No. 630,153. Patented Aug. 1, 1899.

W. A. P. WILLARD, Jr.

TROLLEY RAIL FOR ELECTRIC ROADS.

(Application filed Dec. 24, 1898.)

No Model.) 2 Sheets—Sheet 1.

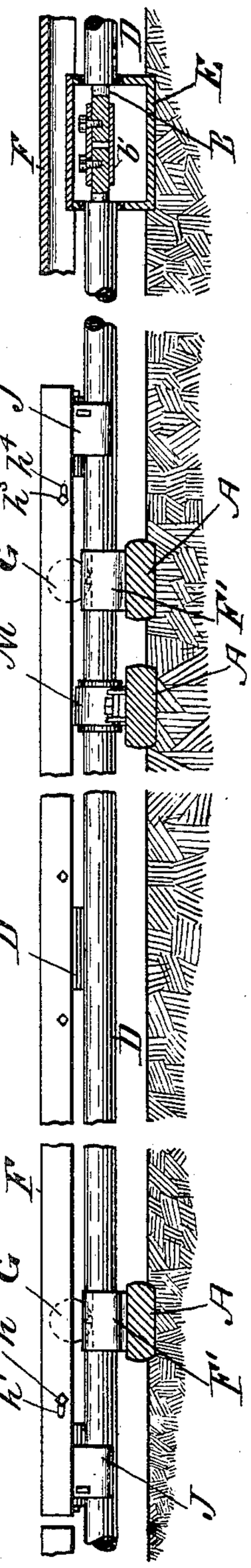

Fig. 1.

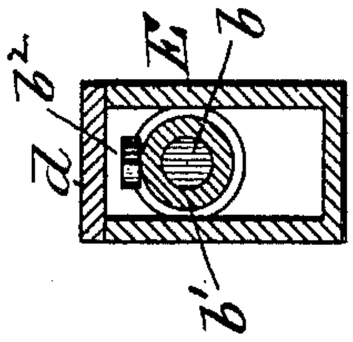

Fig. 4.

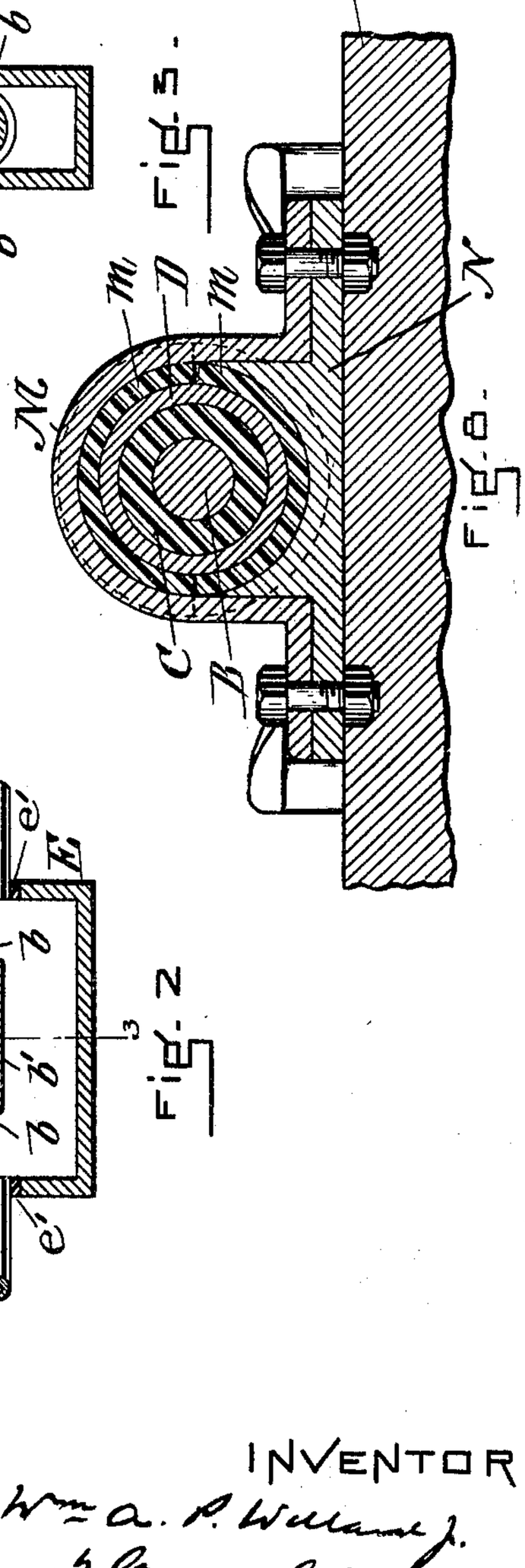

Fig. 3.

