(No Model.) 2 Sheets—Sheet 1.

J. A. ROCHE.

ELECTRIC RAILWAY.

No. 574,171. Patented Dec. 29, 1896.

Fig. 1.

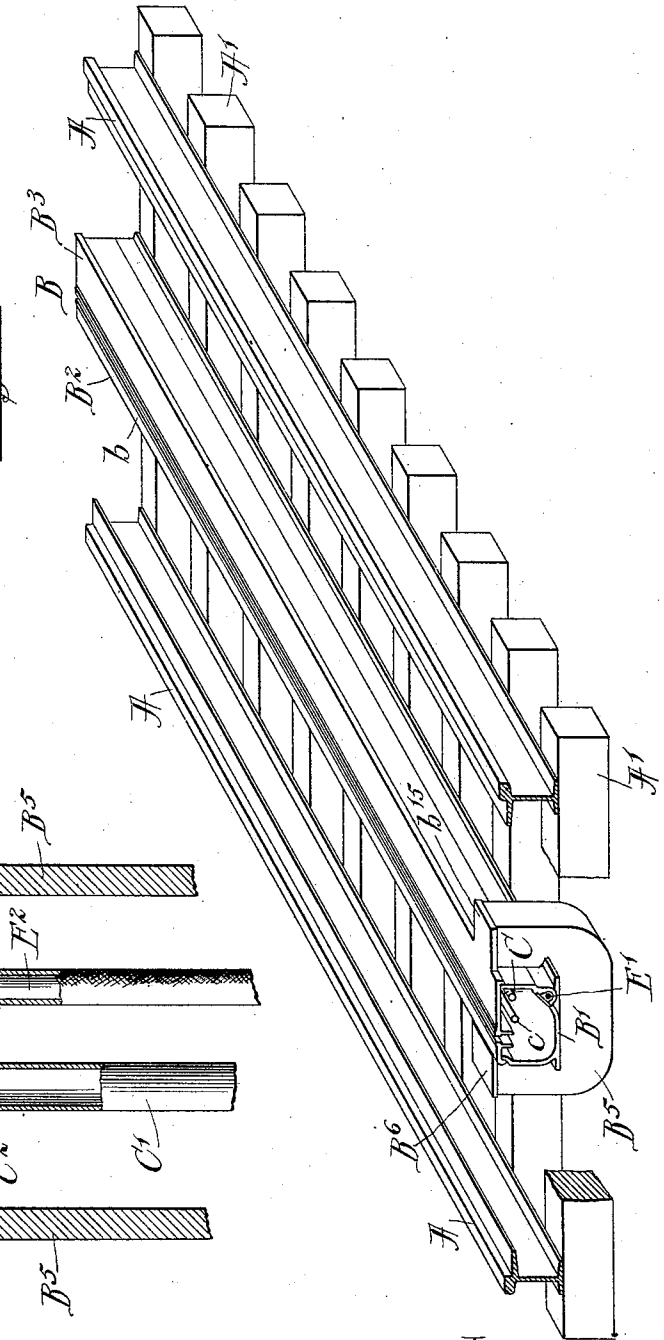
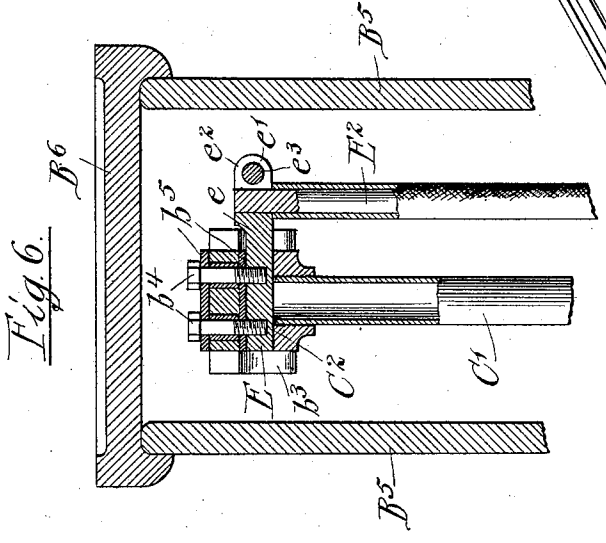


Fig. 6.



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his Attorneys.

