(No Model.) 2 Sheets—Sheet 1.

M. D. LAW.

TRAVELING CONTACT DEVICE.

No. 555,958. Patented Mar. 10, 1896.

Fig. 1.

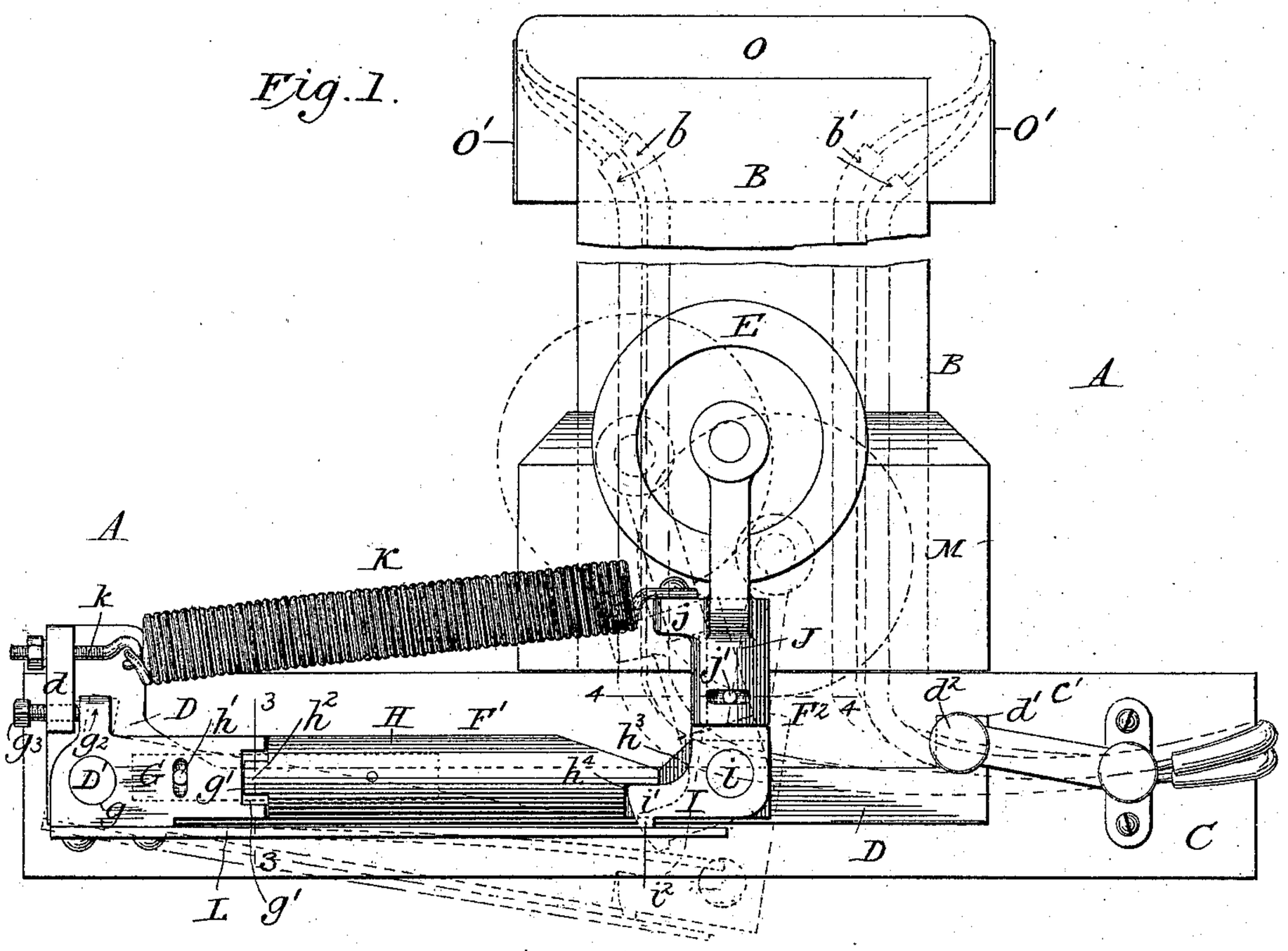
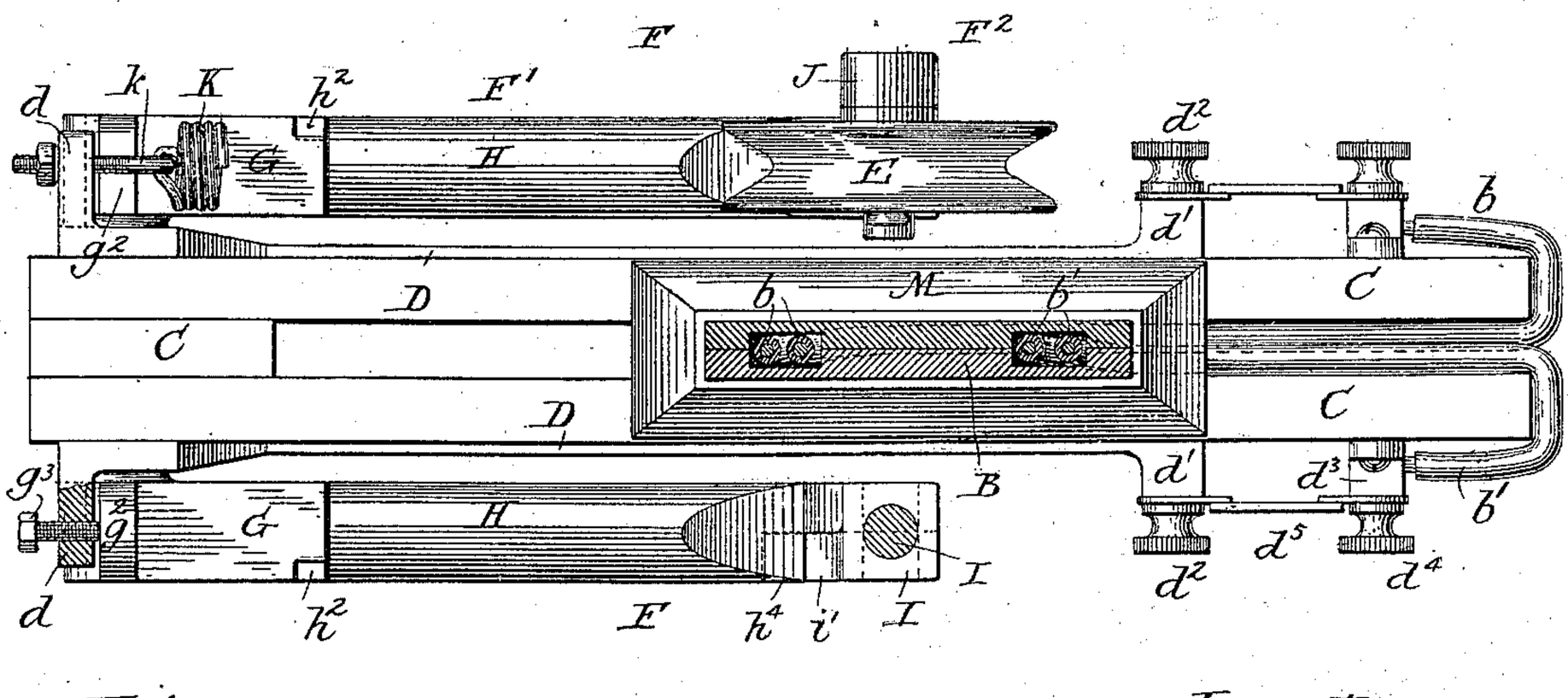


