(No Model.) 3 Sheets—Sheet 1.

W. P. ALLEN.

ELECTRIC CONDUCTOR AND CONTACT DEVICE THEREFOR.

No. 554,103. Patented Feb. 4, 1896.

Fig. 1.

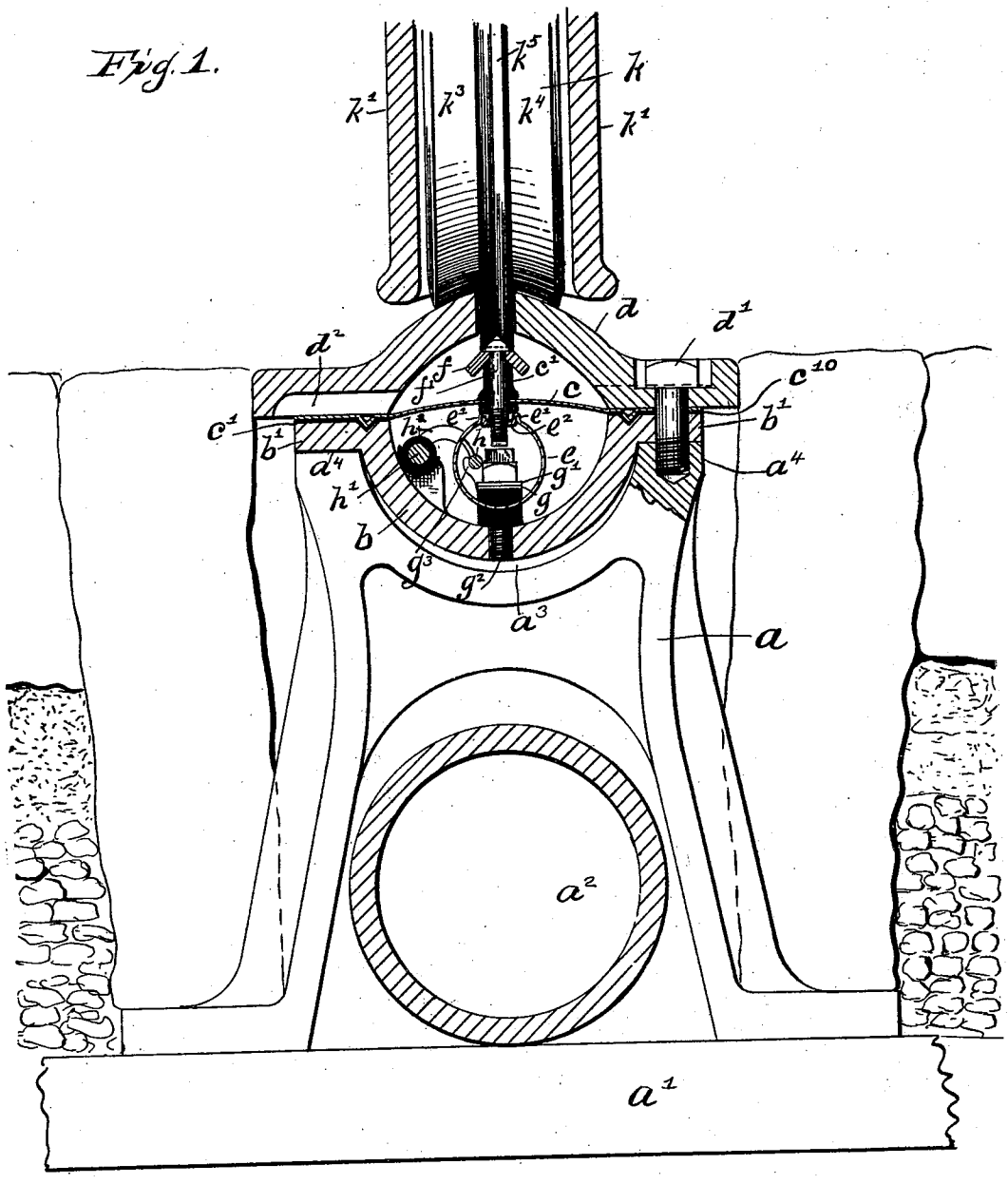
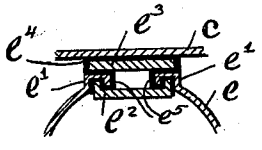