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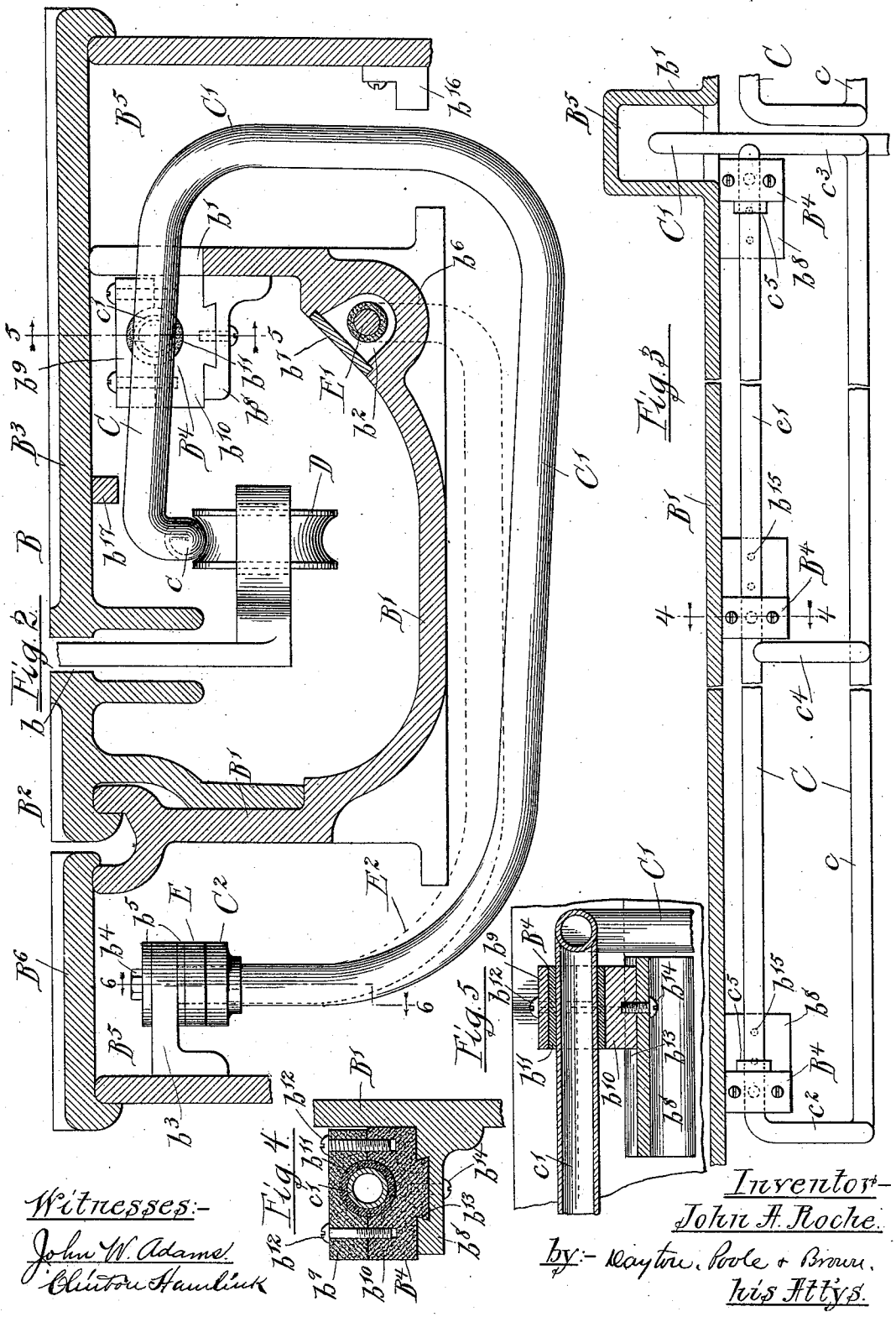

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UNITED STATES PATENT OFFICE.

JOHN A. ROCHE, OF CHICAGO, ILLINOIS.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 574,171, dated December 29, 1896.

Application filed April 13, 1895. Serial No. 545,573. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. ROCHE, of Chicago, in the county of Cook and State of Illinois, 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 improvements in sectional conductors for underground electric railways and to the construction of the slotted conduits within which such conductors are located.

The object of the invention is to produce an improved construction in devices of the character referred to; and it consists in the matters herein set forth, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a perspective view of a section of road-bed constructed in accordance with my improvements. Fig. 2 is an enlarged cross-section of the conduit. Fig. 3 is a fragmentary top plan view thereof on a smaller scale. Fig. 4 is an enlarged sectional detail taken on line 4 4 of Fig. 3. Figs. 5 and 6 are sectional details taken on lines 5 5 and 6 6, respectively, of Fig. 2.

