

(No Model.)

2 Sheets—Sheet 1.

R. M. HUNTER.
ELECTRIC RAILWAY.

No. 446,833.

Patented Feb. 17, 1891.

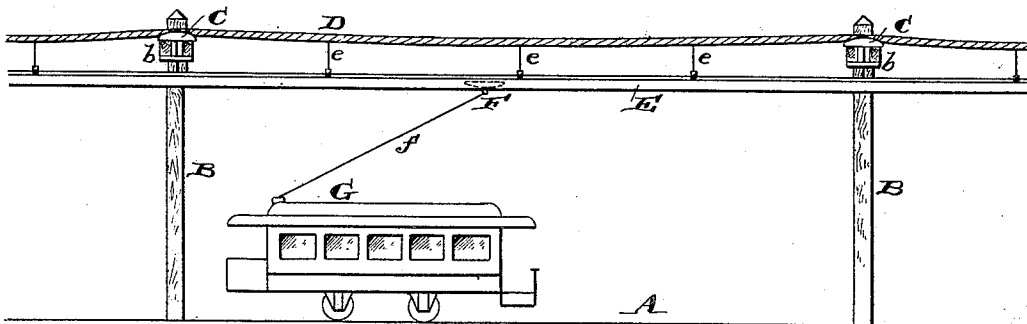


FIG. 1

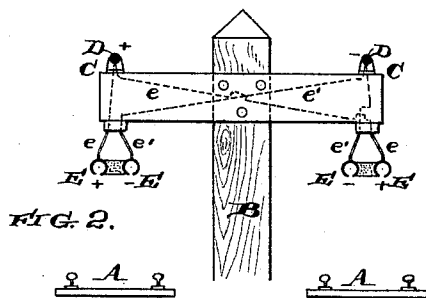


FIG. 2.

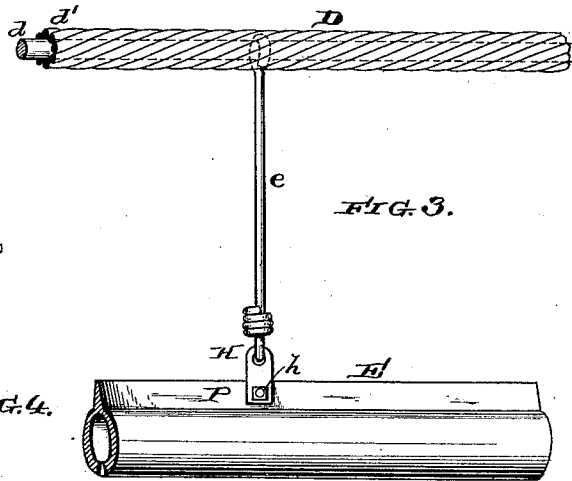


FIG. 3.

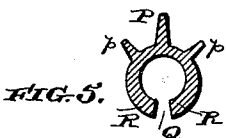


FIG. 5.

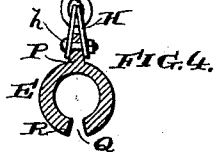


FIG. 4.



FIG. 6.

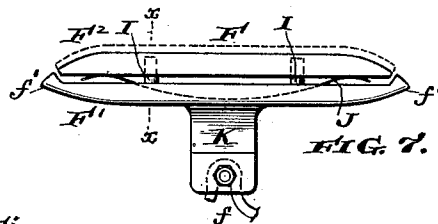


FIG. 7.

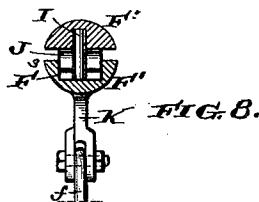


FIG. 8.

