(No Model.) 2 Sheets—Sheet 1.

C. A. LIEB.

TROLLEY FOR ELECTRIC RAILWAYS.

No. 440,814. Patented Nov. 18, 1890.

Fig. 1.

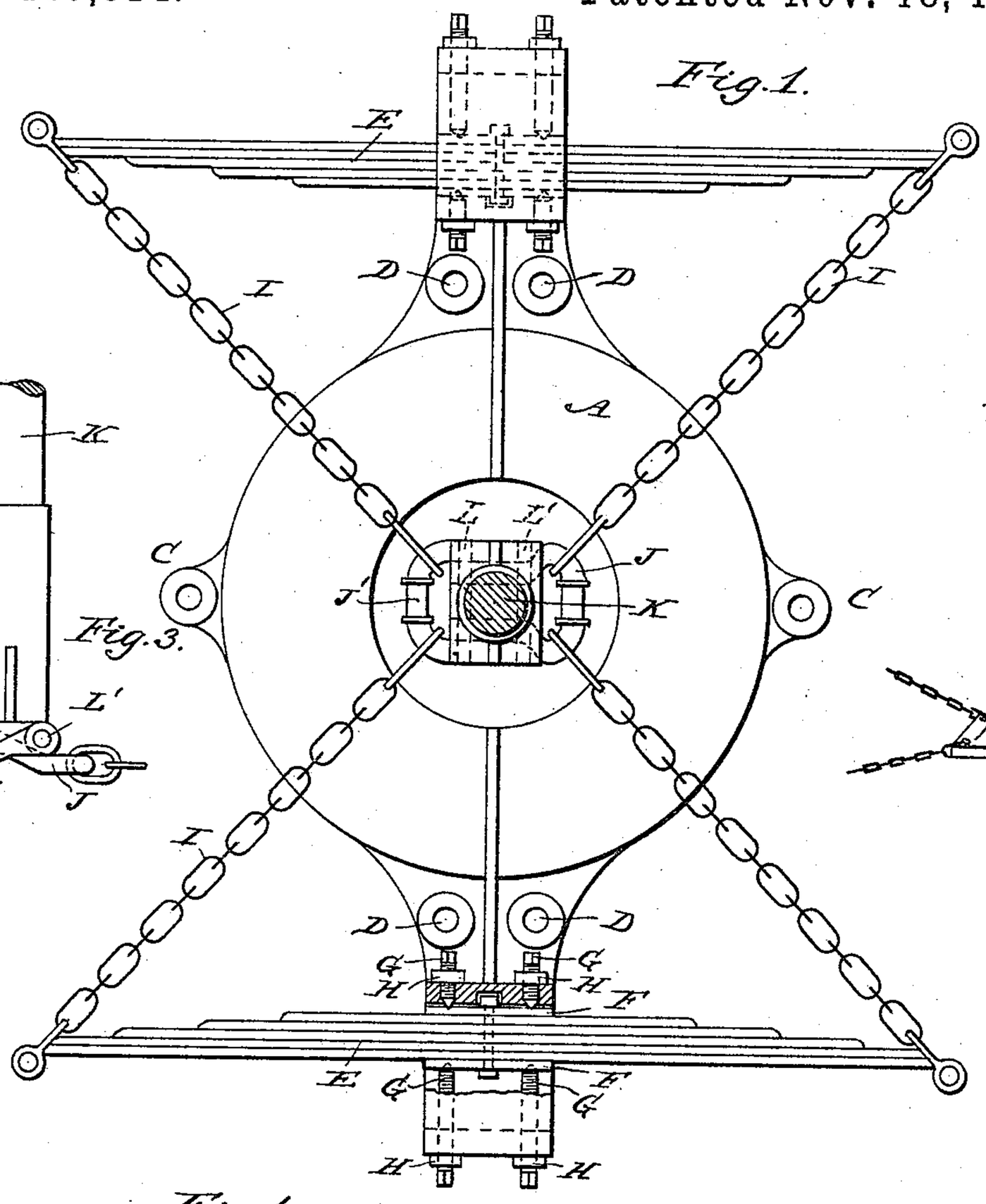


Fig. 7.

