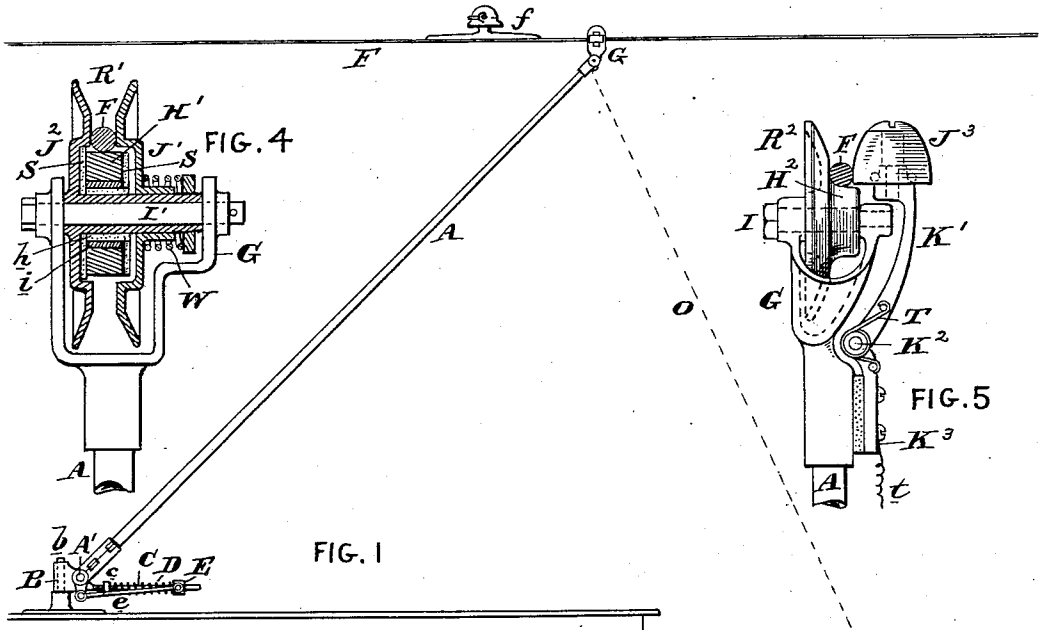
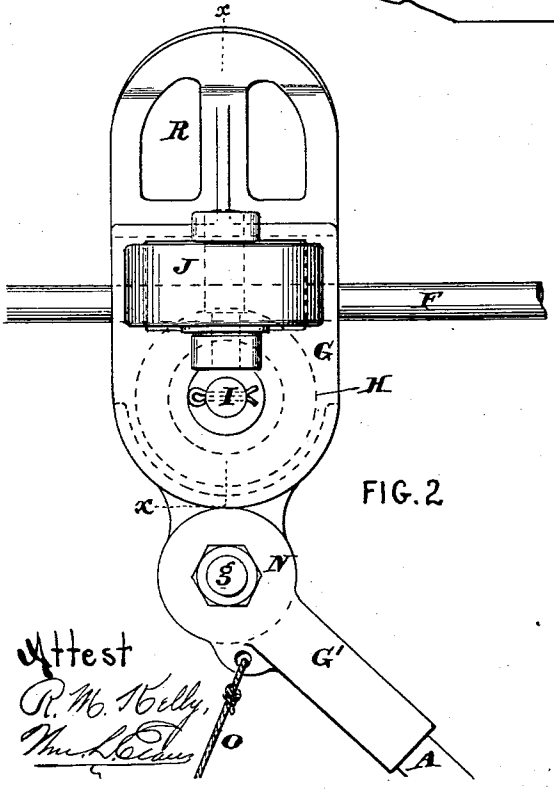
(No Model.)

