No. 781,842. PATENTED FEB. 7, 1905.

L. M. McBRIDE.

MULTIPLE CONTACT TROLLEY.

APPLICATION FILED JULY 5, 1904.

2 SHEETS—SHEET 1.

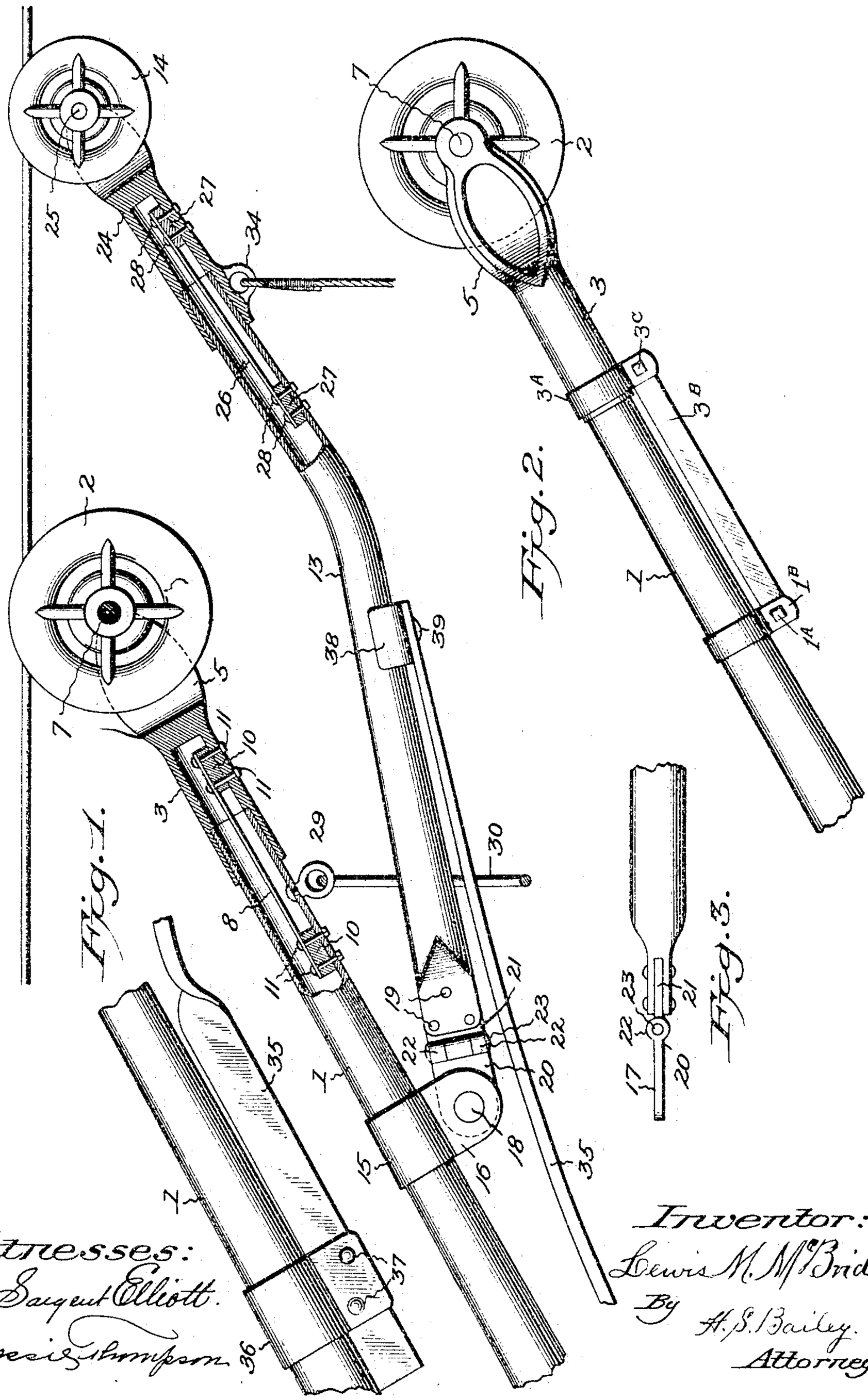

Fig. 1.

Fig. 2.

Fig. 3.

