(No Model.) 3 Sheets—Sheet 1.

D. MASON.

ELECTRIC RAILWAY SYSTEM.

No. 519,794. Patented May 15, 1894.

Fig. 1.

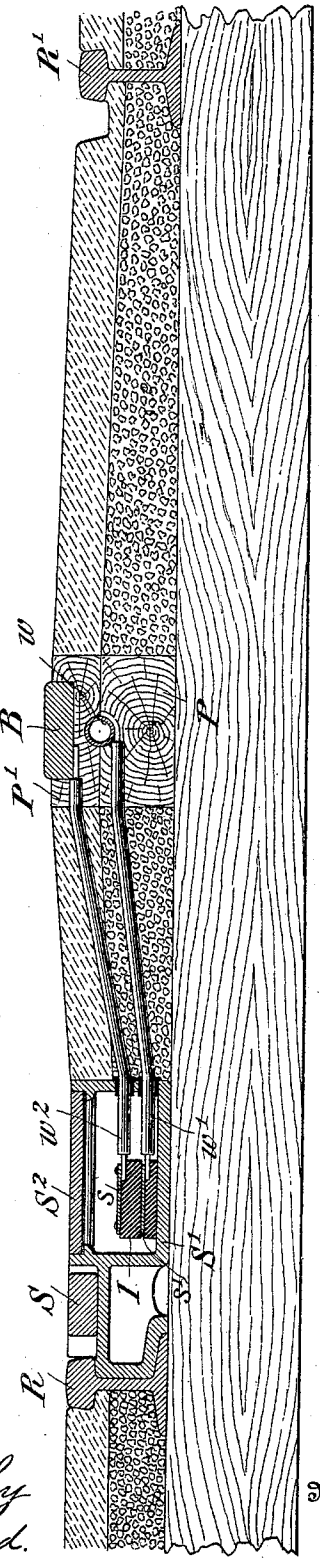
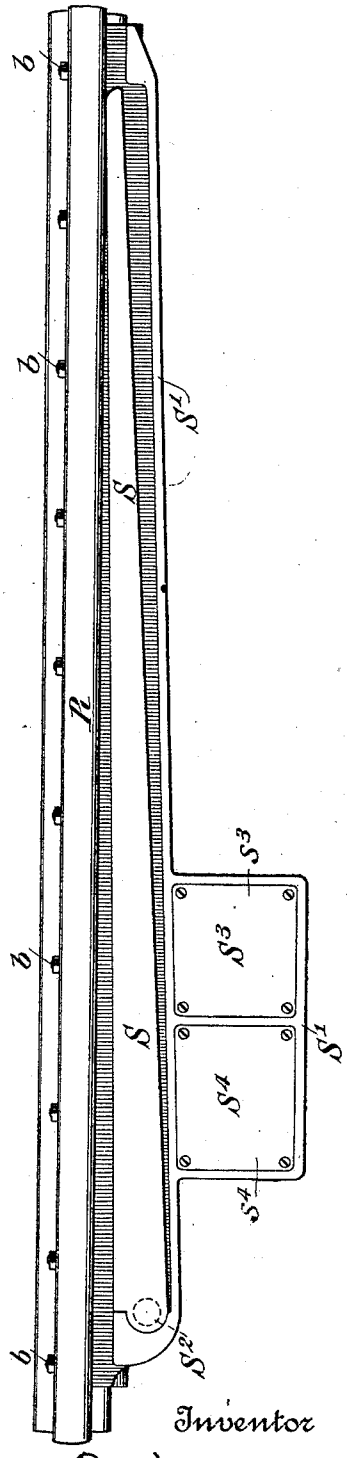


Fig. 2.



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ELECTRIC RAILWAY SYSTEM.

