

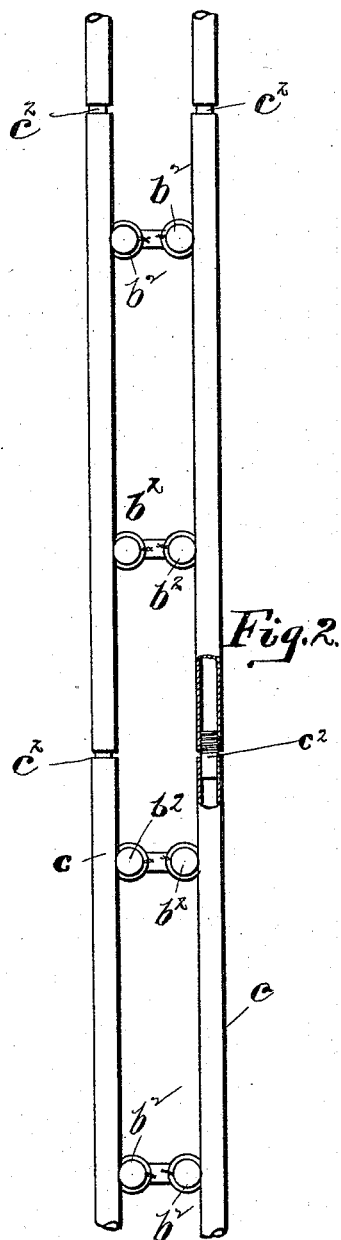
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2 Sheets—Sheet 1.

D. F. GRAHAM & W. P. ALLEN.  
CONDUIT FOR ELECTRIC RAILWAYS.

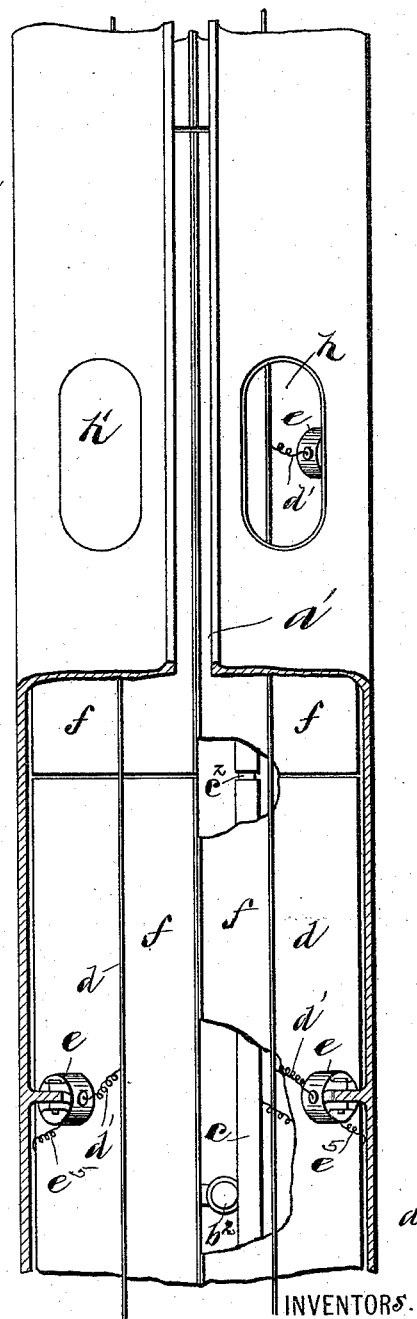
No. 526,392.

Patented Sept. 25, 1894.



*Fig. 1.*

*Fig. 2.*



WITNESSES:

