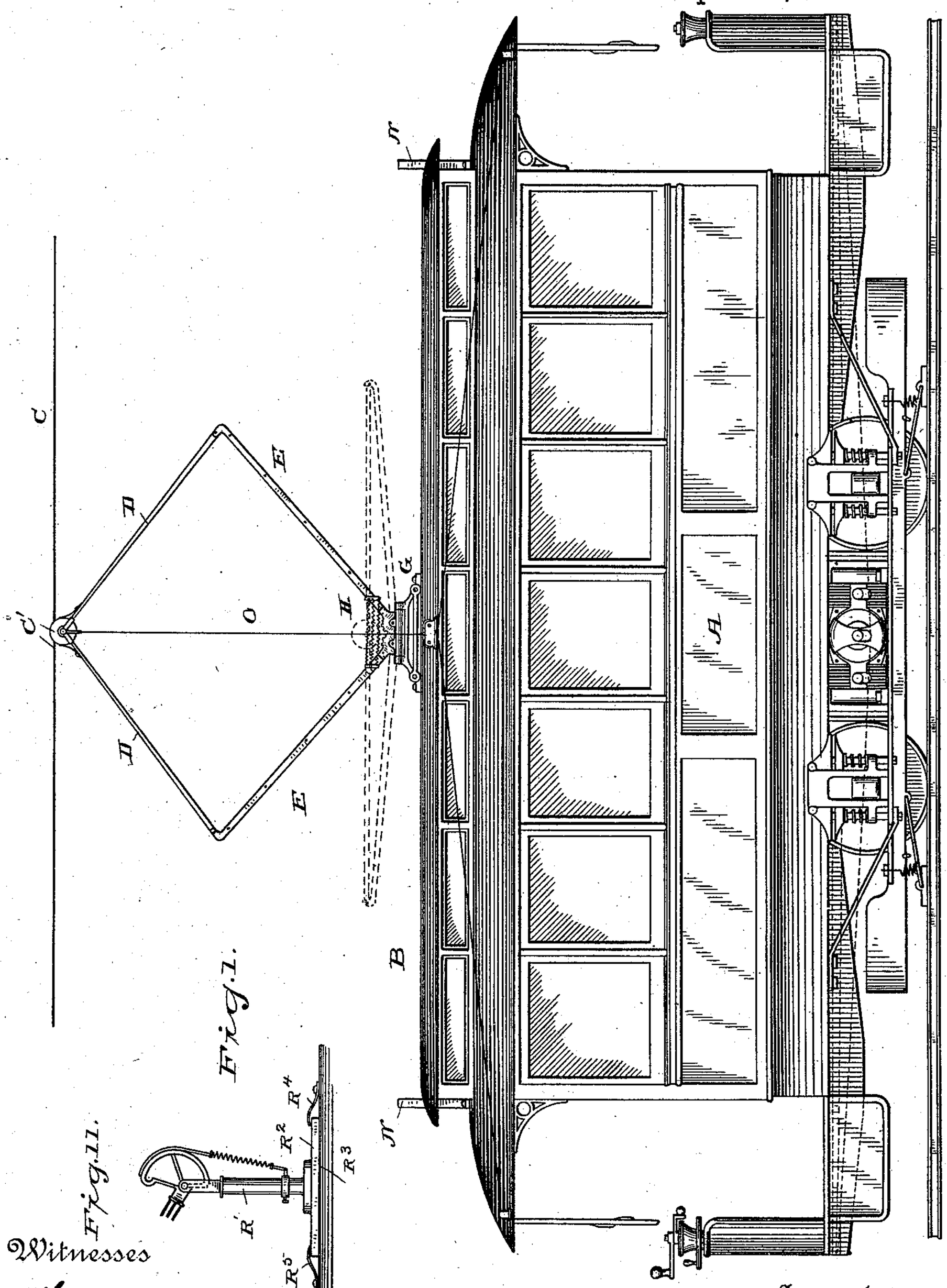
(No Model.) 3 Sheets—Sheet 1.

C. J. VAN DEPOELE.

UNIVERSAL UPWARD PRESSURE CONTACT ARM.

No. 402,117. Patented Apr. 23, 1889.



Witnesses

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(No Model.) 3 Sheets—Sheet 2.

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UNIVERSAL UPWARD PRESSURE CONTACT ARM.

No. 402,117. Patented Apr. 23, 1889.

Fig. 2.

