

(No Model.)

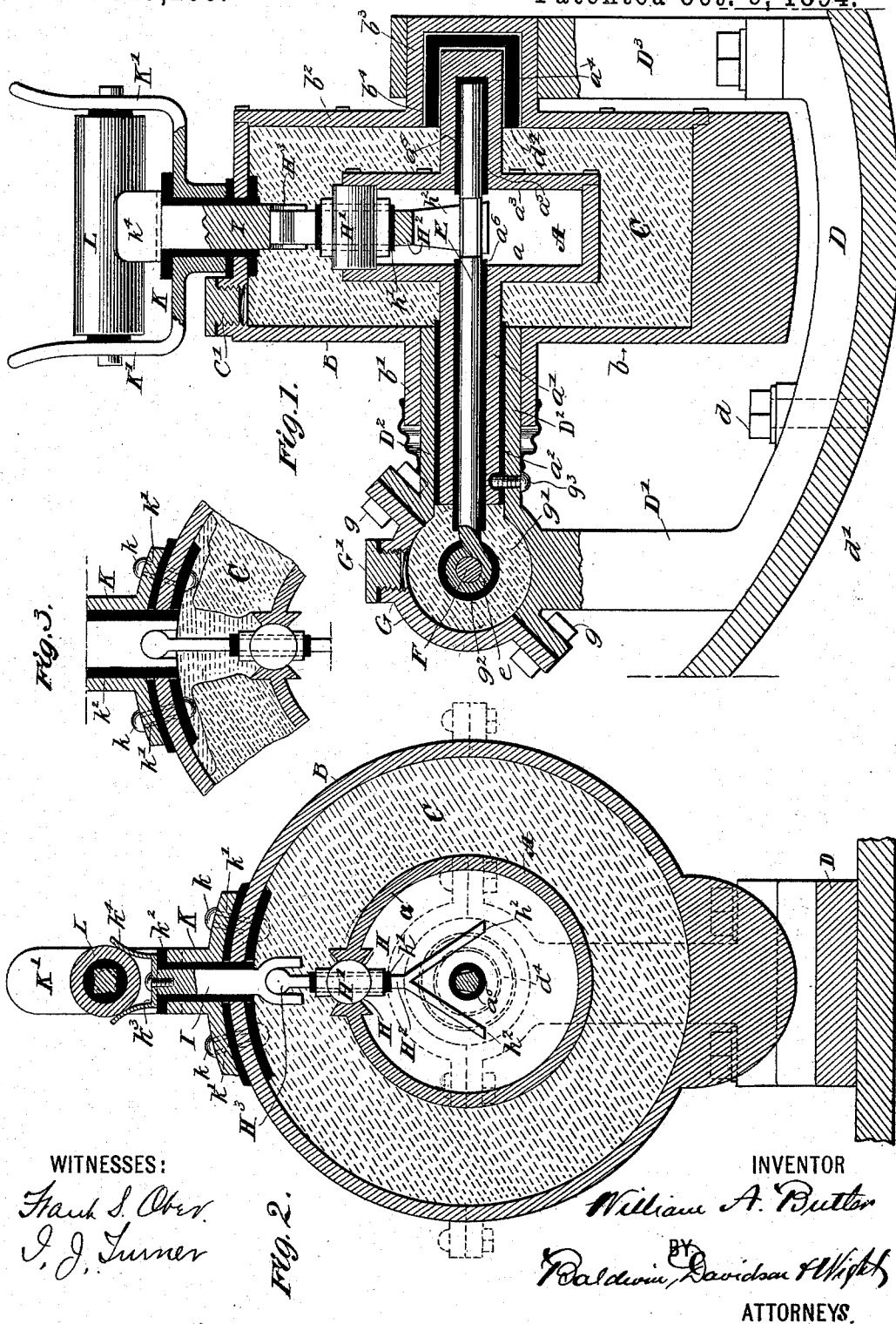
3 Sheets—Sheet 1.

