(No Model.) 2 Sheets—Sheet 1.

M. D. LAW.

TRAVELING CONTACT DEVICE FOR ELECTRIC RAILWAYS.

No. 594,406. Patented Nov. 30, 1897.

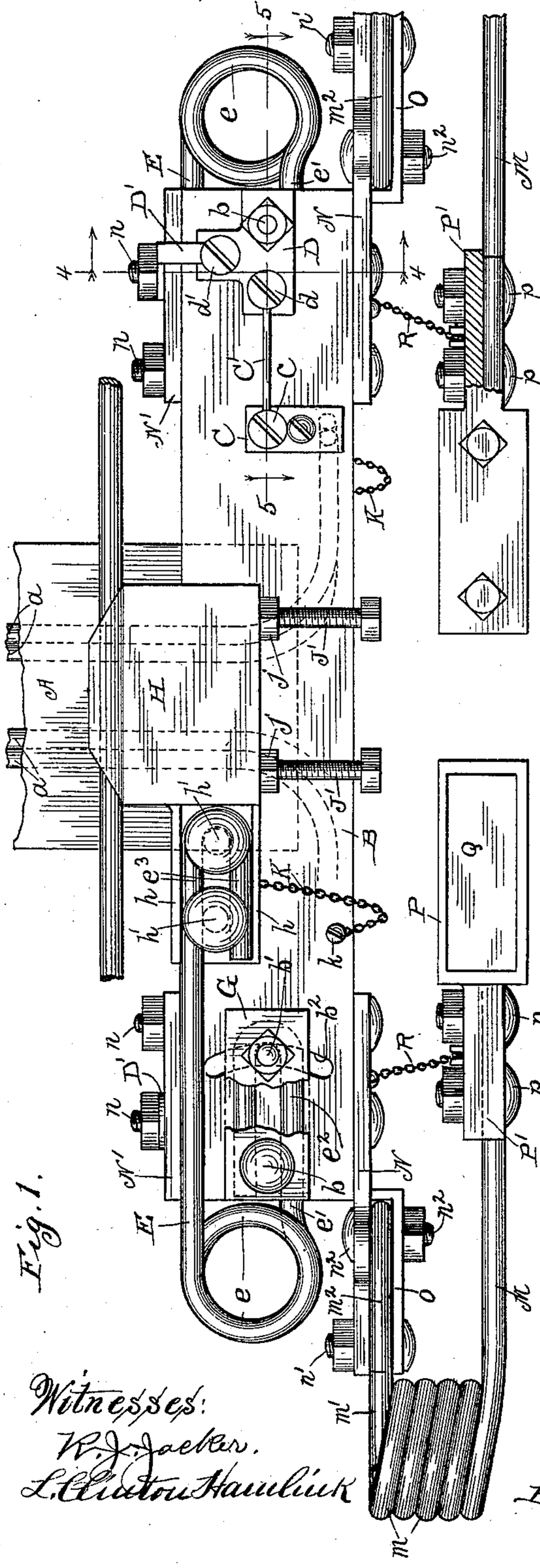

Fig. 1.