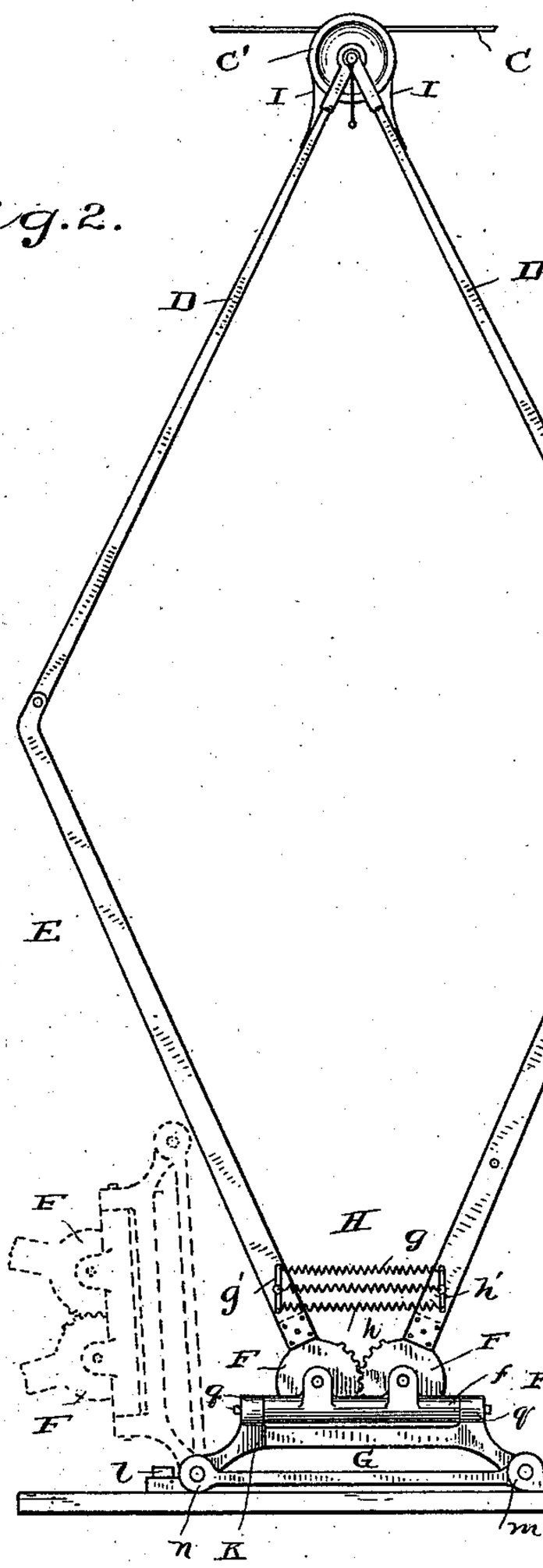


Fig. 3.

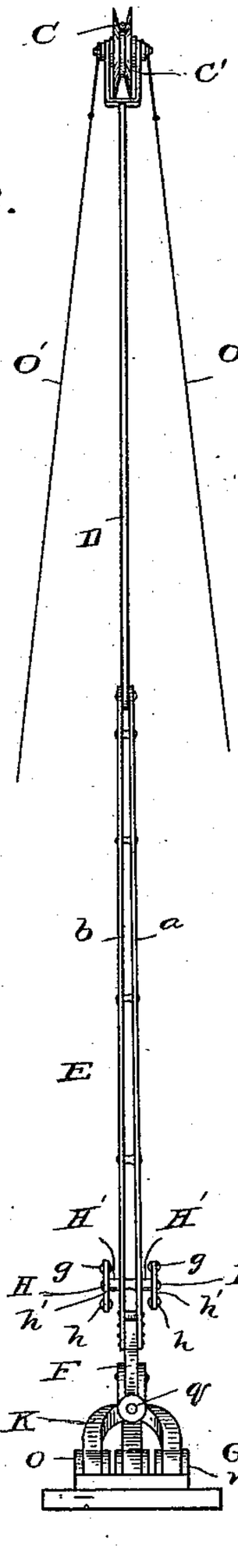
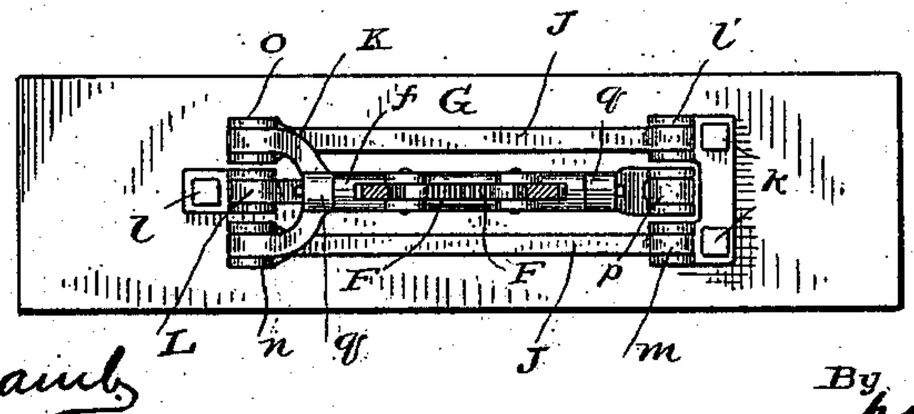