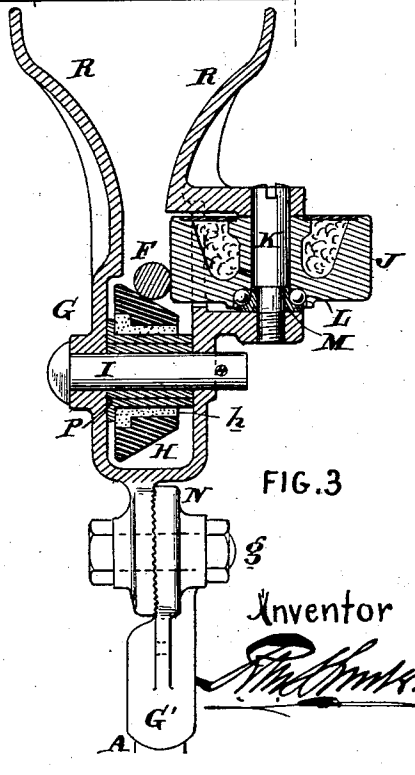
R. M. HUNTER.

CURRENT COLLECTING DEVICE FOR ELECTRIC RAILWAYS.

No. 588,111. Patented Aug. 10, 1897.







Attest
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RUDOLPH M. HUNTER, OF PHILADELPHIA, PENNSYLVANIA.

CURRENT-COLLECTING DEVICE FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 588,111, dated August 10, 1897.

Application filed February 4, 1897. Serial No. 621,933. (No model.)

To all whom it may concern:

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

My invention has reference to current-collecting devices for 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 a part thereof.

This application (Case No. 295) relates to improvements in trolley devices for electric railways, and comprehends certain modifications or improvements upon the general construction set out in Letters Patent No. 566,984, granted to me on September 1, 1896.

In my Letters Patent above referred to I have disclosed an original type of trolley having for its especial novelty the employment of a frame or support carried by the car and with which it is connected by a suitable flexible joint, and the said frame being guided at its outer or free end by a mechanical traveling connection with the conductor and combined with a separate current-collecting device making a traveling electrical contact with the conductor and sustained by the flexible frame through a suitable connection therewith at or close to the conductor. In my preferred form of said invention the frame was provided with an underrunning insulated guiding-contact for the conductor secured by supporting close to the suspended conductor a complete but small underrunning current-collector capable of universal movement and sustained in operating position by a spring independent of the support of the frame.

My present invention has for its object a further development of the same general features—namely, a supporting-frame carried by the car and guided at its free end by the conductor through the media of an insulated underrunning or guiding device and supporting a side running or moving contact device adapted to collect the current from the suspended conductor and deliver it to the motor-circuit.

In carrying out my invention I provide the car with an upwardly-extending frame or support jointed to the car by a suitable flexible or universal joint and held in position by a suitable spring or otherwise. The upper end of the frame or support is provided with an insulated underrunning guide-wheel or guiding part which does not collect or convey current, but performs the function of guiding the frame in a vertical direction relatively to the suspended conductor. This frame so guided sustains a suitable side-running contact so arranged that it makes a moving electrical connection with the suspended conductor and adapted to transfer the electric current therefrom to the motor-circuit upon the car.

In one form of my invention I employ the insulating guiding-wheel in the form of a conical or tapering wheel running upon a transverse axis and combine therewith a side-contact wheel whose vertical position relatively to the conductor is governed thereby and which rotates about a vertical or upright axis, said combination operating by the upward pressure of the conical wheel to force the suspended conductor over and against the side-contact wheel or to force the side-contact wheel against the conductor, as the case may be. In this form of my invention the supporting-frame may convey the current from the side contact to the motor-circuit upon the car, or a separate electric circuit may be led down independent of the support.

In another form of my invention I construct the side contact in the form of vertical flanges or disks insulated from the under guiding-wheel and rotating upon a common axis therewith. In this case the flanges or disks are moved laterally relatively to the guiding-wheel to make contact with the conductor against which said wheel rests and by which the position of the flanges or disks with respect thereto is governed. In this case the guiding-wheel need not be conical.

In another form of my invention the guiding-wheel may have one vertical flange and rotate upon a transverse axis and be combined with a laterally-moving contact-wheel insulated from it and spring-pressed so as to pinch the conductor between the flange of the guide-wheel and itself. The current may be con-

veyed from the contact-wheel in either of the ways first mentioned.

