(No Model.) 2 Sheets—Sheet 1.

W. R. DE VOE.

CONDUIT ELECTRIC RAILWAY.

No. 520,304. Patented May 22, 1894.

Fig. 1.

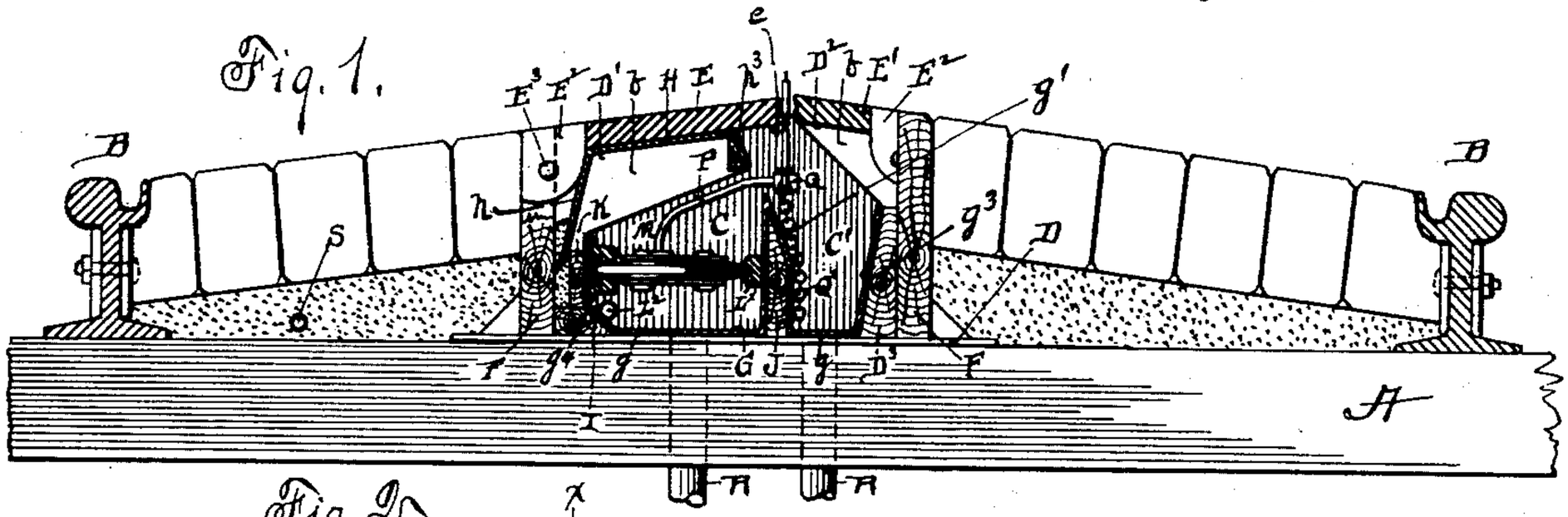


Fig. 2.