W. A. BUTLER.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

No. 527,265.

Patented Oct. 9, 1894.



WITNESSES:

Frank S. Ober.
J. J. Turner

INVENTOR

William A. Butler

BY

Ralston Davidson & Wright

ATTORNEYS.

(No Model.)

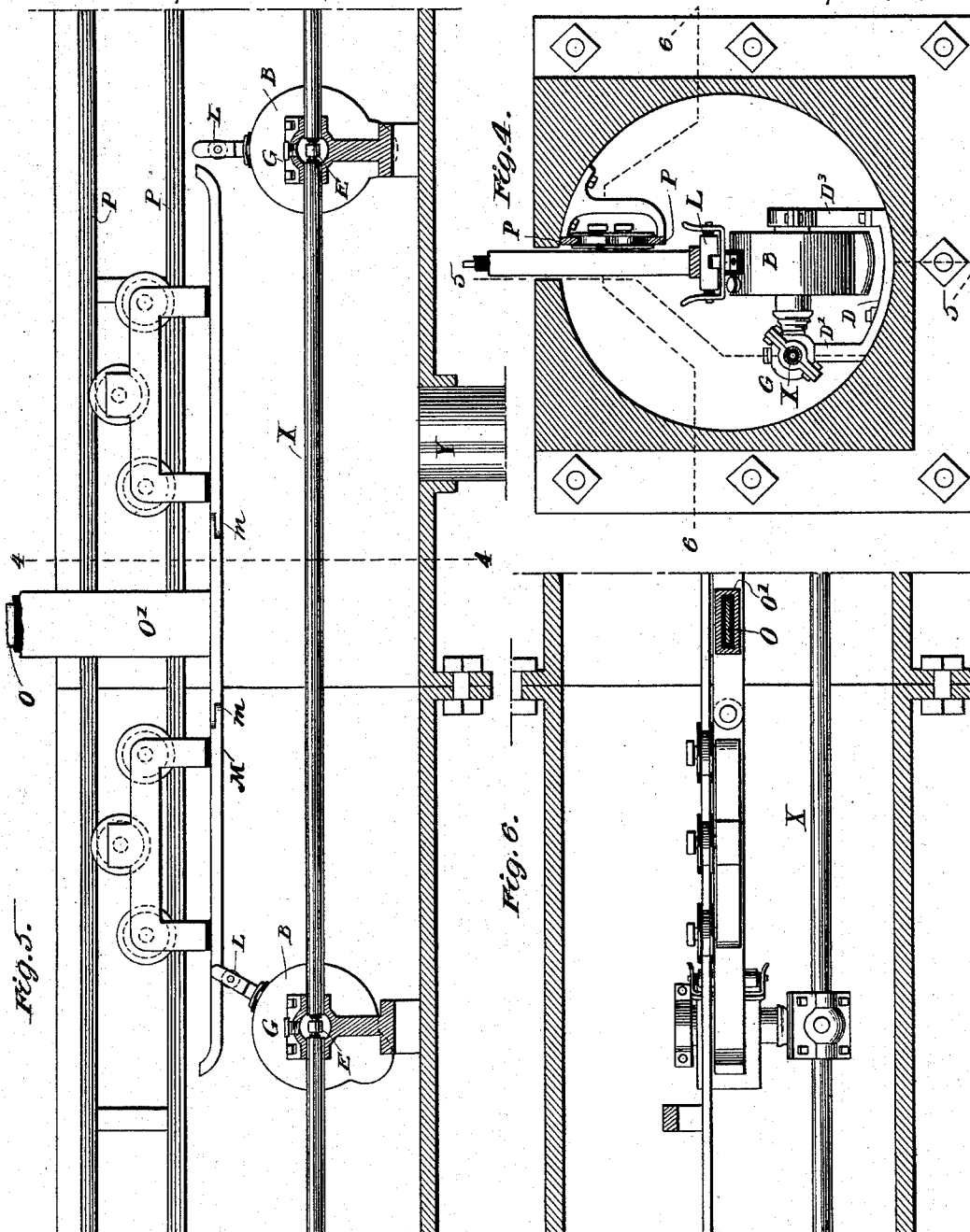
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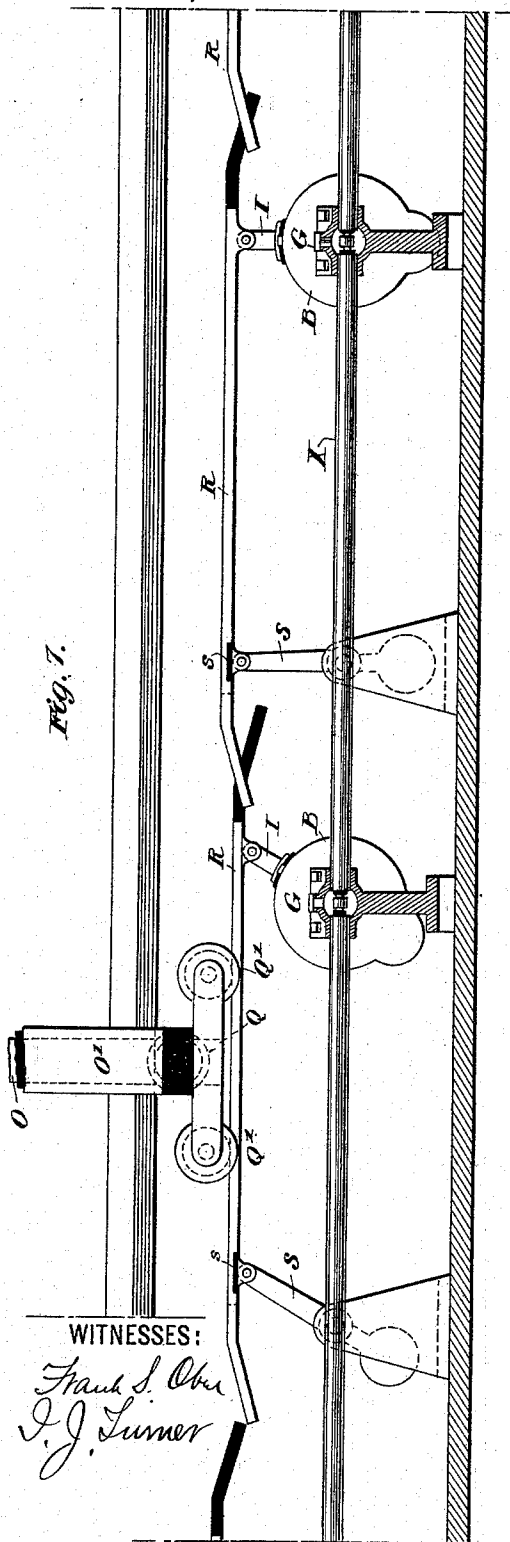
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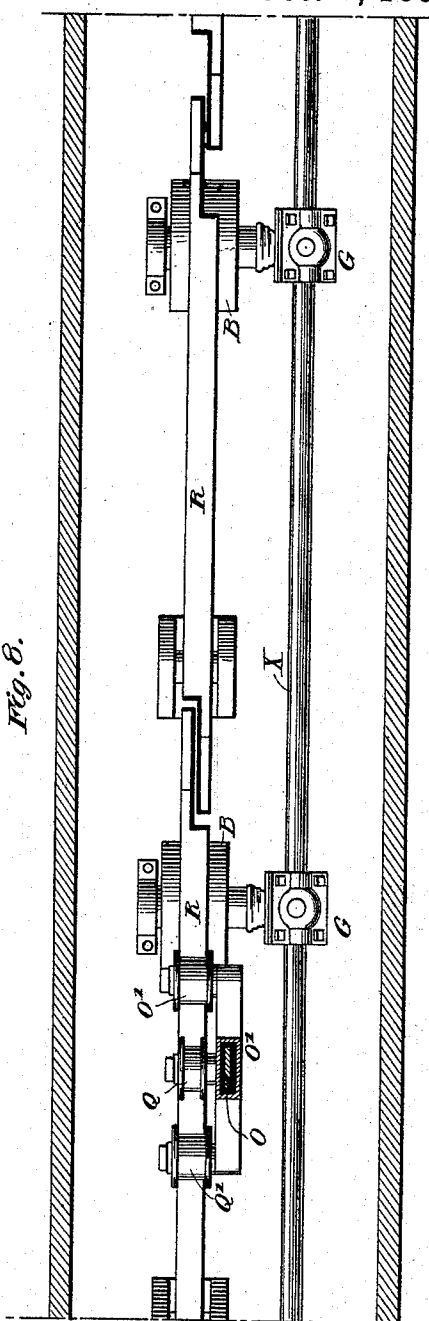
Fig. 7.