In said drawings, A designates the rails of an underground electric-railway road-bed, and B the slotted conduit which extends longitudinally thereof and may be located either between or at one side of the rails, as desired. Said conduit is made, as usual, of cast-iron sections of suitable lengths, which are bolted or otherwise secured together at their ends to afford a continuous subway extending from one end of the line to the other. Each conduit-section consists of a channel-shaped base-casting B′, and cover-plates B^2 and B^3, that are secured to the channel B′ with their inner or adjacent edges at a sufficient distance apart to provide a conduit-slot *b* of suitable width between them. The conduit illustrated in this instance is particularly designed to rest directly upon the ties A′ of the road-bed, and to this end is made of substantially the same depth from top to bottom as the rails A, so that the upper surfaces of the conduit and rails lie in substantially the same horizontal plane.

C C designate a continuous series of oscillatory frames pivotally mounted in bearings B^4 within the conduit at one side and near the top thereof and each supporting at its free inner edge a short section *c* of exposed conductor adapted for contact with the traveling current-gatherer or trolley D of the car. The ends of the adjoining sections *c* are arranged in such close proximity that in passing from one end of the line to the other the current-gatherer or trolley D when in operative position is always in contact with at least one section, while at the same time said sections are sufficiently separated to always prevent any direct electrical communication between them. Each of said frames C is furthermore provided with a rigidly-attached arm C′, which extends outwardly through an aperture *b*′ in the adjacent side wall of the conduit and is then curved downwardly around the conduit and upwardly again so as to terminate in a contact-head C^2, located in proximity to an exposed contact-plate E. Said contact-plates are in constant electrical communication with an insulated cable E′, which constitutes the main wire of the conduit, and in this instance they form the exposed terminals of short insulated branch wires E^2, leading from said cable, which is itself located within a longitudinal groove b^2 formed in the inner surface of the conduit proper.

The contact-plates themselves are located outside of the conduit proper at the opposite side thereof from the frames C and within the upper portion of U-shaped hoods or chambers B^5, which are cast integral with the main channel B and extend around and beneath the same in position to inclose the rigid arms C′ of said frames, and which are made sufficiently narrow to readily drop between the ties A′ and thus do not interfere with the locating of the conduit above said ties. The contact-plates are in this instance shown as supported in the desired position by bracket-lugs b^3, which project into the chamber B^5 from the adjacent wall thereof. Suitable bolts b^4 serve to clamp the plates to the under sides of the lugs, and both the plates and bolts are insulated from the lugs by an intervening

layer b^5 of vulcanite or other non-conducting material. To afford a convenient connection with the insulated branch wires E^2, the plates E are each elongated to form a clamping-head e, which is perforated to receive the exposed extremity of the branch wire E^2. A milled slot e' extends from the perforation of the head to the outer margin thereof and divides the end of the head into two separate lugs e^2, through which a clamping-bolt e^3 is passed. By tightening up said bolt the lugs e^2 are drawn together, so as to firmly clamp the wire E^2 within the head. From its connection with the contact-plate E each wire E^2 depends beneath the conduit and passes up through a suitable aperture b^6 in the wall of the conduit into the groove b^2, where it connects with the line-wire E'. The mouth of the groove b^2 is normally closed by narrow cover-strips b^7, which are herein shown as countersunk flush with the inner surface of the conduit and may be readily sealed, if desired, to prevent any escape of water from the conduit into the groove b^2 and thence through the apertures b^6 into the surrounding chambers B^5.

The general operation of the sectional conductor thus described will be readily understood. Normally the unbalanced weight of each frame C causes it to drop down, so as to separate the head C^3 of the arm C' from the superjacent contact-plate E and maintain the conducting-strip c out of circuit. When the trolley D passes beneath said strip c, it lifts the same by swinging the whole frame C about its bearings B^4 until the contact-plate head C^2 of the rigid arm C' strikes the contact-plate E and throws said strip c into circuit. As soon as the trolley passes the frame drops down again by its own weight and breaks the circuit again on that section of the conductor, but the trolley D in the meantime will have passed beneath the succeeding strip c and thrown that into circuit, the arrangement being such that each succeeding strip is lifted and thrown in circuit by the trolley before the previous strip is released thereby. The passage of the current to the trolley is therefore continuous, although each particular conductor-section c is in circuit only during the time required for the trolley to pass its length. The contact-strip c and supply-arm C' are of course insulated from contact with the conduit, so as to avoid any leakage of the current during the interval that the strip and arm are in circuit.

