

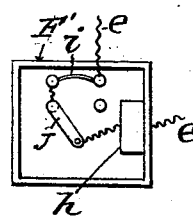
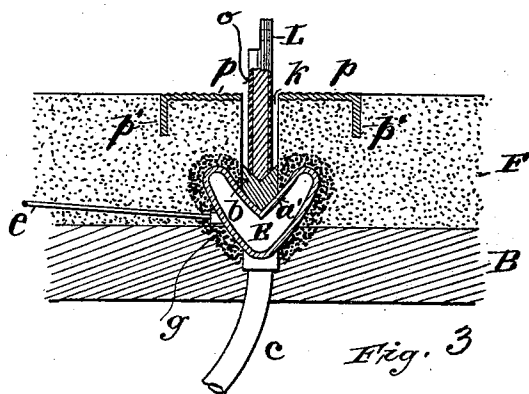
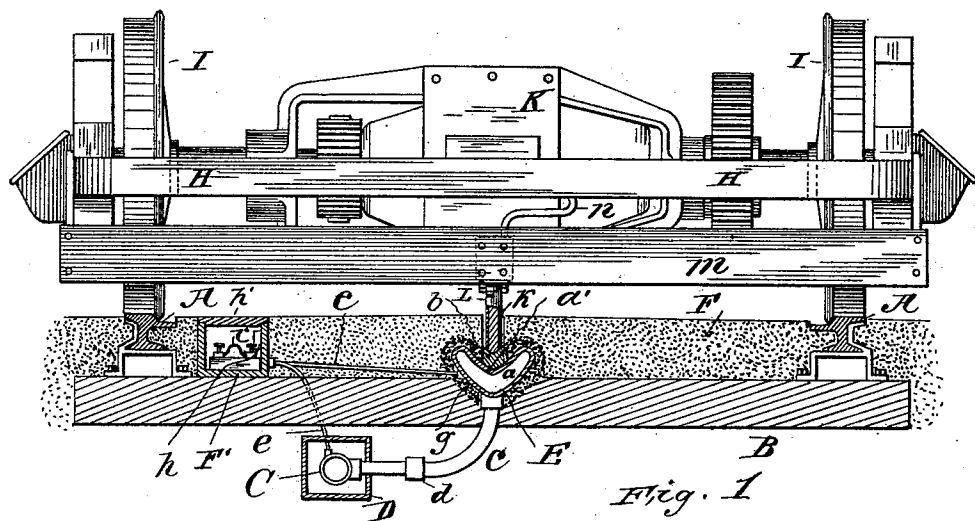
(No Model.)

2 Sheets—Sheet 1.

D. MASON.
ELECTRIC RAILWAY SYSTEM.

No. 530,192.

Patented Dec. 4, 1894.



Attest:
C. W. Benjamin
Wm. E. Treffer

Inventor:
David Mason.
by Wm. E. Treffer,
att'y.

(No Model.)