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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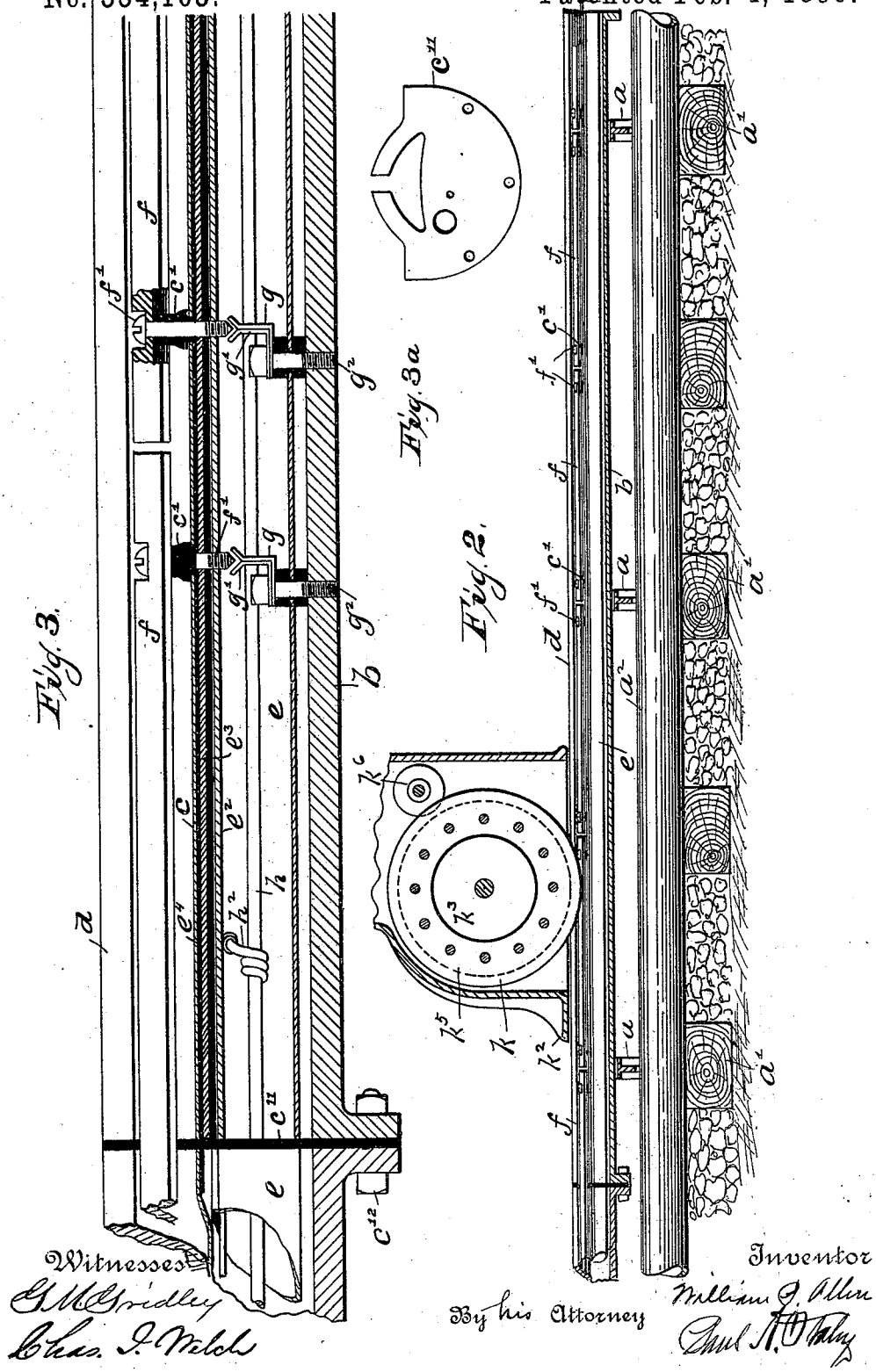
ELECTRIC CONDUCTOR AND CONTACT DEVICE THEREFOR.

No. 554,103. Patented Feb. 4, 1896.



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ELECTRIC CONDUCTOR AND CONTACT DEVICE THEREFOR.

No. 554,103. Patented Feb. 4, 1896.

Fig. 8.

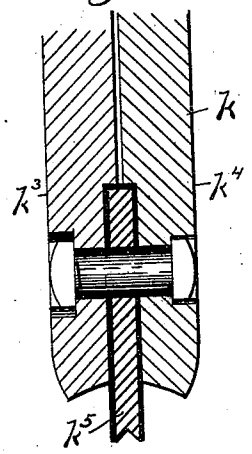


Fig. 7.