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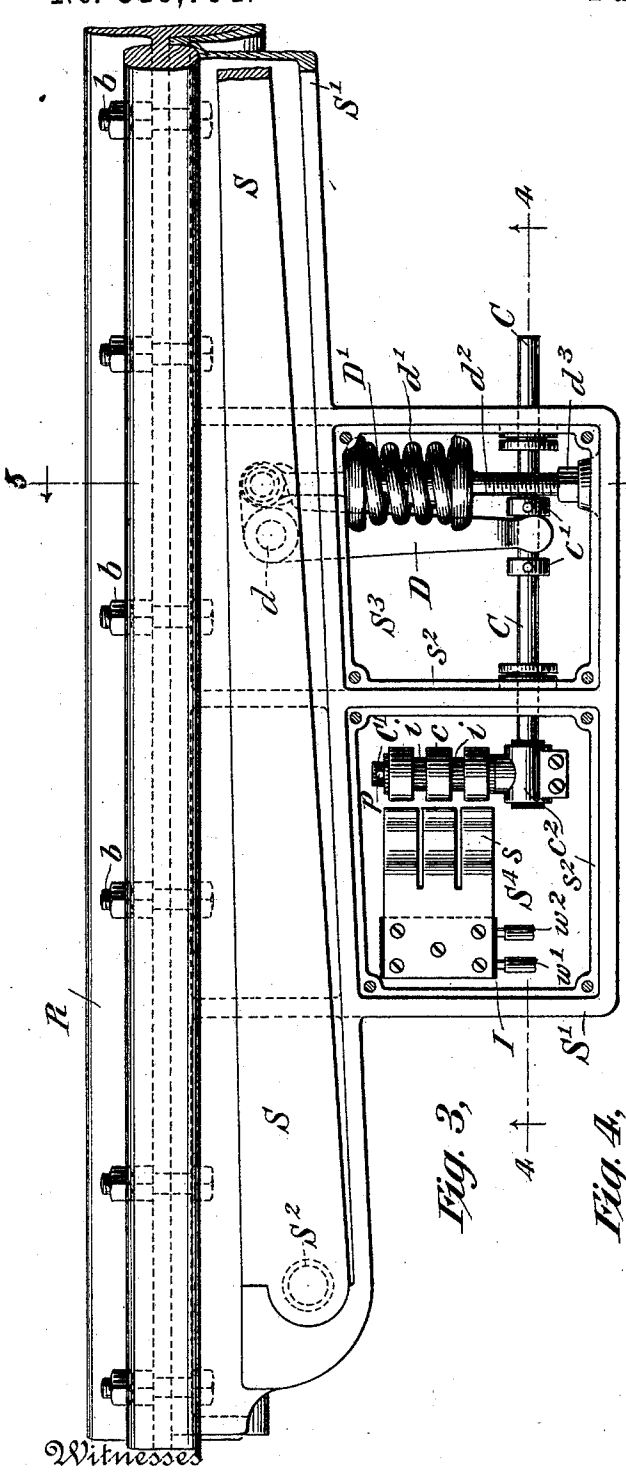

Fig. 3.

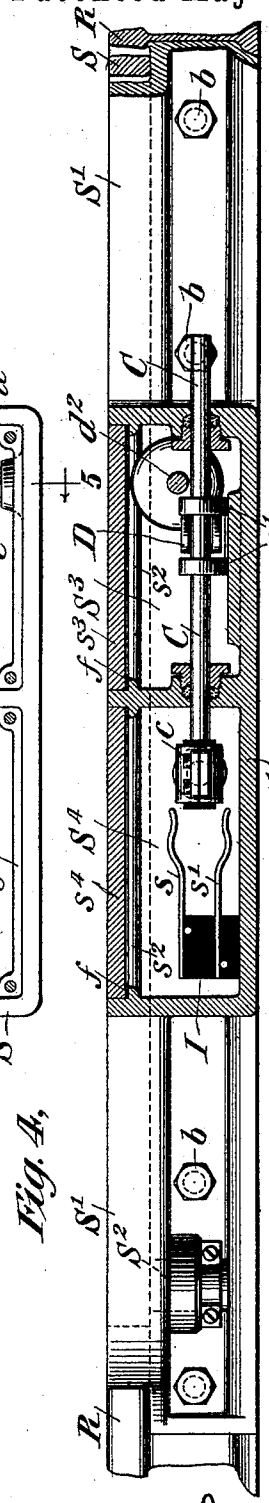

Fig. 4.

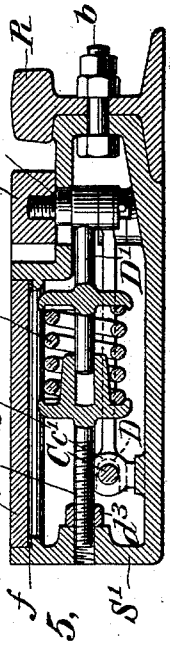

Fig. 5.

