at intervals by the several posts or supports C′, and being additionally supported by means of a filling E′ of any suitable non-conducting material, with which filling the pipe B is packed after the wire is placed in position therein.

F indicates a vertical tube, preferably of metal, having its lower end screwed into the opening c^2 of the T-coupling C, while its upper ends screws into a similar opening d^2, extending upward through the bottom of the standard-head into the chamber *d′*.

F′ indicates a second vertical tube, of some suitable non-conducting material, inclosed within the tube F and extending downward beyond the same to the line-wire E, and also extending slightly upward above the tube F into the chamber *d′*. The upper end of this tube F′ is threaded externally to receive a

correspondingly-threaded apertured cap *f*, which screws thereon, a packing *f'* being interposed between the said cap and the end of the tube F'. This cap and packing are both made of some suitable non-conducting material. The bottom of the chamber *d'* is provided with a circular flange d^3, rising vertically therefrom and surrounding the upper end of the opening d^2.

G represents a plunger adapted to fit within the tube F and provided at its upper end with an enlarged head *g*, from which arise lugs *g'*, which form the bearing-blocks of a grooved trolley-wheel G'. This plunger and trolley-wheel are constructed of a suitable conducting material.

G^2 represents a piston of non-conducting material mounted on the plunger G and secured thereon between the head *g* of the plunger and a nut g^2, which is mounted upon the plunger below the head G^2, the body of the plunger being externally threaded at this point to receive the said nut. The piston G^2 fits tightly within the chamber *d'* and is provided with an air-passage g^3, extending, first, vertically downward and then laterally outward to the periphery of the reduced lower portion of the piston G^2. This air-passage forms a means for permitting ready ingress and egress of the air to and from the interior of the chamber *d'*, so as to obviate any such compression or exhaustion of the air as would tend to resist the free movement of the said piston in said chamber.

H represents a coiled spring mounted in the chamber *d'* of the standard-head and bearing at its lower end against the bottom of said chamber, the upper end of said spring bearing against the under side of the piston G^2 and tending to hold or force the same normally upward into the position shown in Figs. 4 and 5.

The car I is provided, as usual, with wheels *i* and with an electric motor I', by means of which motion may be imparted to the said wheels to move the car.

J represents a shoe supported beneath the car-axles I^2 by means of springs K, interposed between the body of the car I and the said shoe J, the position of the shoe being such that when the car is in position on the track the shoe will occupy the slot *a* of the cable-conduit and will extend some little distance downward through the same, as shown. The body of the shoe J is vertically rigid and laterally flexible, being composed of a number of segments *j*, hinged together by means of vertical pintles *j'*, passing through suitable apertured lugs j^2 on the abutting margins of the several sections. Each segment is provided with two vertical rollers J', journaled therein and protruding from opposite sides of the segment at the ends thereof. The precise number and arrangement of these rollers are immaterial, although I prefer the number and arrangement just described and shown in the drawings. The rollers J' are formed of some non-conducting material, while the body of the shoe J is composed of some conducting material. The lower edge of the shoe J is straight for the greater portion of its length, as clearly indicated in Fig. 1, the said lower edge being curved or inclined upward, however, at each end, as indicated at j^3. The shoe J is electrically connected with the motor I' by means of wires i^2, arranged either as shown or in any other suitable manner.

The shoe J is supported from the axles I^2 of the car by means of springs K, interposed between said shoe and divided sleeves K', mounted one on each axle and connected by a rod *k*. Rods *k' k'* extend from the sleeves K' downward and outward to the ends of the shoe, said rods being pivoted to their respective sleeves and connected with the shoe by a flexible connection—such, for instance, as an eyebolt k^2, as shown.

The operation is as follows: As the car I advances the inclined end portion of the lower edge of the shoe J comes in contact with the trolley-wheel G' next in front of it, and, as the car still advances, this inclined surface, acting upon the said trolley-wheel, forces said wheel and the plunger G downward against the action of the spring H. When these parts have reached their point of lowest depression, the lower end of the plunger G will be in contact with the line-wire E, pressing the same against the post or support C', so as to insure a firm and intimate contact. The current will then pass from the line-wire through the plunger G, trolley-wheel G', shoe J, and connecting-wires i^2 to the motor I'. As the car advances still farther, the reverse incline at the other end of the shoe J will permit the plunger and its trolley-wheel to rise under the influence of the spring H, thereby breaking the contact between the plunger G and line-wire E. It will be observed that several of the trolley-wheels and their plungers will be simultaneously depressed by the shoe J, and that before the said shoe has passed clear of any one of these parts so depressed it will have engaged the next trolley-wheel in succession and will depress the same and thereby form a contact with the line-wire to take the place of the contact just broken at the rear end of the shoe. The vertical rigidity of the shoe-body insures a proper depression of the trolley-wheels and their plungers, while its lateral flexibility permits it to adapt itself to any curves which may exist in the track and in the slot *a*, and at such points of curvature the non-conducting rollers J' will by their contact with the metallic edges of the said slot prevent the body of the shoe from coming into contact with the said edges, which contact would tend to divert the current from the motor and be attended with danger to any one coming in contact with the metallic portions of the road-bed. It will be noted that the line-wire E is entirely inclosed in a conduit or pipe filled with non-conducting material, access be-