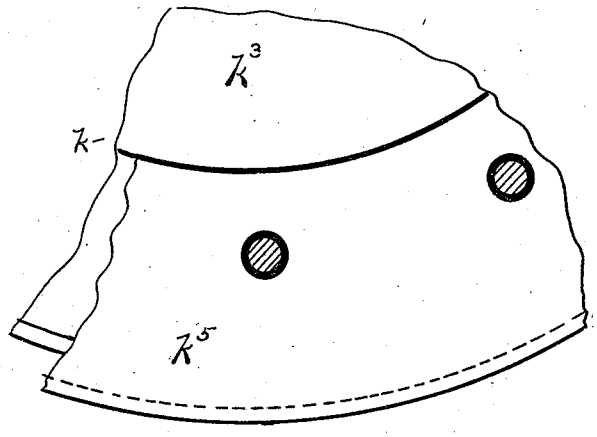


Fig. 4.

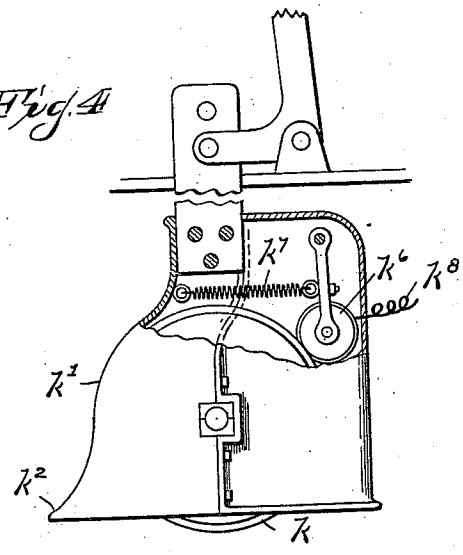


Fig. 5.

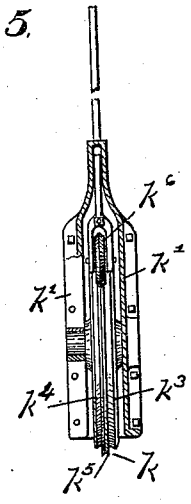
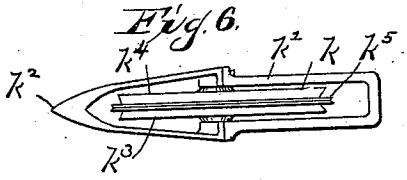


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM P. ALLEN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF TWO-THIRDS TO O. S. KELLY AND ALVARO S. KROTZ, OF SPRINGFIELD, OHIO.

ELECTRIC CONDUCTOR AND CONTACT DEVICE THEREFOR.

SPECIFICATION forming part of Letters Patent No. 554,103, dated February 4, 1896.

Application filed July 15, 1895. Serial No. 555,989. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM P. ALLEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Conductors and Contacting Devices Therefor, of which the following is a specification.

My invention relates to improvements in electric conductors and contacting devices therefor, and is especially adapted for use with electric railways.

The object of my invention is to provide a simple and effective conductor in which the loss from induction or leakage is reduced to the minimum.

A further object of my invention is to provide a conductor which may be placed between the track-rails of an ordinary railway, the construction of the conductor and its inclosing casing and supports therefor being such that the entire device may be supported on the ties which support the track-rails and obviate the necessity of a conduit in the sense that that term is usually employed.

I attain these objects by the constructions shown in the accompanying drawings, in which—

Figure 1 is a transverse sectional view of a conductor and its supporting device involving my invention. Fig. 2 is a side elevation of the same with the outer casing in section. Fig. 3 is a longitudinal sectional view of the same on a larger scale. Fig. 3^a is a detail of the same. Fig. 4 is a side elevation, partly in section, of the contacting device. Fig. 5 is a transverse sectional view of a portion of the same. Fig. 6 is a bottom plan view of the same. Fig. 7 is a side elevation of a portion of the contacting-wheel in detail, and Fig. 8 is a sectional view of the same. Fig. 9 is a detail of the flexible casing for the conductor.

Like parts are represented by similar letters of reference in the several views.