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

C. J. VAN DEPOELE.

UNIVERSAL UPWARD PRESSURE CONTACT ARM.

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Fig. 5.

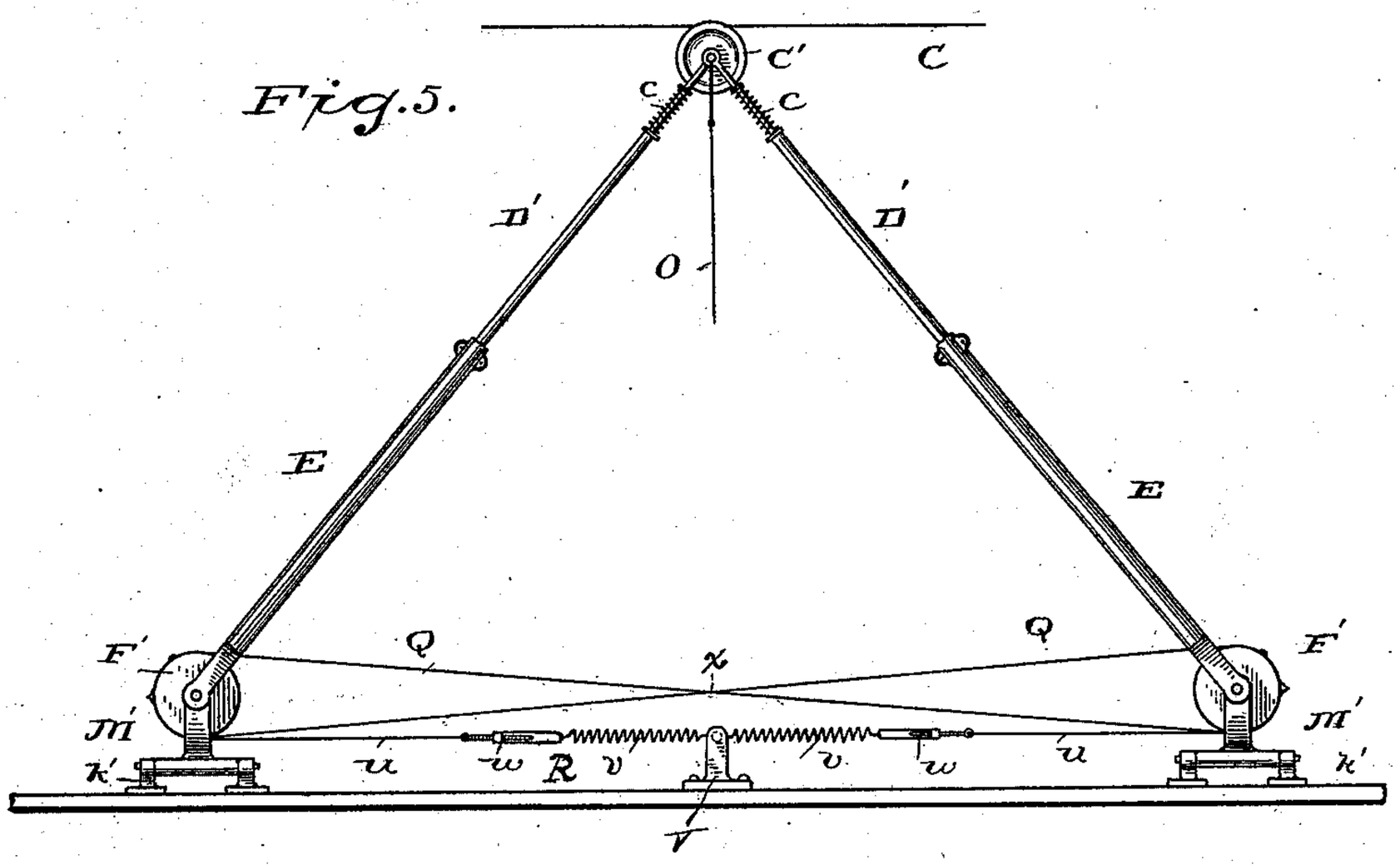


Fig. 9.