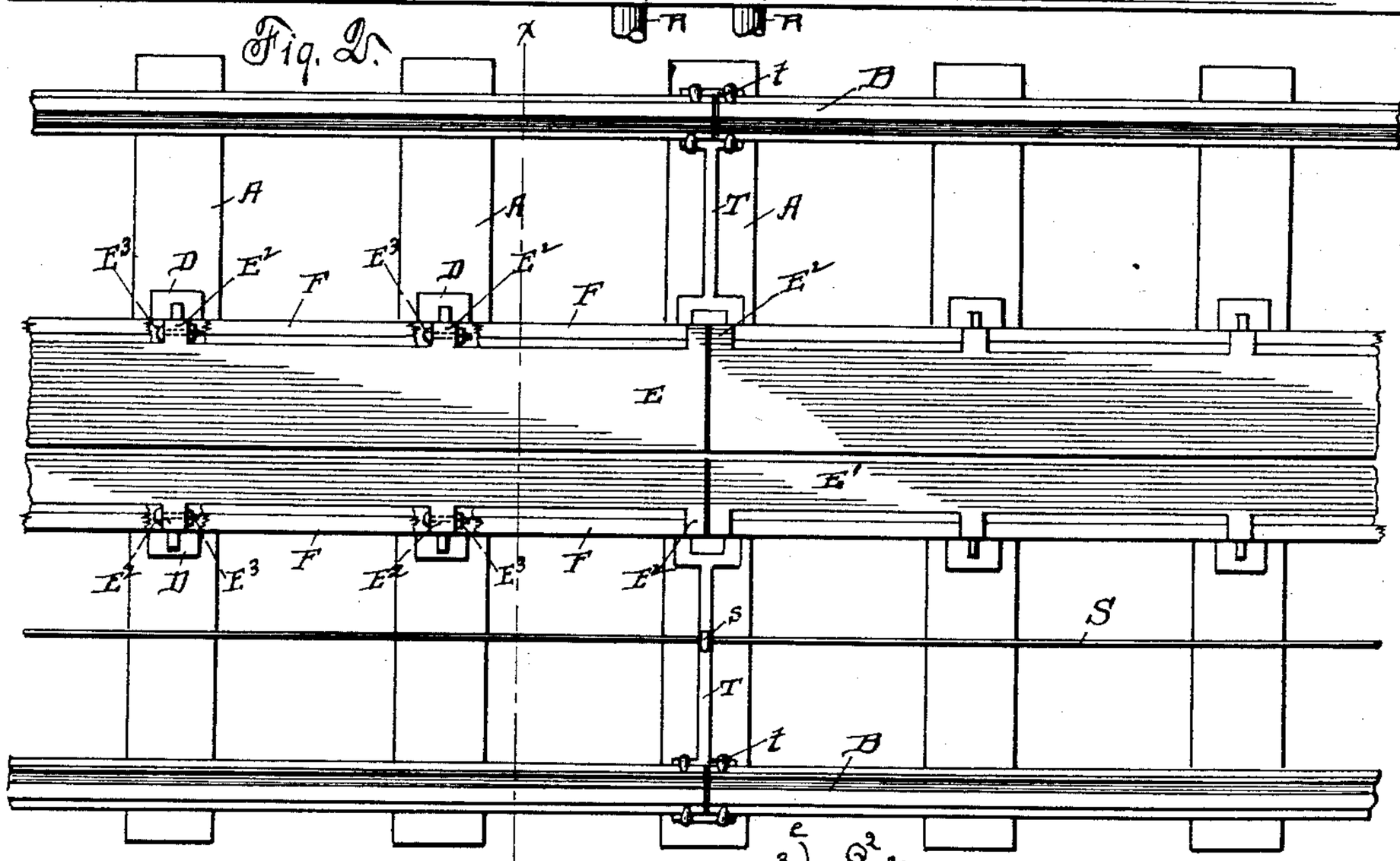
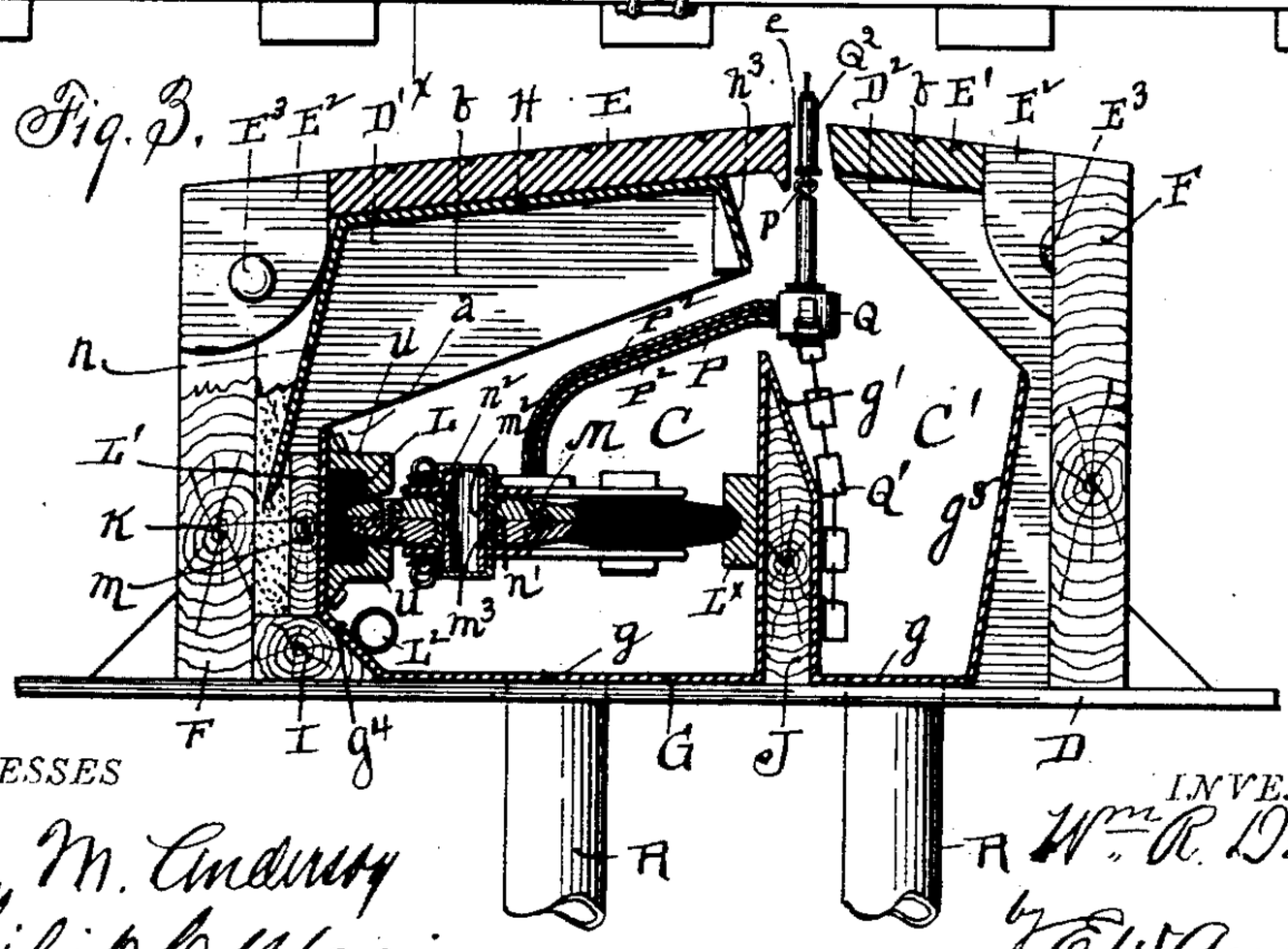