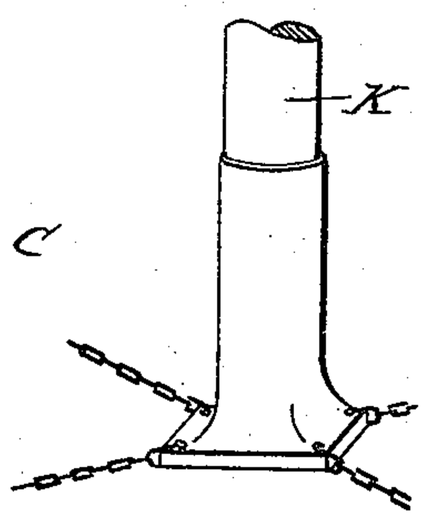


Fig. 3.

Fig. 4.

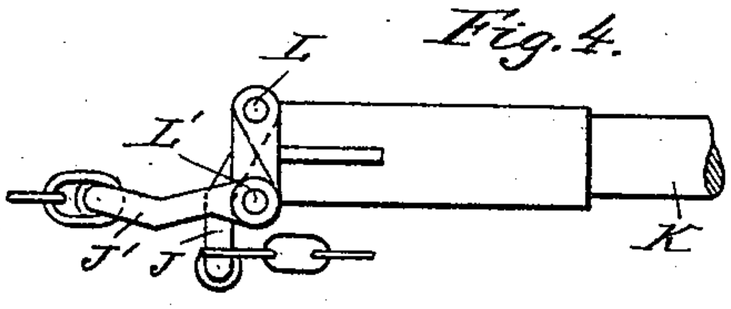
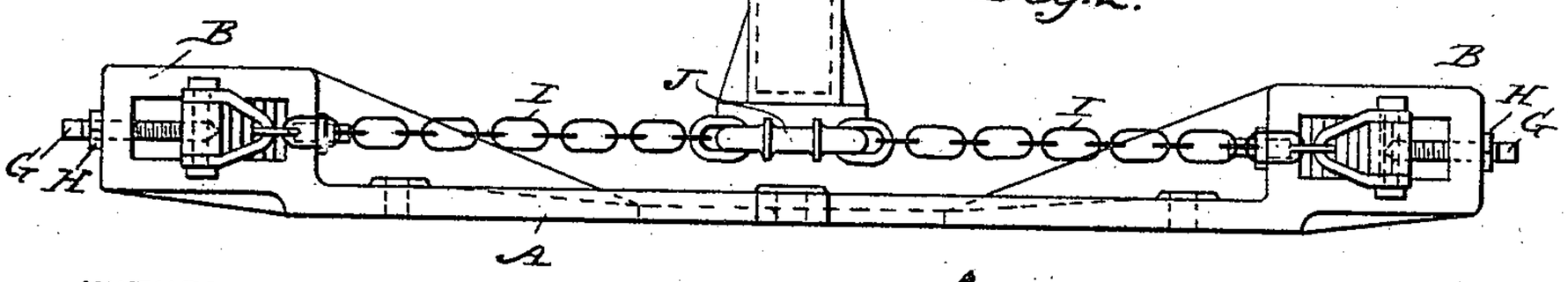


Fig. 2.



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his ATTORNEY

(No Model.) 2 Sheets—Sheet 2.