I prefer to employ in addition to the trolley D, through which the current passes, a similar trolley located a short distance in advance of the same and acting to lift the strip c and thus bring the same in circuit with the supply-conductor before the current-carrying trolley reaches the strip. By this construction sparking at the contacts is prevented, inasmuch as the circuit is closed before the current passes through the contact-pieces. A third trolley located behind the current-carrying trolley holds the strip c elevated and the contacts closed until after the current-carrying trolley has passed beyond the strip to the next one.

In the particular construction shown each of the frames C consists of a continuous piece of metal tubing. One end c' of the tube extends the full length of the frame through the bearings B^4, which are herein shown as three in number, and forms the pintle upon which the frame swings. The tube is then bent forwardly at right angles to the pintle c' to form a supporting-arm c^2 for one end of the strip c, which strip constitutes the next section of the tube and is bent to extend horizontally at right angles to the arm c^2 and parallel to the pintle c'. A second radial supporting-arm c^3 for the other end of the contact-strip c is formed by bending the tube back again to meet the initial end of the spindle c', to which it is brazed or otherwise rigidly secured, and from said juncture with the spindle c' said arm c^3 is continued to form the rigid arm C', which constitutes the other end section of the tube. The whole frame, including its rigid arm C', is thus conveniently formed of a single piece, except for a transverse stiffening-arm c^4, which is herein shown as located between the contact-strip c and the spindle c', midway between the ends of the frame. The end of said bar c^4, which adjoins the contact-strip c, and the corresponding ends of the end arms c^2 and c^3 are furthermore shown as bent sharply downward, so as to meet the contact-strip from the upper side thereof and leave its under surface entirely free from any interruption or unevenness which might interfere with the smooth passage of the trolley.

All parts of the metal frame thus described are obviously in circuit when the arm C' and contact-strip c are in circuit. The insulation between the contact-strip and conduit is therefore provided between the frame and the conduit and in this instance in the bearings B^4. The latter are shown as being supported on integral brackets b^8 of the adjacent conduit-wall. Said bearing comprises upper and lower bearing-blocks b^9 and b^{10}, of vulcanite or other insulating material, between which the spindle c' is journaled, a plumbago bushing b^{11} being provided around the spindle to avoid the necessity of using oil or grease for a lubricant. The bearing-blocks b^9 and b^{10} are held together by suitable screws or bolts b^{12}, and the lower block is shown as provided on its lower face with a dovetailed rib b^{13}, which engages a corresponding groove in the bracket b^8 and is fastened therein by screws b^{14}. To provide for the endwise adjustment of the frames C, the brackets b^8 are made considerably longer than the bearings B^4 and are provided with several apertures b^{15} for said screws b^{14}, so that each bearing may be moved endwise in its dovetailed groove b^{13} and secured in any desired position on the bracket. Endwise movement of the frame in its bearings

is prevented by collars c^5, which are secured on the spindle c' in position to engage opposite faces of the bearings B^4.

The frames C and contact-strips c are made of such suitable lengths as may be found practicable, and the base-sections B′ of the conduit may be made of equal length with the frames C, or two or more of said frames may be provided to each section B′, as found convenient. In the former case each of the sections B′, cast with a single U-shaped hood or chamber B^5 to receive the rigid arm C′ of the frame and said hood, will preferably be located close to one end of the section. In the latter case two or more of said hoods or chambers will be cast in each section to receive the several arms C′, which arms may obviously be located at the middle of the frames C or otherwise instead of at the ends thereof, as shown in the present instance. Owing to the simplicity of the construction the parts are little liable to get out of order or require frequent attention. The contacts E may be readily exposed for examination at any time by removing small cover-plates B^6, which for convenience are made separate from the main cover-plates of the conduit and are consequently so small as to be readily handled. The whole conduit may also be exposed, when desired, by removing the cover-plates B′ and B^2, and as the opposite ends of the chambers B^5 to those in which the contacts E are located are herein shown as closed by extensions b^{15} of the cover-plates B^2, they will also be exposed by the removal of said plates.

The cover-plates B′ and B^2 are shown as supported at their inner edges by the rigid attachment of their outer edges to the side walls of the conduit, such rigid attachment being formed by means of depending integral flanges B^3 B^4 on the cover-plates, which flanges engage the inner face of the side walls, and depending marginal flanges on the outer edges of the said plates, which flanges extend outside of and engage the upper edges of the side walls. This particular construction in means for supporting the cover-plates is shown in a separate application filed by myself and another and forms no part of the present invention.

