(No Model.) 3 Sheets—Sheet 1.

E. E. RIES.

COMBINED ELECTRIC RAILWAY AND WIRE CONDUIT.

No. 386,087. Patented July 10, 1888.

FIG I.

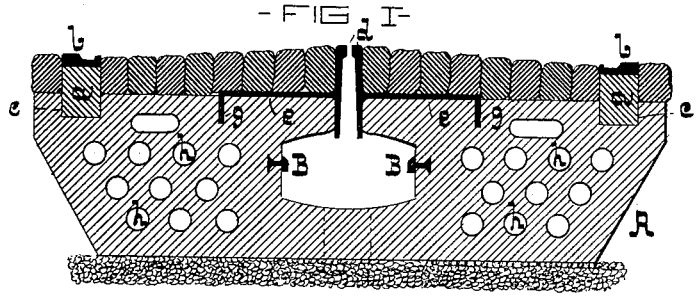


FIG II.

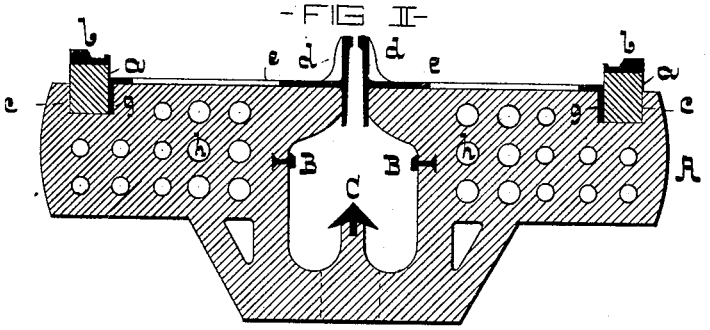


FIG III.

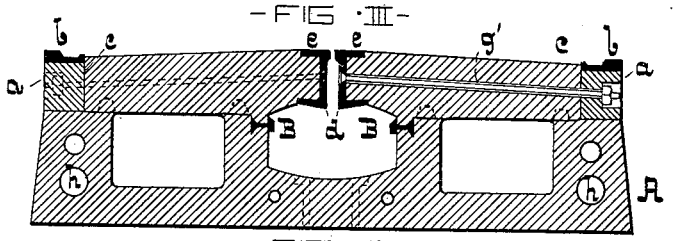
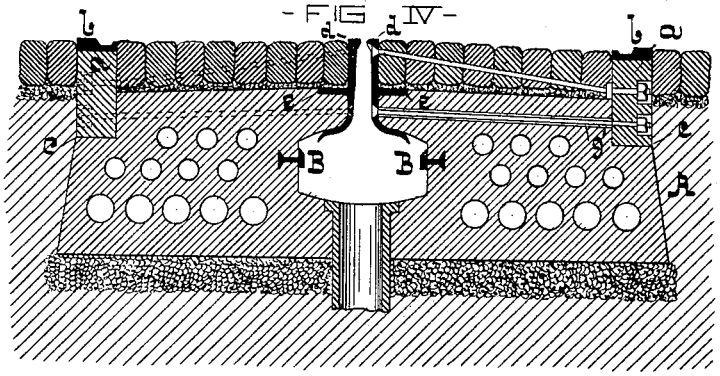


FIG IV.



WITNESSES-

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(No Model.) 3 Sheets—Sheet 2.

E. E. RIES.

COMBINED ELECTRIC RAILWAY AND WIRE CONDUIT.

No. 386,087. Patented July 10, 1888.

FIG V.

