(No Model.) 2 Sheets—Sheet 1.

C. J. VAN DEPOELE.

CLOSED CONDUIT FOR ELECTRIC RAILWAYS.

No. 458,866. Patented Sept. 1, 1891.

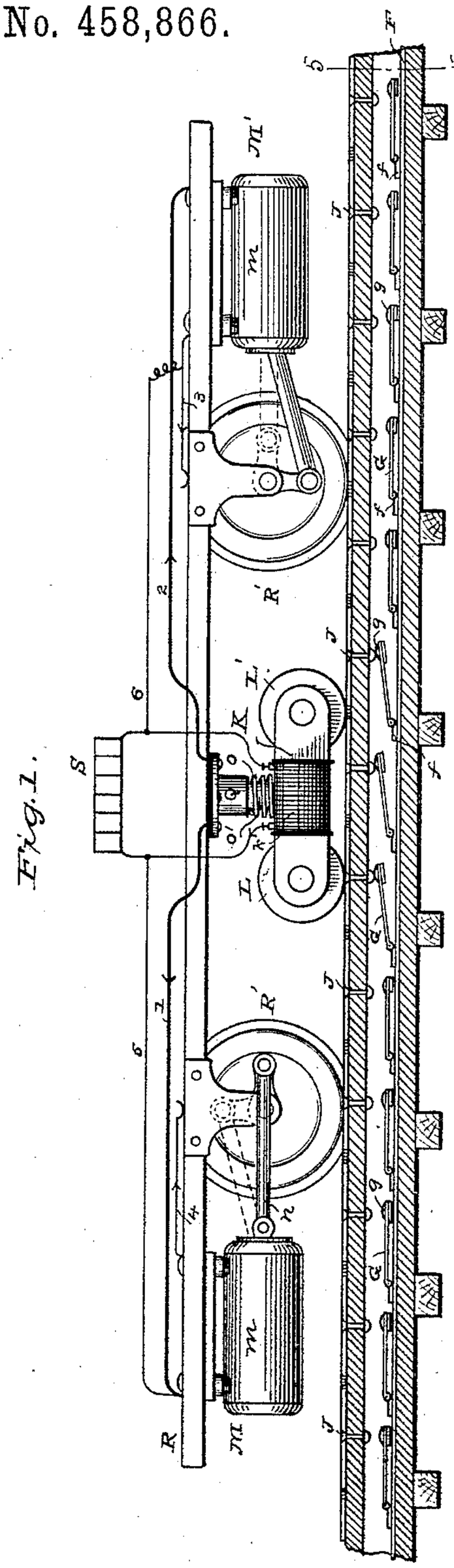

Fig. 1.