Fig. 3.



WITNESSES

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THE NATIONAL LITHOGRAPHING COMPANY.
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

W. R. DE VOE.

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Fig. 4.

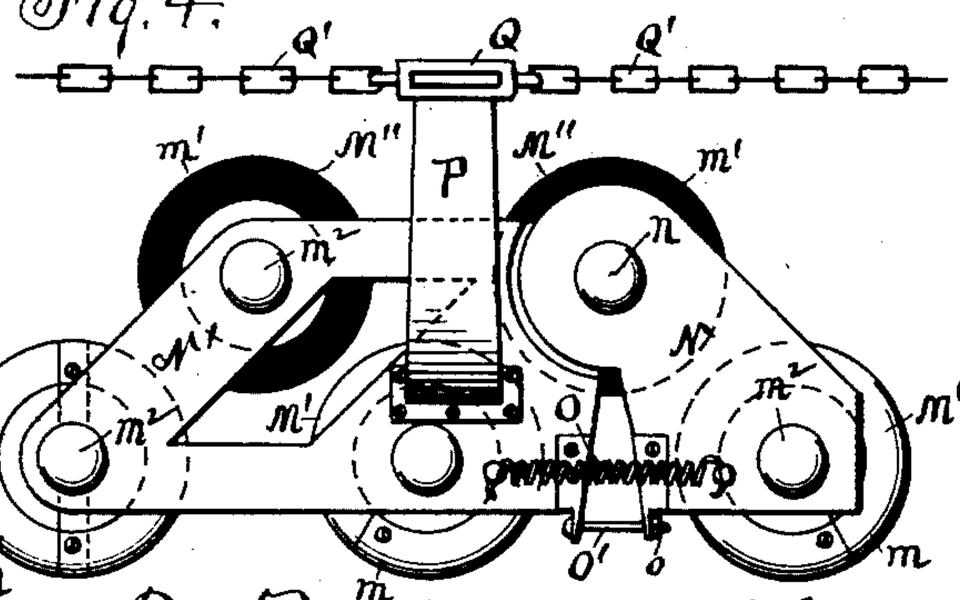


Fig. 5.

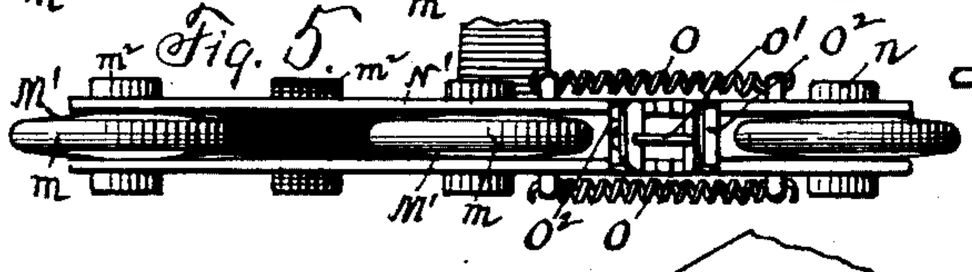


Fig. 6.

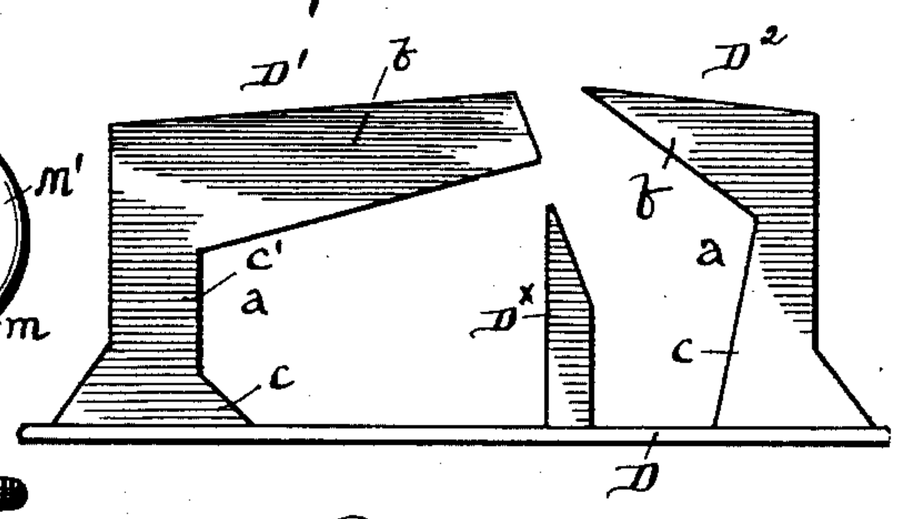


Fig. 7.