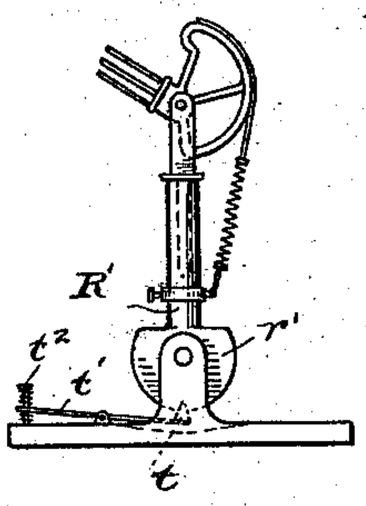
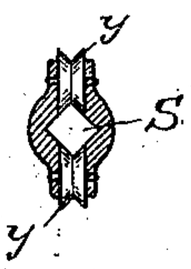


Fig. 6.

Fig. 10.

Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

UNIVERSAL UPWARD-PRESSURE CONTACT-ARM.

SPECIFICATION forming part of Letters Patent No. 402,117, dated April 23, 1889.

Application filed February 19, 1889. Serial No. 300,396. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Universal Upward-Pressure Contact-Arms, of which the following is a description, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

My invention relates to electric railways of that class in which the electric current is conducted from the generator along the line of way by an overhead conductor and supplied to the motor upon the car or other vehicle by moving contact devices carried by the vehicle and engaging the under side of the overhead conductor.

The present invention appertains more particularly to the devices for establishing a moving electric connection between said overhead conductors and the motor on the car, and has for its object the obviating of various difficulties which now exist in the use of the so-called "upward-pressure contact-arms." As these arms are now made and supported upon the top of the vehicles, no perfect provision has been made for their automatic retraction, either in case any obstacle—such as the branch of a tree—should occur in the path of movement, or in case (as frequently happens where the track passes under a bridge) the conductor dips to within a few inches of the top of the car, and contact-arms are constantly broken or damaged for lack of such provision.

My invention therefore has for its object, primarily, the construction of a contact-arm which shall automatically yield to and pass ordinary obstructions without injury.

A further object is to provide a support for the contact-arm which shall be adapted to tilt bodily or reduce the arm under extraordinary strain, as upon becoming detached from the conductor, when the contact-carrying device would assume an upright position, and that the onward travel of the car be brought violently in contact with any stationary object extending across the track—as, for example, a cross-wire and bridge, or the like—which would be almost certain to seriously damage, if not destroy, the contact-supporting apparatus. My safety device will, however, under such conditions release the arm or its support and allow the entire structure to tilt over backward upon the roof of the car.

A still further object is to provide such a support for the contact-arm that it shall have, in addition to its backward and forward and vertical movements, a slight lateral movement, whereby it may be brought into re-engagement with the conductor after disengagement therefrom.

The invention also comprises an extensible arm or frame extending between the top of the car and the conductor and carrying at its highest point the contact-trolley, said arm or frame being operative from either direction, thereby dispensing with the necessity for reversing the trolley-arm or turning the car around when the direction of movement of the car is to be changed.

Finally, the invention consists in the various details of construction and arrangement of parts, whereby I am enabled to accomplish the desired objects in a simple and effective manner.

In the drawings, Figure 1 is a view in elevation of a car provided with contact devices embodying my invention. Fig. 2 shows the contact-arm and supporting devices in side elevation. Fig. 3 is an end view of what is illustrated in Fig. 2. Fig. 4 is a plan view of the tilting support for the contact-arm. Fig. 5 is a side elevation of a somewhat different form of my invention. Fig. 6 is a side elevation of the modification, showing the means for laterally moving the contact-arm. Fig. 7 is a detail, partly in section, showing one of the members of the contact-supporting device shown in Fig. 6. Fig. 8 is a cross-section of Fig. 7 on line 8 8 thereof. Fig. 9 is an elevation, partly in section, showing pivotal and supporting points of a different form of contact-carrying arm to which my safety device is applied. Fig. 10 is a view similar to Fig. 9, showing a somewhat different arrangement of the safety device. Fig. 11 shows the same style of contact-arm as seen in Figs. 9 and 10, with another form of safety device applied thereto.

