(No Model.) 2 Sheets—Sheet 1.

F. J. SPRAGUE & P. F. O'SHAUGHNESSY.

ELECTRIC RAILWAY.

No. 414,172. Patented Oct. 29, 1889.

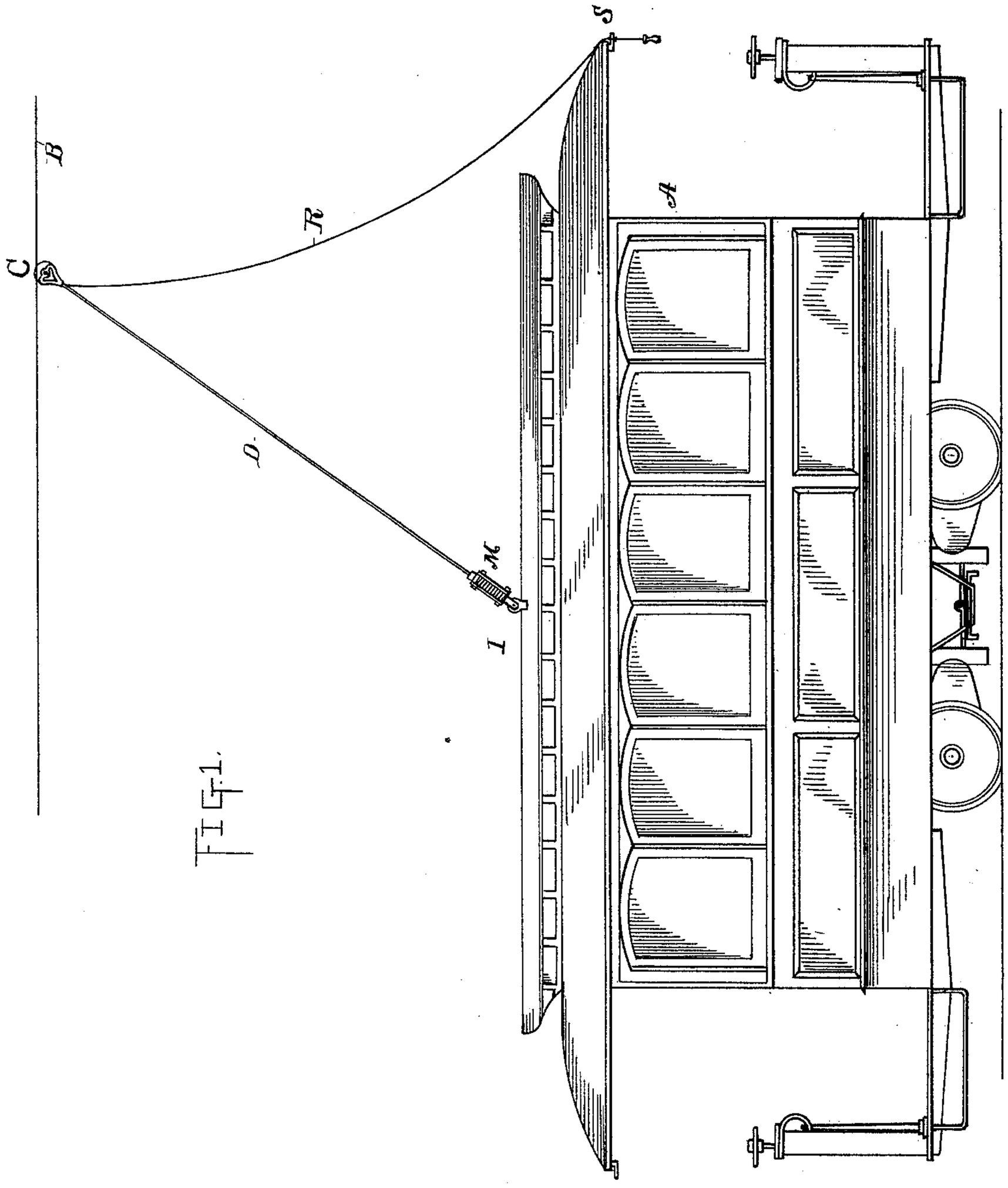

FIG. 1.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 2.