In the said drawings, a represents a supporting standard or chair, which is preferably bifurcated at the lower end and supported at the bottom on ties a', such as are usually employed for supporting the ordinary track-rails of street or other railways. Within the bifurcated portion of these chairs, and extending longitudinally along the line of the same, is a drain-pipe a^2, preferably of the ordinary porous drain-tile with open joints. These supporting-chairs a are formed at the top with concave portions a^3 and supporting faces or shoulders a^4, which are adapted to support the ends of U-shaped frame or casing pieces b, which are formed at each side with laterally-projecting flanges b' to rest on the supporting-shoulders a^4 of the supporting-chairs. These frame or casing pieces b are made in sections of suitable lengths—say from three to four feet long—and are adapted to rest at each end on the chairs a, which are placed at corresponding intervals. The upper part of the U-shaped frame or casing is closed by a flexible diaphragm c, preferably of thin sheet metal, which is also made in sections, but preferably of a greater length than the sections of the casing b. The flexible diaphragm c is extended at each side so as to project over the flanges b', by which it is supported, an interposed gasket c^{10}, of rubber or other suitable material, being placed between the parts to insure an air and water tight joint.

Above the flexible diaphragms c are covering-plates d, which rest upon the diaphragm at the outer edges, and which are bolted or otherwise secured to the lower casing-pieces and the supporting-chairs preferably by means of countersunk bolts d', which extend through the covering-plates, diaphragm, and frame-pieces and into the chairs, as shown in Fig. 1. These covering-plates extend upwardly and inwardly, with their inner edges separated sufficiently to form a slotted opening, which is arranged centrally above the middle of the diaphragm c.

Within the chamber formed by the casing-pieces b and the diaphragm c there is placed a flexible tube e of sheet metal. This tube is preferably formed of a single piece of metal, which is constructed at each side with hook-shaped flanges e', with which there is adapted to engage a U-shaped strip e^2, the sides of which intermesh with said hook-shaped flanges. Between the parts is placed a rubber gasket e^5, which is formed of a shape to

pass between the adjacent edges of the tube and rest on top of the same, a clamping-plate e^3 being provided above said gasket. Between the clamping-plate e^3 and the diaphragm c there is another packing-strip e^4. The diaphragm is perforated at suitable intervals and there are supported thereon, by means of sleeves or supports c' of insulating material, metallic rail-sections f. The sleeves c' are preferably made of hard rubber and have interposed between the same and the diaphragm suitable washers of elastic rubber or similar material. The metallic rail-sections f are formed of angle-iron and they are supported on the sleeves c' with the angle uppermost, the sleeves being beveled at the sides for this purpose. These rail-sections are connected to the tube b and the diaphragm c by means of bolts or screws f', which extend through said rail-sections, through the sleeves c', diaphragm c, and plate e^4, and are screwed into the **U**-shaped plates e^2 inside the tube. The heads of the screws f' are countersunk so as to extend below the corner or angle of the sectional rail. The screws f' are made of sufficient length to extend into the tube so as to project below the bottom of the plate e^2, the end being beveled or wedge-shaped and adapted to constitute one part of a circuit-closing device. The other part of said circuit-closing device consists preferably of two plates g g', which are substantially **L**-shaped, but have on one side angularly-projecting faces extending in opposite directions. These plates are placed together and are secured in their proper position by bolts g^2, which extend through one flange of said plates and the bottom of the tube e and into the outer casing b, suitable washers of insulating material being employed to insulate said plates from the other parts. The said plates are each further provided with a laterally-extending hook-shaped projection g^3, and in these projections there is supported a conducting-wire h, which extends throughout the entire length of the conductor, being supported at intervals by the contacting-plates g.

Within the chamber below the diaphragm c there is preferably arranged a feeding conductor h', which is insulated in the usual manner and which may be connected at suitable intervals to the conducting-wire h by suitable insulated connections h^2, which extend from the feeder-wire through the tube e to said conducting-wire h, care being taken that the opening through which said wire passes is completely closed by the passage of the insulated wire through the same so as to form an air and water tight joint.

The contacting-points f', which are connected to the metallic rail-sections f, are normally supported above the contacting-plates g g' by the resilience of the diaphragm c and the tube e. A suitable pressure, however, on the rails f will cause the contacting-points f' to engage with the plates g g', the beveled portion thereof being adapted to pass between the plates, which will thereby be forced apart to permit the contacting-points f' to engage with the same sufficiently to insure a good contact. The live conducting-wire h will thus be electrically connected to the rail-sections f, with which the contacting-screws f' are connected.