WITNESSES:

Frank S. Ober
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Fig. 8.



INVENTOR

William A. Butler

BY
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ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM A. BUTLER, OF NEW YORK, N. Y., ASSIGNOR TO JOHN GILMORE
BOYD, OF SAME PLACE.

CONDUIT SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 527,265, dated October 9, 1894.

Application filed April 20, 1894. Serial No. 508,322. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. BUTLER, a citizen of the United States, residing at New York, in the county and State of New York, 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 contact devices are arranged at intervals in a slotted conduit beneath the roadway.

The object of the invention is to insure a thorough insulation of the contact devices to prevent leakage and waste of current, and yet permit of a perfect completion of the circuit through the motor carried by the car. To this end I arrange the electrical contacts within an insulating box of a peculiar construction, the principal feature of which is, that the contact devices which establish connection with the main circuit are inclosed within an inner box which is surrounded by a larger box, the space between the two boxes being filled with insulating material. The outer shell or box has a slight rocking motion around the inner shell by which the internal contact device of the inner shell is operated, and through the medium of suitable conductors extending to the outside of the outer shell, a circuit is established through the brush or shoe carried by the traversing car.

The details of construction and features of novelty are hereinafter more fully set forth.

As will be obvious after understanding my organization, the contact boxes may be located in the conduit in such a way that the under face of the shoe or brush carried by the car will form contact with the conducting part of the outer shell, and cause the required movement thereof, or the boxes may be arranged within the conduit in any of the ways or according to any of the systems well known in the art and to which they are applicable.

My invention also contemplates that the brush or contact device carried by the car shall be a trolley of one or more wheels, and that the moving parts of adjacent boxes may be connected pivotally to an elongated trolley bar upon which the wheels may run, and

in all cases I provide weights or springs, by which the movable outer shells of the boxes and the trolley bars connected thereto, shall be returned to their normal position after the passage of the contact shoe or trolley.

Any style of construction of conduit may be employed in connection with my invention. I have preferred to illustrate that shown, described and claimed in the patent of Cassidy and Butler, No. 515,572, dated February 27, 1894. The flanged ends of the conduit sections of that construction may be formed with laterally projecting brackets to afford supports for the rails, or girders upon which the rails are mounted. I have shown the contact boxes arranged immediately beneath the slot in the conduit. They might obviously, however, be placed at one side as is common in many systems of conduit construction.

The accompanying drawings show my invention in a practical and efficient form now best known to me, but obviously the details of construction or organization may be modified by those skilled in the art.