Witnesses:

Henry Denny
A. J. Denny

Inventor:

Wm. H. Barker

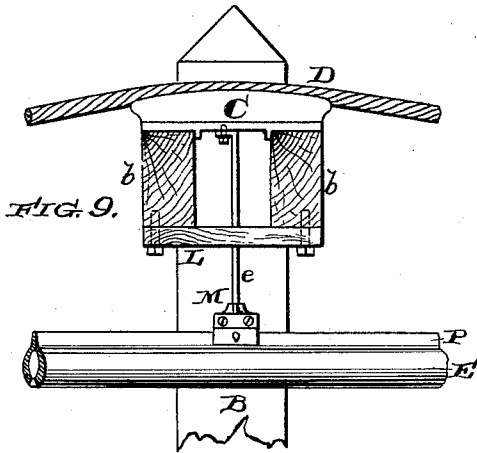
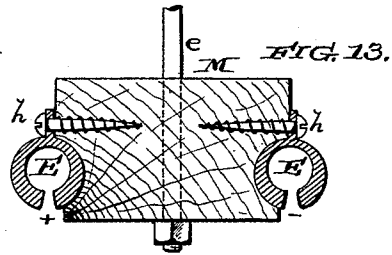
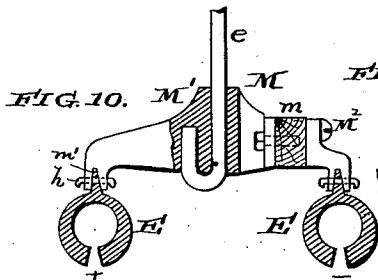
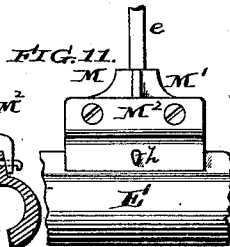
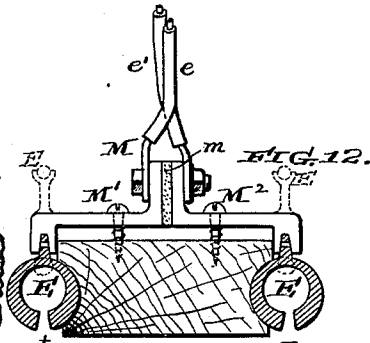
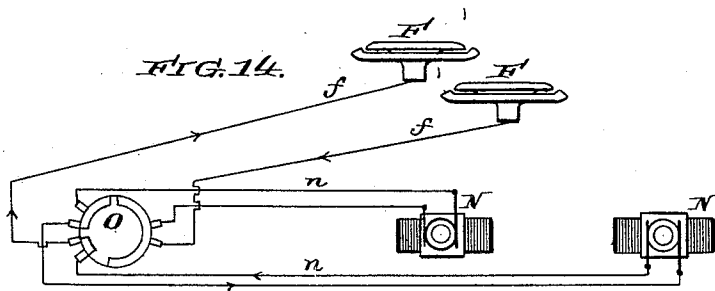
(No Model.)

2 Sheets—Sheet 2.

R. M. HUNTER.
ELECTRIC RAILWAY.

No. 446,833.

Patented Feb. 17, 1891.



Witnesses:

Henry D. King
A. J. Dunn

Inventor:

R. M. Hunter

UNITED STATES PATENT OFFICE.

RUDOLPH M. HUNTER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY
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OF BOSTON, MASSACHUSETTS.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 446,833, dated February 17, 1891.

Original application filed March 16, 1888, Serial No. 267,367. Divided and this application filed November 24, 1890. Serial No. 372,522. (No model.)

To all whom it may concern:

Be it known that I, RUDOLPH M. HUNTER, of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Electric Railways, of which the following is a specification.

My invention has reference to electric railways; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form part thereof.

This application (Case 182) is a division of my application, (Case 50,) No. 267,367, filed March 16, 1888.

The object of my invention is to provide a suitable construction adapted to suspended or overhead conductors for electric railways, whereby strength, durability, simplicity, and low resistance result with cheapness of construction.

Other advantages of my present invention are that the working-conductors may be made of cheap metal and can be readily replaced at small cost when worn and the line-circuits which supply the currents to the working-conductors are without wear.