C. A. LIEB.

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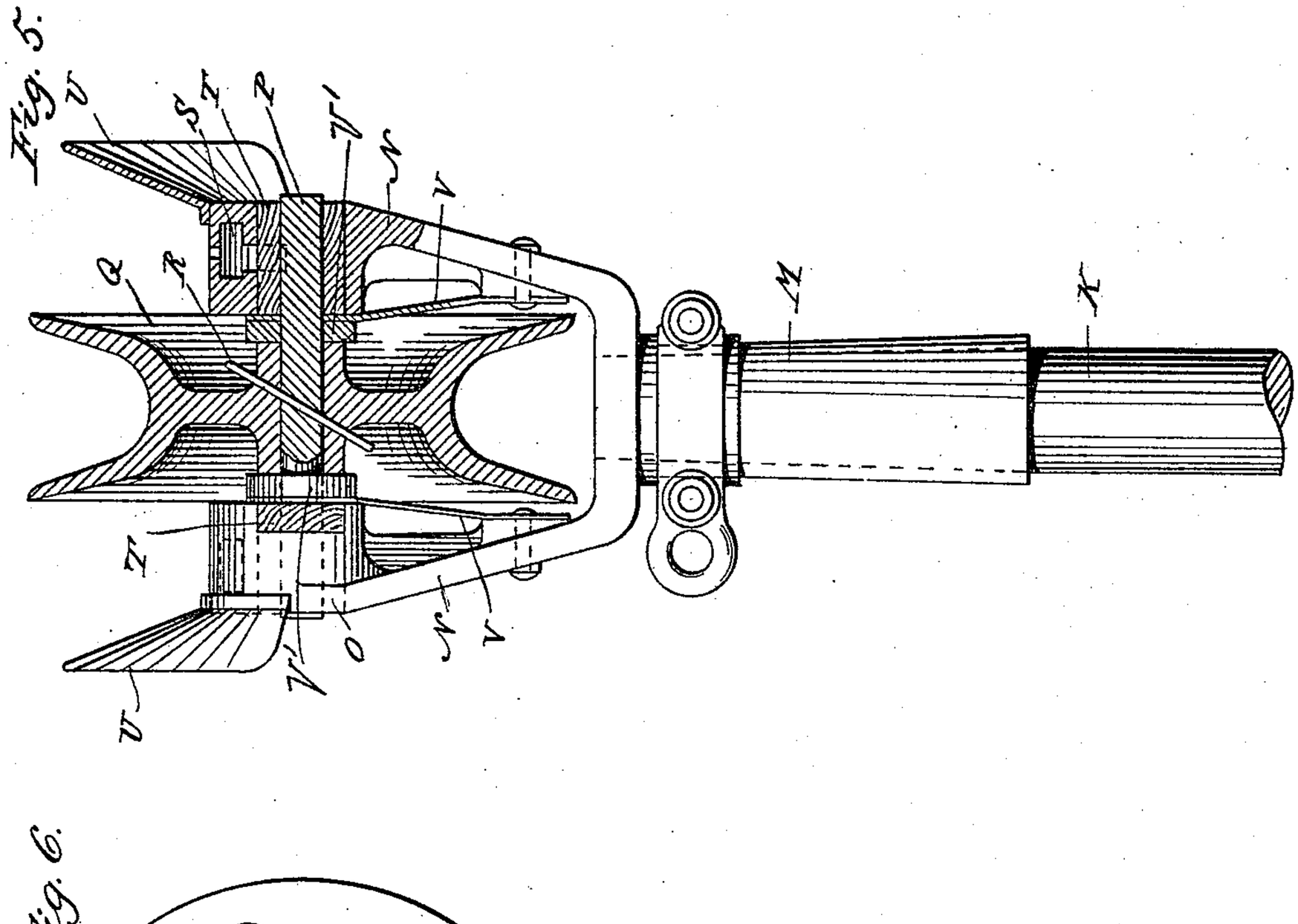
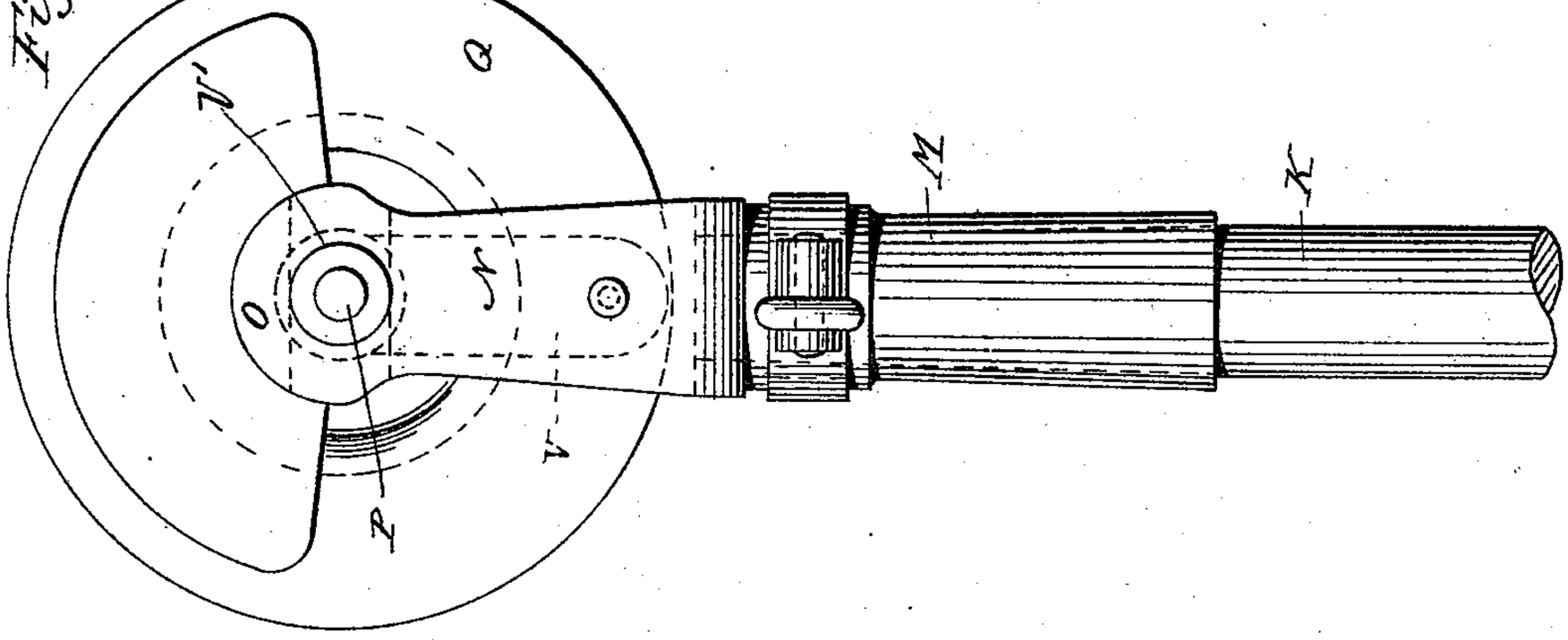


Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES A. LIEB, OF NEW YORK, N. Y.

TROLLEY FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 440,814, dated November 18, 1890.

Application filed June 13, 1890. Serial No. 355,374. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. LIEB, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Trolleys for Electric Railways, of which the following is a specification.

My invention relates to improvements in trolley-poles for electric railways, and it has special relation to the means for supporting the pole, and also to improvements in the trolley-wheels.

In the drawings the same reference-letters indicate the same parts in all the figures, and in them I show the devices separate from the car.

Figure 1 illustrates a plan of the pole-supporting devices. Fig. 2 illustrates a side elevation of the parts shown in Fig. 1. Fig. 3 illustrates an elevation of the frames upon which the pole rests, the pole being upright. Fig. 4 illustrates a view of the parts shown in Fig. 3, the pole being bent over. Fig. 5 illustrates a front view of the trolley-wheel, partly in section. Fig. 6 illustrates a side elevation of the parts shown in Fig. 5. Fig. 7 illustrates an elevation of a modified form of the base or support for the pole.

A is a base made of metal or other suitable material. At its ends are two raised frames B B, and at its sides I prefer to form two lugs C C, through which bolts may pass to attach the base to the top of the car. Other bolts may pass through holes D D, &c., made in the frame.

E E are leaf-springs, which are clamped between plates F F by means of set-screws G G, preferably provided with set-nuts H, so that the position of the springs may be adjusted in the frames B. The springs may consist of a single leaf or plate, or of a number of them, as shown. I prefer to employ the well-known wagon-springs for this purpose.

J are chains or equivalent supporting devices, which extend from the extremities of the springs to the support for the pole K. It consists of two frames J and J′, each having the general form of a horseshoe. The extremities of one of them, however, pass within the extremities of the other, (see Figs. 1, 3, and 4,) and at their ends each of these parts are pivoted to the base of the pole K by cross-bolts L and L′. Thus the pole may be bent over in either direction, the action of the parts being such as shown in Fig. 4—that is to say, when the pole is bent over to the right, as shown in Fig. 4, it pivots on the bolt L′, and tension is applied to the springs through the chains or their equivalents, which are pulled upon and drawn inwardly by reason of the tipping of the pole. If, on the other hand, the pole be bent to the left, it will pivot upon the pin L in the same manner. I prefer to support the pole upon the devices which I have just described, because thereby I secure a practically uniform pressure of the trolley-wheel upon the wire irrespective of the degree of inclination of the pole. It may, however, be supported upon a base such as shown in Fig. 7, which is substantially square on its bottom, and to the corners of which the chains are attached. In this form of base, however, as before stated, I do not secure the same uniformity of tension that I do in the other form.