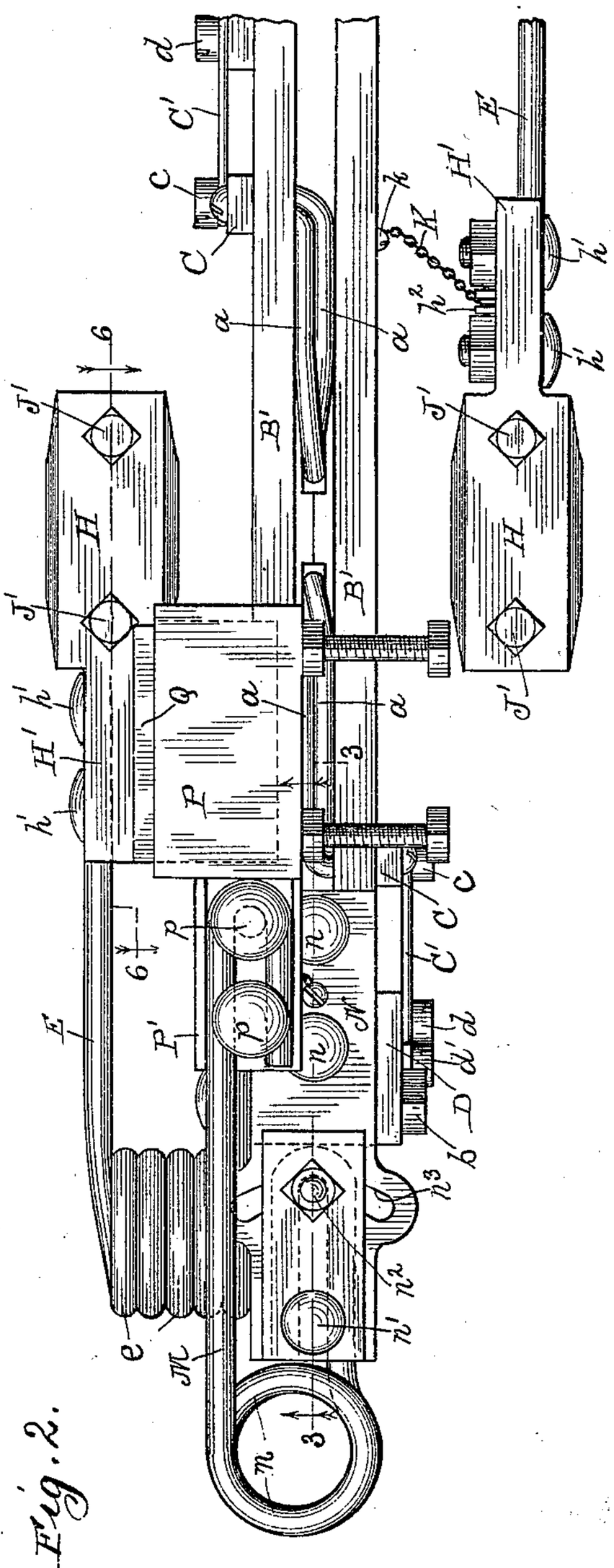

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 7.

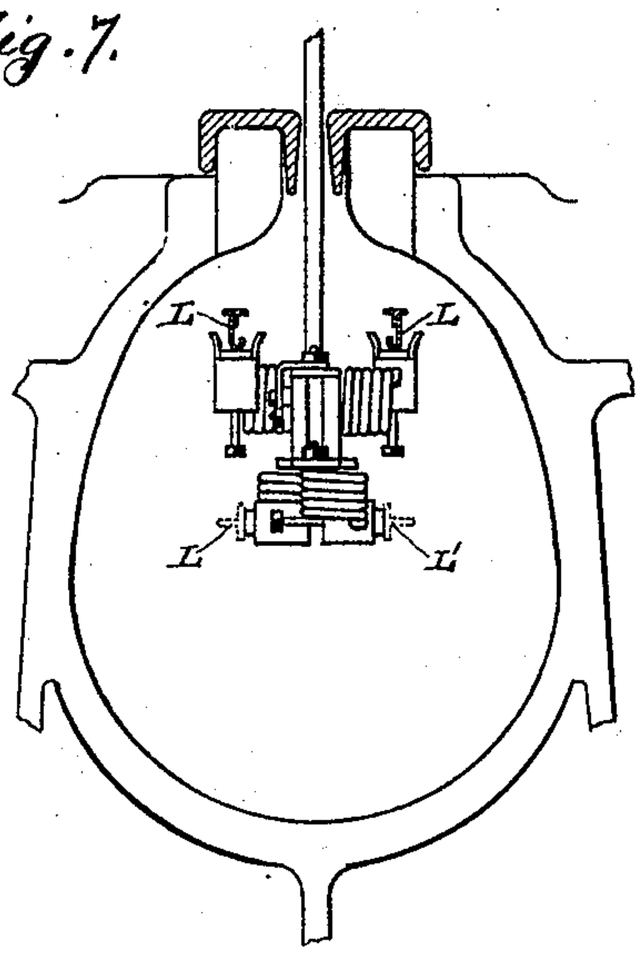


Fig. 3.