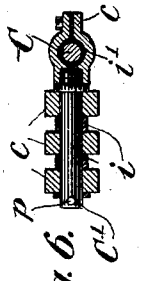

Fig. 6.

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ELECTRIC RAILWAY SYSTEM.

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Fig. 7.

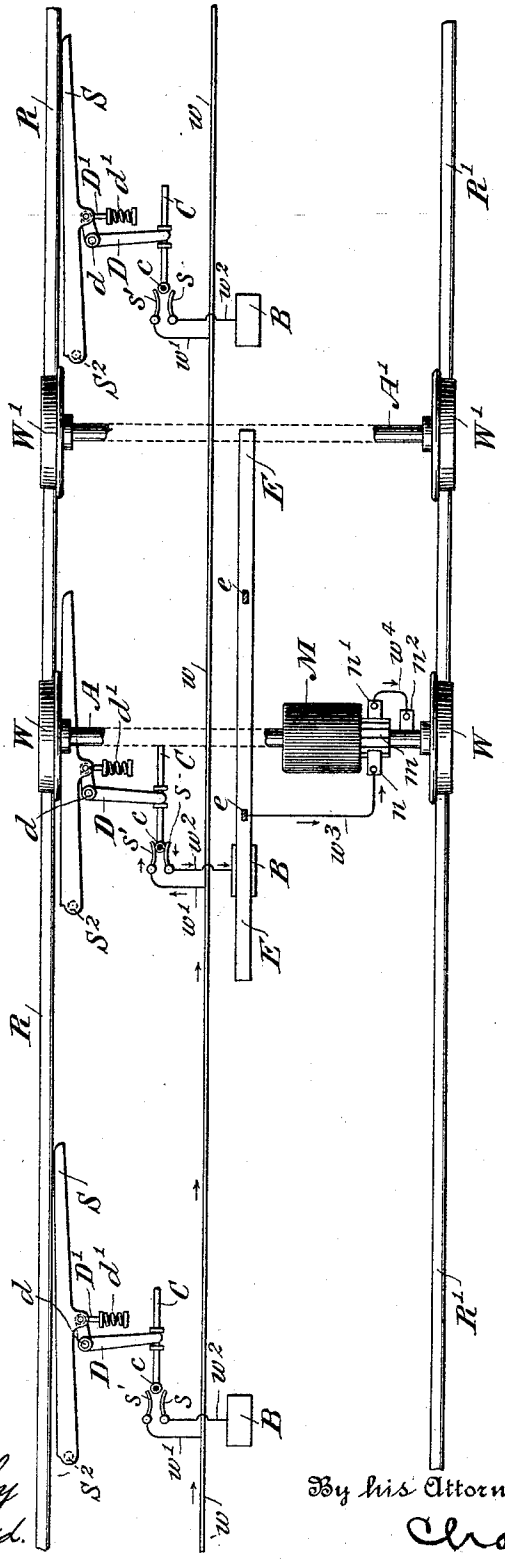
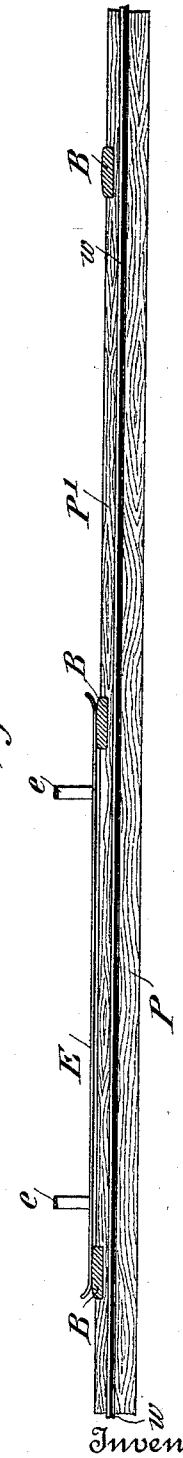


Fig. 8.



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UNITED STATES PATENT OFFICE.

DAVID MASON, OF SCHENECTADY, NEW YORK.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 519,794, dated May 15, 1894.

Application filed June 27, 1893. Serial No. 478,952. (No model.)

To all whom it may concern:

Be it known that I, DAVID MASON, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have made a new and useful Improvement in Electric-Railway Systems, of which the following is a specification.

My invention relates particularly to improvements in that type of electric railways where the propelling current is conveyed by a current main or lead which is insulated throughout its length and is automatically connected to a series of short sectional contacting or trolley conductors as the propelled vehicle moves over the road-way.