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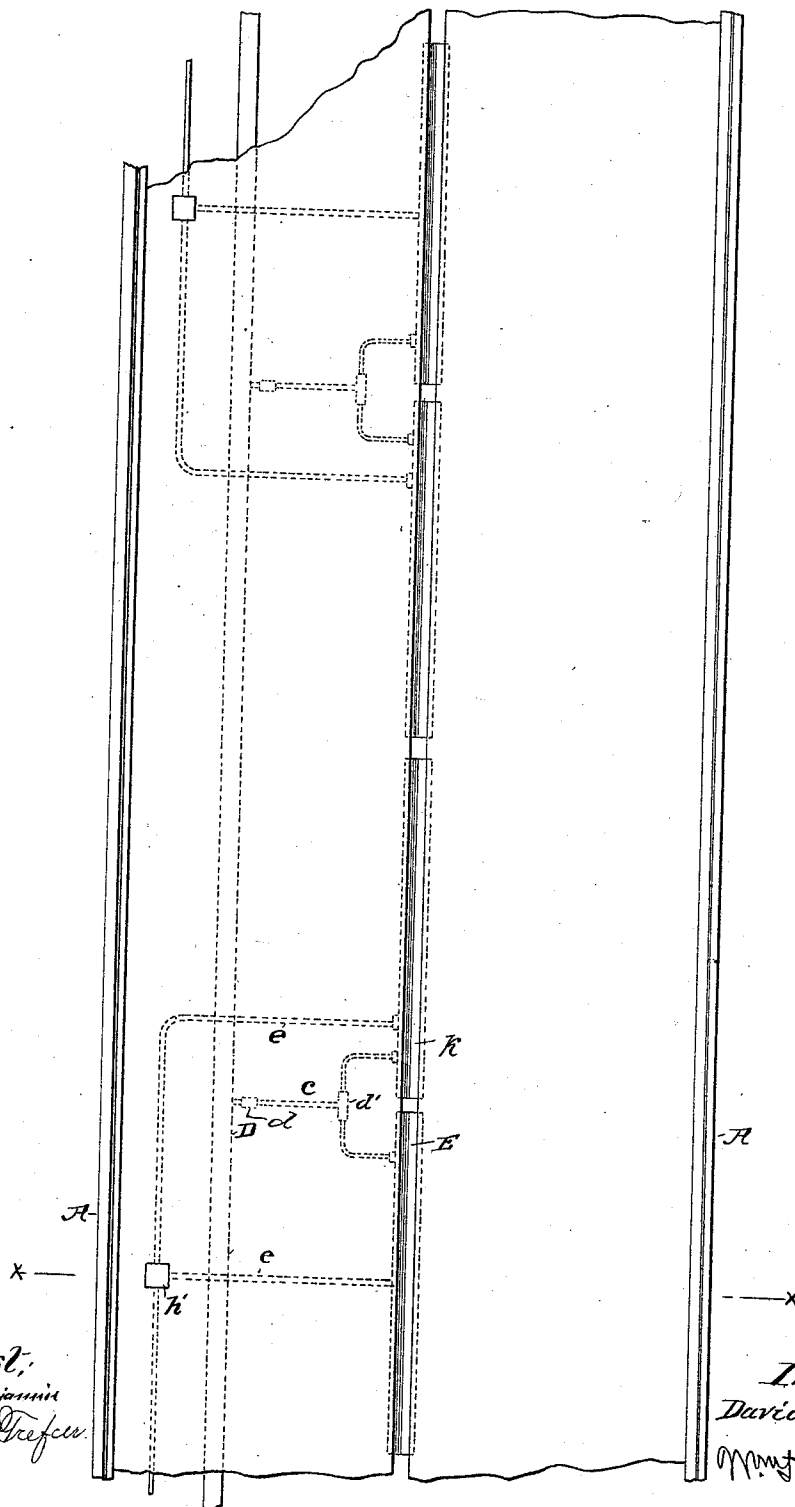


Fig 2.

Attest,
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UNITED STATES PATENT OFFICE.

DAVID MASON, OF NEW YORK, N. Y.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 530,192, dated December 4, 1894.

Application filed February 16, 1894. Serial No. 500,336. (No model.)

To all whom it may concern:

Be it known that I, DAVID MASON, a citizen of the United States, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Electric-Railway Systems, of which the following is a specification.

My invention, while applicable in whole or in part to electric railways generally, has reference more particularly to that system of such railways in which the energy for operating the motors is supplied from a main conductor or lead through a series of short sectional conductors arranged beneath the surface of the road bed; the object of the invention being to provide an electric railway system of this character which, while preventing all dangerous shocks to people and animals occupying or passing along the tracks, shall at the same time be simple in construction and operate with the maximum degree of efficiency under all conditions of the track and road bed as regards being covered with ice, snow or water, or when free therefrom.