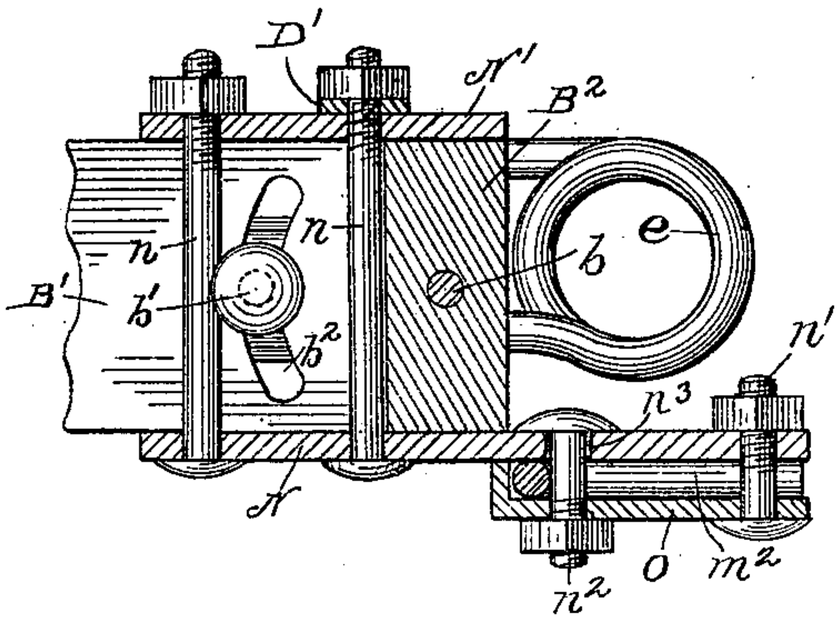
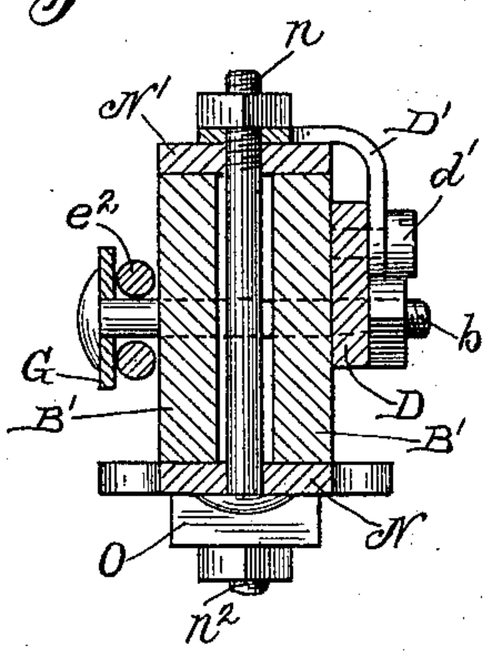


Fig. 5.

Fig. 4.