In carrying out my invention I suspend one or more supporting and current-supplying conductors or cables, and from it or them I suspend the working conductor or conductors, which are hung substantially parallel to the rails—that is, at a fixed distance from the track. In a double-track railway I may use two supporting-cables and a conductor or conductors over each track. In this construction the working-conductors of the two tracks will be connected in parallel, reducing the resistance of the line as an entirety. The supporting-cables would hang like a catenary, while the working-conductors would be preferably horizontal and suspended from said cables at intervals in their length, so as to maintain the horizontal arrangement and prevent sagging or rupture. As the cables may be made strong and of good conductivity, the strength of the working-conductors is of second importance. Even when hung, as here explained, the two working-conductors may

both be insulated from the sustaining-cables and convey the electric current to the motors. These suspended working-conductors may be of any construction desired.

When using the supporting-cables as supply-conductors I may make the working-conductors of rolled iron, owing to its cheapness and easy manufacture and facility for making repairs. The supporting-cables may be made of steel covered with strands of copper, or the reverse, or all of copper, or it may be entirely of silicon bronze, which has a conductivity almost equal to copper, combined with great tensile strength. When employing the word "cable" I mean a rod or rope of wires or other materials, or any strand suspended from one support to the next.

In the drawings, Figure 1 is a side elevation of an electric railway embodying my invention. Fig. 2 is a cross-section of same on line *z z*. Fig. 3 is an enlarged detailed view of a portion of same. Fig. 4 is an end sectional view of a part of Fig. 3. Fig. 5 is a cross-section of one form of working-conductor. Fig. 6 shows a cross-section of the conductor-bar before being rolled into a tube. Fig. 7 is a side elevation of a collector for the working-conductor. Fig. 8 is a cross-section of same on line *x x*. Fig. 9 is an enlarged side elevation of the upper end of the posts and the connections between the suspended conductors. Fig. 10 is a cross-section showing the method of hanging the two parallel working-conductors. Fig. 11 is a side elevation of same. Figs. 12 and 13 are cross-sections similar to Fig. 10, showing modified ways of connecting and insulating the suspended working-conductors; and Fig. 14 is a diagram showing the arrangement of the motor-circuits on the car connecting with the motors and collectors.

A is the road-bed or railway, and B are vertical posts, preferably having cross-arms *b* at the top.

Supported upon the shoes C, which rest upon the cross-arms *b*, are the cables D, which are preferably made of sufficient strength for supporting the working-conductors, and also

preferably of good conductivity to reduce the line-resistance. These cables D may have a central rod d , about which are wrapped the small wires d' . The entire cable may be of silicon bronze or part may be of copper or steel, or the parts d and d' may be of steel and copper, one to give strength and the other conductivity.

Arranged below the suspended cables D are the two pairs of working-conductors E, one of which is connected by a conductor e to one of the cables D, while the other of said working-conductors of one pair is connected by a conductor e' with the other cable D, and likewise the other pair of working-conductors E are connected to said cables D, one of which conveys positive currents and the other negative currents. By this means we will have the pairs of working-conductors in multiple connection with each other and with the cables D, and below each cable may be suspended a positive and negative working-conductor, or pairs of conductors may be arranged for two tracks, one of which pairs may be arranged upon each side of the line of posts B over the tracks. These connections are clearly illustrated in Fig. 2. The working-conductors E are preferably arranged horizontal or parallel to the road-bed, whereas the cable D hangs like a catenary, as indicated in Fig. 1, and these working-conductors may be suspended at numerous intervals by the suspending rods or conductors e .

It is evident that while it is preferable to supply the line-currents to the conductors or cables D, it is perfectly clear that the cables D may be used only as sustaining-cables, and the current b wholly transmitted through the working-conductors E. In this latter case the supporting-rod e would necessarily be insulated from the conductors E, as shown in Fig. 13, whereas in the other case it would be electrically connected with the proper working-conductor E, as shown in Figs. 10 to 12.

I do not limit myself to any form or construction of working-conductor or particular method of suspension or electrical connection when considering my invention broadly.