It is evident that in any of these constructions the under guide-roller might be fixed, in which case it would be simply a guide, but I prefer to make it rotatable to reduce wear. I will describe it hereinafter as rotatable, but do not limit myself thereto.

It will be observed that in all of these cases which are given as examples of types of my invention I employ a side-contact device at a distance from the car whose position vertically relatively to the suspended conductor is insured by the guiding-wheel or guide and supporting-frame. By carrying the side contact upon the end of a long rearwardly-extending supporting-frame or supporting-arm I am enabled to secure large range of vertical movement as well as lateral movement, but this would be impracticable with the side-running contact if it were not for the guiding effect of the insulated guiding-wheel, since this element at all times locates the position of the side contact relatively to the suspended conductor. The mere configuration or shape of the parts employed is immaterial and are only given as examples of my invention generically considered.

My improvements will be better understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a trolley for electric cars embodying my invention. Fig. 2 is an enlarged elevation of the top thereof. Fig. 3 is a cross-sectional elevation of Fig. 2 on line *x x*. Fig. 4 is a cross-section of a modification of my invention, and Fig. 5 is an elevation of another form of my invention.

A is a long upwardly-extending support or arm, preferably trailing, and is pivoted at A′ to a turn-table B, journaled upon a vertical axis *b* on a pedestal secured to the top of the car-body or vehicle. The turn-table B is furnished with a rearwardly-extending arm C, about which is placed a coiled spring D.

E is a loose cross-head guided by the arm C and resting against the spring D. The cross-head E is connected with a short arm of the support A below the pivot or transverse axis A′ by links *e*. By this means the tension of the spring D acts upon the support A to hold it in an upright position. The other end of the spring D is received against the nut *c*, which is screwed upon the arm C and by its adjustment adapted to put the spring under more or less tension. The turn-table is completely reversible about its pivot *b* and carries with it the support A when reversing the direction of travel of the car.

F is a suspended conductor or trolley-wire and is hung from hangers *f*, carried by insulators in the usual manner, so as to expose substantially smooth under and side surfaces.

Secured upon the top of the support A is a socket G′, upon which is bolted a head-piece G, carrying the contact device. The joint between G and G′ consists of two serrated or toothed disks N, one upon each part, arranged in vertical planes and bolted together by a bolt *g*. By this means the head G may be adjusted at any angle to the support A to suit different lengths of support and heights of the trolley-wire F. The head G has a transverse bearing I, upon which is loosely journaled a conical or tapering guiding-roller H. The hub of the roller H is formed with the journal bearing or sleeve P, insulated from the body of the roller by a sleeve of insulating material *h* or in any other manner, the object being to insulate the body of the roller H from the support A, so that it only performs the function of a guide and not an electrical collector. The particular construction of roller H is immaterial, though I prefer to have it conical or tapering.

J is the current-collecting or contact roller and rotates in a horizontal plane, so as to make a side contact with the suspended conductor F. This roller J projects through the side of the head G and preferably slightly over the guiding-roller H, as shown in Fig. 3. This contact-roller J is journaled upon a vertical pin or bearing K and preferably rests upon antifriction rollers or balls L. For simplicity of construction these balls rest upon a cone or floor M, held in place by the pin or bearing K. The side-contact roller J may be made in any other suitable manner. The adjustment at N enables the roller J to be set so that normally it is horizontal.

O is the trolley-cord to pull down and reverse the trolley.