Fig. 2

WITNESSES

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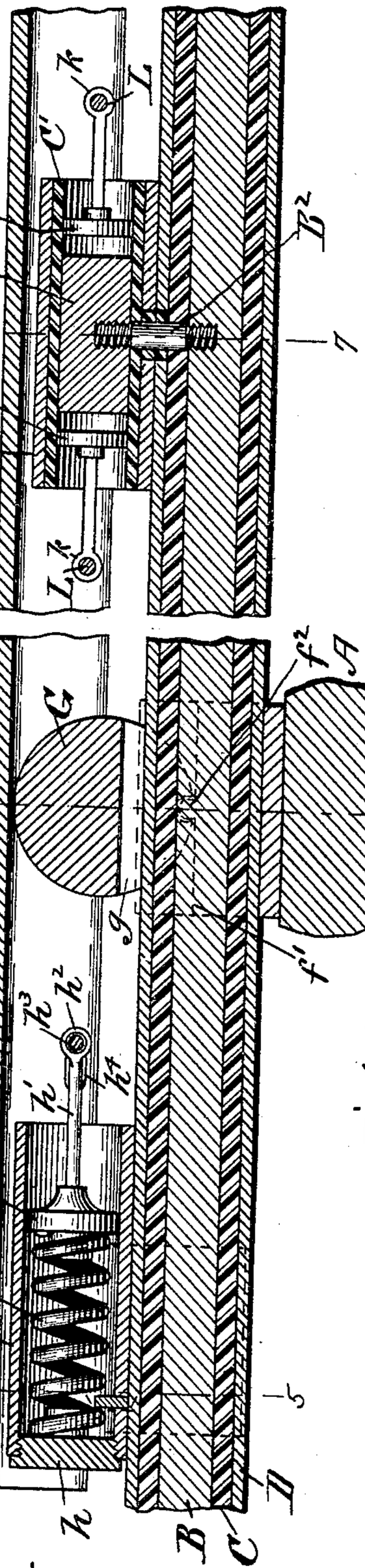

Fig. 1.

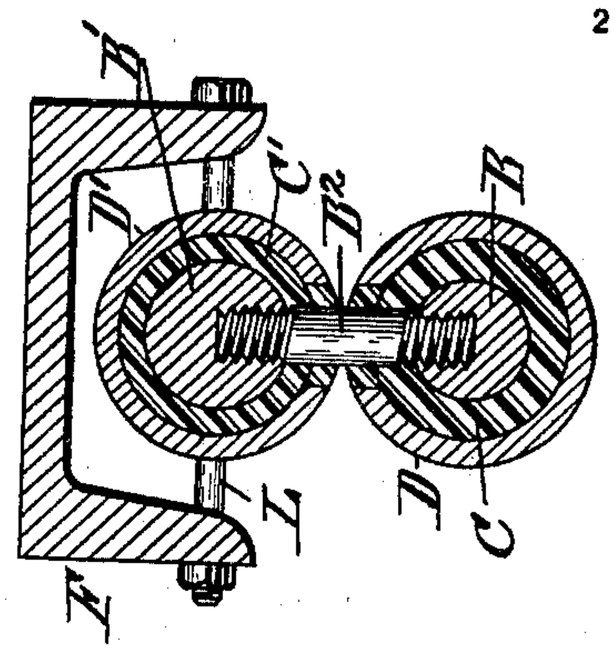

Fig. 7.