To the ends thus specified, the invention consists, first, in a working conductor arranged beneath the road bed and electrically connected with the main conductor or lead, with means for heating such working conductor; second, in the peculiarities of construction of the working conductor and in the means for connecting it with the tubular main conductor or lead, whereby it is not only heated therefrom when required, but also supplied with the necessary current, and third, in various other combinations and arrangements of parts, all as will hereinafter more fully appear.

Referring to the accompanying two sheets of drawings, which form a part of this specification, Figure 1, is a transverse section of a railway and road bed with my invention applied in connection therewith, showing also in front elevation a car truck with an electric motor thereon; Fig. 2, a plan of a section of railway and road bed, showing in full and dotted lines the application of my invention to the same; Fig. 3, a sectional detail of a portion of a road bed of a slightly modified construction, with various parts of my invention arranged in relation thereto, and Fig. 4, a detail, showing in plan a junction box with the cover removed.

In all the figures, like letters of reference are employed to designate corresponding parts.

A A indicate the railway rails, which are or may be of any ordinary or preferred construction, and which are supported upon cross-ties B, or otherwise, as may be desired.

C indicates the main conductor or lead along which the electric current that is to form the propulsive force is transmitted from a dynamo or other source of electric energy. In the construction of this conductor, I preferably make it of tubular form, whereby to avail of it not only as a conductor for the electric current, but also as a means for conducting steam or other heated gases or fluids for purposes to be hereinafter explained, and in its location I preferably dispose of it beneath the surface of the ground. In the exemplification shown in the drawings, it is inclosed within a suitable box or trough, D, and arranged beneath the track and road bed, with the material out of which the containing box or trough is made preferably treated to insulate the conductor carried therein. In addition to being thus treated, the box or trough D may be filled around the conductor with any appropriate electricity and heat non-conducting materials, whereby to not only increase the insulation of the conductor C, but at the same time prevent the dissipation of heat contained in the gas or other heating agency transmitted along the same by radiation.

E indicates the conductor by means of which the current is delivered to the motor, the same being either made continuous throughout or composed of a series of independent sections. In the construction of this conductor, which for the sake of convenience I shall term the "working conductor" herein, various forms may be adopted, it only being essential that, whatever its form, it be provided with means whereby it may be heated throughout its length and with a body along which the electric current may travel. With the preferred form of construction however, it is composed of a series of sections which severally consist of a tubular body, *a*, tightly closed at both of its ends, and provided on its upper surface with a longitudinal groove, *a'*, extended throughout its length for the reception of a rib or bar, *b*, which may be fixedly or other-

wise arranged therein. As thus constructed, the sections composing the working conductor are arranged end to end beneath the surface of the road bed F in a line substantially parallel to the tracks A A. In some cases, it is found convenient to construct the body portion *a* of this conductor of material that is a good conductor of electricity, and the body portion then, in addition to serving as a means for heating the same, also acts, with the rib or bar *b*, as a conductor for the current, while in other cases it is found desirable to make such body portion of a material that is a non-conductor of electricity, in which event it merely serves as a means to heat the said conductor, and the rib or bar *b* alone acts as a conductor of the current. Either of these forms of construction may be adopted as may be desired.

When the form of conductor having the body portion constructed of a conducting material is employed, the entire body portion and rib or bar are thoroughly insulated, as, for instance, by surrounding them on all of their outer surfaces, excepting the top of the rib or bar, with a mastic composed of sand and bitumen, or with other insulating material as shown at *g*. On the other hand, when the body portion *a* is constructed from a material that is a non-conductor of electricity, then it is obvious, that only the rib or bar requires insulation.

Extending from each of the sections of the working conductor, when composed of sections, or from different points along the same when made continuous throughout, to the main conductor or lead C, are pipes *c*, by means of which the steam or other heating agency carried along the conductor C may be communicated to the working conductor and the latter heated therefrom. These pipes are preferably constructed of a material that is a non-conductor of electricity, and are or may be formed in two sections united by a right and left hand screw threaded union joint, *d*, as illustrated. In addition to being thus connected to the main conductor or lead C by the pipes *c*, the working conductor E is connected thereto by the conducting wires *e*, which are thoroughly insulated and are or may be provided with suitable resistances and fuses if so desired.