As indicated in the drawings, A represents a well-known form of street-car, of which B is the upper part of the roof or deck, upon which the contact-carrying device is supported. C

is the suspended conductor supplying the current to the motor or motors upon the car A.

One form of my improved contact-carrying device is shown in Figs. 1, 2, and 3. As there seen, it consists of a pair of arms, D D, having forked or bifurcated upper extremities, between which is pivotally sustained upon any desired style of journal-bearing a grooved metallic contact-wheel, C′, the extremities of the arms D D being pivotally connected by the axis of the contact-wheel. The lower ends of the arms D D are pivotally united to the upper ends of a second pair of arms, E E. As a desirable construction the arms E E are made up of two thin tapering metal pieces or bars, *a b*, which may be inclined outward toward their lower extremities to give greater stiffness, and are united at intervals by blocks *e*, secured between the side pieces, *a b*, by rivets or bolts passing therethrough. Obviously the arms E E might be constructed of solid metal or of tapering tubes. The upper extremities of the arms E E are bent inward at the point where the arms D D are pivoted thereto, in order that when said arms D are forced down, as by the lowering of the plane of the suspended conductor, they may in extreme cases lie parallel with the arms E E, which, when constructed in that position, occupy the smallest possible space.

The lower extremities of the arms E are connected by means of intermeshing gear-teeth formed upon the adjacent peripheries of two pivoted disks, F F, supported upon a shaft, *f*, mounted upon a standard, G, on the roof of the car. The arms E E being mechanically united by the gears upon the disks F, the structure formed by the arms D D and E E will open and close to raise or lower the contact-wheel C′ and constitute a four-armed pivoted frame sustaining a contact device moving in a vertical plane. The contact device is normally pressed upward against the under side of the suspended conductor by the upward tendency of the pivoted arms imparted by batteries of tension-springs H H, secured upon each side of the lower portions of the arms E E, and desirably composed of a plurality of springs, *g h*, connected at either end to cross-pieces *h′ g′*, which are pivotally connected to projections H′ upon either side of the said arms E. The action of the tension-springs H is to draw the arms E E together, thereby closing and elongating the frame and elevating the contact device. The tension of said springs should therefore be in proportion to the weight and length of the arms D D E E, so as to keep the contact always pressed up against the under side of the conductor, and at the same time be capable of extension to a point which will admit of the wheel being depressed until the arms assume substantially parallel horizontal positions. It is desirable that when depressed to its lowest possible point the axis of the contact-wheel or lateral projections attached thereto rest upon the upper parts of the tension-springs H H, so that when released, as by elevation of the plane of the conductor, the said springs will impart to the contact-wheel an initial upward movement sufficient to enable them to exert their normal action upon the arms E E. Where this arrangement is undesirable, however, one or more buffer-springs, *i*, may be attached to the arm or arms E for the purpose of raising the contact-wheel and arms D D to a point where the springs H H can act.

Near the upper end of each arm D is attached a fender-spring, I, said springs extending to a point slightly below the horizontal diameter of the contact-wheel to guide any obstacle over the wheel. For example, the fender-springs will act to prevent the conductor from being caught between the wheel and its axial support in case it were displaced from the peripheral groove in said wheel.

In connection with the fender-springs and the general construction of the conductor-supporting frame, it will be apparent that in case the contact-wheel were detached from the conductor and consequently elevated to its highest point, if any upper portion of one of the arms D would come in contact with an obstacle—such as a cross-wire—the said arm would be depressed and pass safely thereunder, the mechanical connection between the arms E E imparting to the several parts of the frame a similar movement. This action refers, however, only to obstacles striking the contact-carrying device at or near its upper portion and with a similar decrease of force. Should the contact become detached, if the car were running at a high rate of speed, the collision of the contact-supporting frame with an obstacle would usually result in its destruction. To obviate this difficulty, I therefore provide, as a separate feature of invention, a support for said frame, which, under dangerous pressure, will tilt and permit the frame to fall bodily rearward, and thus pass the obstruction without injury. This device I have called a "tilting standard"