Figure 1 is a longitudinal vertical section through one of my improved contact boxes; Fig. 2, a transverse section therethrough; Fig. 3, a detail view showing a modification; Fig. 4, a transverse section through a conduit on the line 4, 4, of Fig. 5; Fig. 5, a longitudinal section on the line 5, 5, of Fig. 4; Fig. 6, a longitudinal section on the line 6, 6, of Fig. 4; Fig. 7, a longitudinal section of a conduit showing the organization in which trolley bars or tracks are employed and upon which a trolley carried along by the car runs; and Fig. 8 is a plan view of the same organization, the walls of the conduit as well as the hanger from the car being shown in section.

Figs. 1 and 2 show one form in which my improved principle of construction of the contact boxes may be embodied. Each box is composed of an inner shell A, and an outer shell B both preferably cylindrical. They may be made of iron or other suitable material and preferably both the interior and exterior faces of all the parts of both shells should be coated with insulating material, such for instance as vitreous enamel or japan. The inner shell is to be stationary and the outer one is to have a slight rocking or oscil-

lating motion around it, and the space between the two may be filled with insulating material C, such for instance as oil or paraffine, which may be introduced at the opening 5 in the outer shell, closed hermetically by the plug C', or in other ways, one of which is hereinafter described.

The parts may be constructed and arranged as follows: A box supporting bracket or frame 10 D adapted to be secured in the conduit and upon the wall thereof, as for instance by one or more bolts d, d' representing the wall of the conduit, is formed with an arm D', the upper end of which is formed like one half of a divided coupling box such as used for making 15 electrical connections, and a tube D² extends from the recess thereof. The inner shell A is formed in two parts. One part is a circular cup a from which a tube a' extends. This 20 tube lies in the tube D² of the bracket and the annular space between the two tubes is filled with insulation a^2 which may be of hard rubber or other suitable material. All the parts should be tightly fitted together. The 25 other part of the inner shell is the cover a^3 which is bolted to a , as shown, and is preferably formed with a hollow hub or projection a^4 . A cup a^5 of insulating material fits tightly in the hollow hub and a cylinder a^6 30 of insulating material fits tightly in the tube a' . A conducting rod E extends through the sleeve of insulating material a^6 , and into the cup of insulating material a^5 , and its projecting end e is to be secured to the main 35 conductor F, which extends along the conduit and is supported in the coupling boxes at the ends of the arms D' of the brackets D. This joint may be formed as follows: The lead armor and insulation of the main con- 40 ductor is cut away as seen for instance in Fig. 5, and the end e of the rod E is secured to it. This may be done by bending the end e around the conductor and soldering it if desired. The other half or cover G of the 45 coupling box is then placed in position and secured by bolts g to the half of the coupling formed on the end of the arm D'. Through an opening in the cover G, closed by a screw 50 plug G', insulating material may be introduced in a liquid form to completely fill the interior space of the coupling, such insulating material being marked g' . The black circle g^2 surrounding the conductor F indicates the insulation thereof.

55 As seen in Fig. 2, the cylindrical shell or cup a is a slotted longitudinally, and the opposite walls of the slot H are concave, being curved on the arc of a circle to form a bearing for a cylindrical plug H', which may be 60 inserted endwise before the cover a^3 is placed in position. Tight joints are formed, and consequently the inner shell A is practically hermetically closed. The cylindrical plug H' is bored transversely to receive a bushing 65 h' of insulating material, through which a contact arm H² passes and in which it tightly fits. The lower end of the arm is bi-