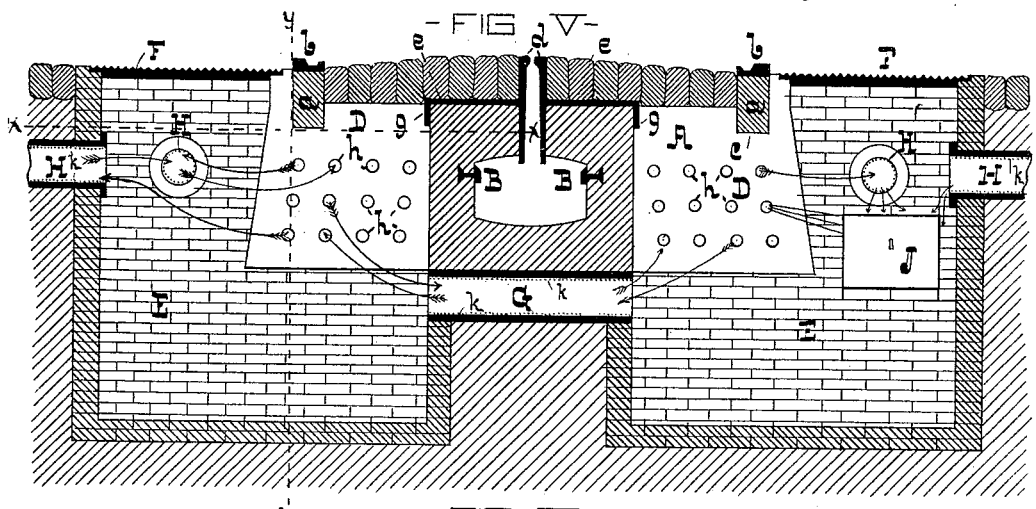


FIG VI.

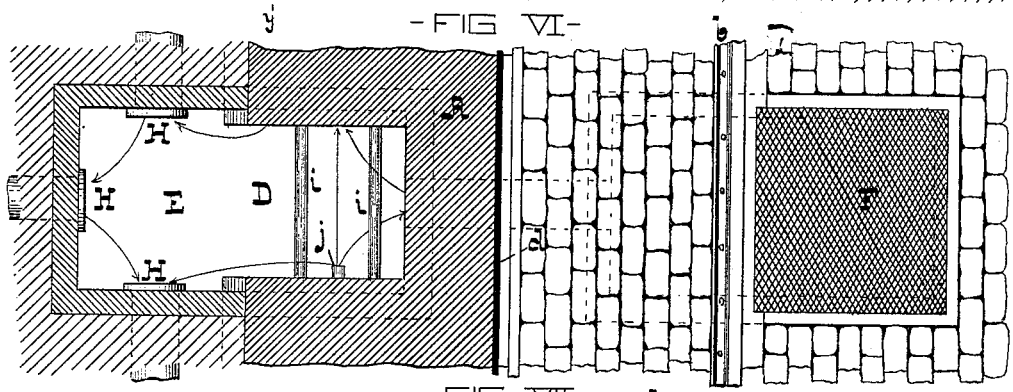
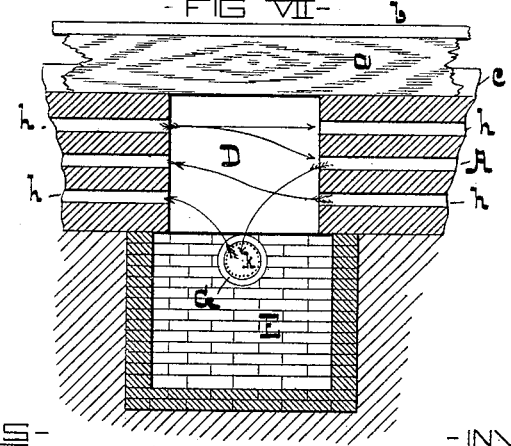


FIG VII.



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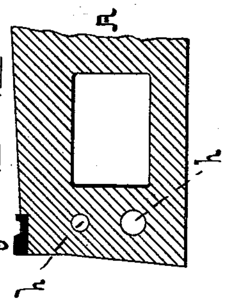
(No Model.) 3 Sheets—Sheet 3.

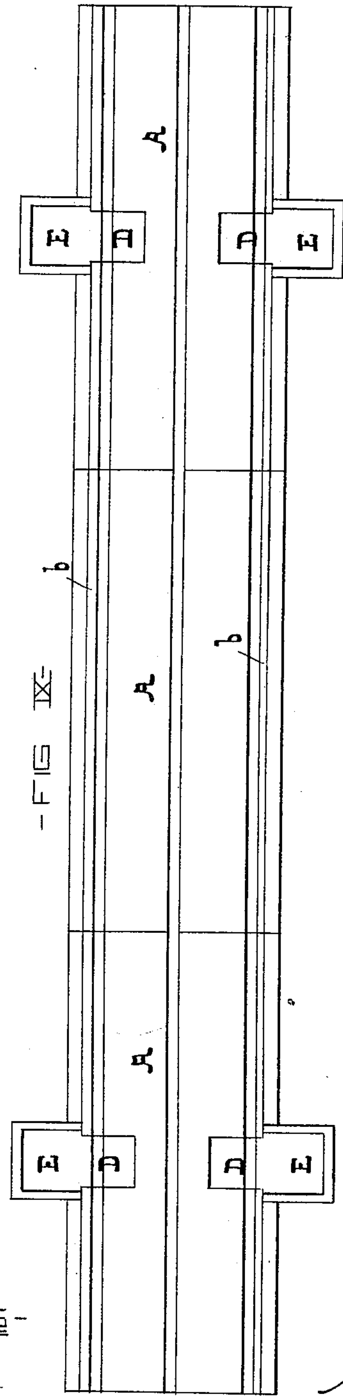
E. E. RIES.

