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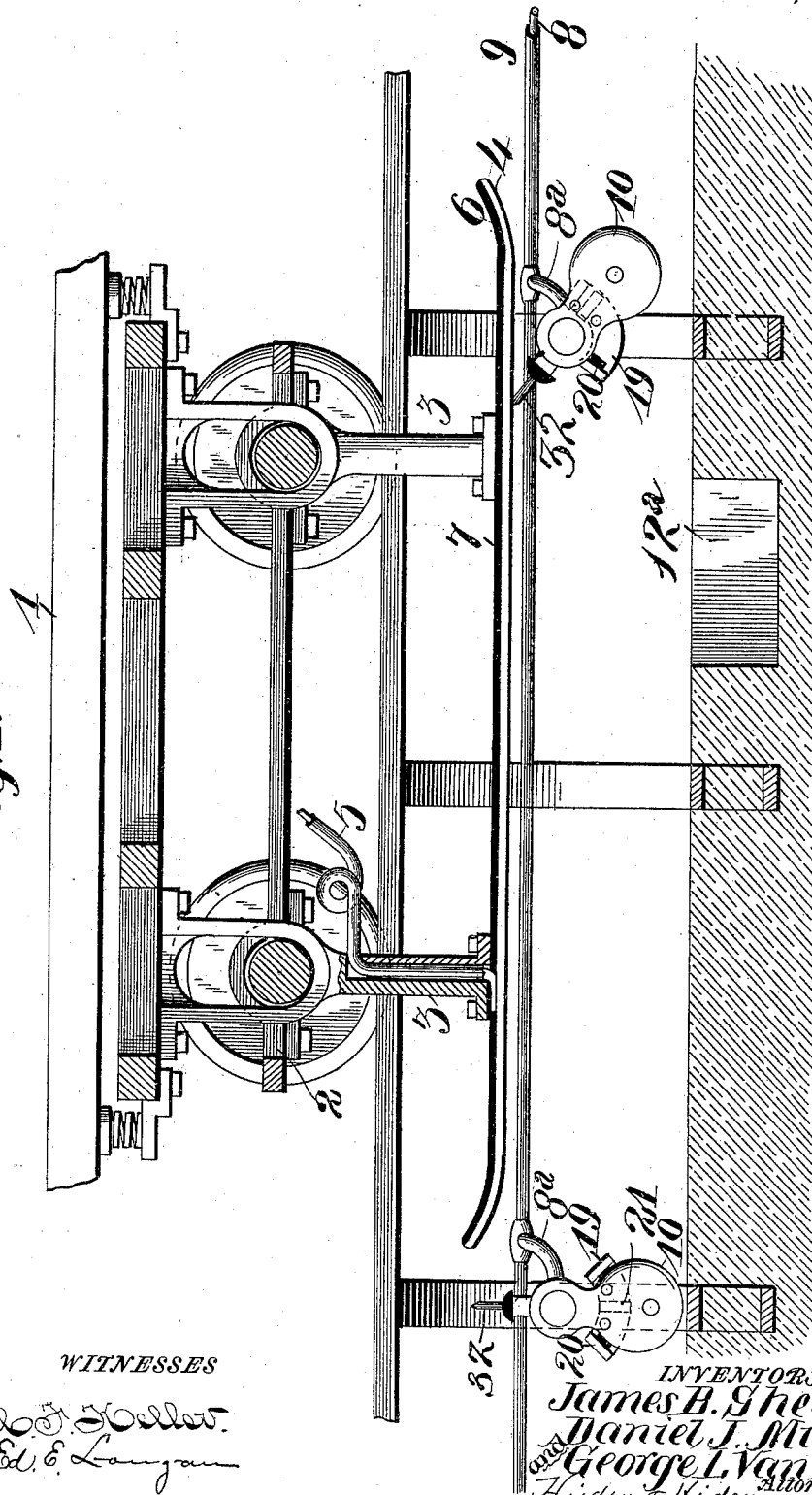
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J. B. SHELDON, D. J. MURNANE & G. L. VAN BEEK.  
UNDERGROUND ELECTRIC RAILWAY.