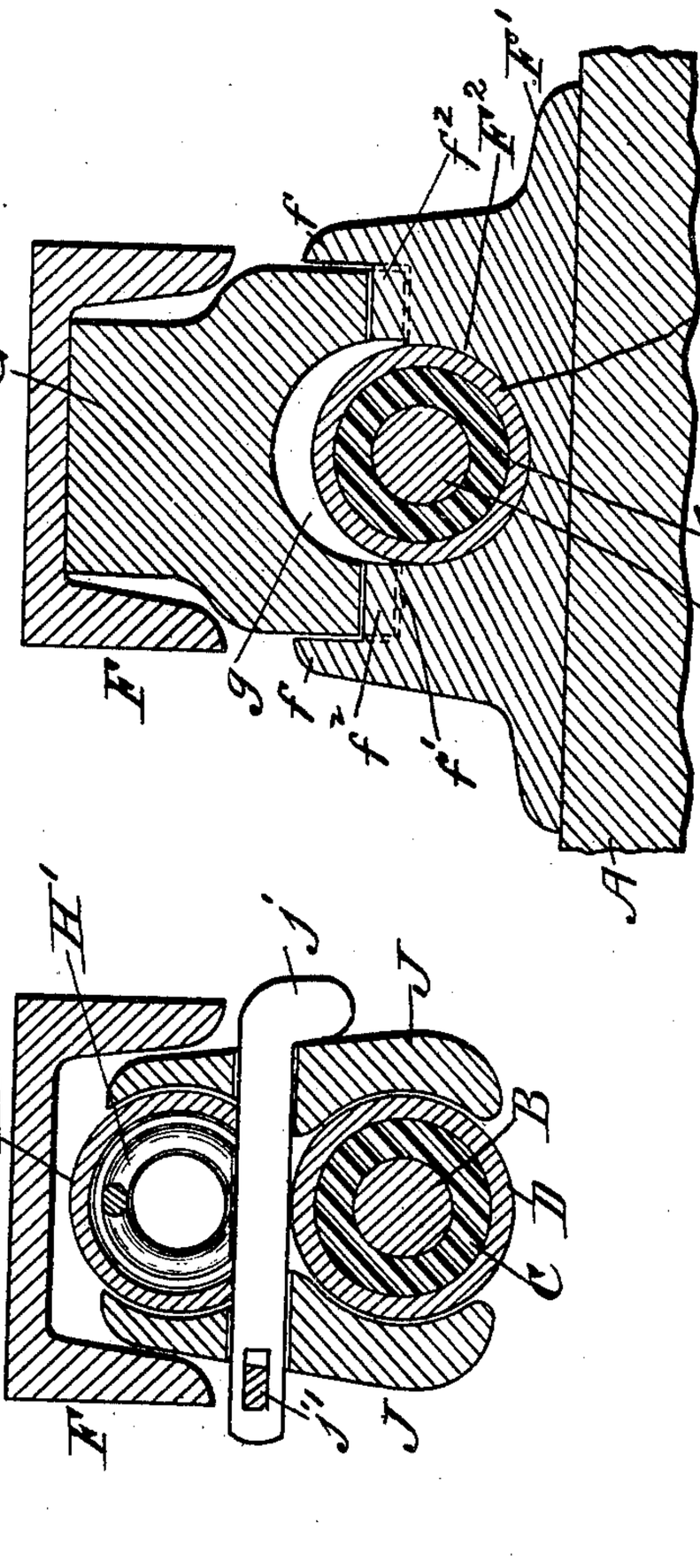

Fig. 6.

Fig. 4.

Fig. 5.

WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM A. P. WILLARD, JR., OF HULL, MASSACHUSETTS.

TROLLEY-RAIL FOR ELECTRIC ROADS.

SPECIFICATION forming part of Letters Patent No. 630,153, dated August 1, 1899.

Application filed December 24, 1898. Serial No. 700,208. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. P. WILLARD, Jr., of Hull, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in Trolley-Rails for Electric Roads, of which the following is a specification.

My invention relates to that class of trolley-rails in which the portion to be engaged by the shoe or trolley carried by the car is normally out of electrical engagement with the conductor, but when moved horizontally is thrown into electrical engagement therewith and so supplies the current through the trolley to the car-motor. Such systems belong to the class known as "third-rail" systems and are usually operated by means of a shoe laid down from the car and capable of a horizontal movement after being engaged with the rail, so that when the car is stationary the rail may be moved horizontally by means of the shoe to make the necessary electrical contact to convey current through the motor carried by the car.

My invention consists in details which it is believed will greatly improve such rails both in construction and in operation.

My invention will be understood by reference to the drawings, in which—

Figure 1 is a side elevation of a portion of a trolley-rail embodying my invention. Fig. 2 is a longitudinal section showing the connection between two ends of the conductor. Fig. 3 is a section on line 3 3 of Fig. 2. Fig. 4 is a longitudinal section of a portion of the rail shown in Fig. 1, drawn to a larger scale and showing the various operative parts. Fig. 5 is a corresponding section on line 5 5 of Fig. 1. Fig. 6 is a corresponding section on line 6 6 of Fig. 1. Fig. 7 is a corresponding section on line 7 7 of Fig. 1, and Fig. 8 is a section showing the mode of clamping the conductor-tube to the sleepers.