Fig. 2.



Witnesses,

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E. C. Neale

Inventor,

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Dayton, Cook & Brown

(No Model.) 2 Sheets—Sheet 2.

M. D. LAW.

TRAVELING CONTACT DEVICE.

No. 555,958. Patented Mar. 10, 1896.

Fig. 3.
ON 3-3

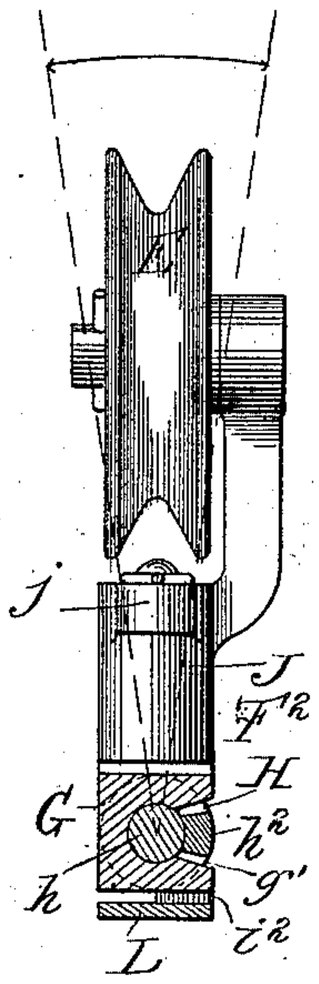


Fig. 5.