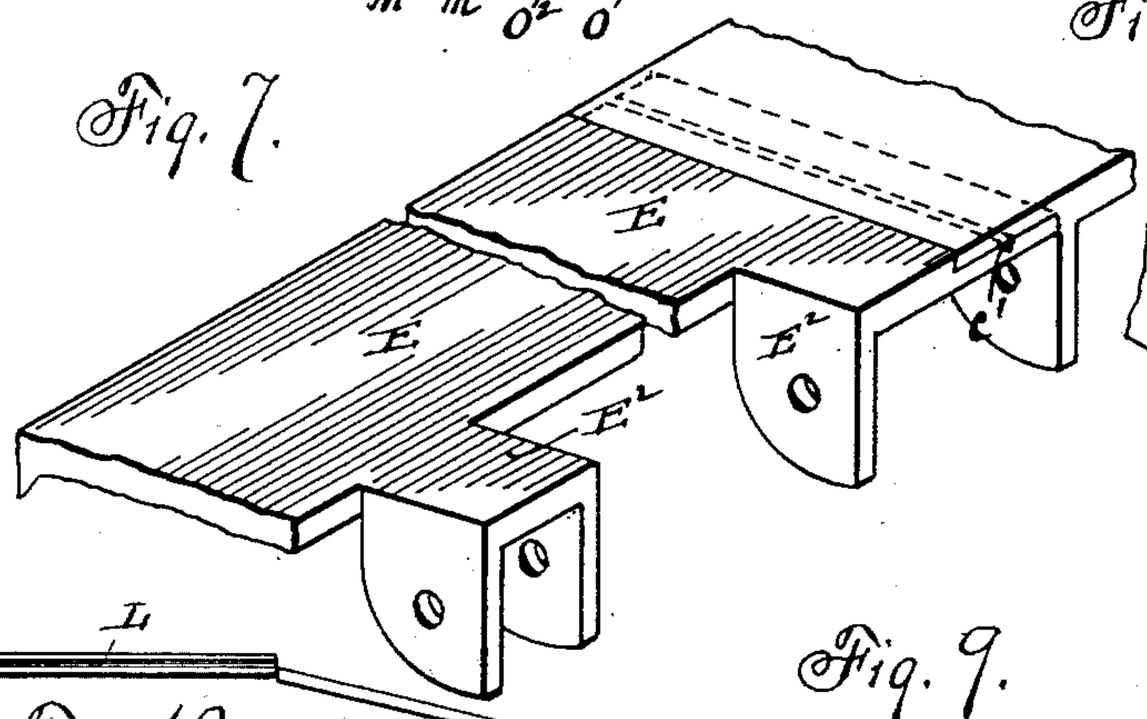


Fig. 8.

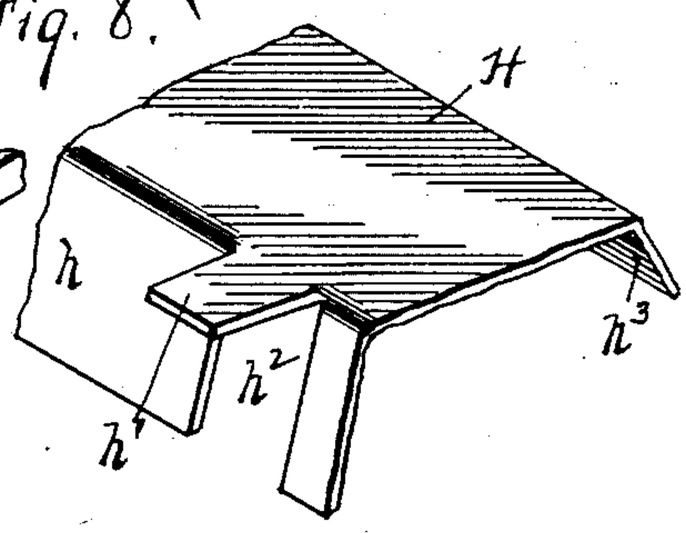


Fig. 9.

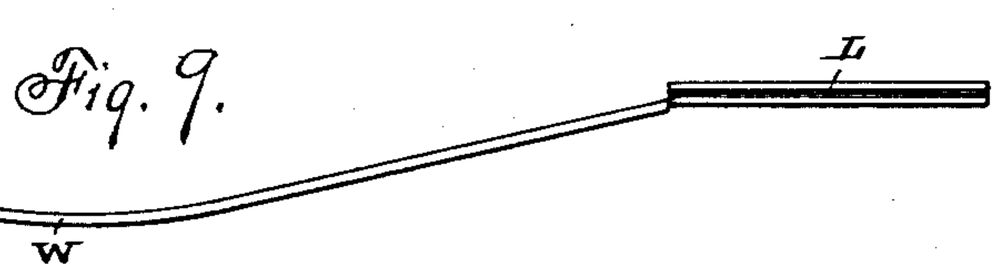


Fig. 10.