A represents the sleepers to which the rails forming the track are attached and which are also used in this case to carry the third rail, preferably laid midway between the two rails of the track. Upon these sleepers is laid in suitable chairs (see, for example, Fig. 8) an insulated conductor. The form of insulated conductor which seems to me now most desirable for this purpose is one having a conducting-core B, surrounded by an insulating-covering C, the whole inclosed for protection in a pipe D, which may be of iron or any other suitable material. This conductor may be laid in sections as long as are convenient. It is best fastened in place as shown in Fig. 8, in which N is a chair grooved to hold the pipe D, which carries the conductor. A strap M, passing over the pipe D and bolted at each end to the chair N, holds the pipe in place, two segments *m m*, of porcelain or other insulating material, surrounding the pipe D and preventing any possible leakage therefrom. The whole may be spiked or otherwise secured to the sleeper. Two sections of this conductor may be conveniently joined in the following manner. (See Fig. 2.)

E is a box, preferably of metal, which has two openings opposite each other surrounded by insulating-collars e' to receive the incoming and outgoing tubes D, the box having a suitable cover *d*. These tubes D pass through the walls of the box, but do not pass within the box, the ends *b b* of the conductor passing, however, to the center of the box, where they meet and are bound together by a cylindrical or other shaped bond b', of brass or other conducting material, which is bolted to the two ends of the conductor by bolts b^2.

F is a contact-rail having depending flanges. It is supported also upon the sleepers in the manner shown especially in Figs. 4 and 6. F′ is a chair provided with a groove F^2 to receive the conductor inclosed in its tube D. This chair may be spiked or otherwise secured to a sleeper and is provided with side rails *f* at its top, between each of which and the groove F^2 is a track f', supporting the supporting-roll G. This roll is thinner at the top than at the bottom in order to lie and roll easily between the flanges of the contact-rail F, its bottom also being grooved at *g*, so that as it rocks it will not touch the tube D. The roll is also grooved on its bottom in a line parallel with its axis, these grooves being of proper size to fit over projections or ribs f^2, formed on the track f' above referred to, this construction being for the purpose of preventing the roll G from traveling as it rocks. Upon the top of the roll G rests the contact-rail F. A longitudinal push given to the contact-rail in either direction will cause it to

reciprocate upon these rolls G as friction and supporting rolls.

To limit the travel of the contact-rail F and return it to its normal position after it has been moved, I provide at each end thereof a cylinder H, having its outer end closed by a plug *h*. Within this cylinder is a spring H′ and a follower H^2. The cylinder may be held in place in the manner indicated in Fig. 5, in which there are shown two clamping-plates J, shaped to fit and partially surround both the cylinder H and the tube D and bind them firmly together. These plates are slotted to receive a headed pin *j*, having at its narrow end a slot to receive a key *j*′, this pin *j* holding the clamping-plates J tight against the cylinder H and tube D. The pin *j* also passes through the cylinder H and keeps it from moving longitudinally. To operate this spring mechanism, I provide the follower H^2 with a rod *h*′, carrying an eye h^2 at its outer end, through which is passed a bolt h^3, which passes also through a slot h^4 in the flanges of the contact-rail F.

To establish electric contact, I provide a contact mechanism, connected to the contact-rail, which will make contact only when the rail is at either end of its stroke. Such a contact mechanism is shown in Figs. 4 and 7 and consists of a protecting-tube D′, an insulating-tube C′, and a short piece of conductor B′, the three being arranged as shown in Fig. 4. The conductor B′ is somewhat shorter than the tube D′ and with the tube C′ D′ forms the central head of a double cylinder, each end of which carries a follower K K′. This device is tapped in its middle, and into it is screwed a short piece of conductor B^2. The lower end of this conductor B^2 is threaded, and the structure as a whole is screwed down through a tapped opening in the tube D into the conductor B, thus forming an electrical contact between B and B′. The conductor should be carefully insulated from both D and D′. To operate this mechanism, the rod of each follower K K′ is provided with an eye *k*, through which passes a bolt L, running through the flanges of the contact-rail F. (See Fig. 7.) The normal position of each follower is at some little distance from the end of the conductor B′, that distance depending upon the amount of travel which it is intended shall be given to the contact-rail F.

