No. 607,610. Patented July 19, 1898.

S. H. SHORT.

ELECTRIC RAILWAY SYSTEM.

(Application filed May 24, 1897.)

(No Model.)

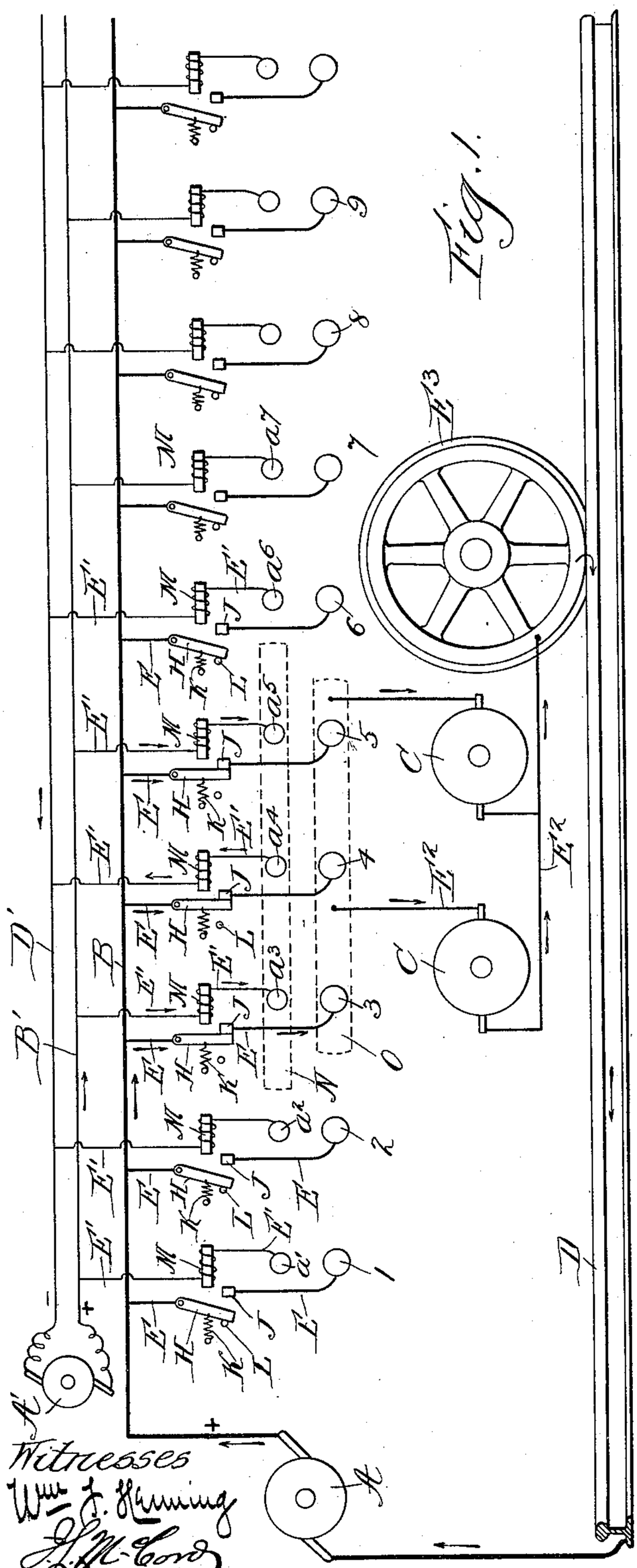

Fig. 1.