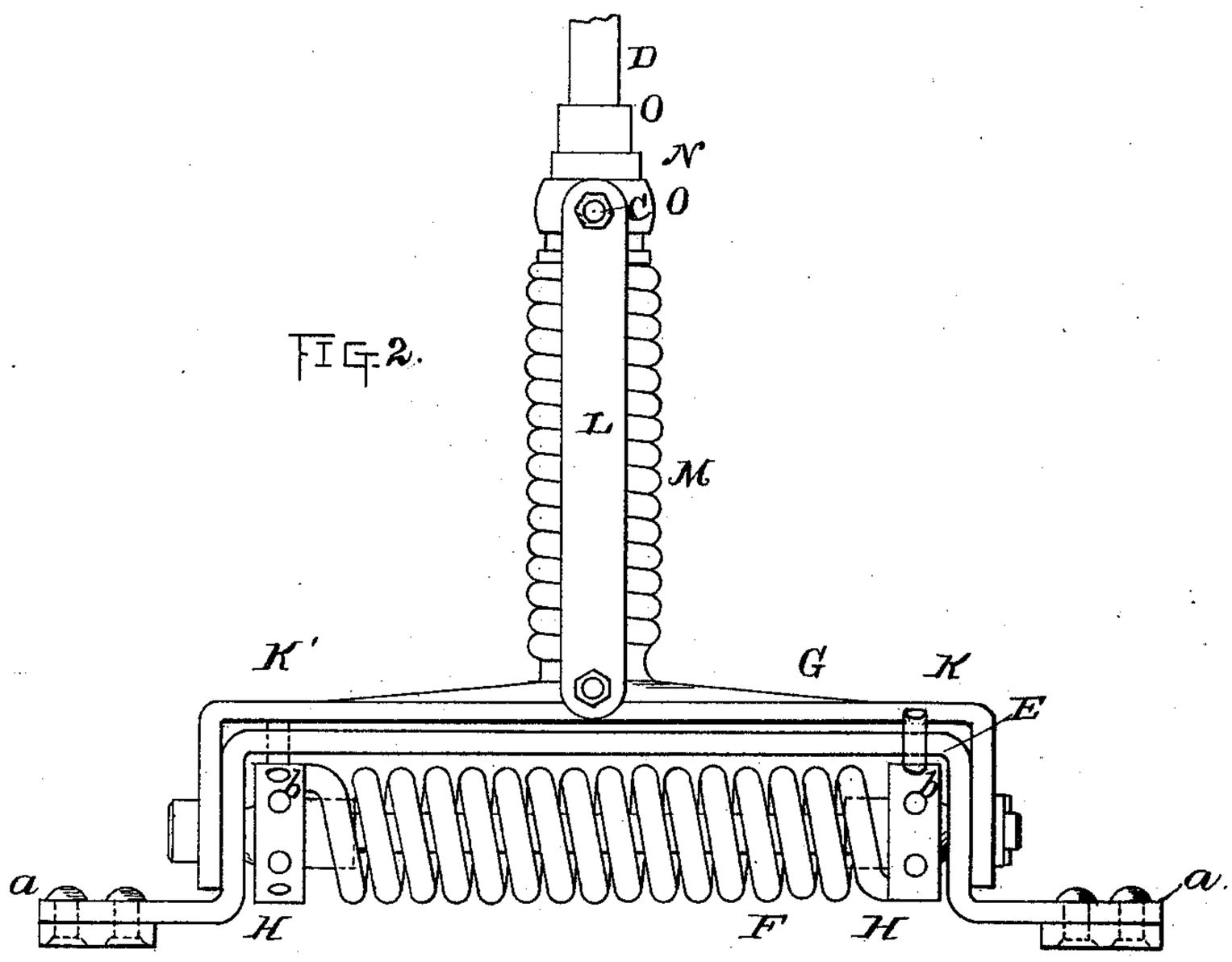
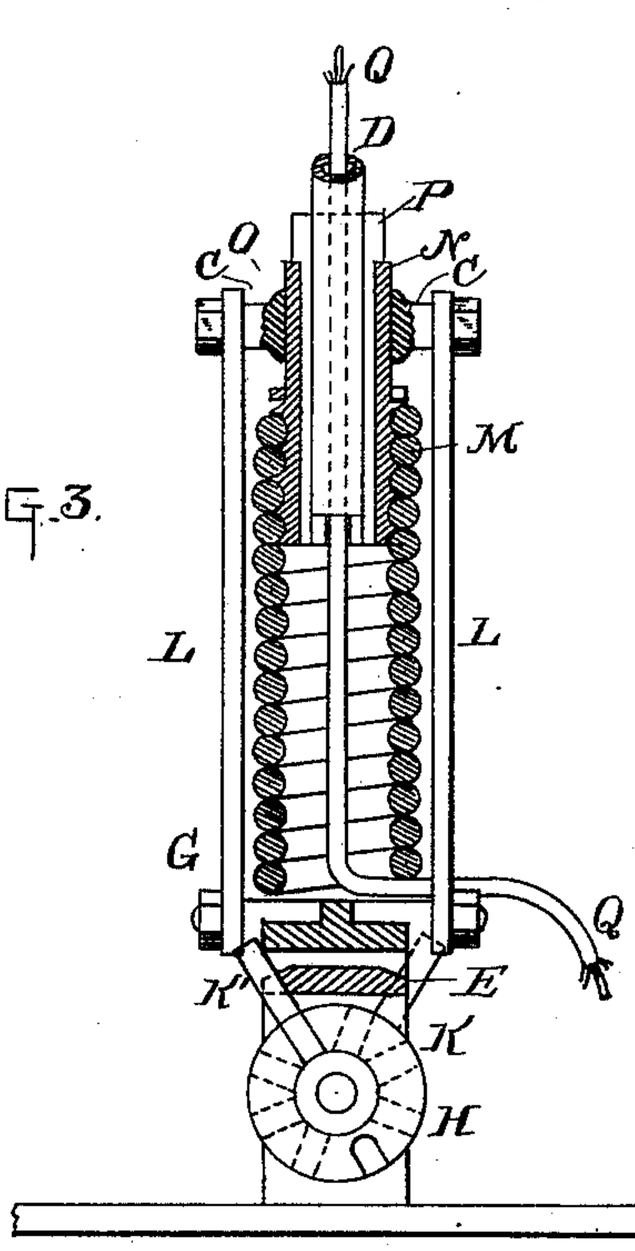