It will now be perceived that as the arm A is pressed upward at its free end the conical guide-roller presses upon the under side of the trolley-wire and by virtue of its conical construction tends to move sidewise. This action moves the head G sidewise and presses the contact-roller J firmly against the side of the wire F. The greater the upward pressure and obliquity of the upper surface of the guide-roller H the greater side pressure. The suspended conductor F is received, as it were, in a wedge-shaped jaw, one side of which is compressed in the vertical face of the side-contact roller. Hence absolutely positive contact is insured. Furthermore, it will be seen that slight jumping of the arm A will not interrupt the contact, as occurs in underrunning-contact collectors, producing injurious sparking and heating, as well as self-induction, in the motor-circuit, but the conductor will move over the vertical face of the side-contact roller J and permit an inch or more of jumping without breaking the contact. As the rollers in this construction have no flanges, I provide the head G with two upwardly extending and flaring guides R R, whose lower edges terminate approximately above the edges of the rollers H and J, respectively, to guide the trolley-wire into the space between said rollers. As these guides R do not rotate, it is evident that for roads down steep inclines or mountain sides they

may be extended to form a large fork to prevent any possibility of the trolley jumping the conductor, and thus losing control of the car.

In the construction illustrated in Fig. 4 I have shown the roller H substituted by a cylindrical roller H′, and upon each side thereof I provide independent disks J′ J², whose rims flare, as at R′. The disk J² is provided with a long hub *k*, journaled upon a transverse pin or bearing I′, carried in the head G. The other disk, J′, is sleeved upon the hub *k* and pressed toward the disk J² by a spring W, which construction I have found in practice excellently adapted to make the disks grip or grasp the trolley-wire F. Intermediate of the disks J′ J², I place the guiding-roller H′ and journal it upon the bearing *i*, insulated from but encircling the hub *k*. I also interpose insulating-disks between the sides of the roller H′ and disks J′ J², so as to permit play of one or both of the latter, but keep the roller insulated from them. In this construction the roller acts as the guide for holding the side-contact disks in operative contact at all times with the trolley-wire. By making the faces of the disks as shown the wire F may have considerable vertical play without producing sparking. Strictly speaking, the disk J′ is movable to or from disk J²; but generically it may be said the rollers and disks are relatively movable. This construction insures a double side contact, whereas in Figs. 1, 2, and 3 there is but a single side contact. The current may be conveyed to the motor by the arm A or by a separate wire from the disks J′ J².

In the construction shown in Fig. 5 the head G has journaled in it on a horizontal axis the guiding-wheel H², having a large flange R². This wheel or roller may be insulated from the head G, as in the case of Fig. 3. J³ is the side-contact roller and is journaled upon the top of an arm K′, pivoted at K² to an insulated plate K³, secured to the base of the head G. The current collected by the roller J³ is conveyed to the motor by a conductor *t*. In this case it is not essential to insulate the roller H², as the head G and support A do not carry the current; but when the plate K³ is not insulated the roller H² should be insulated, as in Fig. 3. The arm K′ is provided with a spring T to press it toward the head G for the purpose of crowding the contact-roller against the side of the conductor. In this case, as in the others, the roller H² acts as a guide to insure the proper vertical position of the roller J³ at all times. The top of the roller is rounded, so as to correspond to the curvature of the flange R² of the roller H², thus forming a sort of natural rolling jaw or fork to readily receive the conductor F. This construction, as in the case of the others, will permit of a considerable vertical play without breaking the connection with the conductor or causing sparking. In the case of the constructions of Figs. 4 and 5 the adjustable construction G′ may be employed, if desired.

My improved current-collecting device or trolley is excellently adapted for passing under bridges, tunnels, switches, or frogs and may be used with the present types of frogs and switches or with a special type thereof, which will form subject-matter of a separate application.

The construction illustrated for sustaining the support A from the car may be changed or modified and may be answered by any mechanical or electrical means which will sustain the support with provision at its free end for universal movement.

While I have shown the guide-rollers H, H′, and A² journaled upon horizontal axes, I do not confine myself thereto, as it is self-evident that such axes might be inclined.

While I prefer the constructions shown, I do not limit myself thereto, as the details may be modified in various ways without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a trolley, the combination of a support jointed to the car at the bottom, and having a guide at the top adapted to travel along the under side of the suspended conductor, combined with a current-collecting roller journaled upon an upright axis and arranged close to the side of the guide and electrically insulated from it, whereby the contact is made with the conductor immediately in the vicinity of the guide.