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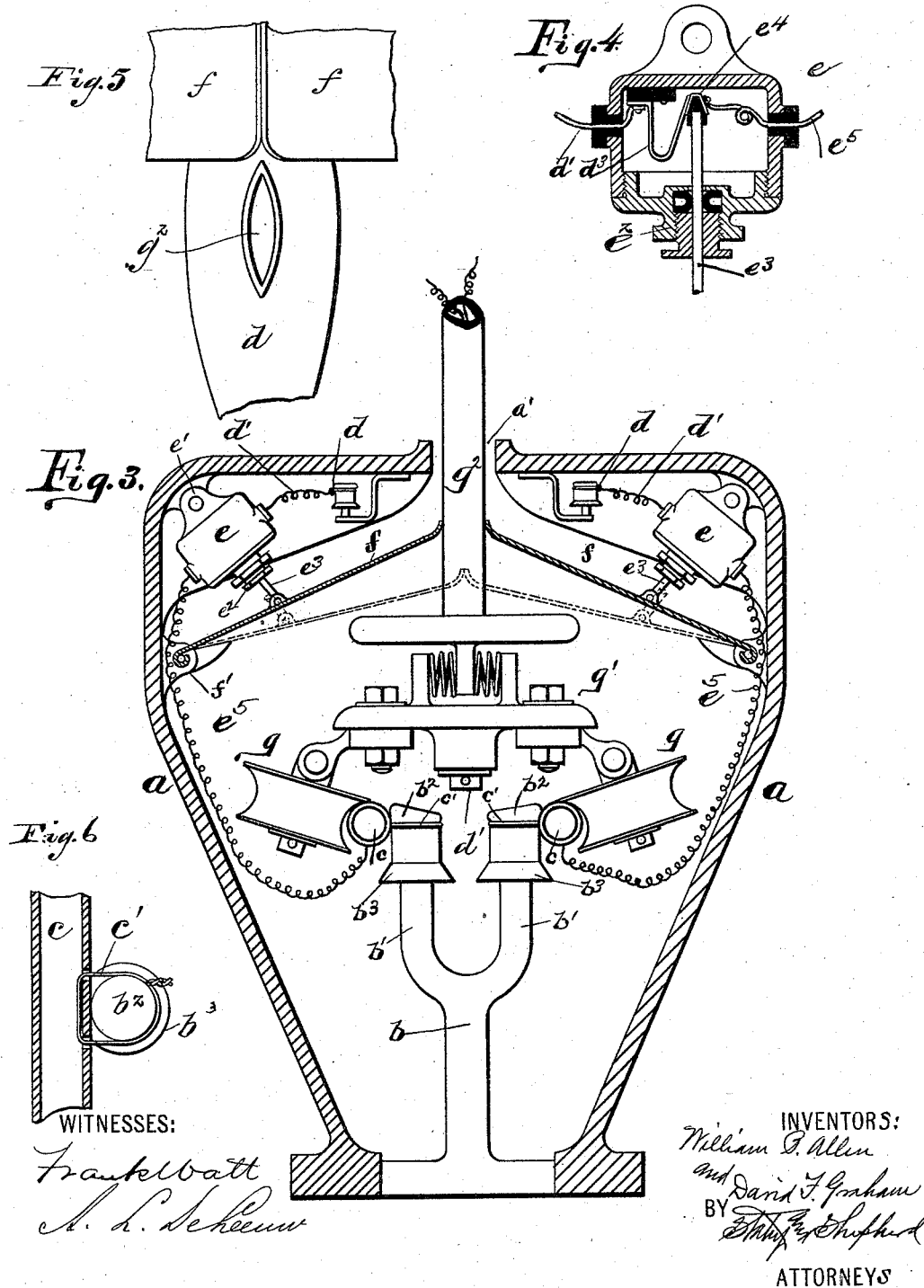
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# UNITED STATES PATENT OFFICE.

DAVID F. GRAHAM, OF SPRINGFIELD, OHIO, AND WILLIAM P. ALLEN, OF CHICAGO, ILLINOIS, ASSIGNORS OF ONE-THIRD TO OLIVER S. KELLY, OF SPRINGFIELD, OHIO.

## CONDUIT FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 526,392, dated September 25, 1894.

Application filed October 25, 1893. Serial No. 489,139. (No model.)

*To all whom it may concern:*

Be it known that we, DAVID F. GRAHAM, residing at Springfield, in the county of Clark and State of Ohio, and WILLIAM P. ALLEN, residing at Chicago, in the county of Cook and State of Illinois, citizens of the United States, have invented certain new and useful Improvements in Conduits for Electric Railways, of which the following is a specification.

Our invention relates to improvements in conduits for electric railways; and the object of our invention is to provide devices by which the electric current may be carried in the conduit or underground and transmitted thence to a moving contact device on a car or other vehicle.

Our invention consists in the various constructions and combinations of parts hereinafter described and pointed out in the claims.