My invention has for its objects: first, to obtain as far as practicable, good insulation to the entire system of conductors; second, cheapness of structure, and third, the placing of the operative parts of the apparatus in such relation to the road-way as to render them at all times easily and quickly accessible for repairs and necessary changes. These objects are accomplished by the use of the apparatus hereinafter described which will be fully understood by referring to the following specification and accompanying drawings, in which—

Figure 1 represents a cross sectional view of an ordinary tramway supplied with my improved apparatus. Fig. 2 is a plan view of the mechanically actuated switching apparatus which is controlled by the movement of the wheels of the vehicle. Fig. 3 is also a plan view illustrating in addition the mechanical and circuit connections in one of the switch boxes adjacent to one of the switch actuating levers. Fig. 4 is a longitudinal vertical sectional view taken through one of the switch boxes on the line 4—4, Fig. 3, and as seen looking in the direction of the arrows from the bottom toward the top of the drawings. Fig. 5 is a transverse section taken through Fig. 3 on the line 5—5, and as seen looking at that figure in the direction of the arrows from right to left. Fig. 6 is a detail sectional view of the movable circuit controlling apparatus which closes and breaks the circuits in the switch boxes as the moving car or vehicle operates the switches. Fig. 7 is a part plan, part diagrammatic view illustrating the complete system and mode of operation of the same. Fig. 8 is a side elevational view illustrating the buried current main or lead, the sectional or stationary contact points in the road-bed, and one form of trolley shoe for conveying the current from the sectional conductors or contacts to the motor on board of the car.

Referring now to the drawings in detail in all of which like letters of reference represent like parts wherever used, R and R′ represent the rails of a tramway embedded in a concrete or asphalt street resting upon cross ties of the usual form.

P and P′ represent two longitudinal stringers of wood which have been creosoted or otherwise saturated with insulating material.

w represents a pipe or tube of conducting material located in a groove between the aforesaid timbers. This pipe or tube together with the timbers is located preferably midway between the rails R and R′ and embedded, as is clearly shown, in concrete or asphalt, said pipe constituting the current feeder or main and is connected at the power house directly to one pole of the dynamo or other source of electrical energy which is to supply current for propelling the cars or vehicles.

B B represent blocks of conducting material such as iron, copper, or the like, located at suitable distances apart and embedded in the upper timber P′.

w′ w′ are branch conductors thoroughly insulated but connected each at their inner ends to the current feeder or main *w* and at their outer ends to contact springs *s′* located in switch boxes S′, which switch boxes are equal in number to the number of short conducting sections or contacts B and are provided with two compartments $S^3 S^4$ and bolted securely to one of the rails R by bolts *b b*, see Figs. 2, 3, 4 and 5. Each switch box is provided with an operating switch lever S pivoted to the switch box at S^2 with its free end resting directly against the inner face of the rail R.

D is a switch actuating lever which is pivoted at *d* directly to the upper face of the switch box and is provided with a short and a long arm, the former of which is attached directly to the lever S while the latter extends into the compartments S^3 of the switch

box S′ with its free end lying between a pair of collars c' c' carried by a plunger C having longitudinal movement through the walls of the two-part switch box S^2 S^3. To one end of this plunger C in the compartment S^4 of the switch box S′ is secured an arm C′ through the agency of a clamp or collar c^2, said arm being insulated from the plunger by insulating material i'. Upon this arm are located three metallic rollers c separated from each other by washers i and held in place by a pin p, see Fig. 6. In this same water tight compartment S^4 are secured two sets of contacts springs s s' insulated from each other at I and with their free ends normally separated, see Fig. 4, but lying in the path of the conducting rollers c carried by the arm C′ and plunger C. The upper spring s is connected in each instance through an insulated conductor w^2 directly with one of the sectional conductors or exposed contacts B.

D′ is a push rod secured to the short arm of the lever D and having, through the agency of a strong spiral spring d' and collars, mechanical connection with an adjustable bar or rod d^2 provided with a set nut d^3 for regulating the stress of the spring upon the aforesaid lever, and consequently upon the switch actuating lever S, see Fig. 5, the arrangement being such that through the agency of this spring there will be no possibility of an operation of the switching lever S by other means than the flanges of the car wheels W W′, see Fig. 7.