Fig. 4.
ON 4-4

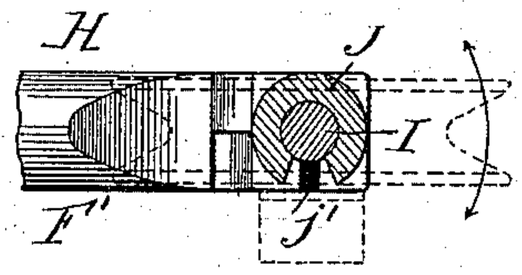
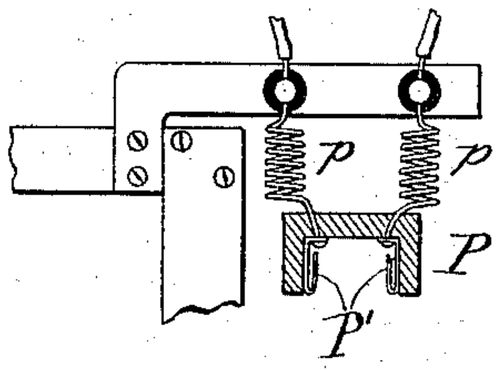


Fig. 6.



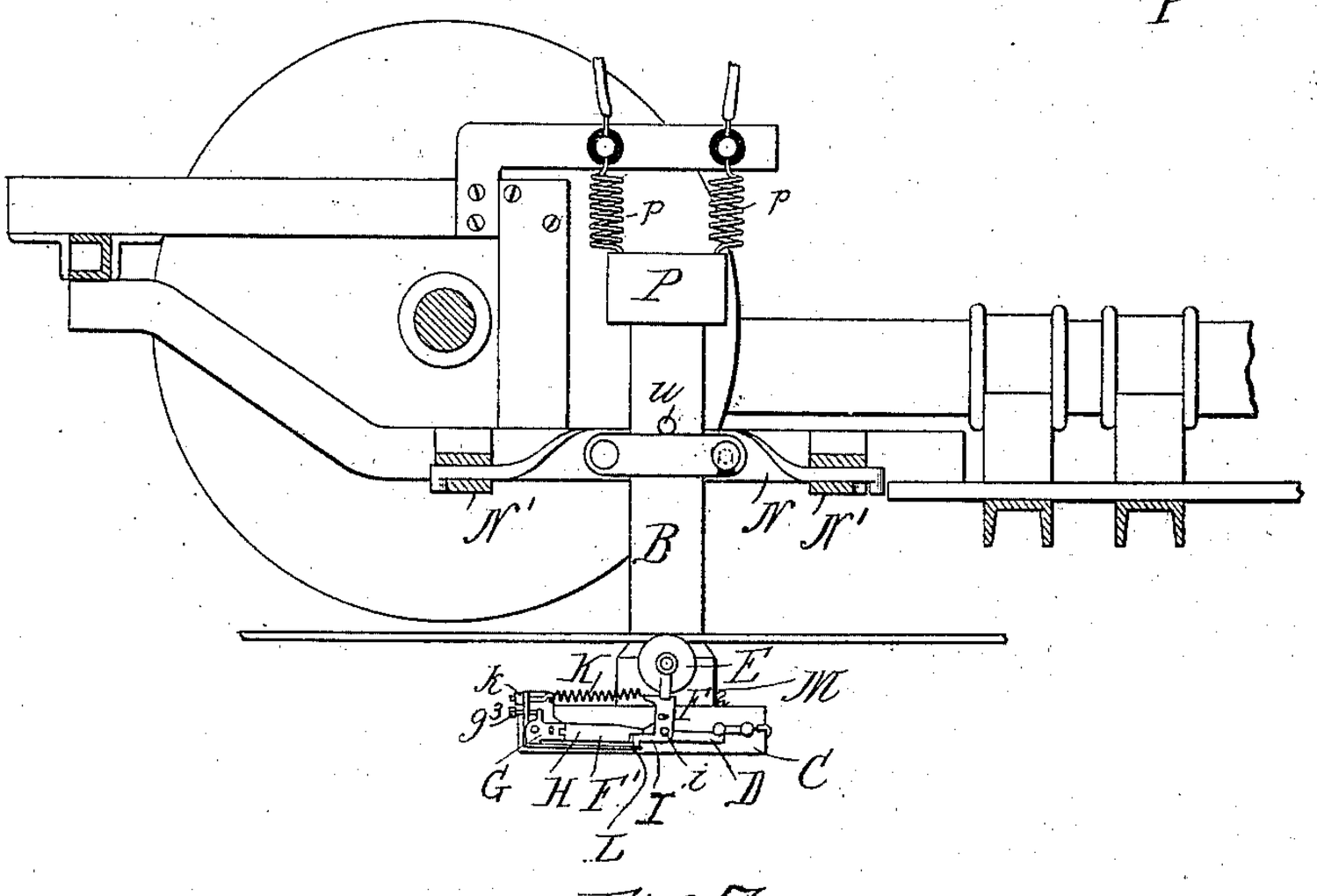
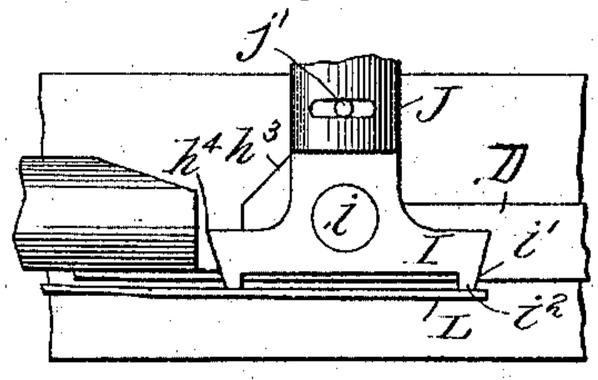