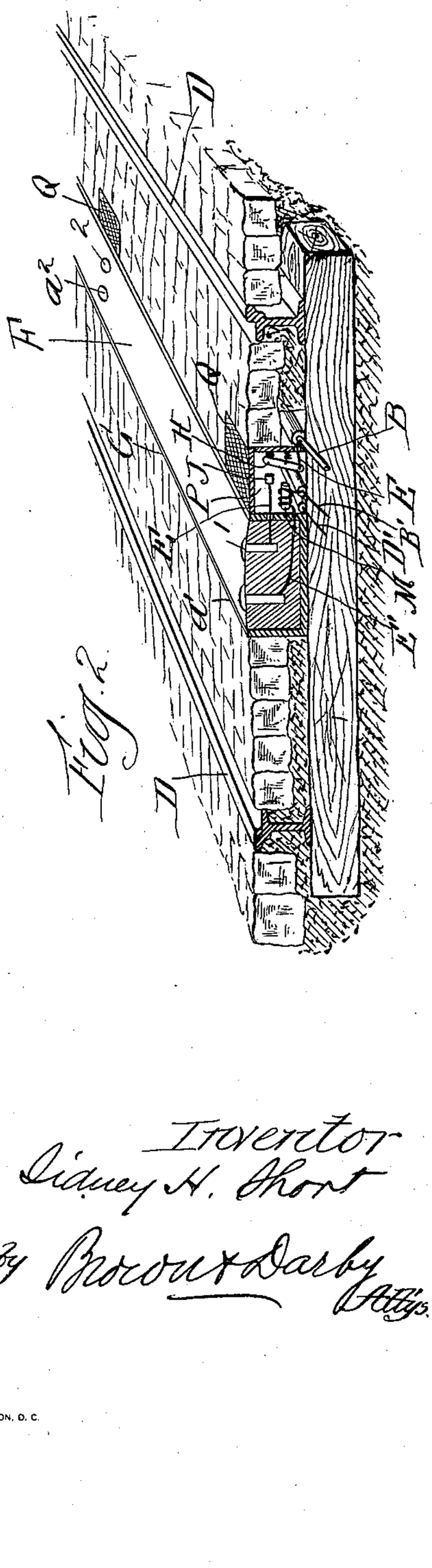

Fig. 2.

Witnesses
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UNITED STATES PATENT OFFICE.

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ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 607,610, dated July 19, 1898.

Application filed May 24, 1897. Serial No. 637,886. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY H. SHORT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Electric-Railway System, of which the following is a specification.

This invention relates to electric-railway systems.

The object of the invention is to provide means for supplying moving vehicles with electric currents for propelling, lighting, and heating purposes without the use of overhead wires and poles and without the use of an open conduit between the rails.

The invention consists, substantially, in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally specifically pointed out in the appended claims.

Referring to the drawings and to the various views and reference-signs appearing thereon, Figure 1 is a view, somewhat in diagram, illustrating the application of the principles of my invention. Fig. 2 is a perspective view of a road-bed for street-railway cars, showing the application thereto of an apparatus embodying the principles of my invention.

In carrying my invention into practical effect the propelling, lighting, or heating current is supplied from any suitable and suitably-arranged generator A through conductor B, thence to the motor C or other translating device on the car in a manner presently to be more fully explained, and thence to a return or ground connection, which may be of any suitable arrangement, and, as shown in the drawings, the rail D may serve the purpose of a return connection. The main supply conductor or feeder B may be arranged in any suitable manner and is intended to supply current throughout the entire railway system. For instance, this feeder-line may pass underground either between the rails or outside of the rails or in any other suitable arrangement, preferably in a closed conduit and thoroughly insulated. At suitable intervals throughout the length of the feeder B—say at intervals of eight or nine feet—are tapped branch conductors E, leading to a series of contacts 1 2 3 4 5 6, &c. These contacts may be arranged in any suitable or convenient relation to the road-bed, either to one side of or between the rails; but preferably, as shown in Fig. 2, these contacts are mounted in a bed of concrete or cement F, arranged in any suitable manner—for instance, in a trough G, arranged in the road-bed and between the rails—the ends of the contacts 1 2, &c., being presented upon the top surface of the cement or asphalt F, in which said contacts are embedded, said exposed upper ends forming contact-points through which circuit may be made to the car and to the translating devices carried thereby, as will presently be more fully explained. In order that the exposed surfaces of the contacts 1 2, &c., may not constitute terminals of live circuits and also for the purpose of preventing leakages of the current, the circuit through each of the branch sections or conductors E is normally broken, and I provide means for automatically closing these circuits by the passage of the car itself, as will presently be more fully explained, whereby the contact-points 1 2, &c., form live-circuit terminals only at the time the car is passing thereover, thus avoiding any danger that might result from leaving the contacts 1 2, &c., exposed above the surface of the street or road-bed. In the particular form shown, to which, however, I do not desire to be limited or restricted, as many variations therefrom and changes therein would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of my invention, each branch circuit E includes a pivoted lever H, forming part of said circuit, and a contact-point J, with which said lever is adapted to contact to close said branch circuit. The lever H may be normally held out of contact with contact J in any suitable or convenient manner—for instance, by means of a spring or retractile K, which normally operates to hold the lever H against a stop L, and suitable means are provided whereby the passage of the car effects a closing of the lever H upon contact J in the branch circuits E in order to complete the circuit of the translating devices from the supply-conductor B to the