COMBINED ELECTRIC RAILWAY AND WIRE CONDUIT.

No. 386,087. Patented July 10, 1888.



-FIG VII-



-FIG IX-

WITNESSES-

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UNITED STATES PATENT OFFICE.

ELIAS E. RIES, OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-HALF TO ALBERT H. HENDERSON, OF SAME PLACE.

COMBINED ELECTRIC RAILWAY AND WIRE-CONDUIT.

SPECIFICATION forming part of Letters Patent No. 386,087, dated July 10, 1888.

Application filed November 23, 1886. Serial No. 219,661. (No model.)

To all whom it may concern:

Be it known that I, ELIAS E. RIES, of the city of Baltimore and State of Maryland, have invented certain Improvements in Road-Beds, of which the following is a specification.

The object of the present invention is to provide an underground conduit for the conductors of an electrical railway which shall be of such construction as to form a firm and rigid support for the traffic rails and that portion of the roadway lying between said rails on either side of the conduit opening or slot.

In carrying out this invention I prefer to form the road-bed of a non-conducting and moisture-proof concrete, cement, or other material—such as an asphaltic or other bituminous concrete—either in the shape of a continuous conduit made on the spot from such material while in a plastic state or, preferably, in the form of prepared sections or blocks of the material of convenient length, which are placed in position and then joined or cemented to one another by a joint formed of some of the plastic material, as shown in the application of Henderson and Ries, Serial No. 177,379, filed September 17, 1885. These conduit sections or blocks are of such width as will admit of the rails of the car-track being supported thereon, the said rails or the stringers to which they are secured being confined in suitable pockets or other depressions in the surface of the blocks forming the conduit, or placed against projections on the surface of the same, in order that the relative distance between the track-rails and the conduit-slot may remain constant and uniform without regard to lateral movement or other variations due to the pressure of surface traffic. As will be seen, the stringers are held in place irrespective of the paving-blocks, which merely come in contact therewith, and the paving-blocks, which are confined between the said stringers, and the plates, which form the longitudinally-extending slot, are not liable to displacement by any movement of the other paving-blocks situated exteriorly or outside of the traction-rails, thus obviating the effects of expansion of the pavement through heat or the freezing of water in the interstices between the said blocks. Moreover, the upper surface of the conduit at either side of the slot forms a continuous and solid bed for the paving-blocks, so that no settling of the street-pavement between the track-rails can take place. This construction of the conduit also gives a prepared surface for the stringers and saves the expense of all grading in the laying of the tracks, except that required in placing the conduit sections or blocks, which are preferably placed upon either a continuous concrete bed formed of broken stone and cement, or upon ties formed of this material located under the abutting ends of the conduit-sections. Further, I provide the conduit-blocks on either or both sides of the opening with a series or system of ducts of any suitable size or shape, through which may be carried cables or wires for electric lighting, telegraph, or telephone uses. The conduit-blocks may have any desirable shape of cross-section best calculated to give strength, rigidity, and permanence to the structure, and in some cases the blocks may be lightened by coring out portions thereof, as is commonly done in heavy castings and concrete structures of various kinds. Furthermore, in order to provide for properly carrying, distributing, and branching the various conductors of the conduit and making the necessary connections therein, I construct in the earth, at proper intervals along the line of the conduit and at both sides thereof, working-chambers or man-holes of masonry, brick-work, or concrete rendered impervious to air or moisture; and I further provide the conduit sections or blocks located at such points with recesses or alcoves which extend from the sides of the said blocks transversely of the same to near the conduit-opening, and which communicate with and are accessible from the said working-chambers. The chambers or man-holes on either side of the conduit are preferably connected by means of tunnel or connecting pipes passing under the conduit proper, through which pipes wires or cables can be transferred from one side of the conduit to the other. The alcoves and working-chambers also serve as means whereby the splicing or uniting of the cables or wires is or can be effected, and whereby certain of the wires and cables may be branched away from the main lines; and to facilitate and admit of this arrangement I employ suitable switch and con-

necting boards, and provide branch ducts or conduits which terminate in the said working-chambers, which latter are protected against the entrance of dirt and moisture by removable water-tight covering-plates of any desirable construction.