Fig. 7.



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UNITED STATES PATENT OFFICE.

MYRON D. LAW, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO ALBERT G. WHEELER, OF CHICAGO, ILLINOIS.

TRAVELING-CONTACT DEVICE.

SPECIFICATION forming part of Letters Patent No. 555,958, dated March 10, 1896.

Application filed September 28, 1894. Serial No. 524,369. (No model.)

To all whom it may concern:

Be it known that I, MYRON D. LAW, of Washington, District of Columbia, have invented certain new and useful Improvements in Traveling-Contact Devices; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to traveling-contact devices for electric railways.

The device to be described has been designed with special reference to systems in which the trolleys or collectors make under contact with conductors located within a slotted conduit; but it will be apparent that by a reversal of the position of the trolley-carrying arms the device is well adapted for use in systems wherein the trolleys make top contact with or ride upon the conductors of the conduit.

One object of the invention is to admit of travel of the trolleys in either direction upon the conductors, thereby avoiding the necessity of shifting the contact device, as a whole, when reversing the direction of travel of a car.

Another object of the invention is to so construct and arrange the contact parts of the motor on a car and on the trolley device as to avoid liability of rupture or damage to the connecting-wires in attaching and detaching the trolley device.

With these and minor objects in view the invention consists in the matters which will be described in detail in the ensuing specification and then pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a traveling-contact device embodying my invention. Fig. 2 is a plan view of the same, partly in section. Figs. 3 and 4 are details of part of the trolley-wheel-supporting arm. Fig. 5 is a side elevation showing one manner of attaching the contact device to the supporting-frame and establishing contact with the motor. Fig. 6 is a sectional detail showing another mode of supporting the terminals of the connecting-wires leading to the motor. Fig. 7 is a detail, in side elevation, of the lower part of a trolley-arm, showing a modification in which the trolley-arm is capable of oscillation from a vertical position in either direction.

As shown in the accompanying drawings, the traveling-contact device, which is designated as a whole by the letter A, is connected with the car and sustained therefrom by means of a metal (preferably steel) bar, shank or leg B, herein termed the "supporting-bar," which is detachably secured at its upper end to the car or a part of the running-gear thereof, such as a truck-frame, and extends downwardly through the slot of the conduit into the interior of the latter. Said bar carries at its lower end the traveling-contact device proper. This, as shown in the drawings, is double, or adapted for making contact with two line conductors, and it consists in its main parts of a supporting-frame C, of insulating material, which is attached to the lower end of the bar B, metal strips D D, attached to the side faces of the frame C, trolley-wheels or contact-pieces E E, which move in contact with the line conductors, and swinging or pivotally-supported trolley-arms F F, which are in metallic connection with the strips D D. Said trolley-arms are provided with horizontal and vertical portions F' F^2, and are formed by means of four separate metal parts or sections G, H, I and J, of which the parts G and H constitute the horizontal parts of the arms and the sections I and J the vertical parts thereof. Said horizontal and vertical parts of the trolley-arm are connected by a pivotal joint formed by a pivot-pin *i*, which engages and unites the intermediate sections H and I of the arm.