The operation of my device is as follows: The rail F is normally out of electrical contact with the conductor. If the car is to be started, a contact-shoe carried by the car and adapted to be given a downward, forward, and backward movement is pushed downward and, for example, in the direction indicated by the arrow in Fig. 4. This will move the contact-rail F against the strength of the spring H′, (shown at the left of Fig. 4,) because of the engagement of the bolt h^3 with the end of the slot h^4, and this movement will carry the piston K′ against the opposing end of the conductor B′, thereby making electric contact from the conductor B, through the joint B^2, to the conductor B′, follower K′, and its rod to the bolt L, and from it to the track F and through the shoe to the motor, the circuit being completed through the car-wheels or in any other desired manner. The current being thus given to the motor, the car is moved off this section and onto the next section. When the shoe has left this section, the spring H′, expanding, throws the parts back into the position shown in Fig. 4, breaking contact between the rail and the conductor, and the contact between the contact-shoe and the rail F of the next section causes it to move in a similar manner and give to the motor the current. If the car is to move in the opposite direction, the direction of movement of the contact-rail is reversed by the contact-shoe, the spring H′ at the end of the rail (not shown) being compressed, the tension of the spring H′ shown in the drawings remaining as shown, because of the sliding of the bolt h^3 in the slot h^4 and the follower K making contact with the opposing face of the conductor B′. In either case the contact-rail moves freely except as its movement is controlled by a spring H′ upon the friction-rolls G. The direction of the current through the motor is controlled by devices on the car.

My invention is not limited to the peculiar construction shown in the drawings, but it may be embodied in a variety of forms. The contact-rail moves horizontally and longitudinally, and hence cannot be brought into electric contact with the conductor by means merely of the downward pressure of a person stepping on it or of a horse or carriage. I prefer to make it in sections of, say, twenty to thirty feet, though it may be made of any convenient length. The conductor also may be of any convenient length, its length depending upon the convenience of manufacture and not upon the length of the trolley-rail sections. The structure can be easily laid and without the help of skilled labor, which makes it advantageous, and when laid it renders the third rail, which heretofore has been dangerous in many of its forms of construction, absolutely safe.

What I claim as my invention is—

1. In a third-rail system, an insulated conductor and means for supporting it, said means consisting of a suitable chair adapted to be attached to a sleeper, insulating-segments adapted to rest in said chair and surround said conductor, and a strap passing over said segments and attached at each end to said chair, all as and for the purposes described.

2. In a third-rail system, means for electrically connecting adjacent ends of two sections of the conductor, said means consisting of a covered box having in two sides opposite each other openings provided with insulating-linings to receive the ends of the conductor-

sections and insulate them from said box, and a conducting-bond adapted to receive and be bound to the conducting-sections, in combination with said conducting-sections, the ends of which within said box are uninsulated, all as set forth.

3. In a third-rail system in combination with an insulated conductor and a horizontally-movable rail suitably supported above said conductor and normally out of electrical contact therewith, means for making electrical contact with said conductor, said means consisting of a contact-piece normally insulated from said rail, and two contact-followers each attached to said rail and located one on each side of said contact-piece and in proximity thereto, whereby the movement of the rail in either direction will make electrical contact with said contact-piece, as and for the purposes set forth.

4. In a third-rail system, an insulated conductor, a third rail adapted to be moved horizontally and means whereby electrical contact is established between said third rail and said conductor, said means consisting of a contact-piece electrically connected with said conductor and surrounded by an insulating-cylinder, in combination with two followers, each located in said cylinder one on either side of said contact-pieces and each movable within said cylinder, each follower being provided with a link connection with said rail, all as and for the purposes set forth.

5. In a third-rail system, a conductor provided with contact-pieces and a third rail having contact-followers located thereon on each side of a contact-piece and means whereby said followers are kept out of contact with said contact-piece, said means consisting of two cylinders, one at each end of said rail, each containing a spring, and a follower connected to said rail by a slotted connection, as and for the purposes set forth.

6. In a third-rail system having an insulated conductor a third rail, a follower linked thereto and a spring-containing cylinder carrying said follower, means for holding said cylinder in place, said means consisting of two clamps adapted to engage with said conductor and said cylinder, and a cross-pin passing through said clamps and said cylinder and means whereby said pin is held in place and said clamps are bound against said cylinder and said conductor, as and for the purposes set forth.

In testimony whereof I have set my name this 22d day of December, 1898.

WM. A. P. WILLARD, JR.

Witnesses:
HELEN MARGETTS,
BERTHA A. WILLARD.