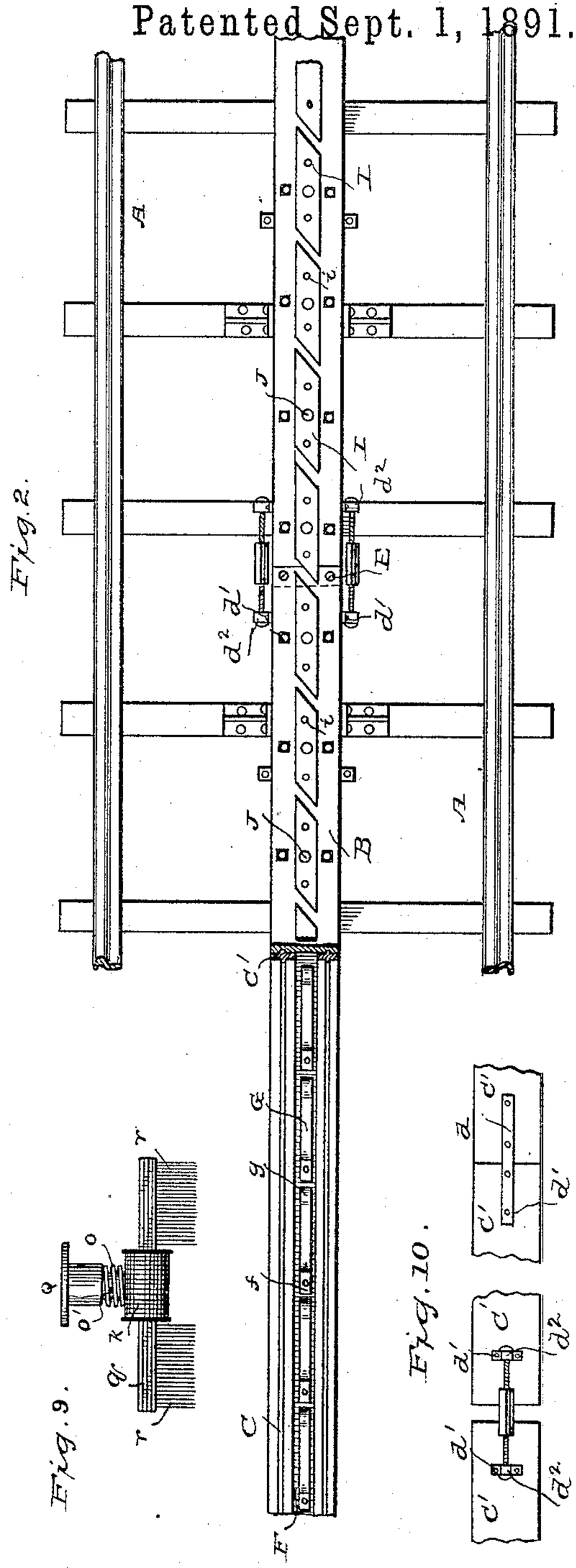

Fig. 2.

Fig. 9.

Fig. 10.

Witnesses
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

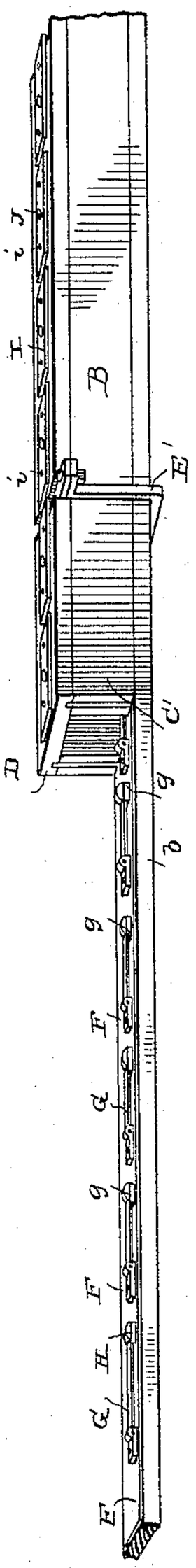


Fig. 6.

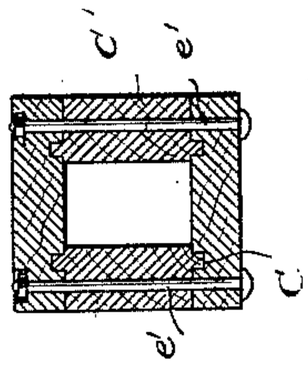


Fig. 5.

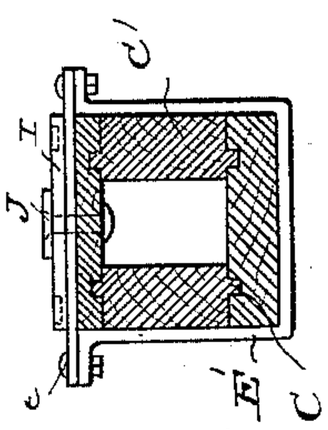


Fig. 8.