No. 489,764.

Patented Jan. 10, 1893.

Fig. 1.



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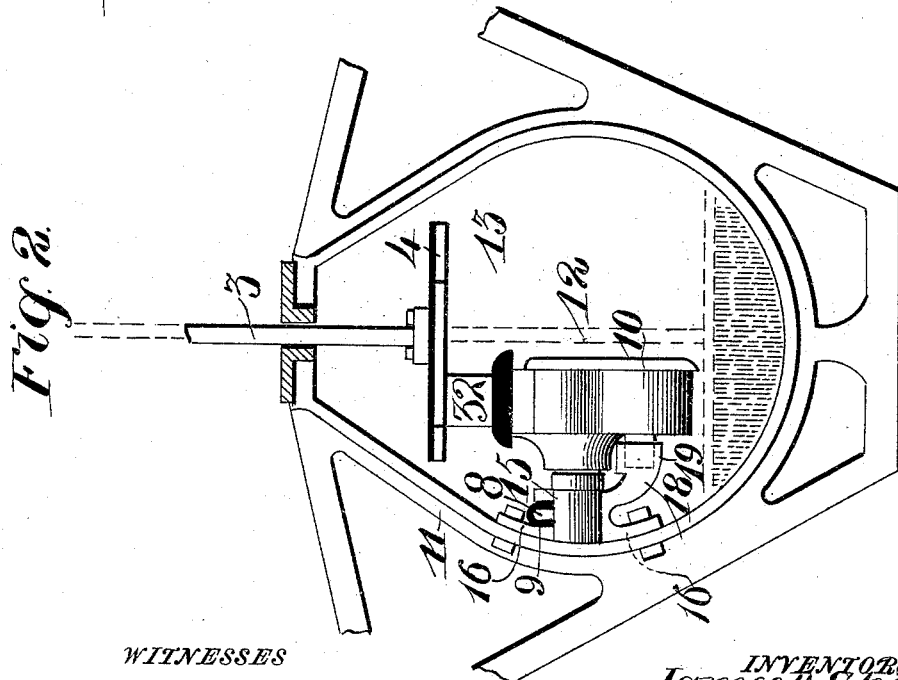
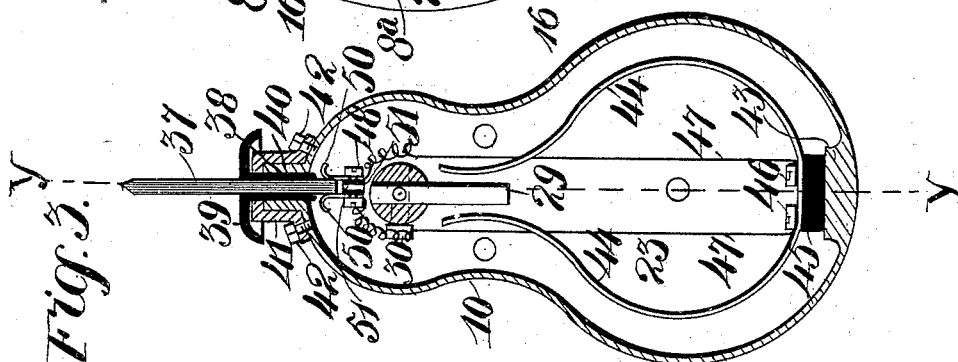
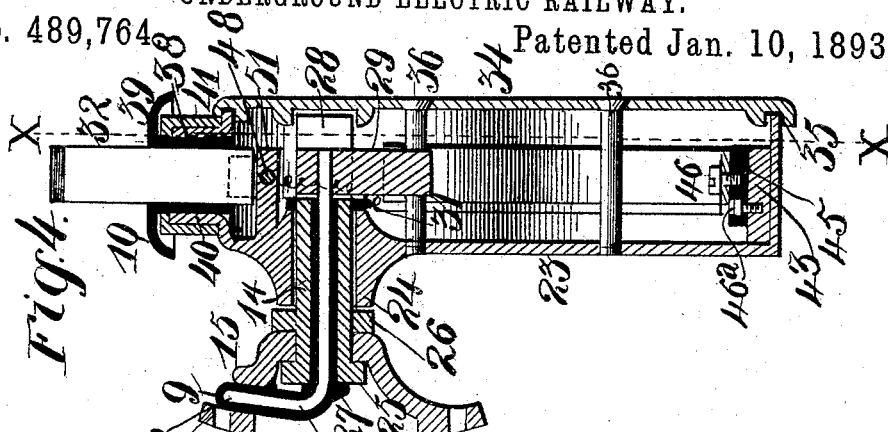