The opposite side pieces or members of the frame C consist of bars or plates of insulating material, which serve to electrically insulate from each other parts of the device which are attached thereto, as will hereinafter appear. The trolley-supporting bar B is provided with longitudinal passages or channels, carrying conductors *b* *b'*, by means of which electrical connection is made between the car and the traveling-contact devices. In the particular construction shown said bar consists of two flat plates secured together and having opposing grooves on their inner faces, forming the passages referred to.

The contact device illustrated is adapted

for use in systems in which conducting or line wires are used for both the supply and return currents, and for this purpose is, as before stated, made double, having in fact two separate contact devices, one at either side of the supporting-bar, for making separate contact with two line conductors there located. The parts at opposite sides of the bar being alike, a detailed description of one will apply to both, and the parts at one side of the bar only will be herein referred to in describing the construction of these parts.

Secured to the longitudinal vertical face of the frame C is a metal bar D, provided at one end with a bearing-stud D′ and with a lateral projection or lug *d*, and at its opposite end with a boss *d′*, in which is inserted a set-screw d^2. At the bottom of the bar B the conductors *b b′* extend through the space between the side pieces of the frame C, and around the edges thereof to the outside of the frame, where they are connected with the bars D D at opposite sides of the frame, preferably through the medium of safety cut-outs consisting of binding-posts d^3, having set-screws d^4, and fusible strips d^5, engaged at their ends by said set-screws d^2 and d^4, the ends of the conductors being held in the binding-post d^3 d^3.

The bearing-stud D′ forms the supporting-pivot for the trolley-supporting arm F. The section G of said arm is immediately engaged with said stud, said section consisting of a metal block provided with a transverse bearing-aperture *g* to receive said stud. The section H is connected in longitudinal alignment with the section G, and said parts, which constitute the horizontal portion of the trolley-arm, are connected with each other by a pivotal joint or swivel, the axis of which is arranged longitudinally of the said parts, so that the section H may rotate about its own longitudinal axis upon the section G. The section I is pivoted to the section H by means of the transverse horizontal pivot *i*, which allows said part I to swing in a vertical plane parallel with the side face of the supporting-bar or with the plane of the trolley-wheel, and the section J, which immediately sustains the trolley-wheel, and in which the latter is mounted, is connected with the section I by means of a vertical pivot or swivel, enabling the trolley-wheel to turn or rotate in a horizontal plane.

The several joints and pivotal connections described enable the trolley to move or turn in a number of different ways. The pivotal connection of the trolley-arm with the frame D enables the trolley to move bodily in a vertical direction, so that it can rise and fall to correspond with vertical deflections of the conducting-wire. The horizontal pivot connecting the sections G and H enables the trolley to move bodily laterally or sidewise relatively to the supporting-bar, so that it may easily and smoothly follow the wire, notwithstanding variations in the distance of the same from the conduit-slot. The transverse pivot connecting the sections H and I enables the trolley to yield bodily backward and downward in case it strikes any projection on the wire (such as may exist at a joint or at a supporting-clip) when the contact device is moving with the free end of the trolley-arm in advance. Such movement of the trolley is indicated by the dotted lines at the left of the trolley shown in the drawings, Fig. 1. A corresponding backward and downward movement of the trolley is permitted when the device is running in the opposite direction by the swinging of the section G about the pivot D′. The vertical pivot connecting the sections I and J enables the trolley-wheel to turn relatively to the trolley-arm, so as to remain parallel with the conductor and smoothly follow the same with a minimum of friction.

The trolley-arm is held in its elevated position and the trolley maintained in contact with the conductor by means of a spring K, herein shown in the form of a contractile coiled spring, which is attached at one end to the lug *d* and at its opposite end to a lug or arm *j* on the outer section J. Said lug or arm *j* projects toward the pivot of the trolley-arm. Said spring, when thus connected with the section J, not only serves to press the trolley upwardly against the conductor, but also tends to hold the trolley in the same plane with the conductor. The spring K is shown attached to a screw-threaded bolt *k*, which passes through the lug *d* and is provided with a nut by means of which it may be adjusted to vary the tension of the spring. In addition to the spring for lifting the trolley-wheel, I also propose to apply a spring or springs to the trolley-arm sections H and I in such manner as to hold the upright part of the arm vertical, except under the action of backward or upward pressure sufficient to overcome the force of the spring or springs. As shown in the drawings, a single plate-spring L, attached to the section G and acting on the lower end of the section I, serves both purposes—that is to say, it presses against the lower portion of said section I in such manner that the said part I cannot be turned on its transverse pivot, nor can the section H be turned on its longitudinal pivot, without flexing the spring.