My improved standard G, for supporting the upward-pressure contact-arm, is seen in Figs. 2, 3, and 4. This standard comprises two brackets, *k* and *l*, secured upon the top of the car about two feet distant, according to the size and weight of the parts to be sustained. One of these brackets, *k*, has two ears, *l′ l′ m m*, extending from each end thereof, between each two of which ears are pivoted rods J J, free at their opposite ends and having pairs of ears *n n o o* formed thereon, between each pair of which is pivoted one of the forks of an arched tilting frame, K. The second bracket, *l*, has only one pair of ears formed thereon, between which is pivoted at one end a rod, L, similar in all respects to rods J J, and having at one end ears *p p*, between which is pivoted the unforked end of the frame K. Projecting upward from said frame K are suitable lugs, *q q*, forming bearings for the ends of a rocking shaft, *f*, having two pairs of ears extending upward there-

from, between each pair of which is placed one of the gears F F, before referred to, a suitable pin passing through said ears and gears serving as an axis therefor. It will be seen that by this construction, whenever an obstacle greater than the weight of the parts is met with in the movement of the contact-carrying frame, the frame K will be tilted endwise upon the ends of the rods J J, or in the opposite direction upon the end of rod L, according to the direction in which the car is moving, allowing the contact-arm to fall over and lie down upon the top of the car, straps N N being provided, as shown in Fig. 5, to receive the falling frame and avoid injury either to the car or frame. It will still further be seen that by pivoting the shaft *f* as described the contact-arm may have any desired lateral movement, suitable means being provided to limit the extent thereof.

Lateral movement of the frame is brought about and controlled by means of the system of ropes and pulleys shown in Figs. 1, 3, and 6. Ropes O O′ are attached at one end to the point where the arms D D are pivoted together, from which point they diverge laterally, passing under double pulleys *r r* on opposite sides of the frame and suitably mounted on the top of the car. At this point the ropes separate into two parts, P P, one part passing to one end of the car and the other to the opposite end, within reach of the operator. This construction affords means for lowering the contact by pulling both ropes at once and for shifting the contact-arm laterally to either side to bring it into engagement with the conductor by pulling upon one rope or the other. By releasing both ropes the contact will be permitted to rise into engagement with the conductor or to assume any desired position.

In Fig. 5 I have shown a different form of my invention. In this figure the upward-pressure contact device is composed of two members, each member composed of a lower part, E, made hollow for containing a suitable spring, *s*, and an upper part, D′, adapted to move within the lower part and kept normally extended by the spring *s*. The parts D′ D′ of each member are pivoted together by the axis of the contact-wheel in the manner before mentioned, and the contact-wheel is supported thereby.

Each part E is rigidly attached at its lower end to a wheel, F′, pivoted in a suitable standard, M′, which in turn is pivoted to suitable standards, *k′ k′*, secured upon the top of the car, thus giving lateral movement thereto. The wheels F′ F′ are connected together by ropes Q Q, each of which is attached to the upper portion of the periphery of one of the wheels F′ and the lower portion of the opposite wheel F′, thus crossing each other at the point marked *x*. The lower portions of the periphery of these wheels are still further connected by a spring-connection, R, supported by a standard, V, said spring-connection consisting of short ropes *u u*, attached at one end to the wheels F′ F′, their opposite ends being united by a spring, *v*, the tension of which is adjustable by means of an ordinary turn-buckle, *w*. I wish it to be understood that I do not limit myself to this particular form of spring-connection, as any suitable device may be substituted therefor. I also place upon the upper part of the arm D a fender-spring, as explained.

If desired, I may, as shown in Fig. 6, provide short telescopic sections *c* in the telescope D′ in order to take up shocks which are very slight.

The method of operation of this form of my invention is similar to that heretofore referred to. When an obstacle is encountered in the path of movement of the connecting device, or when the conductor dips, one of the members will be forced down, and, through the medium of the connecting-ropes Q Q acting upon the other member, and the downward movement of said members, the telescopic end sections, D′ D′, will be forced in against the pressure of the springs *s*, and the contact-supporting frame will be depressed to the necessary extent. When the strain is taken off, the spring-connection R will force upward the parts E E of the different members, and at the same time the springs *s* will force out the telescopic sections.