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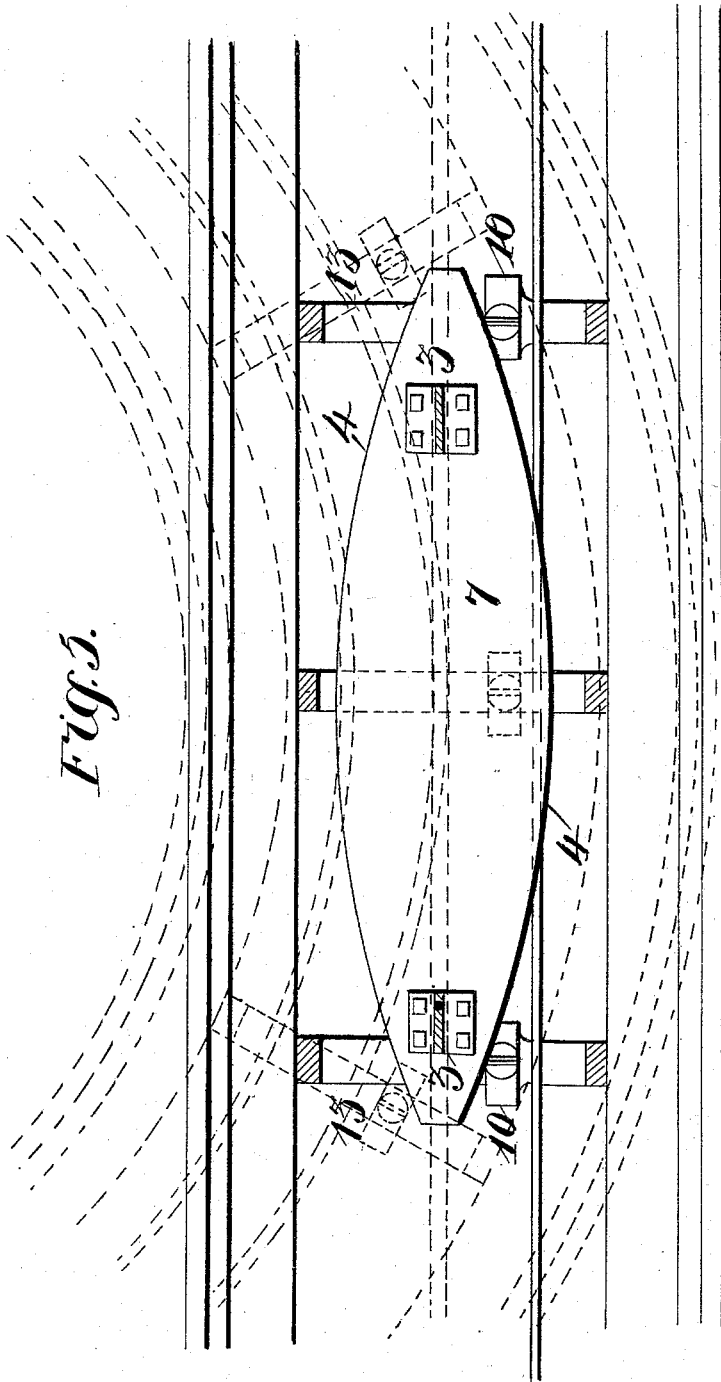
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# UNITED STATES PATENT OFFICE.

JAMES B. SHELDON, DANIEL J. MURNANE, AND GEORGE L. VAN BEEK, OF  
ST. LOUIS, MISSOURI.