In the further description of the said invention which follows reference is made to the accompanying drawings, forming a part hereof, and in which—

Figure I is a cross-sectional view of one form of the improved road-bed, showing the traction-rails and their supporting-stringers in position and the plates which form the longitudinal slot in place. This view also shows the paving-blocks between the traction-rails and the conduit-slot and a part of the pavement situated exteriorly of the said traction-rails. Fig. II represents a modified form of conduit, in which the central portion immediately beneath the conduit opening or slot extends below the remaining or wire-carrying portion of the conduit. This view also shows a different arrangement of the plates forming the conduit-slot. Fig. III shows a conduit-block with longitudinally-extending cored openings therein to lighten the structure, and in this case the stringers are embedded below the surface of the conduit-block, the surface of which forms the road-bed between the tracks, so as to dispense with paving-blocks at that point, this form of conduit being designed for suburban and other railways on which the ordinary surface traffic is comparatively small or entirely absent. It also shows the plates which form the conduit-slots tied to the stringers by means of bolts or rods passing through the material of the conduit, the inner ends of which are provided with countersunk heads flush with the surfaces of the said plates, and the outer ends fitted with nuts which are embedded in the stringers. Fig. IV illustrates a modification in the construction of the conduit, in that the tie-bolts which pass through the material of the conduit are supplemented by others which are above the conduit and serve to brace the slot-plates and maintain the proper width of the conduit slot. It also illustrates a different termination of the slot-plates. Fig. V is also a cross-section of the conduit, showing the alcoves and working chambers or vaults. It also illustrates the connection or union of the vaults on either side of the conduit by means of tunnel or connecting-pipes and other details of the invention, as will hereinafter fully appear. Fig. VI is a half-sectional plan of Fig. V, or, in other words, a section of that figure, taken on the dotted line *x x*, the remaining half being shown in full. Fig. VII is a section of Fig. V, taken on the dotted line *y y*. Fig. VIII illustrates a modification, hereinafter described. Fig. IX is a plan, on a reduced scale, of a part of the road-bed, showing the same as formed of a series of united blocks.

Similar letters of reference indicate similar parts in all the views.

A represents the conduit, formed, preferably, of asphaltic concrete, although any other non-conducting and non-absorbent concrete, cement, or other material will answer. This conduit is preferably made in sections or blocks of convenient length, as already stated, although it may, if desired, be formed in one continuous length, as described in the application before referred to. The central conduit-opening is of sufficient width and depth to accommodate the current collecting or contact devices attached to the motor-cars and to secure proper drainage facilities, and the conduit-wall below the central opening is of such thickness as to impart to it sufficient rigidity and strength to withstand any side pressure tending to close the conduit-slot.

B B are the conducting-rails or contact-surfaces, which, when the conduit is made of non-conducting material, as described, are embedded in the sides of said conduit. In Fig. II a third conducting-rail, C, is employed, in addition to the ones B B, and situated directly under the conduit-slot. In this construction the depth of the conduit-opening is somewhat increased, inasmuch as with this form of rail vertical contact-wheels are used, and in order to obviate as much as possible any unnecessary increase in the weight of the conduit, and at the same time give the required strength of material under the conduit-opening, I provide the requisite additional depth by forming a downward projection along the central portion of the conduit only.

The conducting-rails B B may be embedded in the conduit-sections during the process of manufacture and their ends electrically united in any suitable manner; or the conduit sections or blocks may be simply provided with longitudinal grooves, in which the conducting-rails may afterward be placed; but I prefer in most cases, principally for convenience in handling, laying, and connecting the conduit-sections, to form each section or block in three parts, as shown in Fig. III, said parts being firmly united after the conducting-rails are placed in position between them, either permanently by means of a suitable cement—such as liquid asphalt applied hot—or removably by forming the surface of the lower portion with longitudinally-extending ribs that engage with corresponding depressions in the two upper portions, as shown by the dotted lines. This latter construction not only permits of the conducting-rails being placed in position and the proper connection made between them after the lower portion of the bed of the conduit is laid, but permits of free access to the interior of the conduit, and of renewing the upper portions forming the roadway in cases when the surface of the conduit-blocks are directly exposed to surface traffic other than that required by electric railway propulsion.