return-conductor, as will presently more fully appear. In the particular form shown, which I have found simple and efficient for the purpose, but to which I do not desire to be limited, I provide an auxiliary generator A′ of small capacity adapted to supply current to the auxiliary conductors B′ D′, said conductors being arranged to extend throughout the entire railway system and tapped by the branch conductors E′ at suitable distances corresponding to the branch main conductors E, except that preferably, though not necessarily, only every other of the auxiliary branch conductors E′ are connected to the auxiliary supply-conductor B′, while the intermediate alternate auxiliary branch conductors E′ are connected to the other auxiliary supply-wire D′. These auxiliary branch conductors each lead to contacts a a^2 a^3 a^4 a^5 a^6, &c., which may be arranged in a manner similar to that above described with reference to the contacts 1 2 3, &c., through which the circuit is adapted to be closed by the passage of the car in any suitable and convenient manner, as will presently be more fully explained. Included in each of the auxiliary branch conductors E′ is an electromagnet M, the switch-lever H of the branch conductors E forming or carrying the armature of said electromagnets. From this construction it will be readily seen that when the coils of electromagnets M are energized the particular lever H which forms the armature for said magnet is attracted thereby against the action of its retractile K, so as to move said lever into contact with contact J, thereby completing the auxiliary circuit from the main supply-conductor B to the contacts 1 2 3, &c., corresponding to the particular branch circuit that is closed. It will also be seen that so long as the coil of electromagnet M is energized just so long will said branch circuit E be closed.

I will now describe means whereby the passage of the car closes the circuits of electromagnets M and also the circuits of the branch conductors E through the translating devices. The contacts 1 2 3, &c., are preferably arranged in alinement with each other, as shown in Fig. 2 and indicated in Fig. 1. Similarly the contacts a' a^2, &c., are arranged in alinement with each other, as shown and indicated. Carried by the car is a pair of contact-plates N O, (indicated in dotted lines in Fig. 1,) respectively adapted to travel over and to make contact with the successive contacts a' a^2 a^3, &c., and 1 2 3, &c. The contact plates or shoes N O should be preferably of a length such as to simultaneously contact with three or more of the contacts respectively contained in the row of contacts, in connection with which each of said contact-shoes coöperates. The contact plate or shoe O, carried by the car, is in electrical connection, through circuit E^2, with the translating devices on the car, and thence to return-conductor—as, for instance, through the wheel E^3 of the car to the rail D.