2. In a trolley, the combination of a support jointed to the car at the bottom, and having a rotating guide at the top formed with a tapering or conical surface adapted to travel along the under side of the suspended conductor, combined with a current-collecting roller journaled upon an upright axis and arranged close to the side of the rotating guide and electrically insulated from it whereby the contact is made with the conductor immediately in the vicinity of the rotating guide and pressed against the conductor by the action of the inclined face of the rotary guide upon said conductor.

3. In a trolley, the combination of a support jointed to the car at the bottom, and having a roller-guide at the top having its diameter at one side greater than on the other and adapted to travel along the under side of the suspended conductor, combined with a current-collecting roller journaled upon an upright axis and arranged close to the smaller-diameter side of the rotating guide and electrically insulated from it, whereby the contact is made with the conductor immediately in the vicinity of the guide.

4. In an electric railway, the combination of a suspended conductor, an upwardly-extending support jointed to the car and forced upwardly under an elastic pressure, a head secured to the top of the support, and two

rollers carried by the head one, a horizontal roller being journaled thereto on a transverse axis and the other a vertical roller on an upright axis, said rollers being relatively insulated one from the other and having their adjacent faces, namely the top of the horizontal roller and side of the vertical roller, arranged relatively to each other so as to form substantially a V-groove between them having its lowest part or apex in a point adjacent to the upper surface of the horizontal roller and in a vertical line with the vertical face of the vertical roller, whereby the upward action of the support causes the two rollers to remain in rolling contact with the suspended conductor.

5. In an electric railway, the combination of a suspended conductor, an upwardly-extending support jointed to the car and forced upwardly under an elastic pressure, a head-piece secured to the top of the support, a guide-roller having its diameter on one side greater than on the other supported in the head-piece on a transverse axis and making an underrunning connection with the conductor, and a side-contact roller journaled upon an upright axis in the same transverse plane with the guide-roller but upon the side thereof of smallest diameter and presenting a contact-surface at a higher elevation than the guide-surface of the guide-roller.

6. In an electric railway, the combination of a suspended conductor, an upwardly-extending support jointed to the car and forced upwardly under an elastic pressure, a head-piece secured to the top of the support and provided with one or more upwardly-extending flanges or forks for directing the conductor to the rollers, a conical or tapering guide-roller having its smallest diameter at one end supported in the head-piece on a transverse axis and making an underrunning connection with the conductor, and a side-contact roller journaled upon an upright axis in the same transverse plane with the guide-roller but presenting a contact-surface at a higher elevation than the guide-surface of the guide-roller at its smallest diameter.

7. In an electric railway, the combination of a suspended conductor, an upwardly-extending support jointed to the car and forced upwardly under an elastic pressure, a head-piece secured to the top of the support, a guide-roller supported in head-piece and making an underrunning connection with the conductor, and a side-contact roller journaled upon an upright axis in the same transverse plane with the guide-roller but presenting a contact-surface at a higher elevation than the guide-surface of the guide-roller, and an adjustable joint between the support and head-piece whereby the latter with its rollers may be adjusted relatively to the support.

8. In a trolley, the combination of a support jointed to the car at the bottom, and having a roller-guide at the top having its diameter at one side greater than on the other and adapted to travel along the under side of the suspended conductor, combined with a current-collecting roller journaled upon an upright axis and arranged close to the smaller-diameter side of the rotating guide and electrically insulated from it, whereby the contact is made with the conductor immediately in the vicinity of the guide and an adjustable connection between the support and rollers whereby the latter may be adjusted in position relatively to the support.

9. In a trolley, the combination of a support jointed to the car at the bottom, and having a guide at the top adapted to travel along the under side of the suspended conductor, combined with a current-collecting roller journaled upon an upright axis and arranged close to the side of the guide and electrically insulated from it, whereby the contact is made with the conductor immediately in the vicinity of the guide, and an adjustable frame at the top of the support carrying the guide and side-contact roller whereby they may be adjusted relatively to the support.