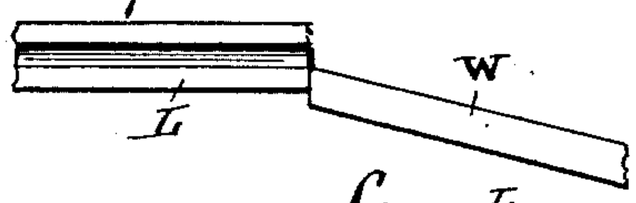
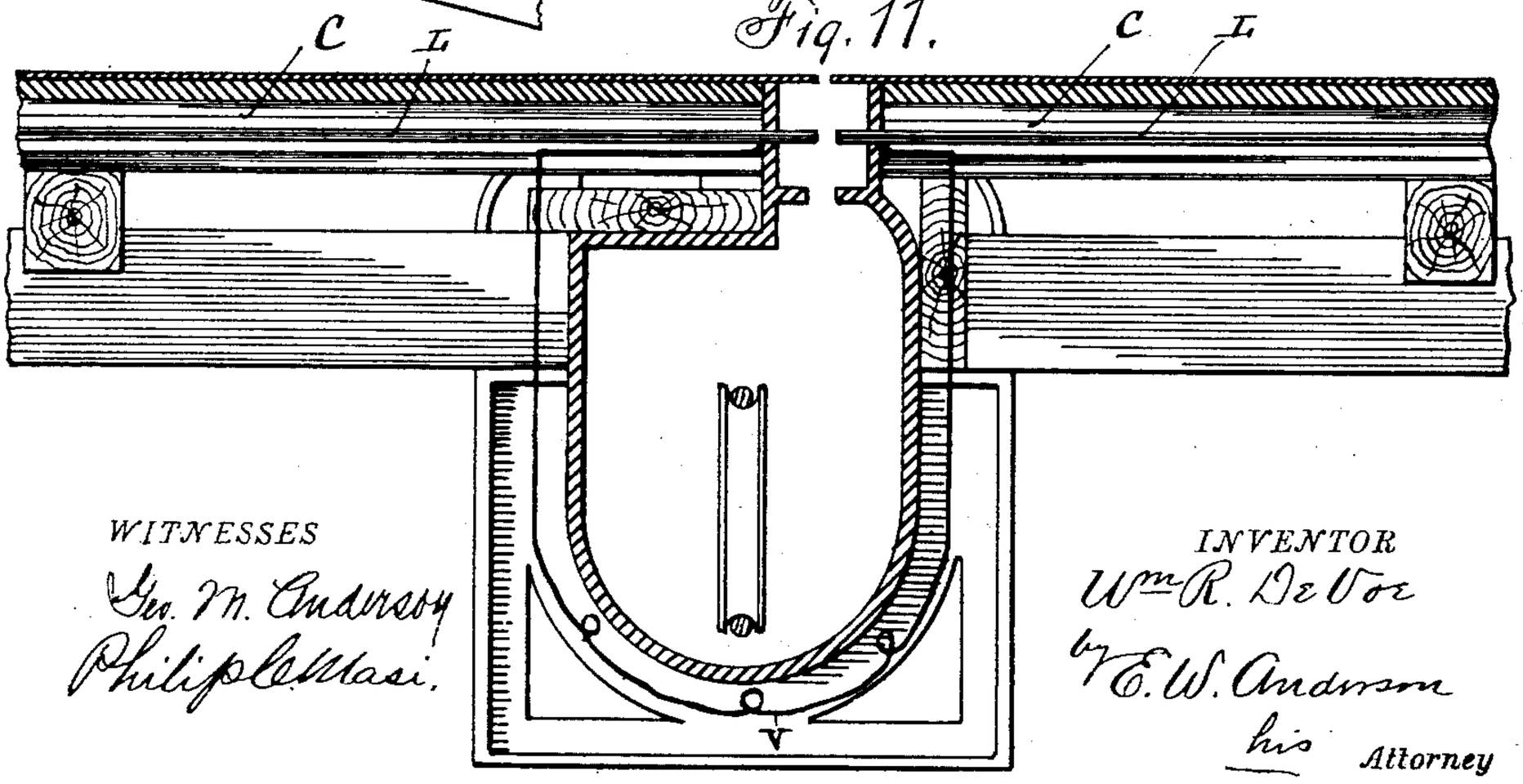


Fig. 11.



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UNITED STATES PATENT OFFICE.

WILLIAM R. DE VOE, OF SHREVEPORT, LOUISIANA.

CONDUIT ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 520,304, dated May 22, 1894.