The width of the conduit A, it will be seen, is such as to allow of its employment as a support for the stringers *a a*, on which the traction-rails *b b* are secured. These stringers rest

in recesses *c c* in the surface of the blocks, which recesses can either be at the ends of the said blocks or at some distance from the ends, as preferred, the former construction being shown in Figs. III and IV and the latter in Figs. I, II, and V. I do not restrict myself, however, to this method of supporting the track-rails; but under certain conditions, especially when the traffic is comparatively light, I may secure the said rails directly to the conduit without the interposition of the stringers, in which event the recesses or grooves *c c* are arranged to receive and hold the rails *b b*, which latter may be of any desired shape of cross-section; or the rails *b b* may, if desired, be directly embedded in the upper portion of the conduit during the process of manufacture or construction, as shown in Fig. VIII of the drawings.

The plates which form the longitudinal slot of the conduit are denoted by *d d*, and it will be seen that they are provided with flanges *e*, which rest on the upper surface of the conduit-blocks A. As shown in Figs. I, II, and V, the slot-plates are held in position and secured against side or lateral pressure by means of a lip or lips, *g*, embedded either in a separate groove formed in the material of the conduit or in the grooves or recesses containing the stringers *a a*. Under some circumstances, however, I prefer to employ instead the construction shown in Figs. III and IV, in which the slot-plates are firmly held to the walls of the conduit-slot by means of bolts *g' g'*, that pass directly through the material of the conduit and through the stringers *a a*, which, as will readily be seen, are likewise firmly clamped in place by the adjusting-nuts at the outer ends of the bolts. In this manner all lateral motion of the slot-plates or track-rails is prevented and a firm and rigid construction for the roadway secured, all the elements of the conduit, including track-rails, stringers, and surface slot-plates, being practically as one single piece.

In Fig. IV the slot-plates *d d* are also provided at intervals with supplementary bolts, which not only serve to brace the upper extension of the slot-plates against any side pressure tending to contract the conduit-slot, but which also serve as a means for adjusting and regulating the width of the slot-opening whenever this becomes desirable or necessary. The lower extremities of all the slot-plates terminate or project below the face of the conduit, so as to cause all water entering the conduit-slot to fall clear of the conductors B B, and suitable drainage outlets or pipes are provided at proper intervals.

The ducts, which may be used for carrying electric wires and cables, are denoted by *h h*, and, as will be seen, extend through the conduit on either side of and in a direction parallel with the central conduit. These ducts may be of any convenient size or shape, and can be arranged at any desirable or proper distance apart. The ducts at one side of the central conduit-opening may be employed for conductors or cables carrying currents for electric lighting and power, while the ducts at the other side may be used for telegraph and telephone wires and cables, this arrangement serving to prevent any material disturbances due to induction, &c., between the different classes of conductors, though of course any other disposition of the conductors carried by the conduit can be made as may be required by local conditions.

D D are the alcoves before alluded to as existing in certain of the conduit blocks or sections, and the blocks containing these alcoves are situated at convenient distances apart, or at such places as may be found necessary to unite different wires, or where the said wires are to be branched. The vaults which give access to the alcoves are denoted by E E, and they are covered by roughened and water-tight plates F F, level with the surface of the pavement, and susceptible of removal when necessary. These vaults on either side of the conduit are built of masonry, brick-work, or concrete, and they are united underneath the conduit by means of the tunnel-pipes G, as before alluded to, and which are illustrated in Figs. V and VII.

H H are ducts for branch wires and cables, and their position will of course be governed by the necessities of the case.

The arrows in the various figures illustrate how wires and cables may be carried in different directions, as will be readily understood.

The vaults E E, in addition to providing access to the wires and cables to arrange, connect, and repair them, may also serve as places where switch-boards can be located, and one of such switch-boards is shown in Fig. V and marked J.

In Fig. VI, two cables denoted by *i* are shown as crossing an alcove, and another, *j*, is represented as ending in the alcove and with two of its contained wires branched in different directions.

In Figs. V and VII the tunnel-pipe G and the branch ducts H are represented as having insulating-linings, which are marked *k*.