From the foregoing description it will be seen that as the car passes along the roadbed the contact-shoe N, carried thereby, will simultaneously contact with three or four successive contacts a' a^2 a^3, &c., as shown in Fig. 1, thereby completing the circuit of at least three of the magnets M, thereby energizing said magnets and attracting the levers H corresponding thereto, and hence closing at least three of the branch translating-circuits E. Thus in the particular arrangement indicated in Fig. 1 the contact-shoe N is simultaneously contacting with the contact-points a^3 a^4 a^5, and since, as above explained, only each alternate auxiliary conductor E′ is connected with one of the auxiliary conductors D′ B′, respectively, it will be seen that current will flow from the positive auxiliary conductor B′, through two of the auxiliary branch conductors E′, through contact bar or shoe N to the negative auxiliary conductor D′, through the intermediate auxiliary branch conductor E′, in the particular arrangement as indicated. It may be, however, that the two energized auxiliary branch conductors E′—as a^4 a^6, for instance—may be connected to the return or negative conductor D′, while the intermediate auxiliary branch conductor corresponding to contact a^5 may be the one connected to the positive auxiliary conductor B′. Thus it will be seen that the passage of the car closes the circuits of at least three of the electromagnets M, thereby energizing said magnets and effecting an attraction of the switch-levers H to contact with the contact-points J, and hence closing the branch circuits E to the points 3, 4, and 5. Since the contact-shoe O upon the car is in electrical contact with points 3, 4, and 5 under the above conditions, it will be seen that the circuit of the translating devices on the car is thereby completed, and this occurs only during the passage of the car. As rapidly as the contact-shoe O leaves to the rear one of the contacts 1 2 3, &c., it also completes the circuit through the next contacts 6 7 8, &c., in advance of it. For the same reason the contact bar or shoe N is somewhat longer than contact-shoe O in order that the branch circuit immediately in advance of shoe O may be completed to the contact next in advance of such shoe by energizing the electromagnet M of the auxiliary branch circuit somewhat in advance of the contacting of the shoe O with the contact next in advance thereof. In the same manner the shoe O leaves its last contact 1 2 3, &c., before the circuit of the branch conductor including such contact is broken—that is to say, in the particular form shown the shoe N maintains the auxiliary branch circuit E′, which includes the contact a^3, closed, and hence the auxiliary translating-circuit E, which includes contact 3, until after shoe O has broken contact with point 3 and the bar or shoe N completes the circuit of the auxiliary branch circuit E′, which includes contact a^6, thereby closing the trans-

lating-circuit E, which includes contact 6, before the shoe O makes contact with said contact 6.

If desired, the auxiliary conductors B′ D′ may be carried in a conduit P, arranged to extend throughout the railway system, and manholes Q may be provided at suitable intervals, in which the electromagnets M and switch-levers H may be arranged.

From the foregoing description it will be seen that I provide an exceedingly simple and efficient railway system wherein the current may be supplied to the translating devices on the car, whether they be the propelling of the motor or the lighting apparatus or the heating devices, without the use of overhead wires or underground open conduits. It will also be seen that I provide for supplying current to the car without exposing passers-by or pedestrians to the danger of exposed live terminals or circuits. While it is true that the exposed terminals a' a^2 a^3, &c., are live terminals, it will be remembered that the only duty required of the current in the auxiliary main and branch conductors is to energize the electromagnets. Consequently this current is too small to be appreciable, so far as danger is concerned, and the terminals of the main supply-conductors 1 2 3 and the like are constantly dead, except when the car passes thereover. Hence, through proper insulation I not only avoid danger, but I also provide against waste of current through leakage. It will also be seen that the switch-levers H in the branch working circuits E are in no way dependent upon current flowing through said branch working circuits, either to move said levers or to hold them in position to close said branch working circuits, but are actuated solely by the magnets M in the branch auxiliary connections E′ and the retractiles K. Therefore injurious sparking cannot result upon breaking the branch working circuits. Moreover, since the contact O in the working circuit leaves a surface-contact 1 2, &c., before the shoe N leaves the corresponding surface-contact a' a^2, &c., it will be seen that the branch working circuits E are dead before a separation of switch-lever H and contact J occurs, and hence no sparking is observed. It will also be seen that the auxiliary circuit is never brought into electrical connection with nor is it aided or supplemented in any manner by the main or working current in the performance of its function. The top surface of the cement bed or block F may be suitably curved, if desired, in order to drain such surface of water, thereby preventing the water from completing circuit between adjacent contacts a' a^2, &c.