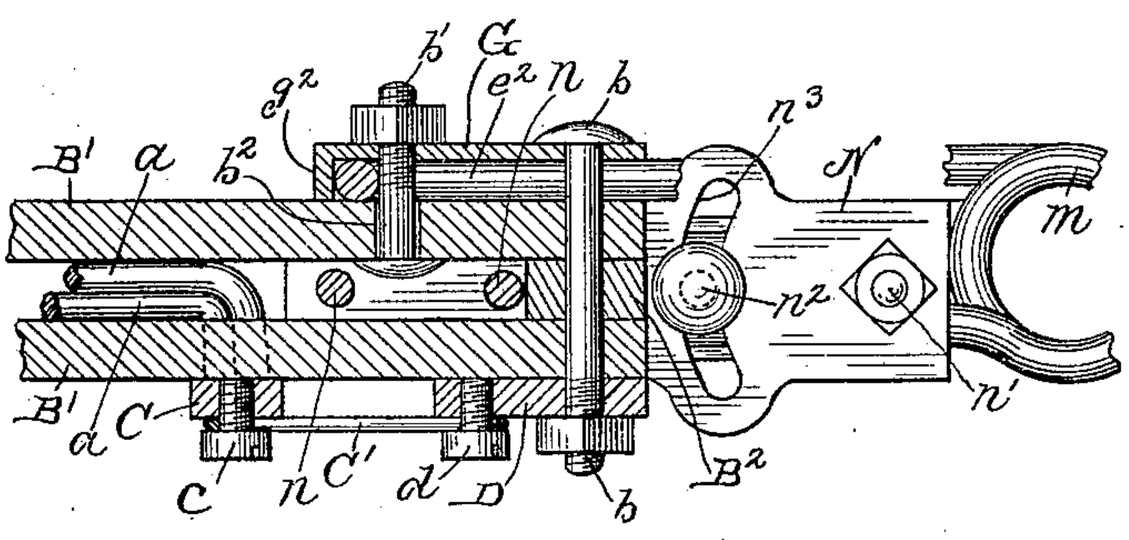
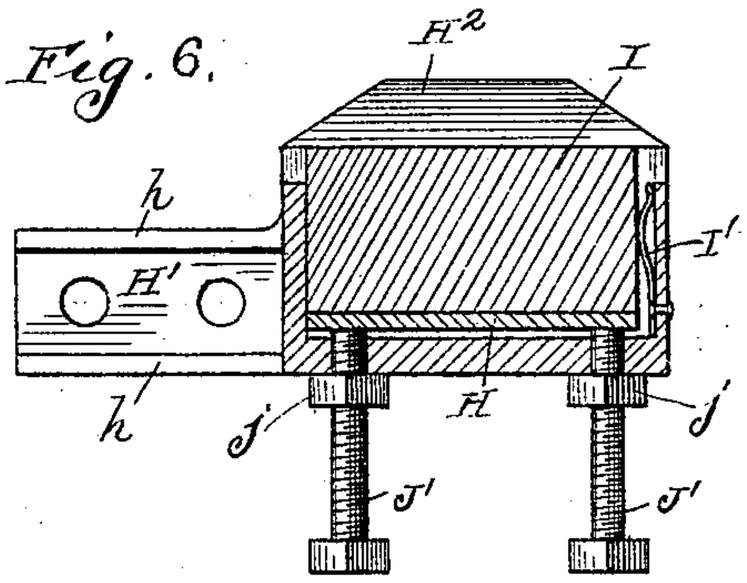


Fig. 6.



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UNITED STATES PATENT OFFICE.

MYRON D. LAW, OF NEW YORK, N. Y., ASSIGNOR TO THE LOVE ELECTRIC TRACTION COMPANY, OF SAME PLACE.

TRAVELING CONTACT DEVICE FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 594,406, dated November 30, 1897.

Application filed July 8, 1896. Serial No. 598,371. (No model.)

To all whom it may concern:

Be it known that I, MYRON D. LAW, of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Traveling Contact Devices for Electric Railways; 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, by which electric connection may be maintained between the motor on the car and an electric conductor arranged parallel with the track-rails, through which current is applied to the motor.

The invention consists in the matters hereinafter described, and pointed out in the accompanying claims.

As one feature of improvement in traveling contact devices of the character described I propose to employ in connection with a smooth and continuous line conductor a brush or contact-piece comprising a block of carbon which travels in immediate contact with the conductor, and a yielding or spring-actuated support for the carbon block constructed to hold the latter yieldingly or with elastic pressure in contact with the conductor. I further propose to employ in connection with such carbon block and its yielding support a socket for the block provided with adjusting devices by which the block may be advanced in the socket as it is worn away by frictional contact with the conductor, and, in cases in which the line conductor has the form of a wire or is so shaped as to afford a narrow bearing-surface for contact with the block, as in the case of a flat conductor-strip, the edge of which is engaged with the carbon, I propose to make the socket with two projecting ears or lugs adapted to project beyond the bearing-face of the carbon block at opposite sides thereof, so as to form guide-flanges to hold the carbon from slipping sidewise out of engagement with the conductor.