The two compartments S^3 and S^4 of the switch box S′ are provided respectively with strong detachable water tight covers s^3 s^4 resting on flanges f and may be removed for obtaining access to the interior of the compartments, said covers being flush with the street surface and the top of the rails R R′ and switching levers S. These switch boxes S′ together with their extended means of support are preferably cast in each instance in one solid piece and are secured directly to one of the rails R by bolts b b and all of the electrical contacts located within said boxes are securely insulated either in oil or in any preferred manner, and the plunger C is preferably provided with stuffing boxes as clearly shown in Fig. 4 for the purpose of keeping out moisture.

Referring now to Fig. 7, it will be noticed that the switch boxes and their switch operating levers S are located at such a distance apart that before the rear wheel W of the car-truck passes over the lever with which it is now in mechanical contact, the front wheel W′ will make a corresponding mechanical contact with the next lever S in advance, the arrangement being such that the circuit will always be closed through the switches in sequence as the car advances and by the alternating action of the front and rear wheels respectively.

M represents the propelling motor, n n' the commutator brushes thereof, w^3 w^4 the motor or trolley circuit connected directly to the trolley shoe E through one of the upright conducting standards e by which it is supported under the car, said trolley shoe in this instance being of sufficient length to always bridge the space between any pair of the fixed or stationary contacts B, although I may arrange the fixed or stationary contacts B in the nature of a series of short sectional conductors located in alignment with each other and having their ends closely adjacent, the trolley shoe E being replaced by an ordinary wheel trolley or contact brush, such as is well known and in general use.

The operation of the apparatus is as follows: Suppose the car to be traveling from left to right, see Fig. 7. That one of the rear pair of wheels W now resting upon the rail R is directly over one of the switches S and its flange as the car proceeds causes this switching lever S to turn about its pivot S^2. Owing to the difference in the length of the short and long arms of the lever D considerable lateral motion is given to the latter, thereby causing its free end to impart to the plunger C sliding motion to the left so that the conducting rollers c carried by the plunger are inserted between the contact springs s and s' thereby connecting the current feeder or main w directly with the branch feeder W^2 and the stationary or fixed contact B upon which the trolley shoe is resting. Consequently the current flows from the generator at the power station through the current main w in the direction of the arrows through the side feeder w', contact springs s', rollers c, contact springs s, branch conductor w^2, stationary contact B, conducting trolley shoe E, motor conductor w^3, commutator brush n, motor M, commutator brush n', conductor w^4, contact brush n^2, axle of the car wheel W to the rail R′, whence it returns in well known manner through the earth directly to the other pole of the dynamo. The car, therefore, advances until the front wheel W′ resting upon the rail R passes in a similar manner behind the next succeeding switch lever S which is actuated in identically the same manner as was that just described. The latter, however, is immediately released as the flange of the wheel W passes from between it and the rail R, when the strong spiral spring d' exerts its influence and returns the lever to its normal position causing the bell crank lever D to move the plunger C and withdraw the contacting rollers c from between the contact springs s and s'. At the same time the front end of the conducting trolley or shoe E has passed into electrical contact with the next stationary contact B, while the rear end has simultaneously moved out of contact with the rear stationary contact B with which it is now seen to be in electrical connection. As the car advances therefore the flanges of the wheels W and W′ will in alternate succession cause the switching levers to be actuated and released and the

motor circuit to be closed through the switching contacts in the corresponding switch boxes in like sequential order.

I do not limit myself to the special details of construction herein shown and described. It is obvious that material changes might be made in the structure and still come within the scope of my invention.

To illustrate: I do not limit myself to the special form and arrangement of switch actuating levers herein shown and described as it is obvious that many forms of levers might be devised and switching attachments connected thereto which would still come within the scope of my claims. I prefer to connect the tubular conductor *w* directly with some source of heat, as steam, hot air, hot water, hot oil, or any hot gas or liquid, and to cause the same to circulate through it for the purpose of thoroughly drying out and insulating the timbers P P′ which support said tube, and also for the purpose of thoroughly insulating the stationary contacts or sectional conductors B. I do not, however, limit myself to this special arrangement of conductors as it is obvious that the current main *w* may be of any preferred form and insulated in any preferred or well known way and the stationary contacts B B may be in like manner sustained in any preferred way or be of any length with relation to each other so long as they receive the operating current from branch conductors connected to switching apparatus controlled in their movement by the action of the wheels of the car or vehicle.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an electric railway system a current main or lead having branch conductors operatively connected with switching levers pivotally secured in alignment with the rails of the track and adapted to be actuated by the wheels of the vehicle, in combination with short sectional conductors or contacts provided with circuit connections for connecting them to the aforesaid branch conductors, substantially as described.