10. In an electric railway, the combination of the suspended conductor, an upwardly and rearwardly extending support jointed to the car and spring-pressed upward, a head-piece secured at the top, a side-contact roller journaled upon an upright axis and arranged at one side of the head, and means carried by the head insulated from the side-contact roller for forcing the suspended conductor and side-contact roller into electrical contact.

11. In an electric railway, the combination of the suspended conductor, an upwardly and rearwardly extending support jointed to the car and spring-pressed upward, a head-piece secured at the top, having upwardly-extending and flaring flanges, a side-contact roller journaled upon an upright axis supported by and arranged at one side of the head, and means carried by the head insulated from the side-contact roller acting upon the bottom and side of the conductor most distant from the side-contact roller for forcing the suspended conductor and side-contact roller into electrical contact.

12. In an electric railway, the combination of the suspended conductor, an upwardly and rearwardly extending support jointed to the car and spring-pressed upward, a head-piece secured at the top, a side-contact roller journaled upon an upright axis and arranged at one side of the head, means carried by the head insulated from the side-contact roller for forcing the suspended conductor and side-contact roller into electrical contact, and an adjustable connection between the head and support whereby the side-contact roller may be adjusted relatively to the support.

13. In an electric railway, the combination of the suspended conductor, an upwardly and rearwardly extending support jointed to the car and spring-pressed upward, a head-piece

secured at the top, a side-contact roller journaled upon an upright axis and arranged at one side of the head, and means carried by the head insulated from the side-contact roller consisting of an inclined guide-surface acting upon the under side of the conductor for forcing the suspended conductor and side-contact roller into electrical contact.

14. A current-collecting device for a trolley consisting of the combination of a head-piece open at the top, an insulated under running or moving guide carried thereby, and a rotary side contact also carried by said head and arranged immediately to one side of the guide for collecting the current from the conductor.

15. A current-collecting device for a trolley consisting of the combination of a head-piece open at the top, an insulated under running or moving rotating guide-roller carried thereby, and a rotary side contact also carried by said head and arranged immediately to one side of the guide for collecting the current from the conductor whose position relatively to the side contact is secured by the action of the rotating guide.

16. In a contact device for a trolley, the combination of a support connected to the car, with two contact parts secured to the end of the support and arranged at an angle to and insulated from each other, one of said parts being adapted to move in contact with the under side of the conductor and the other of said parts being vertical or upright and electrically connected with a circuit to supply current to the car.

17. In a contact device for a trolley, the combination of a support connected to the car, with two contact parts secured to the end of the support and arranged at an angle to and insulated from each other, one of said parts being adapted to move in contact with the under side of the conductor and the other of said parts being vertical or upright and electrically connected with a circuit to supply current to the car, and a forked guide or frame arranged above the surfaces for guiding the suspended conductor to them.

18. In a contact device for a trolley, the combination of a support connected to the car, with a roller side contact journaled upon the support at its free end on an upright axis, means insulated from the roller side contact carried by the support and close to the roller-contact for forcing the suspended conductor against the vertical or upright face of the side roller-contact, and an electric circuit for conveying the current from the roller-contact to the car.

19. The combination of an electric car, a suspended conductor, an upwardly-extending support carried by the car and having an insulated guide at its top pressing against the under side of the conductor, a rolling side contact rotating upon an upright axis carried also at the top of said support and held against vertical movement independent of the guide, and a conductor leading from the roller side-contact roller to supply current to the motor on the car.

20. The combination of an electric car, a suspended conductor, an upwardly-extending support carried by the car and having an insulated guide at its top pressing against the under side of the conductor and having means to limit the lateral movement of the suspended conductor over the guide, a rolling side contact rotating upon an upright axis carried also at the top of said support and limiting the movement of the suspended conductor over the guide in the other direction and held against vertical movement independent of the guide, and a conductor leading from the rolling side-contact roller to supply current to the motor on the car.