As a further improvement in traveling contact devices applicable more particularly to roads in which the conductors are located in underground slotted conduits I propose to employ in connection with a supporting-bar which extends from the vehicle through the slot of the conduit a yielding arm for carrying the contact-piece, said arm consisting of a single piece of spring metal bent into a coil adjacent to its point of attachment to the supporting-bar, said coil affording freedom of movement both vertically and laterally in the free end of the arm.

The invention embraces also certain details of construction in devices of the character referred to, as will hereinafter fully appear.

In the accompanying drawings, illustrating my invention, Figure 1 is a side elevation of the traveling contact device. Fig. 2 is a view of the same from beneath. Fig. 3 is a detail section taken on line 3 3 of Fig. 2. Fig. 4 is a cross-section taken on line 4 4 of Fig. 3. Fig. 5 is a detail section taken on line 5 5 of Fig. 1. Fig. 6 is a detail section, taken on line 6 6 of Fig. 1, through the carbon contact-piece. Fig. 7 is a view in cross-section of an electric-railway conduit, showing a traveling contact device embodying my invention therein.

As shown in said drawings, A indicates a supporting bar or standard which is attached to the vehicle and passes downwardly through the slot of the conduit to support the traveling contact devices therein. To the lower end of said bar is attached a frame B, on which the several parts of the two upwardly-pressing contact devices are mounted, the latter being in this instance shown duplex or double, so as to adapt them for use in roads having both a supply and return conductor for the current. Said frame I prefer to make of insulating material of proper strength and hardness, vulcanized fiber or vulcanite being the material which I consider best adapted for the purpose. Said frame B is herein shown as consisting of two parallel longitudinally-arranged bars B′ B′, Figs. 2, 4, and 5, secured at opposite sides of the supporting-bar A and connected at their ends by means of filling-pieces B^2 B^2 and bolts *b b*, which pass through the bars and filling-pieces in the manner shown. The wires or conductors *a a*, which lead from the motor on

the car to the contact devices, pass through longitudinal passages or channels in the bar A and are led from the lower end of said bar through the space between the frame-bars B′ B′ to metal blocks or plates C C, which are secured to the outer faces of the frame, one at each side of the latter. Other metal plates D D are also secured to the outer faces of the frame conveniently by means of the bolts *b b*, and the said plates C and D at each side of the frame are connected by means of a fuse-strip C′, attached at its ends to the said plates by means of screws *c d*.

E E indicate two spring-arms adapted to support the two contact-pieces F, which run in contact with the line conductors. Said arms are located at opposite sides of the frame A and at opposite ends of the same, the arms being attached to the ends of the frame and extending toward the middle thereof, so that the contact pieces or brushes are adapted to swing in vertical planes at opposite sides of the frame between the ends thereof. Both of said arms and the parts connected therewith are alike, and a description of one will therefore serve for both.

To now describe in detail the construction of one of said arms E and its related parts, said arm consists of a single piece of spring wire or rod, which is rigidly secured at one end to the frame and which carries the contact-piece at its free end. Said rod is bent to form a coil *e*, located adjacent to its end which is attached to the frame B. The ends of the rod or wire extend in the same direction from the coil *e* and are substantially parallel with each other, the coil being located at the side of the frame with its central axis horizontal and transverse to the frame-bars. The shorter end *e′* of the arm is secured to the outer side face of the frame-bar B′, near the end of the same, while the longer end, which forms the arm E, extends in a vertical plane generally parallel with the side face of the frame, toward the center thereof. By this location of the coil the free end of the arm E is adapted to move or swing in a vertical plane and is also afforded a considerable degree of lateral or sidewise movement.