In the accompanying drawings Figure 1 is a plan view of a device embodying our invention; a portion of the same being broken away and shown in section. Fig. 2 is a plan view of the conductors employed in our improved conduit. Fig. 3 is a transverse sectional view of the conduit, and Figs. 4 to 6, inclusive, are detail views of some of the parts of the same hereinafter referred to.

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

In the said drawings *a, a*, represent an outer casing or conduit which may be constructed of any suitable material and of any desired shape; said conduit being provided with a continuous slotted opening *a'*, at the top, through which the contacting device of the moving vehicle is to be inserted. Extending upwardly from the bottom of the conduit at suitable intervals are standards *b*, having branched arms *b'*, *b'*, on which are mounted insulators *b<sup>2</sup>, b<sup>2</sup>*. The insulators *b<sup>2</sup>*, may be made of glass or any other suitable insulating substance, and are provided at the bottom with a downwardly projecting flange *b<sup>3</sup>*, having an inclined top face adapted to shed water or any moisture which may accumulate thereon, and direct the same clear of the supporting standards *b' b'*. Connected to the insulators *b<sup>2</sup>*, and supported thereby are the conductors *c*, preferably formed of

copper tube and attached to the sides of the insulators by means of retaining wires *c'*, which pass through openings in one side of the conductor and around the insulators, as shown in Fig. 6. These conductors *c*, are made in sections, with the respective ends of the sections joined together by plugs *c<sup>2</sup>*, each of which is screw-threaded at one end and adapted to screw into one of said sections, and formed at the other end of a size to fit snugly within the end of the opposite section and permit the same to come and go thereon to compensate for the contraction or expansion of the respective sections. These plugs *c<sup>2</sup>*, are formed of insulating material, so that each section is disconnected electrically from each of the other sections.

Extending along the conduit in any convenient position, either inside or out of the conduit, are feed wires *d, d*, insulated and provided at suitable intervals with branched connections *d'*, which extend into switching devices *e*. These feed wires *d, d*, may be supported in the top of the conduit on suitable insulating devices, as shown in Fig. 3.

The switching devices *e, e*, consist essentially of boxes, preferably cylindrical in form and provided at one end with an ear or lug *e'*, pivoted to a suitable projection extending from the side of the conduit, preferably at the corner, as shown in Fig. 3; the opposite end of said box being provided with a suitable gland *e<sup>2</sup>*, through which a plunger *e<sup>3</sup>*, is adapted to operate.

Extending longitudinally through the conduit above the conductors and below the slotted opening are hinged plates or covers *f*, hinged to suitable projections *f'*, at the sides of the conduit, and when in their normal position adapted to contact so as to completely cover the said conductors; the plates being slightly removed from the sides of the conduit at the point where they are hinged, and arranged on an angle, so that any water or moisture or other substance which falls through the slotted opening will be directed to the sides of the conduit and thence to the bottom thereof and to a sewer or other point of discharge, in a well known manner. These hinged plates or covers *f*, are made of a length

corresponding to the length of the sections in the conductors, and are pivotally connected to the plungers  $e^3$ , which extend into the switching boxes  $e$ . The plungers  $e^3$ , are provided at the top with a metallic contacting device  $e^4$ , in electrical connection with a wire  $e^5$ , properly insulated and connected to the section of the conductor corresponding to said switching boxes; the feed wire  $d'$ , which leads into said boxes being connected to a contacting plate  $d^3$ , adapted, as the plunger  $e^3$ , is moved inwardly, to form an electrical connection with said contacting device  $e^4$ , and thus establish an electrical connection from the feed wire  $d'$ , to the section of the conductor opposite said switching box.

The contacting device, by means of which the current is carried from the conductors to the moving car, consists preferably of trolley wheels  $g$ , mounted upon a suitable frame  $g'$ , suspended from a standard  $g^2$ , substantially in the manner described in our pending application of even date herewith, Serial No. 489,140; the said standard  $g^2$ , being preferably formed with curved sides which meet at the front and back at an angle to form sharpened edges, as shown in Fig. 5.

The hinged plates  $f$ , are each turned up slightly at each end so as to form a curved tapering opening in which each edge of the standard  $g^2$ , is adapted to enter as the same is moved forward, thus raising said plates as the contacting device is further advanced by reason of the curved beveled sides acting as a wedge to separate the said plates. The raising of the plates  $e$ , establishes an electrical connection with the sections of the conductor, which in turn is electrically connected with the contacting device and which is in circuit with the motor or other electrical apparatus on the moving car. As soon as the contacting device has passed one set of plates, the plates return by gravity to their normal position, thus disconnecting the feed wires from the section of conductors over which the contacting device has passed, and establishing an electrical connection with the succeeding section of conductors as the contacting device comes in contact therewith.