It will, of course, be understood that while the arms C′ of the frames have been referred to as "rigid" arms throughout the foregoing description, they are not necessarily required to be absolutely stiff and unyielding, but are merely rigid in the sense that any movement of the frames themselves results in a distinct and definite corresponding movement of their arms, it being obvious that this characteristic may readily exist in an arm which is at the same time comparatively springy or resilient and which will also act to cushion the shock caused by the sudden impact of the ends of the arm with the contact-plate E when the frame is struck by the approaching trolley. When the trolley passes from under the frames, the descent of the latter may be conveniently cushioned by rubber or similar buffers b^{16}, affixed to the wall of the chamber B^5, in position to receive the impact of the arms C′ of the frames. Similar elastic and insulating lugs b^{17} are also provided on the under sides of the cover-plates B^3 to limit the upward movement of the frames under any abnormal lifting force.

The frames themselves must obviously be of a construction sufficiently stiff or rigid to resist any material torsion, so that even if the trolley first strikes the end of the frame opposite to that at which the arm C′ is located said arm will be instantly swung up against its contact-plate E and place the conductor-strip or section c in circuit. For this reason the skeleton tubular construction shown offers great advantage in enabling the frames to be of comparatively great length, (sixteen feet or so, for example,) while still light and rigid enough to operate in the manner desired.

The frames described will preferably be provided with a surface covering or coating of insulating material or paint, except in their parts with which the trolley comes in contact. The presence of such insulating-coating I consider desirable in order to lessen liability of short-circuiting between the frames and adjacent parts of the conduit.

The location of the contact-pieces at the end of the conductor-sections opposite the pivotal axes of the same and the arrangement of the oscillating arms, so that they reach from the pivotal axes past the conductor-sections to the contact-pieces, has the important advantage of affording the necessary length in the arms without requiring the contact-pieces to be located at a distance from the conductor, but on the contrary enabling said contact-pieces to be placed adjacent to the side wall of the conduit in the manner illustrated.

I claim—

1. The combination with a supply-conductor, of a plurality of pivotally-supported insulated conductor-sections, stationary and movable contact-pieces, said contact-pieces being located at the side of the conductor-sections opposite the pivotal axes of the same, and oscillating arms which are rigidly attached to and move with the conductor-sections and which carry the movable contact-pieces, substantially as described.

2. The combination with a slotted conduit and a supply-conductor, of movably-supported, insulated, conductor-sections located in the upper part of the conduit at one side of the slot therein, stationary and movable contact-pieces located near the top of the conduit at the side of the conduit-slot opposite the conductor-sections, and means for actuating the movable contact-pieces from the conductor-sections embracing arms which extend across the conduit beneath the said slot, substantially as described.

3. The combination with a slotted conduit

and a supply-conductor, of pivotally-supported, insulated conductor-sections, stationary and movable contact-pieces located at the side of the conduit-slot opposite the pivots of the conductor-sections, such stationary contact-plates being connected with the supply-conductor, and oscillating arms carrying said movable contact-plate, said arms being rigidly attached to the conductor-sections and extending across the conduit below said conductor-sections, substantially as described.

4. The combination with a slotted conduit and supply-conductor located therein, of pivotally-supported, insulated conductor-sections, and means for connecting the conductor-sections with the supply-conductor comprising downwardly-facing contact-plates connected by means of branch conductors with the supply-conductor and oscillating arms rigidly attached to the conductor-sections and carrying vertically-movable upwardly-facing contact-plates which are rigidly attached to said arm and adapted to be lifted against the stationary contact-plates by upward pressure on the conductor-sections, substantially as described.

5. The combination with a slotted conduit and a supply-conductor of pivotally-supported, insulated conductor-sections located in the conduit, stationary and movable contact-plates located outside of the conduit-wall at the side thereof opposite that at which the pivots of the conductor-sections are located and rigid arms for carrying the movable contact-pieces which arms are attached to the conductor-sections and pass around and beneath the conduit, and exterior housings surrounding the said contact-plates and arms, substantially as described.

6. The combination with a supply-conductor of oscillating frames, which frames consist of conductor-sections, bars arranged parallel therewith and forming pivots for the frames and arms rigidly connecting the conductor-sections with said bars and means for connecting the supply-conductor with the said sections comprising stationary and movable contact-pieces and rigid arms for carrying said movable contact-pieces, said arms being rigidly attached to said frames, substantially as described.