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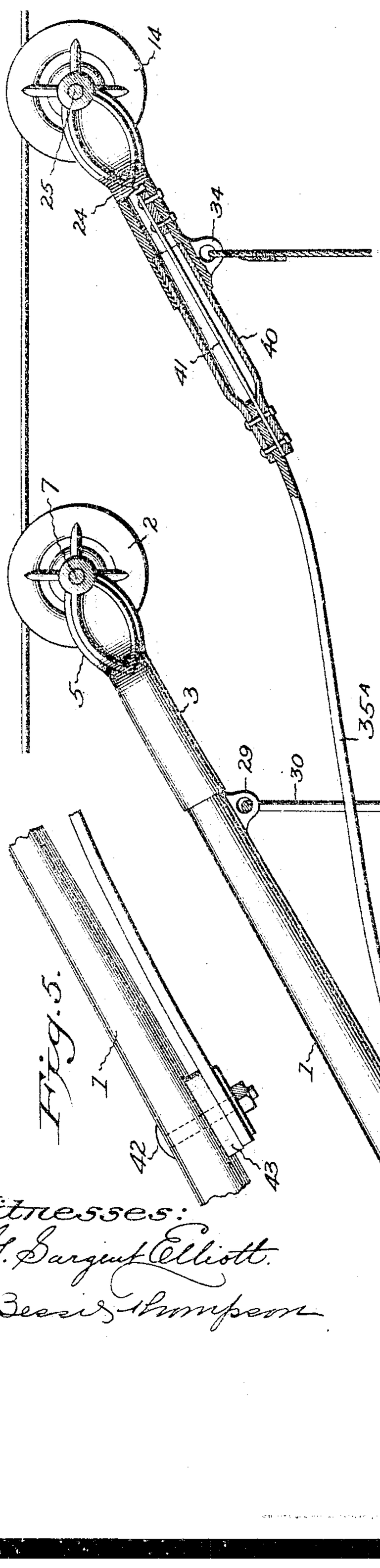

Fig. 4.

Fig. 5.

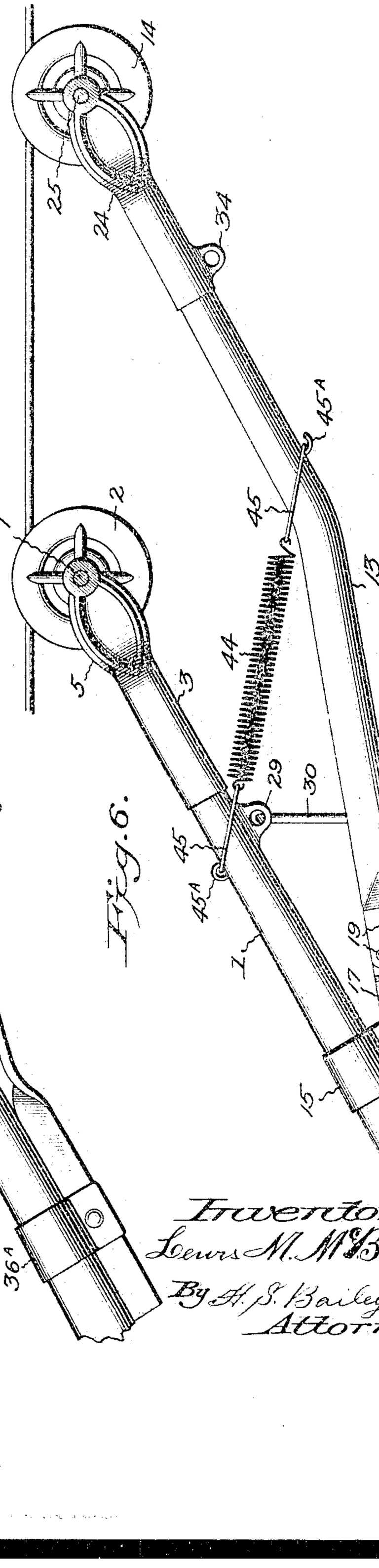

Fig. 6.

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UNITED STATES PATENT OFFICE.

LEWIS M. McBRIDE, OF DENVER, COLORADO.

MULTIPLE-CONTACT TROLLEY.

SPECIFICATION forming part of Letters Patent No. 781,842, dated February 7, 1905.

Application filed July 5, 1904. Serial No. 215,291.