Application filed January 20, 1894. Serial No. 497,535. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. DE VOE, a citizen of the United States, and a resident of Shreveport, in the county of Caddo and State of Louisiana, have invented certain new and useful Improvements in Conduit Electric Railways; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a representation of a transverse section of the conduit and track, one of the draft chains being shown loose from the trolley. Fig. 2 is a plan view of a portion of conduit and track. Fig. 3 is an enlarged section of conduit, with trolley in section with one of the draft chains in the same position as in Fig. 1. Fig. 4 is a plan view of trolley. Fig. 5 is a side view of same. Fig. 6 is an elevation of metallic plate D and projections. Fig. 7 is a perspective view of cover plate. Fig. 8 is a perspective view of metallic lining. Figs. 9 and 10 are detail views. Fig. 11 is a sectional view of a crossing.

My invention has relation to underground conduits for conductors used to carry a current for the propulsion of railway cars, and also to a trolley to be used in connection therewith, an object being to improve the construction and arrangement of the conduit whereby that portion thereof wherein is situated the conductor may be kept practically free from moisture and accumulations of matter from the surface.

A further object of the invention is the provision of an improved lining, together with lining and cover plate supports, whereby the first named object is accomplished, and a strong, efficient, and practical construction of the conduits is obtained.

A further object of the invention consists in an improved form of trolley adapted to the conduit, and so constructed that an intersecting line may be crossed without breaking contact with the conductor and without a change in the position of the trolley, the crossing being also adapted to this end.

Other objects of the invention will hereinafter appear.

With these objects in view, the invention consists in the novel construction and combination of parts all as hereinafter described and pointed out in the appended claims.

Referring to the accompanying drawings illustrating the invention, the letter A designates the usual cross ties or sleepers upon which are supported the traction rails B, and upon which I also support my improved conduit C. Supported upon each of these ties is a metallic plate D, having a horizontal flange or base portion which rests upon the tie and is firmly spiked thereto. Said plates are somewhat longer than the width of the conduit, and near each end portion are formed with an integral, vertical post or projection, that at one end being designated by the letter D′, and that at the opposite end by the letter D^2. These posts or projections are formed on their inner faces with the angular depressions or notches *a*, forming an upper overhanging portion *b*, and a projecting base portion *c*, said portions *b* and *c* having inclined faces. The upper edges of said projections are formed flat, and constitute supports for the cover or surface plates E, E′, in the manner hereinafter described. Said plates are also formed with a vertical intermediate projection $D^{\times}$.

F designates edgewise disposed protection planks which form the outer, lateral walls of the conduit, and which at their ends abut the said posts.

G designates a metallic lining for the bottom and lower side walls of the conduit, said lining being formed in sections of suitable lengths, said sections being each in one integral piece. These lining sections are formed with horizontal portions *g*, which form the bottom of the conduit, said bottom portions being struck up a short distance from one side, to form a vertical hollow integral flange *g′*, said flange being of such a height as to leave a passage between its upper edge and the overhanging arms of the posts D′ sufficient to permit the passage of the trolley arm. This flange *g′* divides the conduit into two portions, the conduit proper C, and a parallel water conduit C′, said flange having an

inclined surface so located with relation to the slot *e* in the cover plate, that any water or other matter entering said slot will fall upon this inclined surface and will be deflected thereby into the water conduit, it being impossible for it to get through into the conductor conduit. At one side the lining is bent upwardly as shown at g^3, and is secured to the inclined faces of the portions *c* of the metallic plate D and to angle blocks D^3 between said plates. At its opposite edge, the said lining is bent upwardly, as at g^4, and is secured to the inclined face of the portion *c* of the post D′, and to a vertical face *c′* of said arm which intervenes between the upper and lower projections. The cover plates E E′ are made in sections of any suitable length, being supported upon the upper edges of the posts D′, D^2, and having at each of said posts a lateral and depending solid lug E^2 which is firmly bolted to the post, thus rigidly securing the cover plate and also strengthening the overhanging portions of the posts owing to the solid bearing therefor which the lugs afford. At joints, the proximate end portions of the sections are rabbeted, overlapping one upon the other in the manner shown in Fig. 7 the said end portions being formed with the lugs E^2 which fit the posts D′ and D^2, bolts E^3 through said lugs and posts firmly connecting the sections together. If desired, a small V-shaped channel *e′* may be cut in the lower rabbeted section to receive and carry away any moisture that may find its way through the joint.

H designates a metallic lining cap which extends over the conduit proper and which has a downward flange *h* which overlies the upward lateral flange g^4 of the lining G. This lining cap is supported on the posts D′ underneath the cover plates, and is made to break the joints of the latter, lugs or extensions *h′* being formed which fit under the lugs E^2, the flange *h* being cut away at h^2 to fit closely around the post, as best seen in Fig. 8. The inner edge of the lining cap has a short depending flange h^3 which turns over the overhanging arms of the posts, and assists in holding the cap to place.

I are angle blocks abutting in between the posts D′ and having inclined faces to which the flange g^4 of the lining is secured intermediate of the cross ties.