To now refer more particularly to the details of construction illustrated in the parts last above referred to, the pivotal connection between the sections G and H is formed by a pivot-rod *h*, Fig. 3, which is secured in the part H and enters a bearing-aperture in the part G, in which it is held by a cross-pin *h′* passing through segmental slots in the part G. Relative movement of the parts G and H is limited by a stop projection h^2 on the part H, which enters a notch *g′*, made wider than the projection, so as to allow a necessary amount of motion between the parts. Upward movement of the trolley-arm under the action of the spring K is limited by means

of a lug or stop-shoulder g^2 at the upper side of the section G, which is adapted for contact with a set-screw g^3, inserted through the lug d. Adjustment of said set-screw determines the upward movement of the trolley, as found desirable.

Pivotal connection between the sections H and I is formed by means of a horizontal pivot-pin i, passing transversely through the meeting ends of said sections. As illustrated, these sections are rabbeted so that the overlapping parts thereof will lie flush with the surface of adjacent parts. The lower end of the section I is extended horizontally to form an arm i', which is provided at its end with a depending bead or lug i^2, designed to project below the adjacent surface of the section H and rest upon the top surface of the spring L, near the free end of the latter. The said part H is provided with a stop shoulder or surface h^4, adapted for contact with the arm i' when the upright part F^2 of the trolley-arm is in its vertical or normal position, said stop-surface serving to limit the upward motion of the arm i' under the action of the spring. The arm i' not only serves in connection with the spring L as a means of holding the trolley from backward movement, but also serves as a means of transmitting the pressure of the spring to the part H to prevent the latter from turning on its longitudinal axis and to thereby hold the trolley yieldingly from lateral movement. This result is due to the fact that the spring presses on opposite sides or edges of the arm i', so that any turning of the part H will result in the depression of the spring. In this respect the action is the same as would be obtained by providing the lower surface of the section H with a broad flat lug to rest in contact with the spring. In the particular construction of the parts above referred to shown in the drawings the said part H is provided with a central web or fin h^3, which enters a slot in the lower end of the bar I, the pivot-pin i being inserted through the overlapping parts to form the pivotal joint at its point. In this construction the part or prong at the lower or bifurcated end of the section I is extended to form two prongs, which constitute in effect the laterally-projecting arm i' hereinbefore referred to, said arm being in this instance a two-part or bifurcated arm. Each part or prong of the arm i' is provided at its end with a depending part or lug i^2 adapted for contact with the top surface of the spring L, near the free end of the latter.

The swivel-joint between the parts or sections I and J is formed, as shown, by means of an upwardly-extending spindle on the part I, which engages a socket in the part J, a pin j' being inserted through the spindle and through segmental slots in the part J to hold said parts from becoming separated.

A ring or sheath M of insulating material is shown as placed around the trolley-bar above the frame C in order to protect that part of the bar from access of moisture and to avoid possibility of the trolley or trolley-arm coming in contact therewith.

A traveling-contact device of the character herein described is removably attached to the car in such manner that it may be readily detached or secured in place when taking the cars from the yard to a barn or vice versa, or in changing from an overhead to underground conductors. Commonly the supporting-bar is attached to a laterally-movable support on the car, which support has freedom of motion laterally, so as to enable the supporting-bar to follow the conduit-slot freely and without binding or friction. Such a support is indicated at N, Fig. 5, the same consisting of a bar which rests at its ends on transversely-arranged guides N′ N′, on which it is free to slide laterally, as set forth in Patent No. 511,346, dated December 26, 1893. The bar is shown as supported or held from dropping through the vertical socket in which it is placed by means of a cotter-pin u.

In order to facilitate the securing of the contact device to and its removal from the car and to avoid the presence of loose ends of conductors, such as have heretofore been allowed to project from the upper end of the trolley-bar for making connection with the conductors on the car, I propose to use a coupling device for connecting the terminals of the conductors on the car and bar, consisting severally of a socket or receiving member and a plug or entering member, said parts being provided with contact strips or pieces arranged to complete the circuits between the car and contact device. These parts, as herein shown, are constructed as follows: Attached to the top or upper end of the bar B is a block O of insulating material. Secured to opposite sides of the block are metal contact-strips O′ O′, with which the conductors b b' are connected at their upper end. P, Figs. 5 and 6, is a socket-piece also made of insulating material and adapted to receive the block O. Said socket-piece is provided on its opposite inner walls with spring contact-pieces P′ P′. These latter are adapted for contact with the plates O′ O′ when the block O is inserted in the socket. Said socket-piece P is connected with the car by the flexible conductor-terminals p p alone.