To all whom it may concern:

Be it known that I, LEWIS M. McBRIDE, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Multiple-Contact Trolleys; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in trolleys for electric-motor cars; and the objects of my invention are, first, to provide a multiple-contact trolley; second, to provide a trolley having an auxiliary contact-wheel adapted to provide an increased-current contacting surface with the trolley-wire, whereby an increased amount of the electric current may flow to the motor and lights of a car; third, to provide a multiple-contact trolley that will prevent arcing between the wheel and wire; fourth, to provide a multiple-wheel trolley in which each wheel maintains an individual and independent bearing on the trolley-wire in rounding curves and entering switches as well as on straight portions of the trolley-wire, thus obviating the danger of either one or both trolley-wheels leaving the trolley-wire when rounding curves or entering switches; fifth, to provide a multiple-wheel trolley that is especially designed to permit the main or front wheel when the trolley-wire is covered with ice or sleet to break and clear the wire of the same, and thus allow the follower-wheel unobstructed contact with the bare trolley-wire. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of the preferred form of my improved trolley. Fig. 2 is a side elevation of a trolley, illustrating a modification in the manner of securing the harp upon the end of the trolley-pole. Fig. 3 is a detailed view of the lower end of the auxiliary trolley-pole, showing the hinge connection, which unites it to the main trolley-pole. Fig. 4 is a side view, partly in section, of a trolley showing a modification in the auxiliary trolley-arm and the manner of connecting it to the main trolley-pole. Fig. 5 is a detail view of the lower end of the auxiliary trolley-arm, showing the same pivotally secured upon the main trolley-pole; and Fig. 6 is a side elevation of the form of trolley shown in Fig. 1, but illustrating a different manner of holding the auxiliary trolley-wheel in contact with the line-wire.

Referring to the drawings, the numeral 1 designates a trolley-pole, and 2 the trolley-wheel, both of which are of the usual construction. To the end of the pole I secure a harp 3, which comprises a short piece of tube, one end of which is provided with a counterbore, which fits revolubly over the end of the pole. The opposite end of this tube is formed into bifurcated yoke-shaped terminal ends 5, which straddle the trolley-wheel 2 and are pivotally connected thereto by a pin 7, which extends through and is secured to them and on which the trolley-wheel is pivotally mounted. The harp is secured to the end of the trolley-pole by a spring 8. This spring may be of any suitable type and may be placed in any convenient position outside of the pole and harp; but I preferably place it within the pole and harp. I preferably use a flat-blade spring the ends of which I secure to two blocks 10 by bolts 11. One of the blocks 10 is placed in the harp and the other in the pole, and the blocks are bolted to the pole and harp by the bolts 11, which pass through the ends of the spring and the blocks. The flat side of the spring is arranged in alinement with the tread of the trolley-wheel, and the function of this spring is to normally hold the main trolley-wheel in direct alinement with the pole and in straight bearing contact on the trolley-wire and to hold the harp onto the pole and at the same time allow the trolley-wheel to resiliently yield or oscillate or partially rotate on the pole to accommodate itself independent of the pole to the curves in the trolley-line. To the trolley-pole I pivotally secure an arm 13, the free end of which carries a supplementary or auxiliary trolley-wheel 14. This arm is piv-

oted to the pole by a compound universal joint, which may be constructed in several different ways, but which I preferably make in the following manner: To the pole I secure a clip 15, which surrounds the pole and is rigidly mounted thereon. This clip is provided with ears 16, that depend from the pole. To these ears one end of a hinge 17 is pivotally secured by a pin 18. The opposite end of the hinge is secured to the end of the tubular arm 13, preferably by rivets 19. The hinge comprises a strap-hinge made of two plates 20 and 21, both of which are provided with eyes 22, that intermesh with each other and are pivotally connected together by a pin 23. The hinge permits the arm to swing laterally of the pole, while the pivotal joint in the clip permits the arm to swing vertically of the pole. The auxiliary trolley-wheel is secured to the outer end of the arm by a resilient oscillating connection, the same as is used for the connection of the main trolley-wheel with the trolley-pole. This resilient oscillating or partially-rotating connection comprises the yoke-shaped harp 24, the yoke end of which straddles the auxiliary trolley-wheel and is pivotally connected to it by the pin 25. The opposite end of the harp 24 is revolubly mounted on the end of the arm and is held there by the spring 26 and the blocks 27, which are placed within the harp and arm and are secured to them by bolts 28, the same as in the pole and harp of the main trolley-wheel. To the trolley-pole adjacent to the harp is secured an eye 29, from which hangs a link 30, which surrounds the auxiliary arm 13 and extends a short distance below it. The object of this link is to engage the auxiliary arm when the trolley is drawn down by the rope and relieve the spring which supports the said arm of excessive strain. On the harp 24 I form an eye 34, to which I secure a pull-rope, which is used by the conductor of the motor-car, to which the trolley is attached, to replace the trolley on the wire in case it jumps the same. While the arm is pivotally secured to the pole to swing laterally, it is necessary that a controlling medium be used which will exert an upward pressure upon the arm to cause the auxiliary wheel normally to engage the live wire and also to hold the arm normally in alinement with the pole, and while I may employ one or more springs of various types arranged in different positions to control the arm I preferably carry out this feature of my invention in the following manner: To the under side of the trolley-pole I secure one end of a flat-blade spring 35, the opposite end of which supports the arm 13. The end of the spring is secured between the ears of a clip 36, which is secured to the pole by bolts 37. The spring is then twisted half round to bring the flat side of the spring upward, and its opposite end is provided with a semicircular guide 38, which is pivotally secured thereto by a bolt 39, the said guide supporting the arm, so that the arm may slide therein. The spring 35 exerts an upward pushing pressure against the arm that would raise its wheel much above the normal running position against the trolley-wire. Consequently when the auxiliary wheel is in contact with the wire the spring and arm are under tension that acts to hold the auxiliary wheel up against the wire through the upward resilient pressure of the horizontal portion of the spring, while at the same time the vertical portion of this spring holds the auxiliary wheel and its arm in alinement with the pole and tends to return it to its normal position of alinement when it is moved laterally to either side of the trolley-pole when rounding curves. This spring consequently exerts a double or compound resilient tension on the auxiliary wheel when rounding curves in which the tensions are at right angles to each other.