The conduit is further provided at suitable intervals with openings  $h$ , adapted to be closed by suitable covers  $h'$ , to form hand or manholes through which access may be had to the working parts. These are preferably located over the respective switching devices  $e$ , and furnish easy access thereto at all times.

The switching boxes  $e$ , being pivoted to the conduit, are free to adjust themselves to any angularity that the plungers  $e^3$ , may assume by reason of the circular movement of the plates about their hinged connection. At the same time the pivoted connection between the plungers and the said hinged plates and between the switching boxes and the conduits, permits the ready removal of said switching devices for examination or repairs.

It will be seen that by the constructions

above described a conduit is provided in which the conductors are at all times electrically disconnected from the feed wires, except at such times as the contacting devices of the moving vehicle engage therewith. The arrangement of the hinged plates or covers completely incloses said conductors and thus prevents any water or moisture from coming in contact therewith.

Having thus described our invention, we claim—

1. The combination with the conductors supported in a conduit, as described, of the hinged plates arranged above said conductors, feeding wires in proximity to said conductors, and switching devices connected with said plates, said switching devices being adapted, as said plates are operated, to form an electrical connection between said feeding wires and the conductors, substantially as specified.

2. In a conduit having a slotted opening, as described, hinged plates in said conduit below said slotted opening, said hinged plates being adapted to contact in a line substantially under said slotted opening and provided with upturned corners, as specified, a moving contacting device having beveled edges adapted to enter between said hinged plates, switching devices connected to said plates, and a sectional conductor connected to said switching devices, and feeding wires having branched connections to said switching devices, whereby a forward movement of the contacting devices elevates said plates and establishes an electrical connection from said feeding wires to said conductors, substantially as specified.

3. In a conduit, a sectional conductor and a series of switching devices, an electrical connection from each section of said conductor to one of said switching devices, feeding wires also connected to each of said switching devices, and hinged plates arranged above said conductors and adapted to be operated by the moving contacting device which engages with said conductors, and a connection from said hinged plates to said switching devices, whereby an electrical connection is established between the feeding wires and the sectional conductor by the operation of said plates, substantially as specified.

4. In a conduit, the sectional conductors supported in said conduit and insulated therefrom, switching devices consisting of pivoted boxes connected to said conduit, feeding wires connected to said switching boxes, and a connection from said switching boxes to the respective sections of said conductors, hinged plates forming covers for said conductors, said hinged plates being formed in sections corresponding to the sections of said conductors, and a movable contacting device connected to said hinged plates, adapted, as said plates are operated, to establish an electrical connection between the feeding wires

and the sectional conductors, substantially as specified.

5. The combination with the sectional conductors arranged in a conduit, as described, of a hinged plate above said conductors, plungers hinged to said plates and operating in switching boxes, said switching boxes being hinged to said conduit, and contacting devices within said switching boxes in electrical connection with the sectional conductors and the feeding wires respectively, and means for establishing an electrical connection between said feeding devices by the movement of said plungers, substantially as specified.

6. In a conduit, a series of standards having branched arms, insulators on said arms, each of said insulators being provided with projecting flanges with beveled surfaces, as described, electrical conductors consisting of a series of tubes joined together, as specified, and retaining wires extending through openings in one side of said tubes and passing around said conductors, substantially as specified.

7. A conductor for electric conduits formed in sections, each section consisting of a me-

tallic tube having at one end a screwthreaded non-conducting plug screwed into the end thereof, which is tapped out to receive the same, said plug being adapted to project from the end of said tube so as to fit loosely in the adjacent end of the next section, thus forming a loose insulated connection between said sections, substantially as specified.

8. In a conduit, a switching device consisting essentially of a pivoted box having a metallic contacting plate therein, a plunger extending through a suitable opening in said box also provided with a contacting plate, and a pivoted connection between said plunger, and a hinged plate in said conduit, substantially as specified.

In testimony whereof we have hereunto set our hands this 14th day of October, A. D. 1893.

DAVID F. GRAHAM.  
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