J are angle blocks to which the flange *g′* of the lining is secured. Spiked to the angle blocks I is a back strip K to the inner vertical face of which the upper portion of the flange g^4 is secured intermediate of the ties.

L designates the supply conductor, which comprises a ribbon of copper bent to form a longitudinal groove or depression to receive the beaded tires of the trolley wheels. Said ribbon is supported by insulation blocks L′ secured to the back strip K through the lining.

$L^\times$ designates a dead or guard rail exactly opposite to and parallel with the conductor L, said rail being grooved to receive the guard wheels of the trolley. This rail is supported by means of the flange *g′* of the lining to which it is secured.

L^2 designates an insulated feed wire which is laid through the conduit.

M designates the trolley, which consists of three horizontal live wheels M′ arranged in a direct line with each other, and which travel in the conductor L, and two dead or guide wheels M^2 which travel in the dead or guard rail. These wheels are flexibly connected upon each side by means of a flexible frame, composed of two metallic conducting plates N, N′, pivoted at *n*, the axle of one of the wheels M′ acting as the pivot. The larger plate N′ is trapezoidal in form, having bearings near its angles for two of the live wheels, and for two of its dead wheels, its pivot connection with the smaller plate N being at one of the angles. The smaller plate has a bearing near one end for the remaining live wheel, and at the opposite end portion a reduced bearing portion which overlies a corresponding portion of the larger plate, the two forming together a bearing for the axis of the dead wheel which serves as the pivot.

The two plates are united at one or both sides, preferably upon both, by tension springs O, nearly or quite in the line of centers of the live wheels, the action of this spring or springs being to draw the plates together and thereby increase the width of the trolley, thus keeping the wheels bearing closely and steadily upon the tracks. In order to adjust the tension of these springs I connect the two frame plates by a tension rod or bolt O′, having a nut *o*. The corresponding plates upon opposite sides are connected by short plates O^2.

The live wheels are formed with a solid metallic body portion, having a peripheral tongue or bead upon which is fitted a copper tire *m*, said wheel and tire being both made in two half-sections with overlapping joints. This permits the tire to be readily put in place and also to be taken off and reversed, the wear being the greatest upon the lower edge. When the tire is worn out it can be readily replaced, thus avoiding the necessity for entirely new wheels. The dead or guide wheels are made of some non-conducting hard substance, such as lignum-vitæ, with a hard rubber tire *m′* thereon. The axles m^2 of the various wheels are made hollow, the interior chambers serving as lubricant receptacles, lubricant channels m^3 being formed to carry the lubricant through to the bearings *n′*. The upper ends of these chambers are closed by screw caps *n″*.

P designates the connecting arm of the trolley which is attached to the larger trolley plate N′, and which is of curved form, extending through the passage above the guard flange *g′*, and thence up vertically to the slot, where it has a loose connection *p* with the motor connection P′. The arm P has a central

copper conductor ribbon covered by metallic strips P^2, from which the ribbon is preferably insulated. Q is a block on the said arm, and insulated therefrom, to which are attached the draft chains Q′ which extend up through the slot and are attached to the car trucks, thus taking the stress off from the motor connection entirely.

Q^2 is a steel sleeve which runs in the slot, and which surrounds the conductor from which it is insulated.

R designates drain pipes from the bottoms of the conduits C, C′, said pipes having sewer or other escape connections, not shown.

S designates the return wire, which at every joint in the rail has a connection *s* with a bond plate T which is connected to or integral with one of the metallic plates D, said plate having at its outer end a chair *t* in which the rail ends are seated. One of these bond plates is provided at every joint in the rail. The return wire may however be omitted, and the rails depended upon entirely for the return.

In order to more effectually guard against any possibility of the live wheels leaving the conductor, guard strips U, U, may be provided above and below the conductor, said strips being secured to the angle blocks I, and to the back strips K. The conduit is set in asphalt, or similar material, as indicated.

In Fig. 11 I have shown the manner in which the parts are arranged at an intersecting cable line. The conduit is extended up close to the cable conduit, and a break of some five or six inches is made in the conductor at the intersection of the cable, the break being bridged by a loop V in the conductor carried under the cable. The distance between the live wheels, and between the dead wheels is sufficient to bridge over the break, so that two of the live wheels and one of the dead wheels will always be in contact with the conductor, the trolley passing above the cable.

Figs. 9 and 10 illustrate a method which may be adopted, when it is desired to carry the trolley underneath some obstruction. In such arrangement the grooved conductor L is made to terminate at each side of the descent, and inclined conducting rails W are provided upon which the trolley wheels run.

It will be observed that the construction of the conduit as hereinbefore described is simple in its nature, the parts being capable of being readily formed and assembled, while the arrangement is such as to effectually keep the conductor conduit free from moisture and dirt accumulations.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric railway conduit, the combination with the cross ties, of the metallic plates secured to said ties, and carrying post projections near each end, the metallic lining having upward flanges fitted to said posts, and an integral upward flange near one side substantially dividing said conduit into two parts, and cover plates rigidly secured to said posts and supported thereby, substantially as specified.