In making a tubular conductor I prefer to form it of cheap metal, such as iron, which may be easily rolled by first rolling it as indicated in Fig. 6, with the thickened edges R R and projections P p , which is afterward rolled into the shape shown in Fig. 5.

In Fig. 4 the longitudinal projecting rib p has been dispensed with. The web or rib P acts as the means of connection for the supporting-rod e . The connection may be made in various ways, the simplest of which have a single conductor E, (shown in Figs. 3 and 4,) in which the wire rod e is attached to plates H, which are bolted at h to the rib, making a good electrical contact, and at the same time a firm connection. Where two parallel working-conductors are to be arranged in pairs, they may be held apart an equal distance by either of the arrangements M. (Shown in

Figs. 10, 12, or 13.) In Figs. 10, 11, and 12 we have two castings M' M^2 , which are bolted together, but insulated from each other at m , and said castings are provided with grooves m' for the reception of the ribs or webs P of the conductors E, which are fastened securely by the bolts or pins h . This supporting conductor or rod e would be secured to the castings M' , supplying electricity of one polarity, and the other working-conductor of the pair may be connected through its casting M^2 and conductor e' with the line-conductor of opposite polarity.

Wooden blocks, as shown in Fig. 12 and well paraffined, may be used to connect the two working-conductors into a rigid structure.

In the case of Fig. 13 we have the two working-conductors secured fast to the insulating block of wood, through which the suspending-rod e passes.

In place of using tubular conductors, as indicated, it is evident that ordinary cables or rods may be used, against which the usual trollies will travel. Where the conductors e e' lead up to the posts they may pass through cross-bars L, so as to properly support the working-conductors directly beneath the cable.

The collectors F may be made in any suitable manner, one form adapted to tubular conductors being shown in Figs. 7 and 8, in which we have them formed of two parts F' and F^2 , held in line by pins I, and adapted to be separated by a spring J, arranged within the recess F^3 of the lower part. This piston is made double-pointed or cigar-shaped, and the points are preferably formed on the lower part, and so as to guard the ends of the upper part. The lower part is provided with a shank K, which extends through the slot O, and is connected with the conductor f , leading to the car. These pistons slide in the tubes E, forming the working-conductors, and may be pulled in either direction by the travel of the car. Their connection with the motor on the car is shown in Fig. 14, in which N N represent two motors having the motor-circuits n n , leading to the switch O, which also receives the flexible conductors f f from the collectors. By moving the switch O the motors N N may be placed in series or parallel; or one or both may be cut out of circuit, thus varying the motor resistance and without the use of auxiliary resistances.

The conductors may be of any form desired, and may be rods or wires in place of slotted tubes.

It is evident that the details of construction herein set out may be greatly modified without in the least departing from the principles of the invention. Hence I do not limit myself to the details here shown.

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

1. In an electric railway, the combination of a suspended cable with a working-con-

ductor supported by and electrically connected to it at intervals along its length, a traveling vehicle, a motor to propel said vehicle, and a contact device making a traveling connection with the working-conductor to supply electric current to the motor.

2. In an electric railway, the combination of supporting-posts, an electric-supply cable supported thereby, and a straight or horizontal working-conductor suspended from said cable by electrical connections at intervals in its length.

3. In an electric railway, the combination of a suspended cable and supporting-posts therefor arranged at a distance apart, with a working-conductor connected to it at intervals along its length and at one or more places between the successive posts, a railway parallel with the working-conductor, an electrically-propelled vehicle, and a traveling electric connection between the vehicle and working-conductor.

4. The combination of posts B, having cross-arms *b b*, castings C, resting upon said cross-arms, supporting-cable D, resting upon said castings, a working-conductor, and suspending connections between the cable and working-conductor.

5. The combination of the cable D, formed with a center of one metal and a covering of twisted wires of another metal, combining strength in the one and conductivity in the other, a working-conductor, and an electrical and mechanical connection between said cable and working-conductor.

In testimony of which invention I have hereunto set my hand.

R. M. HUNTER.

Witnesses:

ERNEST HOWARD HUNTER,
S. T. YERKES.