In Fig. 2 I have illustrated a modification in the manner of securing the harp upon the trolley-pole so as to turn thereon, but to be held normally in line with the trolley-wire. Around the end of the harp 3 is secured a clip 3^A, having ears between which one end of a blade-spring 3^B is secured by means of a bolt 3^C. The opposite end of this spring is secured by a bolt 1^A between the ears of a clip 1^B, which is secured upon the trolley-pole 1. By this construction the spring being on the outside is easily secured, and its edge is in line with the trolley-wire instead of the flat side, as in the case of the springs 8 and 26 of Fig. 1.

In Fig. 4 I illustrate a modification of the support of the auxiliary trolley-wheel. In this modification the long tubular arm 13 is dispensed with and a spring-arm 35^A is employed, the lower end of which is secured to a clip 36^A, a portion of this end extending beyond the clip, so as to bear upon the under side of the pole. The spring is given a half-turn similar to the spring 35, and upon its free end is secured a piece of tubing 40, one end of which is flattened and split to extend on opposite sides of the adjacent end of the spring, to which it is secured by rivets, as shown in Fig. 4. This short piece of tubing is then connected to the adjacent end of the harp like the end of the tubular arm, and the spring 26 in the harp and the end of the tubular arm is replaced by a spring-blade 41, one end of which is secured between the end of the spring 35^A and the sides of the short piece of tube by the rivets that secure the tube and spring together, while the opposite end of this spring is secured to the block and harp the same as in Fig. 1.

In Fig. 5 I illustrate a modification of the manner of securing the spring 35^A to the pole. In this modification I extend a bolt 42 through the pole and place a washer 43 on it at the under side of the pole and then pivotally bolt

the end of the spring against the pole. The object of this arrangement is to give the arm free lateral swing independent of any lateral resilient tension of the spring, which is free to move with it.

In Fig. 6 I illustrate a modification of the method employed to hold the auxiliary spring under vertical tension. In this modification the flat-blade spring 35 is dispensed with and in its place a coiled spring 44 is used, which is attached to the pole and arm below the harp to two rings or collars 45, which are loosely mounted on the pole and arm to oscillate or swing freely thereon. These rings or collars may be loosely secured to the pole and arm by eyes 45^{A} or by any other suitable means.

The operation of my improved multiple-contact trolley is as follows: The springs which are commonly used at the base of all trolley-poles exert an upward constant resilient tension on the pole which holds it in resilient contact with the trolley-wire, while the flat spring within the harp and pole enables the main wheel to turn from the vertical into oblique planes to accommodate itself to the angles it encounters when entering switches and curves. The auxiliary wheel follows the main wheel; but its connection with the pole is such that it is practically independent of the main wheel in its movements. It has the same spring-controlled oscillating twisting movement on its arm that the main wheel has on the pole, and consequently can turn obliquely on its arm to accommodate itself to the angles of curves and switches independent of the main wheel, and at the same time it is under a constant independent vertical resilient tension and is free to accommodate itself to lateral movements independent of the main wheel and pole, while at the same time being under a lateral resilient tension that tends to return and hold it in alinement with the main wheel and trolley-pole.