7. The combination with a supply-conductor, of oscillating frames, which frames consist of conductor-sections, pivot-bars arranged parallel therewith and arms rigidly connecting the conductor-sections with said bars and means for connecting the supply-conductor with the said sections comprising stationary and movable contact-pieces and arms rigidly attached to the frame, for carrying said movable contact-pieces, and bearings of insulating material for said pivot-bars of the frames, substantially as described.

8. The combination with a slotted conduit of oscillatory frames pivotally mounted within the conduit at one side of the slot thereof, conductor-sections supported on said frames in position for engagement by an underrunning trolley, stationary and movable contact-pieces at the opposite side of the slot, a line-wire connected with said stationary pieces, and rigid arms on the frames, extending beneath the slot and actuating the movable contact-pieces to afford connection between the supply-conductor and conductor-sections when the frames are oscillated by the trolley, substantially as described.

9. The combination with a slotted conduit, of oscillatory frames pivotally mounted within the conduit at one side of the slot thereof, conductor-sections supported on said frames in position for engagement by an underrunning trolley, rigid arms on the frames extending outside of and beneath the conduit to the opposite side of the slot from the frames, contact-pieces located above the ends of said arms, and a line conductor connected with said contact-pieces, whereby the lifting of each frame by the passage of the trolley beneath its conductor-strip will raise the rigid arm against the superjacent contact-piece, substantially as described.

10. The combination with a slotted conduit, of oscillatory frames pivotally mounted within the conduit, conductor-sections supported upon said frames in position for engagement by an underrunning trolley, rigid arms on the frames extending around and beneath the conduit, exterior housings on the conduit inclosing said arms, stationary contact-pieces in said exterior chambers above the free ends of the arms, and a line conductor connected with the said contact-pieces, substantially as described.

11. The combination with a slotted conduit, of oscillatory frames pivotally mounted within the conduit, conductor-sections supported upon said frames in position for engagement by an underrunning trolley, rigid arms on the frames extending out of the conduit through an aperture in the upper side wall thereof, and extending around and beneath the conduit, exterior chambers cast integral with the conduit, inclosing said arms, contact-pieces in said chambers above the free ends of the arms, an insulated line conductor within the conduit and connections between each contact-piece and the line conductor, substantially as described.

12. The combination with a slotted conduit, of oscillatory metallic frames pivotally mounted in insulating bearings at one side of the conduit-slot and each supporting an exposed conductor-section in position for engagement by an underrunning trolley, contact-pieces at the opposite side of the conduit-slot, a supply-conductor connected with each of said contact-pieces, and rigid arms on the frames extending around and beneath the conduit and adapted for contact with said plates when the conductor-section is engaged by the trolley, substantially as described.

13. The combination with a slotted conduit, of oscillatory metallic frames pivotally mount-

ed within the conduit at one side of the slot thereof, said frames being formed of two parallel bars, one journaled in insulating-bearings on the conduit and the other forming a conductor-section adapted for engagement with a trolley, and transverse arms connecting said parallel bars, arms on the frames extending around and beneath the conduit, exterior housings on the conduit inclosing said arms, and contact-pieces mounted on insulating-supports in said exterior chambers above the free ends of said arms, substantially as described.

14. The combination with a slotted conduit and a supply-conductor of oscillating frames which frames consist of conductor-sections, pivot-bars arranged parallel therewith and arms rigidly connecting the conductor-sections with the said pivot-bars, bearings for said frames consisting of brackets on the side walls of the conduit, two-part bearings of insulating material secured to said brackets, rigid arms attached to the said frames and stationary and movable contact-pieces of which the movable contact-pieces are carried by said arms and a supply-conductor connected with the stationary contact-pieces, substantially as described.

15. The combination with a slotted conduit, of pivotally-mounted conductor-sections, adapted for the engagement therewith of an underrunning trolley, rigid arms attached to said sections and moving therewith a supply-conductor and contact devices for connecting the said conductor-section with the supply-conductor, comprising rigid arms attached to the conductor-sections and provided with contact-pieces at their free ends, insulated contact-plates attached to the under side of brackets secured to the conduit and branch conductors extending from said contact-plates to the supply-conductor, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 27th day of March, A. D. 1895.

JOHN A. ROCHE.

Witnesses:
C. CLARENCE POOLE,
HENRY W. CARTER.