furcated or provided with two spring blades h^2, h^2 , which straddle the conductor E located 70 axially within the shell as already described; and the outer end of the arm is formed with a cylindrical head H³ that is seated in a socket in and makes electrical contact with a con- 75 ductor I rigidly carried by the outer shell B, and insulated therefrom. The construction of the outer shell B may be substantially that 75 of the inner shell, that is to say, it is made in two parts, one part b being a cylindrical drum from which a hollow bearing b' extends, this hollow bearing being mounted and turning 80 upon the exterior of the tubular projection D² of the bracket. This joint or bearing might be packed in any usual and well-known way, or I may employ some such arrangement as that shown in Fig. 1, viz: I cover the joint 85 by a flexible tube which may be corrugated, and one end of which is cemented to the exterior of the tube D², and the other end to the exterior of the hollow bearing b' . The other 90 part b^2 of the exterior shell consists of a cover which is bolted to the part b , and is formed with a hollow hub b^3 , which has its bearings in a removable arm D³ of the bracket D. A 95 cup d^4 of insulating material is seated in the hollow hub and in such cup is seated the hollow hub a^4 of the inner shell. This man- 95 ner of connecting and mounting the inner shell will hold it rigidly, though I may as an additional precaution provide a set screw g^3 passing through the tube D², and engaging 100 the tubular projection a' of the inner shell, suitable insulating material being preferably introduced between the end of the screw and the latter tube. It will now be obvious that 105 the rocking motion of the outer shell of limited extent will cause either of the spring contact plates h^2, h^2 to be pressed into contact with the conducting rod E, the sides of which 110 may be flattened, if desired, as is indicated in Fig. 2, and that current may therefore be taken from the main conductor F through 110 the conducting rod E to contact h^2 , and arm H² to the conductor I, rigidly mounted in the outer shell.

In Fig. 2 the end of the rod I with the 115 socket for the cylindrical end H³ of the conducting arm H² extends inwardly beyond the wall of the outer shell. I may, however, construct the outer shell in a different manner; that is, it may be divided axially into two 120 halves formed with flanges to be bolted together as indicated in dotted lines in Fig. 2. In that event the socketed end of the conductor I need not extend into the shell, but 125 may be arranged as indicated in Fig. 3, and the upper half of the outer shell may be dropped into position, so that the cylindrical head H³ will be seated in the socket of the conductor I.

When the box is constructed as shown in 130 Figs. 1 and 2, the parts must be differently assembled, but the manner of assembling them is obvious and description is unnecessary.

A yoke K is bolted to the outer face of the shell B by bolts k , insulating material being placed between the yoke and the outer face of the shell, and between the inner face of the shell and the heads of the rivets or bolts k , and as indicated by the dotted lines k' a bushing of insulating material is placed around the bolts k . A flanged bushing k^2 passes through the hollow hub of the yoke, and within this bushing closely fits the socketed conductor I. A cap k^3 is bolted to the outer end of the conductor I and is formed with two contact faces or blades k^4 in contact with which a roller L of conducting material rotates. This roller revolves upon an axis of insulating material, supported in the arms K' , K' of the yoke K.

As before stated I contemplate filling the space between the inner and the outer shell with insulating material. In the construction shown in Figs. 1 and 2, I prefer that the space shall be filled with oil. In the construction indicated in Fig. 3, the space may be filled with paraffine. The slight movement of the upper end of the conducting arm H^2 will compress the paraffine and form a space of sufficient extent to permit the free movement of the arm; or if the space were filled with rubber, its elasticity would permit of the required movement of the arm. In order to return the outer shell to the normal position after it has been struck by the moving shoe of a car, I may weight it at the bottom as indicated in Figs. 1 and 2, or springs may be employed, and where a packing or filling of rubber between the shells is employed, its elasticity assists the return of the outer shell to the normal position. Where paraffine or rubber is used to fill the space between the two shells, it may be introduced at the point C' in liquid form, or I may mold it about the inner shell and then clamp the two parts of the axially divided outer shell upon it.

I contemplate that the box shall be assembled as shown and described, and the only work to be performed in the conduit will be to bolt the brackets D to the wall of the conduit or to such other support therein as may be provided. As shown in Figs. 4, 5 and 6, the contact boxes are placed at suitable intervals within the conduit, and are swept by an elongated brush or contact shoe M, carried by the car.