A multiple-contact trolley such as is herein described eliminates the jar to the motors and their gears caused by the momentary make and break of the motor-circuit when the trolley-wheel passes under the trolley-line section insulators, switches, cross-overs, and hangers and the two wheels afford double the amount of contact, thereby more effectively transmitting the current to the car-motors and preventing the arc between wheel and wire and the consequent heating and burning. The main wheel tends to clear the wire of sleet or ice, and thus give the auxiliary wheel a perfect contact.

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

1. In a trolley, a trolley-pole provided with an arm, connected to said pole, a trolley-wheel mounted on said pole, a trolley-wheel mounted on said arm, and means connected between said trolley-wheels and said pole and arm whereby said trolley-wheels turn at right angles to their vertical rotative plane independent of said pole and arms and of each other, and means for permitting said arm to have an oscillating movement, independent of the pole.

2. In a multiple-contact trolley, the trolley-pole, the trolley-wheel rotatably mounted thereon, to oscillate under resilient tension, the arm pivoted to said pole to move vertically and horizontally, the auxiliary trolley-wheel pivotally mounted on said arm to oscillate under resilient tension, and a spring secured at one end to said pole, and adapted to support said arm at its opposite end, and arranged and adapted to constantly hold said auxiliary wheel and arm under vertical resilient tension.

3. In a multiple-contact trolley, the combination, with a trolley-pole having a main trolley-wheel, an arm pivotally secured to said pole to move vertically and horizontally, means connected to said pole for defining the lateral and downward movement of said arm and a spring connected to said pole and arm arranged and adapted to hold said arm in alinement with said pole and to permit lateral resilient movement of said arm independent of said pole, substantially as described.

4. In a multiple trolley, the combination with the trolley-pole and the main trolley-wheel, of the arm pivotally secured to said pole to move in vertical and horizontal directions, an auxiliary contact-trolley wheel rotatably mounted on said arm in the rear of said main trolley-wheel, means including a compound spring for normally holding said auxiliary wheel in alinement with said main trolley-wheel, and for exerting a constant vertical tension on said arm and means including a spring for providing a resilient, oscillating, transverse movement to said auxiliary trolley-wheel independent of its arm and of said main trolley wheel and pole, substantially as described.

5. In a multiple-contact trolley, the combination with the trolley-pole and the main trolley-wheel, of a tubular arm pivotally connected to said pole to swing in vertical and horizontal directions, an auxiliary trolley-wheel rotatably mounted on said arm to stand in the rear of said main wheel, and a blade-spring provided with resilient portions adapted to exert resilient tension in horizontal and in vertical directions secured at one end to said pole and forming at its opposite end a support for said arm and arranged to exert a constant vertical resilient tension on said arm and auxiliary trolley-wheel and to resiliently confine said auxiliary trolley-wheel in operative following contact alinement with said main trolley wheel and pole, substantially as described.

6. In a multiple trolley, the combination with the pole and the main trolley-wheel, of

the sleeve secured to said pole, a hinge pivoted to said sleeve at one end to swing vertically and the arm secured to the opposite end of said hinge, substantially as described.

7. In a multiple trolley, the combination with the pole and main wheel of the arm pivotally secured to said pole to swing vertically and laterally, the link secured to said pole and surrounding said arm, the pull-rope, the auxiliary trolley-wheel secured to said arm and the double spring arranged to exert constant resilient tension, vertically on said arm, in a vertical direction and to hold resilient said arm in alinement with said pole, substantially as described.

8. In a multiple trolley, the combination with the trolley-pole and main trolley-wheel, of an arm pivotally secured to said pole, an auxiliary contact-wheel, mounted in bearings, rotatable upon said pole, a spring for normally holding said auxiliary wheel in alinement with said main wheel and for exerting a constant upward pressure on said arm; said spring being connected to the trolley-pole at one end, and having a guide pivoted upon its free end, in which said arm lies; and a link depending from said pole and surrounding said arm and spring, so as to limit their downward movement, substantially as described.

9. In a multiple trolley, a pole having a harp mounted upon its extremity so as to turn thereon, a spring connecting said pole and harp, and exerting a tension upon said harp in the direction of its axial movement, and a main trolley-wheel carried by said harp; a trolley-arm carried by the pole, having a vertical and horizontal movement independent of the pole, a harp upon the end of said arm, a spring which exerts a tension upon said harp in the direction of its axial movement, an auxiliary trolley-wheel carried by said harp and a link depending from said pole which limits the downward movement of said arm, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

LEWIS M. McBRIDE.

Witnesses:
G. SARGENT ELLIOTT,
BESSIE THOMPSON.