2. In an electric railway system a current main or lead, a series of sectional trolley conductors and a series of normally open branch conductors for connecting said trolley conductors directly with the current main or lead, in combination with mechanically actuated switching devices adjacent to one of the rails of the track and adapted to be actuated by the flanges of the wheels of the car or vehicle as it advances.

3. In an electric railway system a current main or lead insulated through its length; a series of short exposed trolley conductors or contacts provided with normally open branch circuits running to the current main, in combination with a pivoted switching lever for each trolley section, said switching levers being located in alignment with the rails of the track and adapted to be actuated by the wheel flanges of the vehicle as said flanges pass between them and the rails substantially as described.

4. In an electric railway system a buried current main or lead, a series of exposed contacts or trolley sections each provided with normally open branches and switching apparatus for connecting them in sequence to the current main, said switching mechanism consisting of a series of pivoted levers located adjacent to one of the rails of the track and actuated by the flanges of the wheels of the car or vehicle as it moves over the route, substantially as described.

5. In an electric railway system a series of water tight switch boxes fixedly secured to one line of rails, a pivoted operating lever secured to each box and provided with means for holding its free end against the face of the rail in combination with an insulated current main a series of short sectional conductors and circuit connections between the main the switching mechanism and the sectional conductors, substantially as described.

6. In an electric railway system a switch box having a water tight compartment inclosing circuit making and breaking devices, circuit connections running from a current main through the switch box to a normally disconnected sectional or trolley conductor in combination with an actuating lever operatively secured to said circuit making and breaking parts, said actuating lever being located in alignment with and closely adjacent to one of the lines of tram rails, substantially as described.

7. In an electric railway system a switch box provided with two compartments, one of which contains circuit making and breaking devices and the other mechanical means for operating said circuit making and breaking devices, in combination with an actuating lever adapted to be operated by the wheels of a moving vehicle and operatively connected to the mechanism in the second compartment, said circuit making and breaking devices being operatively connected with a current main or lead and a normally open sectional or trolley conductor substantially as described.

8. In an electric railway system a switch box having two compartments, one of which contains circuit making and breaking devices and the other mechanism for controlling the movements of the same, in combination with an operating lever pivotally secured to said switch box and operatively connected with the switch controlling mechanism in the second compartment of the switch box, said circuit making and breaking devices being operatively connected with a current main or lead and a normally open sectional or trolley conductor substantially as described.

9. In an electric railway system an insulated current main or lead, a sectional or trolley conductor and a switch box provided

with circuit making and breaking devices inclosed in an operative compartment and an operating lever pivotally secured to an extension of the switch box, and provided with means for connecting it with the operative portions of the circuit making and breaking apparatus, said switch box being secured to one of the lines of tram rails with the operating lever in alignment therewith so that the flanges of the wheels of a passing car or vehicle will actuate it, substantially as described.

10. An electric railway system consisting of an insulated buried current main or lead located near the surface of the road-bed; a series of short exposed sectional contacts or trolley sections located in the road-bed; branch conductors running from the insulated main to switch boxes near the surface of the road-bed, additional branch conductors running from the switch boxes to the short sectional contacts or trolley conductors; contact making and breaking devices in the switch boxes for uniting the aforesaid branch conductors; mechanical connections between the contact making and breaking devices, and operating levers pivotally secured in alignment with one of the lines of rails with their free ends resting in mechanical contact with said rails under stress of strong spiral springs, substantially as described.

11. In an electric railway system a series of switch boxes inclosing circuit connections between a buried current main and a series of short sectional contacts or trolley conductors, in combination with operating levers pivoted to the switch boxes and operatively connected with circuit making and breaking devices within said switch boxes, said operating levers being located substantially flush with the surface of the road-bed, and pivotally secured in alignment with the rails of the track so that the flanges of the car wheels will actuate them substantially as described.

In testimony whereof I have hereunto subscribed my name this 26th day of June, 1893.

DAVID MASON.

Witnesses:
M. M. ROBINSON,
C. J. KINTNER.