The rail-sections f are made preferably in lengths of from eighteen inches to two feet and are supported at each end by one of the contacting-screws f'. They are placed so that the angle or corner stands substantially central under the slotted opening between the covering-plates d d, and thus form a **V**-shaped shield above the supporting sleeves or columns c', which is adapted to direct any water or other foreign substance to a point on the diaphragm removed from the openings through said diaphragm. The covering-plates d on the under side are provided with slotted openings d^2 which extend laterally from above the diaphragm and beyond the flanges b' of the frame-pieces b. At each side of said frame-pieces the road-bed is so constructed that a space is left from the grooves d^2 to the drain-pipe a^2, which space may be filled with sand or other similar loose material through which the water which enters the slotted opening between the covers may be directed.

To provide for taking the current from the conductor, as thus described, I employ a contacting-wheel k, preferably supported in an outer casing k', which is formed at the front with an extended and beveled projection k^2, adapted to travel slightly above the covers d and remove from in front of the contacting-wheel any foreign substance which may be collected there. The contacting-wheel k is preferably constructed of two plates k^3 k^4, with an intervening insulated contacting-ring k^5, clamped between the same and insulated therefrom. This ring is adapted to form a projecting rib or flange in the center of the wheel which enters the slotted opening and is grooved on the periphery to contact with the sectional rail f, while the peripheries of the plates k^3 k^4 are constructed to run on the covering-plates d. Within the casing k' and adapted to run in contact with the flange k^5 is a small trolley-wheel k^6, which is held in contact with the contacting-wheel by a spring k^7, and from this trolley-wheel the current is led by a suitable conducting-wire k^8 to the motor or other point. Means (see Fig. 4) are preferably provided for raising and lowering the casing k', together with the contacting-wheel k, so that the device may be raised entirely out of contact or lowered therein, as desired. By this arrangement the contacting device may be withdrawn so as to be entirely out of the way in case it is desired to employ another contacting device—such, for instance, as an overhead trolley. This makes it possible to employ my improved conductor and contacting device on cars which are also

adapted to run over other systems having overhead conductors, the overhead trolleys being held down while the cars are passing over the line equipped with the construction herein described, and the contacting device herein described being raised when the cars are passing over the line supplied with the ordinary overhead system.

It should be stated that the diaphragm *c* and the flexible tube *e* are made in sections of any suitable length, preferably of a length equal to from three to five of the frame-pieces. The respective sections are joined together, and the ends of the respective tube-sections closed by gaskets c^{11}, of rubber or other suitable packing material, which also forms a packing between the respective ends of the frame or casing pieces *b*, as shown at the left in Fig. 3. This gasket is made of a size and shape sufficient to pass between the ends of the frame-pieces and also between the ends of the adjacent sections of the diaphragm and flexible tube, which are forced together by clamping-bolts c^{12}, which pass through the gasket and through suitable flanges formed on the frame-pieces, the ends of the diaphragm and tube-sections being preferably embedded slightly into the gasket of rubber or other flexible material. The respective conductors—that is, the insulated feeding-conductor within the diaphragm and the naked contacting-conductor within the tube—are continued through the respective gaskets; but a tight joint is formed around each of the same, so that the chamber below the diaphragm, as well as the space within the tube, is divided into water-tight compartments, separate from each other and separate from the adjacent compartments formed by the different sections. By this means both the outer and inner conductors are completely inclosed within section air and water tight compartments and danger from leakage is reduced to the minimum.

The covering or rail-plates *d* are also preferably formed in lengths corresponding to the length of the diaphragm and the inner tube or casing, so that the joints between the same stand coincident with the joints between the diaphragm and the inner tube or casing and the joint between two of the frame-pieces, as indicated in Fig. 3, the shape of the gasket employed for this purpose being shown in Fig. 3^a. The entire device is thus formed of insulated sections, so that if by any possible means a leak should occur to the outer casing it is limited to the particular section.

Having thus described my invention, I claim—

1. The combination with an outer casing having a slotted opening at the top, and a horizontal diaphragm dividing said casing into two chambers, the upper one of which is continuous and the lower divided into separate compartments, a conductor having contacting points arranged below said diaphragm in one chamber, and a sectional contacting rail above said diaphragm in the other chamber, insulated connections extending from said sectional rail through said diaphragm and adapted to form a connection from said contacting point to said rail, substantially as specified.

2. The combination with the outer casing having the slotted rail or cover, a flexible diaphragm within said casing adapted to divide the same horizontally so as to form upper and lower compartments, one of said compartments being continuous while the other is divided into sectional water-tight compartments, a conductor below said diaphragm and extending through the various water-tight compartments, and a sectional rail above said diaphragm composed of insulated sections, and contacting devices between said rail and conductor, said contacting devices being located within said water-tight compartment, substantially as specified.