## UNDERGROUND ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 489,764, dated January 10, 1893.

Application filed June 22, 1891. Serial No. 397,545. (No model.)

*To all whom it may concern:*

Be it known that we, JAMES B. SHELDON, DANIEL J. MURNANE, and GEORGE L. VAN BEEK, of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

Our invention relates to electric railways of that class in which the feeding or working electric conductor is located in a conduit in the road bed and incased or insulated for the purpose of overcoming the objection of short-circuiting or grounding incident to the use of exposed conductors in conduits, suitable contact switches being located at intervals along the conduit and designed to be employed by a plow or collector on the car for the purpose of establishing electrical connection between the motor on said car and the working conductor.

Our invention consists in certain improvements in the construction and arrangement of the parts of such a system which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings:—Figure 1 represents in vertical longitudinal section a portion of a conduit and of a car to which our improvements are applied. Fig. 2 is a transverse section through the conduit, showing in elevation one of the conduit yokes (the outer ends of which are broken away) one of the contact switches and the collector or plow in engagement with said contact switch. Fig. 3 shows in vertical section on the line  $x-x$  Fig. 4, one of the swinging contact switches, with the front wall of the shell removed for the purpose of exposing the front parts to view. Fig. 4 is a vertical section on the line  $y-y$  Fig. 3 of the swinging contact switch and the support upon which it is hung, which support likewise receives the insulated feeding conductor and affords a passage for the branch wire which runs from the working conductor to the interior of the swinging shell in which the switch is located. Fig. 5 represents in plan the plow or collector illustrating its form which adapts it for rounding curves without impairing its effect upon the contact switches. 1 represents a car to whose truck-frame 2 is attached a plow or collector which consists preferably of a pair of hangers 3 of sufficient width for strength, but of reduced thickness

so as to readily travel in the usual slot with which the conduit is provided. At their lower ends, the hangers 3 are bolted or otherwise secured to a horizontal sliding contact plate or shoe 4.

Electrically connected to the shoe 4 is an insulated conductor 5 which is passed upward through one of the hangers 3, formed with a passage for the purpose, and this conductor 5, being thus protected from injury in its passage through the slot, passes upward and is attached to one pole of the motor on the car (not shown) in any suitable manner.

6 represents upwardly curved deflecting ends on the shoe 4 which adapts said shoe to ride upon the contacts of the switches as will hereinafter appear.

7 represents an insulation interposed between shoe 4 and hangers 3 for the purpose of insulating the shoe from the hangers and preventing the grounding of the current. This insulation 7, may if desired, cover the entire upper surface of the contact plates and shoe.

8 represents the working or feed conductor, which is hermetically sealed in a metallic tube 9 from which it is suitably insulated by an interposed non-conducting material. Branch conductors 8<sup>a</sup> are joined to the main conductor at intervals along the conduit (we have shown one at each alternate conduit yoke) and these branch conductors are likewise completely insulated and protected by a metallic jacket or tube connected to the main tube 9 by a T-joint or other suitable watertight connection.

10 represents the swinging or pendulum-like contact switches which are pivotally attached to one side of the yokes 11 of the conduit 13 through the medium of hollow spindles 14 mounted in brackets 15. The insulated branch conductors 8<sup>a</sup> pass through the hollow spindles, the insulation terminating at the outer ends of the spindles and the exposed ends of the branch conductors projecting within the shells of the swinging switches and having means for automatically making contact therewith, in the manner hereinafter described when said switches are rocked upon their spindles.

12 represents a broom adapted to sweep accumulated refuse into a sink-hole 12<sup>a</sup>.

The bracket 15 has perforated attaching

lugs 16 by which it is bolted to the yoke 11 as shown in Figs. 2 and 4, while, beneath the spindle is an arm 18 on the bracket, which terminates behind the switches and carries a segment 19 provided with stops 20. The stops may be provided with rubber or other cushions on their inner faces, and a lug 21 on the back of switch 10 projects between the stops 20 and engages therewith to limit the rocking movement of the switch.