When the working conductor is made continuous throughout, then but a single connection will be required, although it is obvious the number may be increased as the exigencies of the service may demand. On the other hand, when this conductor is made up from a number of independent sections, then each of the sections thereof will be connected to the conductor by its own conducting wire *e*, whereby to be brought into electrical connection therewith.

In the form of the invention illustrated in the drawings, I have shown such resistances and fuses employed, the same being lettered *h* and *i*, respectively, and located in the junction

box F' which is preferably though not necessarily arranged in the road bed F with its top flush with the surface thereof, and provided with a suitable cover *h'*, whereby to permit of easy access thereto. By these means, as will be seen, provisions are made for preventing excessive leakage of the current, and also, when the sectional form of working conductor is employed, for varying the speed of the motor to suit its movements to the particular requirements of the line. Again, when the sectional form of working conductor is employed, the junction boxes may be provided with a switch, *j*, whereby to throw out of, and bring back into, the circuit any particular section of such conductor as may be required.

By the construction and arrangement of parts as thus described, provision is made not only for the heating of the conductor E from the main conductor or lead C, and electrically energizing the same therefrom, but also for removing or throwing out of operation one or more of its sections without in any way affecting the others.

The improvements thus far described, it is obvious, are wholly independent of the particular character or form of the road bed F, and may be applied in connection with streets that are paved with Belgian blocks, or cobble stones, or with any of the mastic compounds usually employed for that purpose, it only being essential that, whatever its character, the pavement be provided with a longitudinal groove, *k*, that is extended throughout the length of the conductor D, and is constructed of a depth to reach the upper surface of the rib or bar *b*, over which it is formed. The object or purpose of this groove is to receive the lower end of the trolley arms, whereby the current carried by the conductor D may be transmitted to the motor above, and in its construction it will be made as narrow as possible to prevent the entrance of the wheels of vehicles or other objects through which dangerous shocks may be communicated therethrough, it seldom exceeding five eighths of an inch in width. To permit of this groove being made as narrow as possible, and at the same time to maintain the integrity of its walls under all the conditions to which they may be subjected by vehicles passing over the same, I sometimes employ stone in their construction, which is made in the form of blocks and properly disposed for the purpose. I prefer, however, to make such walls of cement or mastic, as shown in the drawings, which likewise illustrate the entire road bed paved with that material. In most instances, these above mentioned materials will possess the requisite degree of strength and rigidity to withstand the strain that may be put upon them, but when, from the traffic or otherwise, they are not of the proper strength, then the surface of the pavement adjacent to the walls of the groove may be still further strengthened by plates *p*, which are or may be serrated

on their upper surface and secured in place by forcing their downwardly turned edges p' down into the pavement, as shown in Fig. 3.

The car to be used in connection with this system is or may be the same as that usually employed in connection with electric railways generally, and is or may be provided with the ordinary truck frames and motor, as is common with that form of car. In Fig. 1, I have shown one of these truck frames and motors, with the trolley arm, and its connections, whereby the current is communicated from the conductor D to the motor and such motor operated therefrom. In this figure, H indicates the truck frames, I the wheels journaled therein, K the motor, and L the trolley arm. The parts as thus described are or may be the same as those ordinarily employed, but the trolley arm L , instead of being secured to the top of the car, is hinged to the cross bar m of the truck frame H , and, depending through the groove k in the pavement, rests at its lower end upon the upper surface of the rib or bar b . By this means the current supplied to the conductor D is taken off by the trolley arm and communicated to the motor through the conductor m , which extends from the arm to the motor; and in order to prevent the escape of the current from the trolley arm to the ground, in its passage from the conductor D to the motor, I surround it with a covering of insulating material o , as shown.