Having now explained the object and nature of my invention and an arrangement embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. In an electric-railway system, an auxiliary circuit adapted to carry a current of low potential, a series of insulated surface contacts alternately connected to the positive and negative wires of said auxiliary circuit, said connections including an electromagnet, a shoe carried by the car and adapted to make successive contact with a plurality of said contacts whereby circuit is simultaneously completed through a plurality of said magnets, a main circuit, a second series of insulated surface contacts connected thereto through switches forming armatures for said magnets, means for normally maintaining said armature-switches open, a second shoe carried by the car and adapted to make electrical connection with said surface contacts of the said last-mentioned series, for completing the main circuit through the translating devices on the car, as and for the purpose set forth.

2. In an electric-railway system, a road-bed, a trough arranged therein and containing a bed of cement or other suitable material, two rows of contacts arranged in said bed, all of said contacts being insulated from each other, a main circuit and an auxiliary circuit both arranged to extend through the length of the road, branches connecting said circuits respectively to the individual contacts of said rows of contacts at suitable distances apart, a switch arranged in each of said main-circuit branches, an electromagnet arranged in each of said auxiliary-circuit branches, said switch-levers forming the armature of said magnets, said switch-levers normally open, manholes arranged to contain said switches, and magnets, and shoes carried by the car respectively adapted to contact successively with the members of said rows of contacts, one of said shoes in electrical connection with the translating devices on the car and the other of said shoes adapted to bridge the space and to complete the circuit between adjacent contacts in the row of the auxiliary circuit, as and for the purpose set forth.

3. In an electric-railway system, a main supply-conductor extending throughout the length of the road-bed, an auxiliary circuit also extending throughout the length of the road, two rows of surface contacts, branch connections extending from the alternate contacts of one of said rows to the opposite sides of said auxiliary circuit, an electromagnet arranged in each of said auxiliary branch connections, main branch connections extending from said supply-conductor to each contact in the other of said rows, a switch-lever arranged in each of said main branch connections, said levers forming the armatures of said magnets and normally held in position to open said main branches, contact-shoes carried by the car, one of said shoes adapted to contact successively with the surface contacts in one of said rows to complete the circuit therefrom through the translating devices on the car, the other of said shoes adapted to make simultaneous contact with two or more adjacent contacts in the other of said

rows of contacts to bridge the space therebetween and to complete the auxiliary circuit therethrough, as and for the purpose set forth.

4. In an electric-railway system, a normally open main supply-circuit extending throughout the length of the road, a normally open auxiliary circuit also extending throughout the length of the road, a series of contacts arranged in the road-bed, adjacent contacts of said series being respectively connected to the positive and negative wires of the auxiliary circuit, and means arranged solely in said auxiliary-circuit connections and actuated by the closing of the circuit between adjacent contacts of said series for closing said main circuit, as and for the purpose set forth.

5. In an electric-railway system, a normally open main supply-circuit extending throughout the length of the road, a normally open auxiliary circuit also extending throughout the length of the road, a series of contacts arranged in the road-bed, adjacent contacts of said series being respectively connected to the positive and negative wires of said auxiliary circuit, an electromagnet arranged in each of said auxiliary-circuit connections, means carried by the car for bridging the space between adjacent contacts of said series, and means actuated by the energization of said electromagnets for closing the main supply-circuit through the motor on the car, as and for the purpose set forth.

6. In an electric-railway system, a main supply-circuit, an auxiliary circuit, a series of contacts arranged in the road-bed, adjacent contacts of said series being respectively connected to the positive and negative wires of said auxiliary circuit, a second series of contacts arranged in the road-bed, a normally open connection extending from each of said second series of contacts to the main supply-circuit, electrically-actuated means arranged in each of said auxiliary-circuit connections for closing the corresponding main-circuit connection to its road-bed contact, means carried by the car for bridging the space between adjacent auxiliary-circuit contacts, and means also carried by the car for completing circuit from said main-circuit contacts through the translating devices on the car, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 20th day of May, 1897, in presence of the subscribing witnesses.

SIDNEY H. SHORT.

Attest:

M. A. KENSINGET,

JOHN J. BEVER.