To provide flexibility in passing around curves the shoe may be jointed as indicated at m , or the same purpose accomplished in other well-known ways. The ends of the shoe are preferably rocker shaped, and as the car passes along, the shoe makes contact with the roller of one contact box before leaving that of the box immediately preceding. As the curved or rocker shaped end of the shoe strikes the roller L of the contact box, it rocks the outer shell of the box and the conductor I turns the contact arm H^2 upon its bearings H and establishes contact between one of the contact blades h^2 and the conduc-

tor E within the box. A circuit is therefore completed from the main conductor to the shoe, and to the motor on the car through the central insulated conductor O of the hanger O', depending from the car and to which the shoe is attached. In order to guide the shoe accurately, I may form within the conduit a track P P consisting of upper and lower rails upon which run grooved wheels, mounted in frames attached to the end sections of the jointed shoe. In these figures, X indicates the armored main conductor passing along the conduit, and through the couplings G within which the conductors E are attached to the bared main conductor. At intervals I place in the bottom of the conduit drains or traps Y that discharge into the sewer connections.

Another feature of my invention is illustrated in Figs. 7 and 8 wherein the general organization is the same as that already described, except in the following particulars: Instead of using a shoe I employ a trolley on the hanger carried by the car. This trolley may have three grooved wheels, one insulated Q which runs upon a guide rail at the top, and two others Q' which run upon a sectional conductor formed as follows: The end of the conducting rod I extending from a contact box is pivoted to an elongated conductor R, and the same conductor may be similarly supported at another point by a like pivoted arm as S. Such a series of conductors form a track, substantially as indicated in Figs. 7 and 8, upon which the trolley conducting wheels Q', Q' run. Normally the boxes maintain their usual upright position as indicated at the right hand side of Fig. 7, and hold the conducting rail or trolley track R in its highest position. As the conducting wheels Q', Q' run upon this section R of the track, the section is forced down at all points simultaneously, its action being a common parallel bar movement. In this way the connections of the main conductor are completed and the wheels Q', Q' conduct current as long as they are running upon that section of the track. When they leave it, the weights or springs already referred to restore the parts to their normal position, and the section of the track referred to is disconnected from the circuit.

The ends of the track sections R may be curved or turned downwardly and overlap as shown, and of course the trolley wheels Q', Q' make contact with one track section R before leaving the preceding one. The adjacent overlapping faces of the ends of the track sections might be insulated as indicated by the heavy lines in Fig. 8. Instead of having one track section R connected with two adjacent boxes, each section may connect with but one contact box, the other end of the track section being supported by a pivoted, weighted or spring controlled arm S, which however should preferably be insulated from the track section, as indicated at s in Fig. 7. By such an organization the number of boxes required

will be less than where each track section is connected with two boxes, and the expense of installing the system be correspondingly reduced. Of course the track sections are properly aligned with the guide rail, upon which the insulated roll Q runs, and there will be no liability of the trolley wheels Q', Q' leaving the sectional track.

As already stated, the contact boxes when used in accordance with the plan indicated in Fig. 4, may be located at one side of the conduit and not immediately beneath the slot, and similarly the sectional trolley track shown in Figs. 7 and 8 may be located at one side of the conduit.

I claim as my invention—

1. In an electric railway system, a contact box consisting of an inner closed stationary shell having a conductor arranged therein, extending therefrom and adapted to be connected with the lead of an electric circuit, an exterior shell capable of rocking about the inner shell, a contact arm carried by the inner shell, and adapted to be moved into contact with the conductor therein, and a conductor extending through and carried by the outer shell and mechanically and electrically connected with the contact arm of the inner shell, substantially as set forth.

2. In an electric railway system, a contact box consisting of an inner closed stationary shell having a conductor arranged therein, extending therefrom and adapted to be connected with the lead of an electric circuit, an exterior shell capable of rocking about the inner shell, a contact arm carried by the inner shell, and adapted to be moved into contact with the conductor therein, a conductor extending through and carried by the outer shell and mechanically and electrically connected with the contact arm of the inner shell, and insulating material filling the space between the two shells, substantially as set forth.