As a means of adjustably attaching the spring-arm to the frame the end *e′* of the arm is bent backwardly on itself, so as to form a flat loop e^2, Figs. 1, 4, and 5, which rests flat against the outer side face of the frame-bar B′. The said end *e′* of the arm is secured to the bar by means of two bolts, one of which, the bolt *b*, hereinbefore mentioned, passes through the part of the loop e^2 nearest the coil, and the other of which, *b′*, Fig. 5, passes through the outer part of the loop and through a curved or segmental slot b^2, Figs. 3 and 5, in the frame-bar B′, said slot being arranged concentrically with respect to the bolt *b*, so that the angular position in which the arm E is secured to the frame may be adjusted, as desired, by shifting the bolt *b′* toward one end or the other of said slot b^2.

To afford a better and stronger attachment of the arm *e′* to the frame-bar B′, a plate G is placed outside or over the said loop b^2 between the heads of the securing-bolts *b b′* and said loop. Said plate G is provided with two bolt-holes *g g′* and with an inwardly-turned end g^2, Fig. 5, which engages the bent or rounded extremity of said loop e^2. Said plate G not only serves to distribute the pressure of the bolts over the entire length of the loop e^2 and to thereby more securely hold or clamp the arm E in place, but its bent end g^2, by engagement with the extremity of the arm, positively holds the same from shifting or moving inwardly on the frame, any movement of the arm in the opposite direction or outwardly being positively prevented by the engagement of the bolt *b′* with the inner end of the loop e^2.

Now referring to the construction of the brushes or contact-pieces carried on the ends of the arms E E, the same are constructed as follows: H, Figs. 1, 2, 6, and 7, indicates a metal carbon holder or socket, the same consisting of a cast-metal shell open at its top and provided with integral bottom, side, and end walls. The holder H is shown as connected with the spring supporting-arm E by means of an extension or shank H′, extending horizontally at the end of the holder nearest the arm, to which shank the arm is secured. As a means of securing the arm to the shank the latter is provided with upper and lower flanges *h h*, forming a socket or recess at one side of the shank, and the free end of the arm E is bent backwardly on itself to form a loop e^3, which is adapted to fit closely within the said recess, between the top and bottom flanges *h h* thereof. Said loop is secured to the shank by means of two holding-bolts *h′ h′*, inserted through the loop e^3 and the shank, the bolt nearest the body of the holder engaging the end portion of the loop, which end portion of the loop is confined between said bolt and the inner end of the recess of the shank, so as to prevent possibility of any endwise movement of the loop on the shank. Within the carbon-holder H is located a block I of hard carbon, said block fitting within the holder, and being made of uniform size or with parallel side and end surfaces, so that it may slide or be moved up or down in the holder. As shown in the drawings, the recess of the holder is rectangular in shape and its side walls are much longer than its end walls. Beneath the block is placed a follower J, consisting of a flat plate of metal, and two adjusting-screws J′ J′ are inserted through the bottom of the holder and bear against the said follower. Said adjusting-screws are employed to advance the follower and to thereby push the carbon block upwardly or outwardly, when necessary, by reason of the wearing away of its upper surface, which is in contact with the conductor. Jam-nuts *j*, placed upon the set-screws J′, serve to hold said set-screws from turning after adjustment thereof. A leaf-spring *j′* is secured to one of the walls of the holder in

such manner as to act upon one side or end of the carbon block and serves to hold the same from accidental displacement or dislodgment from the holder. For the purpose of insuring engagement of the contact device with the conductor, notwithstanding the relative lateral movement of the parts that may occur in passing around curves or by reason of the lateral movement or swinging of the supporting-bar, the holder H is provided with lateral guide-flanges H^2, conveniently formed by upward extensions of the side walls of the holder.