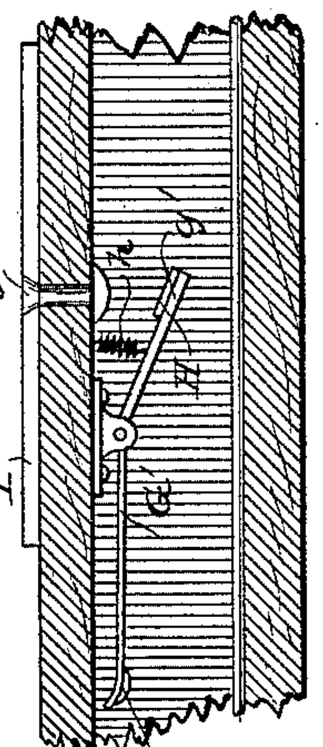


Fig. 4.

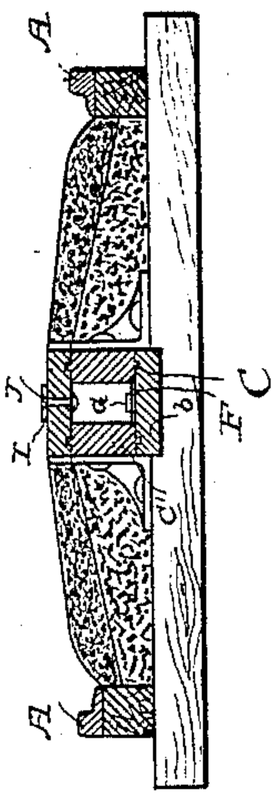
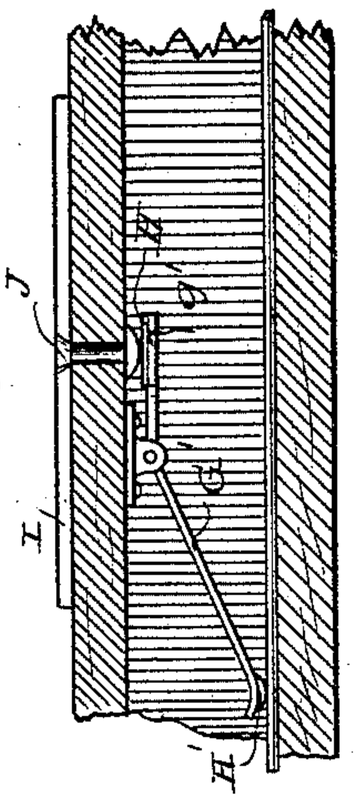


Fig. 7.



Witnesses
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Geo. H. Campbell.

Inventor
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By his Attorney
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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF CHICAGO, ILLINOIS.

CLOSED CONDUIT FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 458,866, dated September 1, 1891.

Application filed February 8, 1887. Serial No. 226,952. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, 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 Closed Conduits for Electric Railways, of which the following is a specification, reference being had therein to the accompanying drawings.

The present invention relates to new and useful improvements in electric railways; and it consists in a new and improved arrangement whereby I am enabled to place the main working conductor in a hermetically-sealed tube or box, thereby effectually excluding water, snow, mud, and other injurious elements, the closed conduit being placed between the rails in the usual manner.

It also relates to new and improved means for making and maintaining electrical connection between the conductor in the closed conduit and a contact-carriage moving along the exterior thereof and communicating with the motor on the vehicle being propelled.

It further consists of the details of construction and arrangement which are hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a diagrammatic elevation of a portion of an electric railway embodying my invention. Fig. 2 is a plan view of the roadway, a portion of the conduit being broken away to show the interior arrangement thereof. Fig. 3 is a perspective view of the conduit with a portion thereof broken away. Fig. 4 is a transverse sectional elevation of the roadway. Fig. 5 is a section on the line 5 5 of Fig. 1. Fig. 6 is a sectional view showing a modified way of securing the parts of the conduit. Figs. 7 and 8 illustrate a modified arrangement of the hinged contacts, and Fig. 9 is a detail showing a modified form of contact device. Fig. 10 is a fragmentary view showing two forms of devices for uniting the ends of the side pieces of which the walls of the conduit are constructed.

Similar letters denote like parts throughout.