FIG. 3.



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UNITED STATES PATENT OFFICE.

FRANK J. SPRAGUE AND PATRICK F. O'SHAUGHNESSY, OF NEW YORK, N. Y., ASSIGNORS TO THE SPRAGUE ELECTRIC RAILWAY AND MOTOR COMPANY, OF SAME PLACE.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 414,172, dated October 29, 1889.

Original application filed January 22, 1889, Serial No. 297,216. Divided and this application filed September 7, 1889. Serial No. 323,271. (No model.)

To all whom it may concern:

Be it known that we, FRANK J. SPRAGUE and PATRICK F. O'SHAUGHNESSY, both citizens of the United States, and both residing at the city of New York, in the county and State of New York, have jointly invented a certain new and useful Improvement in Electric Railways, of which the following is a specification.

Our invention relates to that class of electric railways in which an overhead line is employed, and a contact device, usually a grooved wheel or trolley, makes an underneath contact with said line, such trolley being carried by the car and taking current from the line to propel the car.

More especially our invention relates to an improved support for the trolley by which it is carried on the roof of the car.

Heretofore in the use of devices for this purpose it has been found best in many cases to support the pole which carries the trolley on a vertically-placed spiral spring rising from the roof of the car, whereby the trolley is held firmly against the wire, but is at the same time flexibly supported, so that longitudinal and transverse movement is permitted, whereby the trolley adapts itself to changes in the elevation and direction of the line relative to the car, and whereby the inclination of the pole may be reversed when the direction of movement of the car is reversed. It is often necessary, however, in practice to draw the trolley-pole down close to the roof of the car in order to pass under bridges or other obstructions, and also when the car or the trolley is not in use, and it is found that this excessive bending of the vertical spiral may cause the spring to lose its tension, it being necessary to employ a heavy spring in order to get the required pressure of the trolley upon the wire.

It is our especial object in this invention to provide a trolley-support which shall have all the advantages of the arrangement just described, but in which there shall be no danger of the spring losing its tension by any amount of bending to which it can be subjected. In carrying out this object we employ a spiral spring coiled on a horizontal axis transverse of the car, and we pivot the trolley-pole and connect it with the spring in such manner that the pressure of the spring is exerted to maintain the trolley against the wire in any position and at any angle at which the trolley-pole is placed when in use, and when the strain is put upon the spring by lowering the trolley-pole it will be seen that the pressure being equally distributed among the convolutions of the horizontal spring there is no such strain on any part of the spring as there would be with a vertical spring, and therefore the loss of tension in the spring due to excessive bending is obviated.

In order to permit the lateral movement of the trolley, we provide, in addition to the horizontal spring, a vertical spiral spring interpolated in the trolley-support. Since the lateral movement required is never very great, the vertical spring is very effective for this purpose.

Our invention is illustrated in the accompanying drawings.

Figure 1 is a side elevation of a railway-car having a trolley-support embodying our invention; Fig. 2, a front view of the lower portion of the trolley-support, and Fig. 3 a side view and partial vertical section of the same.

A is an electric-railway car, which, as will be understood, is provided with an electric motor for propelling it, the current for the motors being conveyed by the overhead wire B, and taken from said wire to the car by a grooved wheel or trolley C, making an underneath contact with said wire and carried by a pole D. Upon the roof of the car is placed a standard E, extending crosswise of the roof and having at its ends feet *a*, by which it is