It will be observed that there is no support directly under my trolley-pole, it being suspended by the horizontal chains; also, that it may be bent over in all directions with the same freedom that it can in any direction, and that it is supported at all times by the resiliency of the springs and by them only. This feature, in conjunction with my improved trolley-wheel, (which I am now about to describe,) in which the weight of the apparatus is greatly reduced, enables me to obviate almost entirely the jumping of the wheel away from the wire, because, first, the trolley-pole not being supported in a vertical line from the car, but being suspended upon the springs, is not influenced by the movements of the car, except as they are transmitted to it through the springs and the chains or their equivalents, and also my trolley-wheel being very light there is not any considerable force exerted by it upon the wire, to which is largely attributed its tendency to leave the wire.

My improved trolley-wheel is constructed as follows: Reference being had to Figs. 5

and 6, K is the trolley-pole. M is a socket, upon the upper part of which the bifurcated frame N is placed, which supports the journals O for the trolley-wheel, which is keyed in any suitable manner to a shaft P. I show the key in the form of the pin R, which passes through the hub of the wheel and through the shaft P. S is an ordinary automatic oiler. T is a bushing for the shaft, preferably made of lignum-vitæ. I prefer to use the lignum-vitæ, because its weight is less than metal and it is sufficiently durable. U U are flanges placed upon the upper arc of the frame M, which catches the wire should it escape from the wheel. V are metal conducting-springs for carrying the current. They are by their resiliency pressed against brass or equivalent washers V′, which are fastened to the ends of the aluminium hub of the wheel. The washers are interposed because the aluminium does not afford a very good bearing-surface for the springs. In order that the weight of the trolley-wheel may be reduced, I make it, and preferably also the frame, of aluminium. This metal, being exceedingly light and yet sufficiently strong and a sufficiently good conductor of electricity, is peculiarly adapted for this special use, and, in conjunction with my peculiar method of supporting the trolley-pole, enables me to make an apparatus for the purposes stated which is superior in many respects to any heretofore made. The flanges U U, I also prefer to make of the same metal, although they may be made of wood or other light material.

From the use of the aluminium trolley-wheel, especially if combined with an aluminium wheel-frame, several very important advantages result, owing, as I believe, to the reasons which I will assign for them.

First. I have ascertained that the weight of the trolley-wheel and its frame as heretofore used has largely occasioned the leaving of the wire by the trolley, because the movements of the car or of the trolley-wire, being transmitted to the trolley, gave it an impulse in one direction or the other, as the case may be, which the springs at the base of the pole cannot at once overcome. Hence the trolley-wheel leaves the wire, and when it is again elevated by the springs it frequently does not meet the wire; but by the use of the relatively light aluminium wheel the pole more nearly approaches the condition of a fish-pole or whip, the upper end whereof being light is always under better control by the springs at its base. Hence the wheel remains on the wire irrespective of the movement of the car or the wire itself.

Second. The use of the ordinary trolley-wheels as heretofore made is accompanied by a very objectionable humming noise on the line, caused by the almost incessant tapping of the wire by the wheel, occasioned by uneven wearing of the wire and also of the trolley-wheel, also by the vibration or trembling of the car caused, for example, by sand, gravel, or other material on the track. The use of the aluminium wheel almost entirely does away with this, because the wheel, being more fully under the influence and control of the springs at the base of the pole, runs along the wire with much greater smoothness and less jar than when heavier wheels are used. Hence the wire is relieved of much of the tapping; also, aluminium being a soft metal as compared to the metals heretofore used, and being softer than the line-wires, even when shocks or taps do occur they do not cause the wire to resound as a tap of the same force from a harder metal would.

Third. "Sparking" is very much less with the aluminium wheel than when other kinds are used, because, as above stated, the wheel is in more constant contact with the wire, and also because of the peculiar property possessed by aluminium, whereby it readily radiates heat; also, because of a peculiar electrical affinity between an aluminium trolley-wheel and the line-wire, somewhat similar to induction, whereby the current is copiously transmitted from one to the other through even a small contact-surface without either heating or sparking.