As far as the general purposes of my invention are concerned, weights may be used in place of springs as a means of lifting the trolley-arm and for holding the vertical part of the same upright, but owing to the restricted space allowed for the parts in a slotted conduit springs will more commonly be employed. The arrangement of springs shown has special advantages in point of compactness and of cheapness and simplicity of construction, and some of the features of construction, of which the springs illustrated constitute important parts, are herein claimed as my invention.

The part or section I may have an oppo-

sitely-extending arm or arms, both acting on the spring L in the same manner as the single arm illustrated. In that case no stops will be needed to limit the movement of the upright part of the trolley-arm under the action of said spring L, and said upright part will be free to move in either direction from its vertical or normal position, so that the arm will yield in the same manner in case the trolley strikes an obstruction when going in one direction or when going in the other. Such a construction is illustrated in Fig. 7, wherein all the parts are made in the same manner as hereinbefore described, except that the lug h^4 is omitted, the spring L is made somewhat longer at its end and the part or section I is provided in addition to the arm i' with an arm i^2 extending in an opposite direction therefrom and bearing on the said spring in the manner above referred to.

An important advantage is gained in the construction illustrated from the fact that the socket-piece there shown is supported independently of the carrier-bar N and has movable or flexible connection with the car-frame. An important advantage arising from this construction is that it enables the socket to be easily and quickly applied to the upper end of the carrier-bar without regard to exact adjustment of the supporting-bar on the carrier-bar or other part of the car-frame to which it may be attached. Another important advantage is that it avoids bringing on the socket lateral strains, shocks or blows which come upon the supporting-arm in the turning of curves and at other times by reason of the engagement of the other end of said bar with the slot of the conduit. When the socket is engaged with the upper end of the supporting-bar and is connected with the other parts of the car by flexible connections, such as wire conductors alone, said socket is perfectly free to move with the supporting-bar and no strains whatever are brought upon said socket. Liability of the breakage of the electrical connection under shocks or blows coming upon the supporting-bar is thereby entirely avoided.

I claim as my invention—

1. A traveling-contact device for electric railways, comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a pivoted arm for supporting the same consisting of horizontally and vertically arranged parts connected by a transverse pivot, said trolley-wheel or contact-piece being located vertically above the pivot and springs applied to lift the horizontal part and to maintain in upright position the vertical part of the arm, substantially as described.

2. A traveling-contact device for electric railways, comprising a trolley-wheel or part which travels in immediate contact with the line conductor, and a pivoted trolley-arm consisting of a vertically-arranged part which carries the trolley-wheel or part which travels in immediate contact with the line conductor, and a horizontally-arranged part connected with the vertical bar by a transverse pivot and having a longitudinal swivel, affording lateral movement in the upper end of the vertically-arranged part, said trolley-wheel being located vertically above the said transverse part substantially as described.

3. A traveling-contact device for electric railways, comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a pivoted trolley-arm consisting of a vertically-arranged part carrying the trolley-wheel or part which travels in immediate contact with the line conductor, and a horizontally-arranged part which is connected with the vertical part by a transverse pivot, and is provided with a longitudinal swivel, and a spring applied to maintain the vertical part at right angles to the horizontal part of the arm, substantially as described.

4. A traveling-contact device for electric railways comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a pivoted trolley-arm consisting of a vertically-arranged part carrying the trolley-wheel or part which travels in immediate contact with the line conductor, and a horizontally-arranged part which is connected by a transverse pivot with the vertical part and is provided with a longitudinal swivel, and a spring applied to turn the vertical part on said transverse pivot and also about the axis of the longitudinal pivot, and which tends to hold the said vertical part in an upright position.

5. A traveling-contact device for electrical railways comprising a supporting-bar which depends from the car, a trolley-wheel or part which travels in immediate contact with the conductor and a trolley-arm which is pivoted to the supporting-bar and which consists of vertically and horizontally arranged parts or sections connected by transversely-arranged horizontal pivots, said vertically-arranged part carrying the trolley-wheel at its upper end and being provided with a vertical swivel affording rotative movement of the trolley-wheel about a vertical axis and springs applied to lift the trolley-arm by swinging the same about its pivot and to maintain in an upright position the pivoted vertical part of said arm, substantially as described.

6. A traveling-contact device for electric railways comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a pivoted trolley-arm consisting of vertically and horizontally arranged parts connected by a transverse pivot, said vertical part being provided with a vertical swivel and carrying the trolley-wheel or part which travels in immediate contact with the line conductor at its upper end, and springs applied to the several parts and acting to lift the trolley-arm to hold the vertical part of

the same upright, and to hold the trolley-wheel or contact-piece in a plane parallel with that of the arm, substantially as described.