In some cases I make use of but a single trolley arm L , as shown in the drawings, and this may either project down vertically from its support and be held in that position, or the same may be hinged to its support and be held down into contact with the rib or bar b in a trailing position by spring pressure. Moreover, in some instances, a trolley arm may be carried at each end of the car, in which event they will preferably be hinged to their support, and while held down in a trailing position, when in contact with the rib or bar b , will be provided with means whereby they may be raised from contact therewith.

The several parts being constructed and arranged as above specified, a system of electric railway is produced, which not only permits of the current being taken from below the surface of the street, but, in consequence of the provision for heating the conductors and the arrangement of one or both of these conductors below the pavement, the accumulation of snow or ice on the said conductor and in the street between the rails is prevented. To aid in removing the water from the conductor E , that may accumulate thereon by the thawing of ice or snow or otherwise, the road way may be provided at suitable points with receptacles and traps, whereby such water may be conducted to the sewers and thereby discharged.

Although in the foregoing I have described the best means contemplated by me for carrying my invention into practice, I wish it distinctly understood that I do not limit my-

self strictly thereto, as it is obvious that I may modify the same in various ways without departing from the spirit thereof.

Having now described my invention and specified certain of the ways in which it is or may be carried into effect, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A conductor for electricity composed of a series of independent sections arranged end to end, each section of which is constructed with a tubular body that is closed at its ends, and provided with a longitudinal groove extending throughout its length in which is arranged a rib or bar, substantially as described.

2. The combination, with a working conductor and a main conductor or lead, of means whereby the working conductor may be both heated and electrically energized from the main conductor or lead, substantially as described.

3. The combination, with a working conductor, and a main conductor or lead, of means whereby the working conductor may be heated, and electrical connections between the main and working conductors, substantially as described.

4. The combination, with a working conductor composed of a series of independent tubular sections closed at their ends and arranged end to end, and a main conductor or lead of tubular form, of pipes for connecting the main conductor or lead with the sections of the working conductor constructed of non-conducting material, and electrical connections between such main conductor and the sections of the working conductor, substantially as described.

5. The combination, with a working conductor composed of a series of independent tubular sections closed at their ends and arranged end to end, and a main conductor or lead of tubular form, of pipes for connecting the main conductor or lead to the sections of the working conductor constructed of non-conducting material, electrical connections between such main conductor and the sections of the working conductor, and resistances interposed in such electrical connections whereby to regulate the tension of the current in the different sections, substantially as described.

6. The combination, with the railway rails and a road bed, and a motor carried on such rails, of a working conductor arranged beneath the surface of such road bed, a main conductor or lead connected to such working conductor whereby to both heat and electrically energize the same, and a trolley arm connected to said motor and working down in a groove formed in the road bed with its lower end in contact with the working conductor, substantially as described.

7. The combination, with the railway rails and the road bed, and a motor carried on such rails, of a working conductor constructed in tubular form and arranged beneath the sur-

face of the road bed, a main conductor or lead also constructed in tubular form, pipes and electrical connections by means of which the working conductor is connected to the main conductor or lead and thereby heated and electrically energized therefrom, and a trolley arm connected to such motor and working down in a groove formed in the road bed with its lower end in contact with the working conductor, substantially as described.

8. The combination, with the railway rails and the road bed, and a motor carried on such rails, of a working conductor constructed in tubular sections closed at their ends and arranged beneath the surface of the road bed, a main conductor or lead also constructed in tubular form, pipes and electric connections by means of which the several sections of the

working conductor are connected to the main conductor to permit of their heating and electrical energization therefrom, resistances interposed in such electric connections, and a trolley arm connected with said motor and working in a groove formed in the road bed with its lower end in contact with the working conductor, substantially as described.

9. A tubular conductor for electricity provided with a longitudinal groove extending throughout its length, substantially as described.

In testimony whereof I have hereunto set my hand this 8th day of February, 1894.

DAVID MASON.

Witnesses:

S. L. TRIPPE,

WM. E. TREFCER.