In Fig. 8 I have shown a form of connection between the lower part, E, and the telescopic section D′. It consists of a clamp, S, made in two parts riveted together, having an opening through the center of the same form in cross-section as the telescoping section, provided, also, with small anti-friction wheels *y y*, loose on the rivets, securing the parts of the clamp together, whereby the said section is properly guided and the contact-wheel prevented from twisting sidewise.

In Fig. 6 is shown a form of device similar to that shown in Fig. 5, as far as the telescoping members are concerned, but differing in manner of support.

The spring-connection between the lower parts of the members E E is dispensed with, said parts being pivoted at their lower ends to a casting, *z*, which is pivoted to a standard, T, so as to have the necessary lateral movement. This lateral movement is, as pointed out, for the purpose of allowing manipulation of the contact-wheel from a distance, and the same system of ropes and pulleys is used for imparting the desired motion. There being no spring-connection between the lower parts of the members of this connecting device, it is obvious that, in case of pressure sufficient to force the arm down to a horizontal position on top of the car, the telescopic end sections would act in direct opposition to each other, and hence the contact-wheel would not be automatically returned to its position against the under side of the conductor. In order to obviate this difficulty, I place upon the top of the car a suitable buffer or spring to limit the downward movement

of the arms, in order that they may not reach the dead-level, and with this provision the springs connected to the telescopic sections are amply sufficient to return the arms to their upright position.

I desire it to be understood that I do not limit myself to the tilting standard shown and described in combination with any particular form of upward-pressure contact device, as it is equally applicable to many other forms thereof. For example, in Fig. 9 is seen the lower part of the contact-carrying arm and its supporting-standard, as shown and described, for instance, in Patent No. 394,037, granted to me December 4, 1888. The contact-carrying arm is supported upon a standard, R′, to the lower portion of which is secured a disk or grooved piece of metal, r'. The disk r' is pivotally sustained between the forks of a bifurcated standard, T′, mounted upon the top of the car in any suitable manner. A spring detent or catch, t, is secured upon the extremity of a pivoted lever, t', provided at its outer extremity with an adjusting-screw, t^2. The detent t is pyramid or cone shaped, and is adapted to engage a recess in the under side of the disk r', where it is held with any desired degree of pressure sufficient to maintain its hold and sustain the standard R′ in a vertical position under the strain of ordinary work. When, however, the standard R′ or contact-arm should receive a blow, as by striking an obstruction in its path, the detent t will be forced out of the recess in the disk r', and the contact devices supported upon the standard R′, together with said standard, be permitted to fall over backward, turning upon the axis of the disk r'. The detent-supporting lever t' may be of spring metal and the pressure of the detent t be adjusted by a screw, t^2. The lever t' may also, however, be quite rigid and the pressure of the detent determined by an adjustable tension-spring placed about the adjusting-screw t^2. A slightly-different form of detent device is seen in Fig. 10, in which a vertically-acting detent, t^3, is substituted for the detent t and sustaining-lever t'.

As shown in Fig. 10, an adjustable spring, t^4, is coiled about the detent for holding it in engagement with the notch in the disk r' with the desired degree of pressure.

A modified form of safety device is seen in Fig. 11, where the standard R′ is mounted upon a post, R^2, which base is contained within a suitable recess or between side pieces, R^3, formed in or secured upon the top of the vehicle, to which the devices are applied, the base R^2 being held in its position by springs R^4 R^5, extending over the front and rear extremities thereof, which springs are of such strength that they will ordinarily sustain the contact devices in position, but which will yield sufficiently to allow the base R^2, together with the standard and contact-arm, to be forced out of position on meeting an obstacle, which would otherwise damage or destroy the contact devices. Further, I do not limit myself to the exact constructions herein shown, since many minor modifications may be made therein by persons skilled in the art without departing from either the spirit or the nature of the invention.

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

1. In electric railways, the combination, with the suspended supply-conductor and a moving vehicle, of a contact-carrying device suitably supported upon the vehicle and comprising extensible members pivotally connected at their upper ends and provided with a contact device, substantially as described.

2. In electric railways, the combination, with the suspended supply-conductor and a moving vehicle, of a contact-carrying device suitably supported upon the vehicle and comprising extensible members pivotally connected at their upper ends, and a contact-wheel upon the axis of said pivotal connection, substantially as described.

3. In electric railways, the combination, with the suspended supply-conductor and a moving vehicle, of a contact-carrying device suitably supported upon the vehicle and comprising extensible members pivotally connected at their upper ends and provided with a contact device, and a tension-spring secured between the lower portions of said members for inclining the members toward each other and elevating the contact device, substantially as described.