ing had thereto for contact purposes only at intervals and at such contact-points only by means of plungers, which are normally out of contact with the wire. By reason of this construction a minimum leakage or waste of the current and a maximum of safety, so far as the diversion of the current to the metallic portions of the road-bed is concerned, are obtained. The particular construction of the plunger and its supporting devices prevents access of dust, water, or any other detrimental substances to the point of contact between the plunger and line-wire. It will be observed that the piston G^2 tightly closes the recess d', so that nothing can enter the said recess except through the comparatively minute air-passage g^3, and this latter is bent at a right angle, so as to minimize the chance of any dust or dirt passing through the same. The plunger is further guarded from extraneous substances by means of the circular flange d^3, the cap f, and the packing f', this series of safeguards rendering it almost impossible for any injurious matter of any nature whatever to have access to the plunger after it enters the tube F'.

As I have already stated, the construction shown and described is particularly adapted for use in converting cable roads to electric roads, as it will be readily seen that the pipe B and the plunger-supporting devices can be placed within the conduit without any alterations in the structure thereof, while the shoe J may be readily constructed of such dimensions as to prevent the necessity of any alterations in the size or structure of the slot a of the conduit A. I have also previously stated, however, that my invention is not limited to this particular application, and it will at once be obvious that the advantages of safety and of prevention of current waste will be attendant upon the particular manner of inclosing and contacting with the line-wire, whether the same be used in an underground conduit or elsewhere. I therefore do not wish to be understood as limiting myself to the precise construction shown and herein described.

As a still further protection against loss of current by contact between the shoe J and the walls of the slot a, I have devised a modified form of shoe, which is shown in Fig. 6, in which the bottom of the shoe is provided with a contact-wire J^3, insulated therefrom by blocks j^4 of porcelain or other non-conducting material. This wire bears on the wheels G', which do not come into contact with the shoe proper. It will be understood, of course, that the wire J^2 will be suitably connected with the motor I' without including the shoe J in the circuit, so that contact of said shoe with the walls of the slot a will not divert the current.

Instead of forming the vent or air-passage through the piston G^2, it may be formed through the bottom or side of the standard-head, as indicated in dotted lines in Fig. 4.

What I claim is—

1. The combination, with a continuous insulated conductor, a conduit inclosing said conductor and its insulation, and a plurality of vertically-movable conducting-plungers held normally out of contact with said continuous conductor and adapted to contact with the same when depressed, of a vehicle provided with a shoe having a vertically-rigid and laterally-flexible body to successively bear vertically on said plungers and depress the same, substantially as described.

2. The combination, with a continuous insulated conductor, a conduit inclosing said conductor and its insulation, and a plurality of vertically-movable conducting-plungers, each provided with a wheel at its upper end and provided with a spring to hold its lower end normally upward and out of contact with the continuous conductor, of a vehicle provided with a shoe having a vertically-rigid and laterally-flexible body to successively bear vertically upon the rollers of the plungers and depress these latter into contact with the continuous conductor, substantially as described.

3. The combination, with a slotted underground conduit and a conductor therein, of a flexible contact-shoe adapted to ride in the slot of the conduit and provided with non-conducting rollers projecting from its sides to contact with the walls of the slot, substantially as described.

4. The combination, with a line-wire, of a pipe inclosing the same and composed of sections, T-couplings connecting the several sections and each provided with an insulated supporting-block for the line-wire, and a standard connected with each T-coupling by a tube and provided with a contact-plunger sliding therein, substantially as described.

5. The combination, with an insulated conductor and a pipe inclosing the same, of contact-plungers arranged at intervals along the pipe, a standard for each plunger, provided with a chamber and a spring therein, and a vented piston of non-conducting material secured to the plunger, fitting the chamber, and bearing on the spring, substantially as described.

6. The combination, with a line-wire, a pipe inclosing the same, and an insulating-filling, of chambered standards arranged at intervals, an insulated tube extending from the chamber of each standard to the interior of the pipe, an insulating-cap and packing for the upper end of said tube, a contact-plunger fitting in each tube and provided with an insulating-piston fitting the chamber of the standard and having an air-vent, and a spring located in said chamber and bearing against the piston, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

CHARLES P. TATRO.

Witnesses:
TAYLOR E. BROWN,
IRVINE MILLER.