For limiting the upward movement of the free end of the arm E and the brush or contact device thereon any suitable means may be employed, that herein shown consisting of a chain K, attached at one end to a lug h^2, cast on the rear surface of the shank H′ of the carbon-holder, and at its opposite or lower end to the frame-piece B′ by means of a screw k.

The traveling contact device embracing two spring-arms and brushes thereon, as above described, is one adapted to act upon two contact-strips or conductors extending longitudinally of the conduit in the upper part thereof, such conductors being indicated at L L in Fig. 7, which shows the contact device in end view in connection with the adjacent parts of a conduit. A traveling contact device embracing the same features of construction may, however, be applied to the conductors, against which the contact-pieces act with lateral or outward pressure instead of upwardly, and the contact device shown in the accompanying drawings is provided with a separate or additional set of spring-arms M M, which carry brushes or contact-pieces and are secured to the lower part of the frame B in such manner as to swing or move laterally in a horizontal plane below said frame, as clearly shown in Fig. 1 and also in Fig. 7. A traveling contact device thus equipped with two sets of spring-arms and contact-pieces may be employed with great advantage in cases where it is desired to run a car over two lines having conduits which are differently equipped or provided with differently-arranged conductors—as, for instance, in one part of a line a shallow conduit may be used having conducting-strips L L in its upper part, such as are shown in Fig. 7, while another part or a section of the road may have a conduit provided with conductors such as are shown at L′L′ in Fig. 7, the same being arranged at a lower level and having vertical contact-faces, against which the contact-pieces or brushes are adapted to rest or bear. Obviously a contact device made as described may pass from one set to another of conductors arranged as described without requiring any adjustment or change of the parts or any attention on the part of the person operating the car, while at the same time, by reason of the compact form of the duplex contact device as a whole, it occupies little vertical space in the conduit, and the latter need not be unduly or exceptionally deep or large to permit its passage through the same.

Referring more in detail to the means shown for attaching such auxiliary arms M M to the frame B, said arms are attached to the ends of the frame and extend inwardly or toward the center thereof. A support for each arm is formed by means of a flat horizontally-arranged plate N, which is secured to the bottom surface of the frame-bars B′, Figs. 1, 2, 3, 4, and 5, and projects beyond the end of said bars, said plate being conveniently secured to the frame by means of two vertical bolts n n', which pass through the space between the frame-bars and engage at their upper ends a flat top plate N′, which rests upon the upper edges of the bars and extends between the same, as clearly seen in Fig. 4. The said spring-arm M is provided with a coil m and with a shorter arm m', which is bent to form a loop m^2, which is secured to the plate N by means of bolts n^2 n^3 and a bent plate O in the same manner as before described in connection with the main arm E. To afford angular adjustment of the arm M, said bolt n^3 passes through a curved slot n^4 in the plate N, as clearly seen in Fig. 5. Said arm M is connected electrically with the wires a a by means of a metal strip D′, which is attached at one end to the block D by a screw d' and at its opposite end is engaged with and confined by the upper end of the bolt n. To the outer end of the arm M is attached a carbon-holder P, carrying a carbon block Q and attached to the arm M by means of a shank P′, having flanges p p and bolts p' p^2, which pass through a loop m^3, formed by bending the extremity of the said arm M. A chain R, attached to the carbon-holder and to the bottom of the frame, serves to limit the outward movement of the free end of the arm M in the same manner as before described. The carbon-holder P is like that before described, with the exception that the contact devices are adapted in this instance to act against a conductor-strip having a flat vertical face, and guide-flanges on the carbon-holder are therefore omitted, the carbon block being adapted to project from the open end of the holder, so as to bear upon the vertical flat contact-face of the conductor, as clearly seen in Fig. 2.

The traveling contact device constructed generally as herein described—namely, with horizontally-extending frame-pieces and with movable contact-pieces or brushes supported by spring-arms consisting of wire rods provided with coils and constructed and arranged in the manner shown—has the general advantage of occupying a very narrow space vertically in the conduit, while at the same time of having no pivotal joints that are liable to become worn or get out of order. Moreover, the spring-arms, having integral coils between their ends, afford all necessary movement in the contact-pieces both vertically and laterally. These general features of con-

struction may obviously be employed in connection with any suitable form of brush or contact-piece for engagement with the conductor, and as far as such features are concerned a pulley or trolley may be employed to run in contact with the conductor as well as the carbon-block contact device herein described.