3. In an electric railway system, a contact box consisting of a closed stationary inner shell having arranged therein a contact or conductor adapted to be connected with a circuit exterior to the shell, a contact arm pivoted in or upon the inner shell and adapted to make electrical connection with said conductor, a closed rocking exterior shell and a conductor therethrough, and mechanically and electrically connected with the contact arm of the inner shell, substantially as set forth.

4. In an electric railway system, the combination of the bracket having a coupling box G and a tubular extension D², of a contact box consisting of a closed stationary shell having a tubular projection seated in the tubular extension of the bracket, an insulated conductor extending from the chamber of the coupling G through the tube of the shell to the interior thereof, said conductor being formed with a connected tube, a contact face within the shell, a contact arm pivoted in

said shell and adapted to be moved into contact with said conductor, a closed exterior shell mounted upon the tubular extension of the bracket and having a conductor extending therethrough, and electrically and mechanically connected with the contact arm, substantially as set forth.

5. In an electric railway system, the combination of the bracket having a coupling box G and a tubular extension D², of a contact box consisting of a closed stationary shell having a tubular projection seated in the tubular extension of the bracket, an insulated conductor extending from the chamber of the coupling G through the tube of the shell to the interior thereof, said conductor being formed with a connected tube, a contact face within the shell, a contact arm pivoted in said shell and adapted to be moved into contact with said conductor, a closed exterior shell mounted upon the tubular extension of the bracket and having a conductor extending therethrough and electrically and mechanically connected with the contact arm, a main conductor or lead of the circuit secured in the coupling G and electrically connected with the conductor extending from the inner shell, and insulating material filling the space between the inner and outer shells, substantially as set forth.

6. In an electric railway system, a contact box consisting of a closed inner shell, a contact or conductor arranged therein, the cylindrical pivoted plug having its bearings in a slot in the rim of the shell, the rocking contact arm carried by the plug and adapted when moved to make contact with the conductor within the shell, the rocking exterior closed shell, a conductor extending therethrough and mechanically and electrically connected with said contact arm, and insulating material filling the space between the two shells, substantially as set forth.

7. In an electric railway system, a contact box consisting of a closed inner shell having the circuit conductor or contact located therein and an insulated pivoted contact arm extending through the shell, the inner end of which is adapted to be moved into connection with said conductor, the outer closed rocking shell having a conductor arranged in the wall thereof, and extending to the exterior thereof, said conductor being formed with a socket to receive the head or end of the contact, an arm whereby the contact arm is electrically and mechanically connected with the switch arm, and adapted to be moved by the rocking of the outer shell, substantially as set forth.

8. The combination, substantially as set forth, of a conduit, the main conductor running therethrough, a series of brackets, each having a coupling box through which the main conductor passes, and a contact box consisting of a closed inner shell, a rocking closed outer shell, a conductor or contact projecting from the outer shell, and controlling the contacts within the inner shell, and a contact de-

vice carried by the car adapted to rock the outer shells to complete the circuit.

9. The combination, substantially as set forth, of the conduit, contact boxes or devices arranged therein at intervals, a sectional trolley track each section being supported above the boxes by normally upright pivoted parallel bars and adapted when depressed to complete the circuit through the track section, the adjacent ends of track sections being respectively curved or inclined and having overlapping cut away ends with intervening insulation, and a conducting trolley carried by the car and running upon the sectional track.

10. The combination of a conduit, contact

boxes arranged therein at intervals and each having a pivoted conductor extending therefrom and controlling contacts therein, pivoted arms arranged in the conduit between the contact boxes, a sectional trolley track each section of which is pivotally connected with one end of said pivoted conductors and one of said pivoted arms, and the trolley wheel running on said track, the combination being and operating substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

WILLIAM A. BUTLER.

Witnesses:

FRANK S. OBER,
I. J. SUMER.