7. A traveling-contact device for electric railways comprising a trolley-wheel or part that travels in immediate contact with the line conductor and a pivoted trolley-arm consisting of vertically and horizontally arranged parts which are connected by a transversely-arranged horizontal pivot to the lower end of the vertical part, said vertically-arranged part having a vertical swivel whereby the trolley-wheel may turn on a vertical axis and a horizontally-arranged part having a longitudinal swivel by which the trolley-wheel may swing laterally about a horizontal axis and springs applied to lift the arm to hold the vertical part at right angles to the horizontal part, to hold the vertical part from lateral movement and also to hold the trolley-wheel in a plane parallel with that of the arm, substantially as described.

8. A traveling-contact device for electric railways comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a trolley-arm consisting of horizontally and vertically arranged parts connected by a transverse pivot, the vertical part being provided with an arm extending at one side of said pivot, and a flat spring attached to the said horizontal part and acting on the said arm of the vertical part to hold the latter upright, substantially as described.

9. A traveling-contact device for electric railways comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a trolley-arm consisting of longitudinally and vertically arranged parts connected by a transverse pivot the vertical part being provided with an arm which extends at one side of the pivot and below the surface of the horizontal part, and said horizontal part consisting of rotative and non-rotative sections joined by a longitudinal swivel, and a flat plate-spring attached to the non-rotative section of the horizontal part and acting against the said arm at laterally-separated points to maintain the vertical part of the trolley-arm upright, substantially as described.

10. A traveling-contact device for electric railways, comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a trolley-arm consisting of horizontally and vertically arranged parts connected by transverse pivots, said horizontally-arranged part having a longitudinal swivel and being provided at its outer end with a vertical web or fin and the vertical part being slotted at its lower end to receive said web or fin and provided with a horizontal arm which is made in two parts or divided to extend at either side of said web or fin and a flat spring attached to the horizontal part and acting on the parts or prongs of said divided arm to hold the vertical part of the trolley-arm upright, substantially as described.

11. A traveling-contact device for electric railways comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a trolley-arm consisting of horizontally and vertically arranged parts connected by a transverse pivot, a support to which said trolley-arm is pivoted, and a coiled contractile spring attached at one end to the vertically-arranged part of the trolley-arm and at its opposite end to the said support at a point adjacent to and above the pivot of the trolley-arm, substantially as described.

12. A traveling-contact device for electric railways comprising a trolley-wheel or part which travels in immediate contact with the line conductor, a trolley-arm consisting of horizontally and vertically arranged parts connected by a transverse pivot, said vertical part being provided with a vertical swivel and having a lateral lug at its side adjacent to the pivot of the trolley-arm, a support to which said trolley-arm is pivoted, and a coiled, contractile spring attached at one end to said lug on the upright part, and at its opposite end to said support adjacent to and above the pivot of the trolley-arm, substantially as described.

13. A traveling-contact device for electric railways, comprising a supporting-bar, a frame of non-conducting material attached to the lower end of the same, a metal strip attached to the side of the frame and provided with a bearing-stud and with a lug above the said stud, a trolley-wheel or part which travels in immediate contact with the line conductor, a trolley-arm pivoted on said stud and consisting of horizontal and vertical parts connected by a transverse pivot, and a contractile spring attached to the outer part of the arm and to said lug, said arm being provided with a stop projection or arm adapted for contact with the lug for limiting the upward movement of the arm, and a spring acting on the vertical arm to hold the latter upright, substantially as described.

14. The combination with a traveling-contact device a car and a supporting-bar by which the contact device is carried and which is detachably secured to the car, of conductors on the car, a supporting-bar by which the current is carried from the contact device to the motor on the car, and a coupling device for said conductors consisting of two members, namely, a block and a socket-piece adapted to receive the block, one of said members being attached to the bar and the other having movable or flexible connection with the car, said members being provided with contact-strips forming terminals for the conductors on the bar and car and adapted for contact with each other when the members of the coupling are joined, substantially as described.

15. The combination with a traveling-contact device, a car-frame and a supporting-bar to which the traveling-contact device is attached of a movable carrier on the car-

frame to which the said supporting-bar is detachably secured, an insulating-block attached to the upper end of said bar, contact-strips on said block, conductors extending from the contact device along said bar to the contact-strips, a socket-piece adapted to receive said block, said socket-piece being movably connected with the car independently of said carrier, contact-strips in said socket-pieces and conductors in the car connected with said contact-strips of the socket, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

MYRON D. LAW.

Witnesses:
C. A. NEALE,
C. CLARENCE POOLE.