A are the rails of an ordinary street-railway, and B is a centrally-located tube, trough, or box containing one of the working conductors supplying the current by which the motor or motors propelling the car or cars are actuated.

The arrangement of the conduit proper is substantially as follows: A heavy base-piece *b*, of wood, paper, or other suitable material six or seven inches wide, is formed with continuous grooves along its upper sides, in which grooves rest tenons or tongues C, formed on the edges of pieces C′, which are placed therein so as to form the sides of the conduit. A top piece D, grooved like the bottom piece *b*, fits over the side pieces and is grooved like the bottom piece to receive a second set of tenons formed on the upper edges of the side pieces C′. The several portions of which this conduit is formed should be boiled in tar, or a mixture of wax, paraffine, and rosin, or treated with creosote, and then painted with tar, &c., for the purpose of preserving and at the same time rendering it a good insulator. The conduit is formed in sections or continuously. For the sake of illustration, however, I have here shown it as formed continuously, the bottom pieces being scarfed and united by wooden pegs or screws. The ends of the side pieces are preferably tongued and grooved respectively to fit together endwise, and when so fitted are held together by straps *d*, placed across the joints and securely attached to the respective ends by screws *d′*. The united ends may also be secured and held together across the joint by a turn-buckle or right-and-left screw engaging suitable nuts d^2, secured to the ends to be joined, by which the ends of the side pieces can be forcibly drawn together, and at the same time be readily removed when repairs are necessary. The top is rendered practically continuous, the several sections thereof being joined together with lapped ends, which may be secured in position by wood-screws E, which are forced home into countersunk holes so as not to protrude unnecessarily. At intervals of three or four feet clamp-straps E′ are placed around the exterior of the conduit and secured by bolts *e*. The top portion is, however, let into the top piece D in such a manner as not to come in contact with any of the metallic parts of the structure. Instead of the straps E′, I may use a headed bolt *e′*, passing upward through the several portions of which the con-

duit is composed, as shown in Fig. 6. After the several portions of the conduit have been assembled, as described, they are to receive a thorough coating of the tar, pitch, asphaltum, or similar substance, effectually protecting it from the weather, and at the same time closing all joints and heremetically sealing it. The interior of the conduit should be, for instance, two inches wide and three inches high, within which space is secured a continuous bar F, of copper or other good conductor, which should project slightly under the edges of the side pieces C', which will then hold it firmly in position without the addition of bolts or screws, which might interfere with its otherwise perfect insulation.

Upon the conductor F are secured by screws or permanently by soldering the ears *f*. These ears may also be formed by passing the bars forming the conductor F through a machine that will punch them up from the under side. Within the ears are hinged contact-arms G, which consist of pieces of thin sheet copper, brass, or bronze, or other good conductor, which are somewhat narrower than the conductor F, to avoid touching the side walls of the conduit, and are provided at their free ends with iron armatures *g*. They are further provided with a small piece of carbon H on their upper extremities. The top piece D is provided with a series of metallic plates I, preferably hard brass, of, say, one foot in length and three inches in width, which are secured thereon at about three inches apart throughout the entire length of the conduit by means of suitable screws *i* or pins projecting downwardly from the under side of the plates themselves. The plates are further formed with oblique ends, as shown, and an iron pin J passes down through their center and through the top piece, terminating in a suitable head projecting into the interior of the conduit. The heads of the pins J are located nearly over the armatures *g*, affixed to the contact-arms, and it will be understood that by providing the contact-carriage with iron contact wheels or brushes sufficiently magnetized as the said carriage passes along the pins J will be magnetized, the armatures of the contact-arms G attracted, and the said arms brought up into electrical connection therewith, and the current with which the conductor F is charged be permitted to pass therefrom through the arms G, pins J, plates I, and thence through the wheel or brush of the contact-carriage to the motor or other translating device.