2. In an underground conduit for electric railways, the combination with the cross ties or sleepers, of the metallic plates supported on said ties and secured thereto, said plates having vertical post projections near each end, the metallic lining having the lateral upward flanges fitted against said posts, and the integral vertical grooved flange or projection dividing the conduit into two parts, the cover plates having the depending lugs abutting said posts and bolted thereto, and the metallic lining cap underneath the cover plate, and covering one part of said conduit, said lining cap having a depending flange overlying one of the upward flanges of the lining, substantially as specified.

3. An underground conduit, comprising the metallic plates supported on and secured to the cross ties, and carrying an integral, vertical post near each end, said posts having overhanging upper portions, a metallic lining on the bottom of said conduit and having upward, lateral flanges fitted to the lower portions of said posts, and an integral, vertical flange substantially dividing the conduit into two parts, the angle blocks to which the lining is secured, the outer protection planks abutting said posts, the lining cap over one part of said conduit, and having a lateral, depending flange, and the cover plates supported upon and secured to said posts, substantially as specified.

4. In a conduit for electric railways, a metallic lining plate for the conduit, said plate having an integral upward flange substantially dividing the conduit into two parts, the upper end portion of said flange having a broad, inclined deflecting surface situated directly underneath the slot in the cover plate, substantially as specified.

5. In an electric conduit for electric railways, a metallic lining having upward lateral flanges, and an intermediate vertical flange substantially dividing said conduit into two parts, said flange having a deflecting surface located underneath the slot in the cover plate, substantially as specified.

6. A lining section for underground electric railways comprising a metallic plate, having integral lateral upward flanges, and an intermediate upward, hollow integral flange, substantially as specified.

7. In an underground conduit for electric railways, the metallic plates D, comprising each a base portion forming the tie plates, and the posts, one near each end, and formed with overhanging cover supporting upper portions, and with inclined base portions, substantially as specified.

8. In an underground electric railway conduit, the combination with the metallic plates secured to the cross ties, and their vertical post projections, of the cover plates having

the depending and lateral lugs abutting said posts, and bolted thereto, said plates at their joints having overlapping rabbeted portions, substantially as specified.

9. In an electric railway, the combination with the two-part conduit, a grooved conductor having an insulated support upon one side of one division of said conduit; and a "dead" guide rail supported upon the opposite side of said division, of a trolley having a series of horizontal conducting wheels having beaded tires adapted to run in the groove of said conductor, a series of non-conducting guide wheels running in said dead track, a flexible tension frame connecting said wheels, and a curved trolley arm attached to said frame and connecting with the motor on the car, said series of wheels constituting a bearing sufficiently extended to bridge over breaks in the conductor at intersecting lines, substantially as specified.

10. In an electric railway, the combination with the conduit having the grooved conductor, and the opposite non-conducting guide rail, of a trolley having a series of conducting wheels, having removable beaded tires engaging with the groove of said conductor, and a series of non-conducting guide wheels engaging said guide rail, a flexible two-part frame connecting said wheels, tension springs connecting the parts of said frame, a tension screw also connecting said parts, and a curved conductor arm attached to said frame and connecting with the motor on the car, substantially as specified.

11. In an electric railway, the combination with the conduit having the conductor, and the opposite non-conducting guide rail, of the trolley having a series of horizontal wheels traveling on said conductor, and a series of non-conducting wheels traveling on said guide rail, a flexible conducting frame connecting said wheels, a ribbon conductor attached to said frame, metallic plates carrying said conductor and forming a curved trolley arm, an insulated block to which the draft chains are attached, and a guard sleeve around said conductor in the slot, substantially as specified.

12. In an electric conduit, the metallic plates supported on the cross-ties, and having the vertical, cover-supporting post projections, of bond plates, one at each rail joint, said bond plates at one end being connected with the said metallic plates, and at the opposite end to the rails, and having intermediate connection with a return conductor, substantially as specified.

13. In an electric railway conduit, the combination with the cross-ties, and with the metallic, post-bearing plates supported thereon, of the outer protection planks, the metallic lining, the angle blocks to which said lining is attached, the back strip secured to said angle blocks, the insulators secured to said back strip, and the conductor secured to said insulators, substantially as specified.

14. In an underground conduit for electric railways, the combination of the cross-ties, the plates resting on said ties, and carrying posts, the cover plates supported by and secured to said posts, the lining cap, and a partition wall substantially dividing said conduit into two parts.

15. In an underground electric railway system, the herein described trolley comprising a two-part, flexible frame, a series of horizontal conducting wheels journaled in said frame and having removable tires, a series of non-conducting wheels also journaled in said frame, hollow axles forming the bearings for said wheels, and adjustable springs connecting the parts of said frame, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

WM. R. DE VOE.

Witnesses:

GEORGE H. PARMELEE,

PHILIP C. MASI.