4. In electric railways, in combination with a suspended supply-conductor and a moving vehicle, a contact-carrying device between the same, comprising extensible members pivotally connected at their upper ends and having a contact-wheel thereon, said members being suitably supported upon the vehicle, substantially as described.

5. In electric railways, in combination with a suspended supply-conductor and a moving vehicle, a contact-carrying device between the same, comprising extensible members supported by the car and pivoted together at their upper ends, and having a contact-wheel thereon and a spring-connection between the lower portions of said members for drawing the members together and elevating the contact, substantially as described.

6. In electric railways, in combination with a suspended supply-conductor and a moving vehicle, a contact-carrying device between the same, comprising upper members pivoted together at one end and sustaining a contact-wheel, lower members supported by the car and pivoted to the upper members, and a spring-connection between the said lower members, substantially as described.

7. In electric railways, in combination with a suspended conductor and a moving vehicle, a contact-carrying device extending between the vehicle and the conductor, and a tilting standard supporting the contact device when

in operative relation to the conductor, substantially as described.

8. In electric railways, in combination with a suspended conductor and a moving vehicle, a contact-carrying device extending between the vehicle and the conductor, and a tilting standard upon which the contact device is supported and is laterally movable, substantially as described.

9. In electric railways, in combination with a suspended supply-conductor and a moving vehicle having a standard, a contact-carrying device between the same, comprising extensible members carrying at their upper ends a contact-wheel and at their lower ends being pivoted to swing longitudinally on a suitable support, said support being pivoted to swing laterally on said standard, substantially as described.

10. In electric railways, in combination with a suspended supply-conductor and a moving vehicle, a contact-carrying device carried by the vehicle and comprising extensible members carrying at their upper ends a contact-wheel for engaging the under side of the conductor and pivoted at their lower ends to swing longitudinally on a suitable support, said support being pivoted to swing laterally, substantially as described.

11. In electric railways, in combination with a suspended supply-conductor and a moving vehicle, a contact-carrying device carried by the vehicle and comprising extensible members carrying at their upper ends a contact-wheel for engaging the under side of the conductor and pivoted at their lower ends to swing longitudinally on a suitable support, said support being pivoted to swing laterally, and ropes connected to or near to the axis of the contact device and extending obliquely downward therefrom and passing to the ends of the vehicle, whereby vertical and lateral movement may be imparted to the contact-making device, substantially as described.

12. In combination with a suspended supply-conductor and a moving vehicle having a standard thereon, a contact-carrying device between the same, comprising extensible members carrying a contact-wheel at their upper united ends and pivoted at their lower ends to swing longitudinally on a suitable support, said support being pivoted to swing laterally on the standard, and ropes connected to the pivotal point of the extensible members and passing to the ends of the vehicle, whereby vertical and lateral movement may be imparted to the contact-making device, substantially as described.

13. In electric railways, in combination with a suspended supply-conductor and a moving vehicle, a tilting standard thereon, an extensible contact-carrying frame carrying at its upper end a contact-wheel pivotally connected to said tilting standard at its lower portion, substantially as described.

14. In combination with a suspended supply-conductor and a moving vehicle, a tilting standard thereon, an extensible contact-making device between the same, carrying at its upper end a contact-wheel and at its lower end pivoted to swing longitudinally upon a suitable support, said support being pivoted to swing laterally upon the tilting standard, substantially as described.

15. In combination with a suspended supply-conductor and a moving vehicle, a contact-carrying device comprising upper members pivoted together at their upper ends, and having a contact-wheel thereon, lower members pivoted to said upper members and secured at their lower ends to engaging gears pivoted on a suitable support, whereby movement of one member is imparted to the other, and a spring-connection between said lower members, substantially as described.

16. In the described contact-making device, having upper and lower members, the spring-connection for said lower members, consisting of a plurality of parallel springs attached at opposite ends to pieces pivotally connected to the lower members, substantially as described.

17. The herein-described tilting standard for contact-carrying devices, consisting of eared brackets arranged at a suitable distance apart, links pivoted at one end to one of the brackets, a link pivoted at one end to the free ends of the links and at the other end upon the free end of the link, and a support for the contact device pivoted upon said forked lever, substantially as described.

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

CHARLES J. VAN DEPOELE.

Witnesses:
FRANKLAND JANNUS,
JOHN W. SIMS.