bolted or otherwise secured to the roof. Extending across the standard E, and resting in turning sleeves E′ at the ends of the standard, is a spindle F, which carries outside the standard a bar G, having downwardly-extending ends turning on the spindle F. Upon each of the sleeves E′, within the standard E, is a flange or collar H, containing a series of holes *b*, and upon the spindle is coiled a heavy spiral spring I, whose ends are secured to the collars H. In one of the holes *b* of each of the collars H is inserted a projecting pin K or K′, the pin K projecting in front of the bar G and the pin K′ projecting behind said bar. Above the bar G, on each side thereof, there extend two vertical pivoted links L L, and between the links L L is placed a vertical coiled spiral spring M. Inserted in the spring M and carried thereby is a metal sleeve N, on which is a collar O, from which extend trunnions *c*, turning in the links L L. Within the sleeve N is an insulated sleeve P, in which is inserted the hollow pole D. An insulated wire Q extends from the trolley through the hollow pole, for conveying current to the motor. It will be seen that the pins K and K′ form ends for the horizontal spring I, extending up on either side of stationary bar E and the pivoted bar G, which carries the trolley-pole, whereby, when such pole is inclined to an angle in either direction, the pressure of said spring I is exerted against said bar and tends to return the pole to a vertical position, and so holds the trolley in firm contact with the overhead wire. The trolley-pole may thus be maintained in the inclined position illustrated in Fig. 1, or in a reverse position, or at any required angle on either side of the vertical position. A line R is attached to the top of the trolley-pole and terminates in a handle S at the end of the car, and by means of this line the person in charge of the car can draw the trolley-pole down when necessary. It will be seen that, if desired, the trolley-pole may be drawn down close to the roof of the car, and since the horizontal spring is used, the strain on such spring under such extreme bending is not detrimental to said spring. The spring I also permits the trolley to conform to changes in the elevation of the overhead line relative to the car, while the spring M permits a sufficient transverse movement of the pole to allow it to adapt itself to variations in the relative lateral position of the car and the overhead line. The links L L form a stop which limits this lateral inclination, so that the pole cannot incline so far that the trolley will leave the line, and also form a frame or stop which prevents the spring M from flexing or yielding in the direction of length of the car.

When the direction of movement of the car is to be reversed, the operator draws down the trolley and swings it over to the reverse inclination and allows it to rise against the wire again. If the trolley accidentally becomes displaced and leaves the line, the trolley-pole will assume a vertical position, and the operator may then by means of the line R draw it down past the line and guide it to the line again.

By changing the position of the pins K and K′ in the holes *b* the tension of the spring I may be varied and adjusted.

We do not claim herein the use of the horizontal spring *per se*, as that forms the subject-matter of a separate application, Serial No. 297,216, filed January 22, 1889, of which this application is a division.

What we claim is—

1. The combination, with an electric-railway car, of a contact device carried thereby, a support for said contact device, and two springs forming parts of said support, one permitting longitudinal inclination and the other transverse inclination of said support, and a stop for said last-named spring, preventing the yielding thereof longitudinally of the car, substantially as set forth.

2. The combination, with an electric-railway car and a contact device carried thereby, of a horizontally-placed spiral spring and a vertically-placed spiral spring supporting said contact device, substantially as set forth.

3. The combination, with an electric-railway car, of a contact device, a pole carrying said contact device, a vertically-placed spiral spring carrying said pole, a pivoted support for said spiral spring, and a horizontally-placed spiral spring exerting a pressure upon said pivoted support, substantially as set forth.

4. The combination, with an electric-railway car, of a contact device, a pole carrying said contact device, a vertically-placed spiral spring supporting said pole, and a stop limiting the movement of said spring, substantially as set forth.

5. The combination, with an electric-railway car and a contact device, of a pole carrying said contact device, pivoted links supporting said pole, and a vertically-placed spiral spring connected with said pole and said links, substantially as set forth.

6. The combination, with an electric-railway car and a contact device, of a pole carrying said contact device, a vertical spiral spring carrying said pole, a horizontal bar supporting said spring, and a horizontally-placed spiral spring exerting a pressure on said bar, substantially as set forth.

7. The combination, with an electric-railway car, of a transverse horizontal spindle, a spiral spring coiled thereon, a pivoted transverse bar, turning sleeves on said spindle carrying said bar, with which sleeves said spring is connected, a pole carried by

said bar, and a contact device carried by said pole, substantially as set forth.

8. The combination, with an electric-railway car, of a transverse horizontal spindle, a spiral spring coiled thereon, a pivoted transverse bar, adjustable turning sleeves on said spindle carrying said bar, with which sleeves said spring is connected, a pole carried by said bar, and a contact device carried by said pole, substantially as set forth.

This specification signed and witnessed by the said FRANK J. SPRAGUE at Paris, France, the 26th day of July, 1889, and by the said PATRICK F. O'SHAUGHNESSY at New York city, N. Y., the 27th day of August, 1889.

FRANK J. SPRAGUE.
PATRICK F. O'SHAUGHNESSY.

Witnesses to signature of Frank J. Sprague:
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DAVID T. S. FULLER.

Witnesses to signature of Patrick F. O'Shaughnessy:
D. H. DRISCOLL,
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