I do not in every case propose to attach the contact-arms to the conductor F, as I may for some purposes prefer to suspend them from the top piece, as shown in Figs. 7 and 8, where the contact-arm G' is provided with an iron armature or weight at one end and suspended by a hook fastened into the top piece. Normally the weight of the iron armature *g'* raises the comparatively light contact-arm G' and holds it against the top of the conduit as far as possible from the conductor F. The action of the armature is of course the same as in the other case, and when attracted to the pin J the iron will come in contact therewith, the protective carbon will meet the conductor F, and the circuit be established. In some instances I may prefer to attach a retracting-spring, which is then placed, as shown, at *h* in Fig. 8.

The carbon contacts H H' are provided for the purpose of preventing adhesion of the parts by fusion in case an unusually large spark is formed at the moment of separation.

In operation my improved conduit is practically free from the great objections heretofore found to exist to the use of continuously-slotted devices or containers for electric conductors when said devices were placed under ground, since although it may be possible under extremely favorable circumstances to drain off the water entering such conduits still it is practically impossible to prevent the bare conductor or conductors therein contained from being affected by changes in atmospheric conditions, and, further, the conduit itself being exposed to the elements on at least one of its sides is extremely liable to decay and injury.

Under the present improvement, while it may happen that in bad weather the conduit will be covered with mud, snow, or water, yet, the contact-plates I forming no part of any circuit, under ordinary circumstances no injury of any kind can occur to them or to men or animals from stepping or walking upon them, since there are no circuits to be completed, nor would this danger attend persons walking around or in front of a vehicle being propelled therealong, since the only plates actually in circuit would be entirely under the contact-carriage, which is by preference placed under the center of the car.

The contact-carriage is composed of a heavy iron body-piece K, at each end of which is journaled a suitable iron contact-wheel L, and the length of said carriage is so arranged that when the front wheel L is directly over a pin J the hind wheel L' will be just between two sections and not entirely off either. Upon the center of the piece K is a magnetizing-coil *k*, which is placed directly in the main circuit, the current entering through the wheels L L', passing therethrough and thence to the motors M M' through conductors 1 and 2, and returning from said motors through conductors 3 and 4, which extend to and make connection with the track-wheels or some part of the running-gear by which connection is made with the rails A, constituting the return-conductor.

The contact-carriage is provided at its center with an upwardly-extending post O, arranged to move vertically within a strong metallic socket Q, fixed to the under side of the body of the car R, and a suitable spring O' may be placed within the socket or coiled around the post at its lower end.

S is a secondary battery, the working circuit of which includes the magnetizing-coil *k* and serves to vitalize the contact-wheels and attract the hinged contact-arms to complete the main circuit at starting. The said storage-battery is connected in derivation from the main circuit through conductors 5 and 6, by which it is kept at all times sufficiently charged to answer its purpose.

Instead of the electro-magnetic contact-carriage just described, I may use a permanent magnet similar to that shown in Fig. 9, where *q* is a permanent magnet provided at its extremities with steel brooms *r*, which being substituted for the hinged carriage previously described will make a rubbing instead of a rolling contact. A magnetizing-coil K is wound around the center of said magnet and serves to re-enforce the power thereof. It will be obvious that the brooms *r* may be used in place of the wheels L L′, and vice versa. The motors M M′, as shown, are reciprocating magnetic engines connected directly to the carrying and driving wheels R′ R′. The cylinders *m* themselves consist of solenoids placed over non-magnetic central tubes adapted to receive the reciprocating plungers or pistons to which the connecting-rods *n* are connected in a manner usual with steam-engines. The said solenoids are then inclosed by an exterior iron casing consisting of end pieces and a body-piece, all substantially as shown and described in Letters Patent No. 367,685, granted to me August 2, 1887.

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

1. In electric railways, the combination of a conduit, an electric conductor within the conduit and a conductor exterior thereto, magnetically-controlled circuit-closing devices between said conductors, and a magnet for actuating the circuit-closing devices, substantially as described.

2. In electric railways, the combination of a conduit, an electric conductor within said conduit, a conductor exterior thereto, circuit-closing devices for establishing electrical connection between the exterior and interior conductors, and a magnet for actuating the contact-making devices, substantially as described.