21. The combination of an electric car, a suspended conductor, an upwardly-extending support carried by the car and having an insulated rolling guide movable upon a transverse axis at its top pressing against the under side of the conductor, a rolling side contact rotating upon an upright axis carried also at the top of said support and held against vertical movement independent of the guide, upwardly-forked guides extending above the rolling guide and side contact to direct the suspended conductor to them, and a conductor leading from the rolling side-contact roller to supply current to the motor on the car.

22. In a current-collecting device for an electric car, the combination of a base, an upwardly-extending support jointed to the base and pressed upward by an elastic pressure, horizontal and vertical rollers at the top insulated from each other and forming a notch between them to receive the suspended conductor in which the horizontal roller makes a side contact and collects from the conductor and the vertical roller is insulated and moves against the under side of the conductor to guide the horizontal roller, means upon the top of the support for holding said rollers in relative position whereby the vertical movement of the horizontal roller is controlled wholly by the vertical or guide roller and conductor, and electrical conductor leading from the horizontal roller to the base of the support.

23. In a current-collecting device, a support having at its free end two rollers journaled at an angle to each other and approximately in the same transverse plane and forming an angular recess or space between them for the reception of the conductor and in which one of said rollers is insulated from the other, and a conductor for conveying the current from one of said rollers.

24. In a current-collecting device for a car, a support carried by the car having at its free end two rollers journaled at an angle to each other and approximately in the same transverse plane and forming an angular recess or space between them for the reception of the conductor and in which one of said rollers is insulated from the other, means to force one

of the rollers against the conductor, and a conductor for conveying the current from the other of said rollers to the car.

25. In a current-collecting device, a support having at its free end two rollers journaled at an angle to each other and approximately in the same transverse plane and forming an angular recess or space between them for the reception of the conductor and in which one of said rollers is insulated from the other, means for adjusting the position of said rollers upon the end of said support in the plane of one of said rollers, and a conductor for conveying the current from one of said rollers.

26. In a current-collecting device, the combination of a support having a jointed base for attachment to the car and means to hold the support in an elevated position, with a head secured to the upper end of the support, an insulated conical roller journaled in the head on a transverse axis, a side-contact roller also carried by the head and journaled upon a vertical axis to and adjacent to the conical roller, and an electric circuit leading from said side-contact roller.

27. In a current-collecting device, the combination of a support having a jointed base for attachment to the car and means to hold the support in an elevated position, with a head secured to the upper end of the support having a forked opening at top for the suspended conductor, an insulated conical roller journaled in the head on a transverse axis, a side-contact roller also carried by the head and journaled upon a vertical axis close to and adjacent to the conical roller, means to adjust the head upon the end of the support, and an electric circuit leading from said side-contact roller.

28. In a current-collecting device, the combination of a base for attachment to the car, a long support jointed to the base and pressed upward at its free end with an elastic pressure, a head carried upon the free end of the support, a guide-roller journaled in the head on a transverse axis and insulated from the side-pressure contact device and a side-pressure contact device also carried by the support and head above and to one side of the guide-roller for making an electrical contact with the conductor for supplying current to the car.

29. In a current-collecting device, a support jointed to the car and spring-pressed upward having at its free end a forked head, combined with a guide-surface and a contact-surface arranged at an angle to each other below the fork of the head to form a recess or space between them for the reception of the suspended conductor and in which the guide-surface is insulated from the contact-surface and is presented transversely under the conductor and the contact-surface is arranged vertically or upright and electrically connected with the motor-circuit, and means for holding the guiding and contact surfaces in proper relative position.

30. In a current-collecting device, a support jointed to the car and pressed upward, combined with a guide-surface and a contact-surface arranged at an angle to each other below the fork of the head to form a recess or space between them for the reception of the suspended conductor and in which the guide-surface is insulated from the contact-surface and is presented transversely under the conductor and the contact-surface is arranged vertically or upright and electrically connected with the motor-circuit, and means for holding the guiding and contact surfaces in proper relative position.

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

R. M. HUNTER.

Witnesses:
J. W. KENWORTHY,
WM. L. EVANS.