Fourth. Aluminium does not rust. Therefore all danger of iron-rust dripping upon the roof of the car or upon the passengers during rain-storms is avoided. Regarding the use of the lignum-vitæ journal, I have discovered after considerable experimentation than aluminium does not make a good journal with such lubricants as are now generally used, and I have also discovered that the heat of the sun and the heat imparted at times by the current causes the oil in an automatic oiler to become quite fluid, and it then is apt to escape and fall upon the car and upon the passengers, and also, being quite fluid, it frequently is exhausted before again replenished and the trolley-wheel runs dry and squeaks. By my improvement the oil is not fed directly upon the shaft, but upon the lignum-vitæ bearings, and they become saturated with it, and thus lubricate the shaft, and even if the weather be cold the moment the shaft becomes a little dry heat is generated and the desired saturation of the wood is again immediately restored.

It is obvious that alterations may be made in the details of construction of my apparatus and still its essential features be present.

I claim—

1. The combination, in trolley mechanism, of a trolley-pole vertically supported by springs placed on opposite sides of the base of the pole and in substantially the same horizontal plane therewith, and connections between the springs and the pole, whereby it is yieldingly supported against pressure from all directions, substantially as set forth.

2. The combination of a trolley-pole, a plurality of springs placed on opposite sides of the base of the pole, a frame for the sup-

port of the pole, composed of two parts pivoted to the base thereof on its opposite sides, and connections between the springs and the two parts of the support for the pole, substantially as set forth.

3. The combination of a trolley-pole vertically supported by springs placed on opposite sides of its base, a centrally-located support for the pole, connections between the ends of the springs and the support for the pole, and adjusting-screws whereby the tension of the springs may be regulated, substantially as set forth.

4. The combination of a trolley-pole maintained in vertical position by the tension of springs and having a trolley-wheel and wheel-frame made, essentially, of aluminium, substantially as set forth.

5. The combination of a trolley-pole vertically supported by springs placed in substantially the same horizontal plane as the base of the pole and attached thereto, whereby all the springs are flexed toward the pole upon deflection thereof from its vertical position in any direction, substantially as set forth.

6. A frame for the support of a trolley-wheel, having fixed flanges on its lateral extremities in line with the shaft of the wheel, adapted to catch the wire should it escape from the wheel, and a socket adapted to fit over the end of the trolley-pole, substantially as set forth.

7. A trolley wheel and frame made of aluminium, substantially as set forth.

8. A trolley-pole vertically supported by spring-tension applied to the pole in substantially horizontal lines, so that the spring-tension is increased by deflecting the pole in any direction, substantially as set forth.

9. A trolley-pole supported upon two frames pivoted at opposite sides of the pole, connections between each of the frames, and springs placed on opposite sides of the pole, so that when the pole is inclined one of the frames acts as a resistance and the other as a lever for the righting of the pole, and vice versa, substantially as set forth.

10. A vertically-guiding support for the trolley-pole, comprising, essentially, horizontally-disposed chains or devices connecting at one end with the centrally-disposed support for the pole and at their other ends with springs, substantially as set forth.

11. A support for a trolley-pole, comprising, essentially, plate-springs adapted to adjustment toward and from each other, and a base for the pole, located between the springs, and horizontal connections between the ends of the springs and the base for the pole, substantially as set forth.

12. A trolley-wheel composed, essentially, of aluminium, substantially as set forth.

13. A trolley-wheel the surface whereof which comes in contact with the trolley-wire is of conducting material softer than the wire, substantially as set forth.

14. In a trolley, the combination of a trolley-wheel fast upon its shaft, wooden bushings for the journals of the shaft, and a chamber for lubricant connecting with the wooden bushings, substantially as set forth.

15. In a trolley, the combination of a trolley-wheel composed, essentially, of aluminium, having washers of other conducting material upon the ends of its hub, and spring-contacts which bear upon the washers, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 11th day of June, A. D. 1890.

CHARLES A. LIEB.

Witnesses:
FREDERICK SMITH,
PHILLIPS ABBOTT.