3. In electric railways, the combination of a closed water-proof conduit, an electric conductor within said conduit, a conductor exterior thereto, magnetically-controlled circuit-closing devices between said interior and exterior conductors, and a magnet for actuating the said circuit-closing devices, substantially as described.

4. In electric railways, the combination of a closed tube or conduit formed of some substantial insulating material, one or more electric conductors arranged within the conduit, conductors arranged along the exterior of said closed conduit, and means for connecting the inner with the outer conductors, said means consisting of a contact device controlled by magnetic or electro-magnetic devices traveling with the vehicle or vehicles propelled, substantially as described.

5. In electric railways, a conduit containing one or more electric conductors placed on the inside thereof, a series of disconnected exterior conductors, magnetic contact devices placed within the conduit, and a magnet arranged to bring the interior contact devices into contact with the exterior conductors, from which the current carried by the continuous conductor within the conduit can be led off to the working devices exterior to the conduit, substantially as described.

6. In electric railways, the combination of a conduit, an electrical conductor within the conduit, a magnet upon a traveling vehicle, pins of magnetic material extending through the walls of the conduit, and contact-arms hinged within the conduit and provided with armatures within the field of force of but normally out of contact with said magnetic connections, as set forth.

7. In electric railways, the combination of a closed conduit and a working conductor therein, hinged arms attached to said conductor and provided with magnetic armatures, magnetic connections extending through the walls of the conduit, and a traveling magnet arranged to successively attract the armatures and thereby to establish electrical connection with the inclosed conductor through the magnetic connections, substantially as described.

8. In electric railways, the combination of a sealed or water-proof conduit, an electric conductor therein, said conductor being provided with hinged contact-arms formed in whole or in part of magnetic material, iron pins extending through the walls of said conduit, and a traveling contact connected to the vehicle to be propelled and provided with a magnet arranged to close the working circuit by attracting the armatures, thereby making electrical contact with the pins extending through the conduit when said pins have attracted the contact-arm carried by the conductor, substantially as described.

9. In electric railways, the combination of a conduit having an electric conductor therein, a series of short disconnected metallic plates extending along the top of the conduit, an iron pin or pins extending from the plates through to the inside of the conduit, hinged contact-arms provided with armatures normally out of contact with the pins, and a traveling magnet carried by the vehicle to be propelled, said magnet being arranged to attract the armatures within the conduit, thereby moving the contact-arms into operative relation with the rest of the system and establishing electrical connection between the inclosed conductor and the translating devices connected to the traveling magnet, substantially as described.

10. In electric railways, the combination, with the inclosing conduit, of the conductor F, hinged contact-arms provided with iron armatures at their free ends, and iron pins J, located above said armatures, as described.

11. In electric railways, the combination of the conduit, its inclosed conductor, the magnetic pins J, extending through the upper wall of said conduit, the hinged contact-arms provided with armatures arranged in proximity to said pins, and the carbon contacts secured to said arms, substantially as described.

12. In electric railways, the combination of a suitable conduit, a conductor within the conduit, magnetic connections on the interior of the conduit, a contact-carriage having magnetized contacts, and means carried by the car for magnetizing the moving contact and thus establishing electric connection with the conductor on the interior of the conduit, substantially as described.

13. In electric railways, the combination, with a closed conduit, an electric conductor inclosed therein, and vibrating contact-arms provided with magnetic armatures and also contained within the conduit, of the contact-plates I, arranged in series along the upper side of said contact and each provided with an iron pin extending through the wall of the conduit and separated each from the other by obliquely-formed end spaces, substantially as shown and described.

14. In electric railways, the combination of a closed conduit, an electric conductor therein, contact devices extending to the exterior of the conduit, and the surface contact-plates arranged in series and separated by oblique end spaces, substantially as described.

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

CHARLES J. VAN DEPOELE.

Witnesses:

FRANKLAND JANNUS,

H. A. LAMB.