3. The combination with the outer casing formed with the lower frame-pieces and the upper plates or covers having a slotted opening between the same, a sheet-metal diaphragm clamped between said covers and frame-pieces, and flexible packing material between said diaphragm and frame-pieces to form a lower water-tight compartment, said diaphragm being made in sections and separated by gaskets of packing material which also close the ends of said frame-pieces and form a series of water-tight compartments under said diaphragm, a sectional contacting device above said diaphragm, and insulated connections extending from said sectional contacting device through said diaphragm, and a conductor below said diaphragm adapted, as said diaphragm is depressed, to become electrically connected to said contacting devices, substantially as specified.

4. The combination with the outer casing formed with the upper and lower chambers divided by a flexible diaphragm as described, of an inner flexible tube inclosing contacting devices below said diaphragm as described, a sectional rail arranged above said diaphragm and having contacting-pieces extending therefrom through said diaphragm and tube and adapted to be brought into electrical connection with the contacting devices in said tube, said lower chamber and tube being divided to form a series of compartments, substantially as specified.

5. The combination with the outer casing, and a diaphragm dividing the same into upper and lower compartments, a sectional rail supported on said diaphragm by insulated supports, said rail being located in the upper chamber, a flexible tube in the lower chamber having contacting devices normally in circuit with an electrical conductor, metallic connections from said sectional rail through said diaphragm and tube and extended in proximity to said contacting devices, said tube and diaphragm being formed in sections adapted to yield to permit said contact-

ing devices to establish an electrical connection from the conductor to said rail and insulators between said sections, substantially as specified.

6. The combination with the inclosing tube and a sectional rail insulated therefrom, bolts or studs extending from said rail through said tube to form one part of a contacting device, as described, and flexible plates having hook-shaped projections arranged in said tube, and a conductor arranged in said projections in electrical contact with said plates, said plates being arranged below said studs or bolts and adapted to contact with the same, substantially as specified.

7. The combination with the outer frame-pieces and the upper plates or covers adapted to form a slotted opening between the same, a diaphragm supported between said plates and said frame-pieces so as to form upper and lower chambers within said casing, a sectional conductor within the upper chamber supported by said diaphragm, and a conductor having contacting devices connected thereto in the lower chamber below said diaphragm, and a connection from said sectional conductor to said contacting devices, and outlet-openings from the upper chamber immediately above said frame to a drain connection, substantially as specified.

8. The combination with the outer casing formed in sections as described, and supporting-chairs for each section, a drain-pipe extending under said casing, a diaphragm extending laterally across said casing so as to divide the same into an upper and lower compartment, and packing material between said diaphragm and casing-sections to form water-tight joints in said lower chamber, and outlet-openings from said upper chamber to the side of said casing and above said drain-pipe, substantially as specified.

9. The combination with a sectional rail, the sections of which are insulated from each other, of a metallic tube formed of a single piece of metal having hook-shaped edges, a U-shaped plate to engage said edges but insulated therefrom, a screw-threaded bolt extended through said sectional rail and screwed into said U-shaped plate, an insulating column or sleeve supporting said rail about said bolt, and contacting devices within said tube with which said bolts are adapted to engage when said rail is depressed, substantially as specified.

10. The combination with the outer sectional casing, an inner flexible diaphragm dividing said casing into an upper and lower chamber, an inner flexible tube of sheet metal arranged below said diaphragm, said tube and diaphragm being each formed of sections, the ends of which are separated by gaskets of packing material so as to form a series of separate water-tight chambers below said diaphragm, a continuous conductor within said tube adapted to extend through the various chambers formed by said tube-sections, a contacting device in each of said tube-sections on which said conductor is supported, a feeding-conductor on the outside of said tube but below said diaphragm, and connections from said feeding-conductor to said contacting-conductor, substantially as specified.

11. The combination with the contacting-wheel supported in an outer casing as described, and a trolley-wheel held yieldingly in contact with said contacting-wheel also supported in said outer casing, substantially as specified.

12. The combination with an outer casing formed in sections as described, with the upper plates or covers also formed in sections and insulated one from the other, said plates being adapted to form a slotted opening in the top of said casing also divided into sections, and a yielding diaphragm in said casing, with insulators between said sections and contacting devices below said diaphragm, and connections from said contacting devices through said diaphragm, said connections being arranged below said slotted opening, substantially as specified.

In testimony whereof I have hereunto set my hand this 29th day of June, A. D. 1895.

WILLIAM P. ALLEN.

Witnesses:
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A. C. TYLER.