The switch consists of a shell 23 forming the sides and back of the casing, and having, above the center, perforated boss 24 which receives the spindle 14 upon which the switch has bearing. The spindle is securely held in the bracket 15 by flanges 25 and 26, and the branch conductor is likewise secured against inward displacement by means of a flange 27 on its insulation. The inner end of the spindle 14 is provided with a vertical slot 28 in which is secured a terminal 29 by means of a set screw 30. The terminal 29 receives the end of the branch conductor 8<sup>a</sup>, and said terminal is thoroughly insulated from the spindle. The terminal 29 which is held to the spindle by set screw 30 and the interposed insulation, bears through the medium of insulating washer 31 on the inner face of the boss 24 and thereby retains the shell on the spindle.

Each switch 10 is provided with a contact end 32 which extends upward into the path of the traveling shoe 4, and is adapted to be engaged and depressed by said shoe so as to effect the rocking of the switch and the holding of the same in its deflected position until the shoe passes beyond and comes in contact with the next switch.

34 represents a front plate or cover for the shell, which is provided with a surrounding groove 35 for receiving the edge of the shell, said cover being secured in place by screws 36.

The switch is so formed with a predominance of the weight at bottom, that the switch assumes a vertical position immediately upon being released. The intended operation of this switch is to keep the contact end 32, normally disconnected, electrically, from the terminal 29, but to establish electrical connection between said parts when the switch is rocked by the passing of the shoe. In order to effect this, the contact end is provided with an insulating sleeve 38 and is passed through an opening located in the neck 40 of the shell and seated between a pair of springs 50. If desired, the neck 38 may have a ferrule 41 secured by screws 42 for strengthening the hold on the contact end 32, and the sleeve 40 may have an overhanging flange 39 for excluding moisture. 44 represents a pair of springs secured upon boss 43, in the bottom of the shell, being attached by screws 46 to block 45 which is attached to the boss by screw 46<sup>a</sup>. These springs are curved to give them the requisite amount of resiliency and they terminate adjacent to and on opposite sides of the station-

ary terminal 29. With the springs and terminal in this relation a small degree of rocking movement in either direction will serve to bring the terminal into contact with one spring and a continued movement in the same direction is permitted by the yielding spring without impairing the contact. Extending upward from the base of the springs or screws 46 is a pair of wires 47 which are electrically connected by screws 48 to the springs 50, between which the contact end is seated and which are held to a projection 51 cast integral with or otherwise attached to the shell.

Having thus described our invention, the following is what we claim as new therein and desire to secure by Letters Patent:—

1. An underground electric railway, consisting of a motor-car, supports secured to the truck-frame of said car, a contact-plate secured to said supports and adapted to travel in the subway, a series of swinging or pendulum-like switches located in the subway, and in electrical connection with an insulated main supply-conductor, said switches adapted to be engaged only at their free ends and operated by said contact-plate, whereby electrical connection is made between said main supply-conductor and the motor.

2. In an underground electric railway, a main supply-conductor, and a pivoted switch provided with an exposed flexible contact, and consisting of a hermetically sealed box, with contacts located therein, so devised that when said switch is actuated said exposed contact is thrown into electrical connection with the main supply-conductor.

3. In an underground electric railway, a main supply-conductor, a pivoted switch provided with an exposed contact, and consisting of a hermetically sealed box with contacts therein so located that when said switch is in its normal position said exposed contact is out of circuit with the main supply conductor, but said exposed contact is brought into electrical connection with the main supply-conductor, when said switch is actuated.

4. In an underground electric railway, a main supply-conductor, a contact-plate carried by a motor-car, a pivoted switch provided with an exposed flexible contact, and consisting of a hermetically sealed box, with contacts therein so located that when said switch is in its normal position, the exposed flexible contact is out of circuit with the main conductor, but said flexible contact is brought into electrical connection, when said switch is actuated by said contact plate.

In testimony whereof we affix our signatures in presence of two witnesses.

JAMES B. SHELDON.  
DANIEL J. MURNANE.  
GEORGE L. VAN BEEK.

Witnesses:

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