Although I have only shown and described continuous concrete conduits in which the conduit-opening and ducts are formed in the solid concrete, and this construction is for various reasons preferred by me, yet I do not desire to limit myself to this particular construction, as other modifications will suggest themselves for use in particular circumstances.

I claim as my invention—

1. A road-bed formed of non-conducting concrete or other non-conducting material having a longitudinally-extending conduit with longitudinally-extending surface slot, and independent ducts arranged at the sides of the conduit, substantially as and for the purpose specified.

2. A road-bed formed of a series of blocks having therein a longitudinally-extending conduit, a longitudinally-extending surface

slot, and independent ducts arranged exteriorly of the said conduit, substantially as and for the purpose specified.

3. A road-bed having a longitudinally-extending conduit with a longitudinally-extending surface slot, and independent ducts arranged exteriorly of the said conduit, the said road-bed having alcoves which extend transversely of the said road-bed from the side thereof to near the conduit and break the continuity of the said ducts, whereby access may be had to them, substantially as and for the purpose specified.

4. A road-bed formed of a series of blocks having ducts, as described, with certain of the said blocks provided with alcoves which extend from one or both sides of the said blocks transversely of the same to near the conduit-opening, whereby access may be had to the said ducts, substantially as and for the purpose specified.

5. A block forming a portion of a road-bed having therein ducts, as described, and provided with one or more alcoves which break the continuity of the said ducts, combined with one or more vaults or chambers in communication with the said alcoves, which give access to the same from the street, substantially as and for the purpose specified.

6. A block forming a portion of a road-bed having therein ducts, as described, and provided with one or more alcoves which break the continuity of the said ducts, combined with one or more vaults or working-chambers in communication with the said alcoves to give access to the same from the street, and suitable covering-plates for the said vaults or chambers, substantially as and for the purpose specified.

7. A road-bed having a longitudinally-extending conduit with a longitudinally-extending surface slot, and independent ducts arranged exteriorly of the said conduit, the said road-bed having an alcove which extends transversely of the said road-bed from the side thereof to near the conduit to break the continuity of the said ducts, whereby access may be had to them, and a vault in communication with the said alcove, which extends from the surface of the street to a point below or underneath the said conduit, substantially as and for the purpose specified.

8. A road-bed having a conduit which extends longitudinally thereof and ducts arranged at the side of the said conduit, as described, and an alcove at either side of the said conduit, which breaks the continuity of the said ducts and gives access to them, combined with a vault in communication with the said alcoves to give access to them from the street, and one or more tunnel-pipes to connect the two vaults at a point below the said block, substantially as and for the purpose specified.

9. A road-bed having a continuous concrete conduit for carrying the line-conductors of an electric railway, provided with alcoves, as described, and having in its upper surface depressions for the reception of stringers or other supports for the traction-rails of the said railway, substantially as and for the purpose specified.

10. A road bed containing a longitudinally-slotted conduit formed of a series of non-conducting blocks or sections, metallic plates situated within the said longitudinal slot and separated to form the conduit-opening, and bolts or rods passing transversely through the material forming the conduit-blocks, designed and arranged to firmly hold the slot-plates in position, substantially as and for the purpose specified.

11. A road-bed containing a longitudinally-slotted conduit formed of a series of non-conducting conduit blocks or sections having depressions therein for the reception of the stringers which sustain the traction-rails, and provided with a longitudinally-extending slot, vertical or flanged plates situated within the said slot, and bolts or rods which pass transversely through the material forming the conduit and tie the slot-plates to the stringers, substantially as and for the purpose specified.

12. A road-bed containing a conduit having a longitudinally-extending slot therein and depressions in its upper surface for the reception of stringers to which the traction-rails are secured, combined with vertical separated plates situated in the said slot, having flanges with lips which rest with the said stringers in the depressions in the said blocks, substantially as and for the purpose specified.

13. A conduit for an electrical railway, formed in three sections, a lower and two upper ones, combined with electric conductors which are laid in the lower section of conduit and held in position by the upper sections which bear thereon, substantially as and for the purpose specified.

14. A conduit formed of a series of blocks or conduit-sections divided longitudinally into a lower and two upper portions, the said lower portion containing the conduit-opening and ducts, and serving as a support and foundation for the two upper portions, which latter are removably secured to the lower portion, substantially as and for the purpose specified.

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Witnesses:
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