The employment in connection with a line conductor or conducting-strip and a traveling contact device provided with a yielding or spring support for the contact-pieces or brush of a contact-piece or brush consisting of a carbon block having adjustable connection with its spring-support is found to produce superior and improved results as compared with trolley-wheels or metal contact-pieces, such as have been commonly heretofore used for the same purpose. It is found that the carbon blocks, when made of suitably-hard carbon, will become worn away by the friction of the conductor practically no faster than metal, while at the same time they act to transmit the electric current in a better manner.

By providing means for the adjustment of the block with respect to the spring-support by which it is held in contact with conductor the support may be maintained at all times in the same position with respect to the conductor and will therefore act with an equal or uniform pressure thereon, notwithstanding the wearing away or shortening of the block. Obviously in case the block were worn away to a considerable extent without compensating adjustment in the construction shown the spring supporting-arm would rise and would act with less pressure or tension on the conductor than when the block is of full length, and the same result would follow in the use of any kind of a spring or yielding support for the carbon block. By adjusting the block upwardly as it wears away, however, the arm may be caused to remain at practically the same angle and its coiled spring under the same tension, so as to act with the same force or power in pressing the carbon block against the conductor.

The construction of a contact-piece embracing a socket or holder containing a carbon block which is exposed at the opening of the holder and which may be advanced from the holder as it is worn away by means of suitable adjusting devices, acting to advance the block in the socket, constitutes in itself an important and novel improvement, it being found that such construction affords the greatest facility of adjustment and renewal and therefore great economy in use.

I claim as my invention—

1. A traveling contact device for conduit electric roads, comprising a supporting-bar, a frame of insulating material carried by the same, a contact-piece and a spring-arm for supporting the contact-piece, comprising a single piece of spring metal bent into a coil between its ends, and attached at one end to the frame, and carrying the contact-piece at its opposite end, substantially as described.

2. A traveling contact device for conduit electric roads, comprising a supporting-bar, a frame of insulating material attached to said bar, a contact-piece, and a spring-arm for supporting the contact-piece, comprising a spring-metal rod or wire bent to form a coil with its ends extending at the same side of the coil in substantially parallel relation, and attached at one of its ends to the supporting-frame and carrying the contact-piece at its opposite end, substantially as described.

3. A traveling contact device comprising a spring-arm, consisting of a wire bent to form a coil, and having its end which is attached to the frame bent on itself to form a loop, and two securing-bolts passing through said loop; said frame having a segment-slot for one of said bolts to afford adjustment of the angle of the arm, substantially as described.

4. A traveling contact device comprising a spring-arm consisting of a single piece of wire bent to form a coil and having its arm which is attached to the frame bent on itself to form a loop, two securing-bolts passing through said loop, and a plate applied between the bolt-heads and the arm and provided with an inwardly-bent end which engages the bent end of the arm, substantially as described.

5. A traveling contact device comprising a spring-arm, consisting of a single piece of wire, which is bent back on itself at its free end to form a loop, of a contact-piece provided with a shank which is recessed to receive the bent end of the arm, and bolts inserted through the looped end of the arm and said shank, substantially as described.

6. A traveling contact device for acting on either one of two conductors located one below the other, and one of which is adapted for upward and the other for lateral pressure, comprising a supporting-bar, a frame consisting of horizontal, longitudinally-arranged bars, a spring-arm attached to the side of the frame and moving in a vertical plane, and a second spring-arm attached to the bottom of the frame and movable in a horizontal plane, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 2d day of July, A. D. 1896.

MYRON D. LAW.

Witnesses:
WM. CROCKER DUXBURY,
F. M. HARRINGTON.