(No Model.) 2 Sheets—Sheet 1.

P. EVANS.

ELECTRICALLY OPERATED RAILWAY SWITCH.

No. 493,918. Patented Mar. 21, 1893.

FIG. 1.

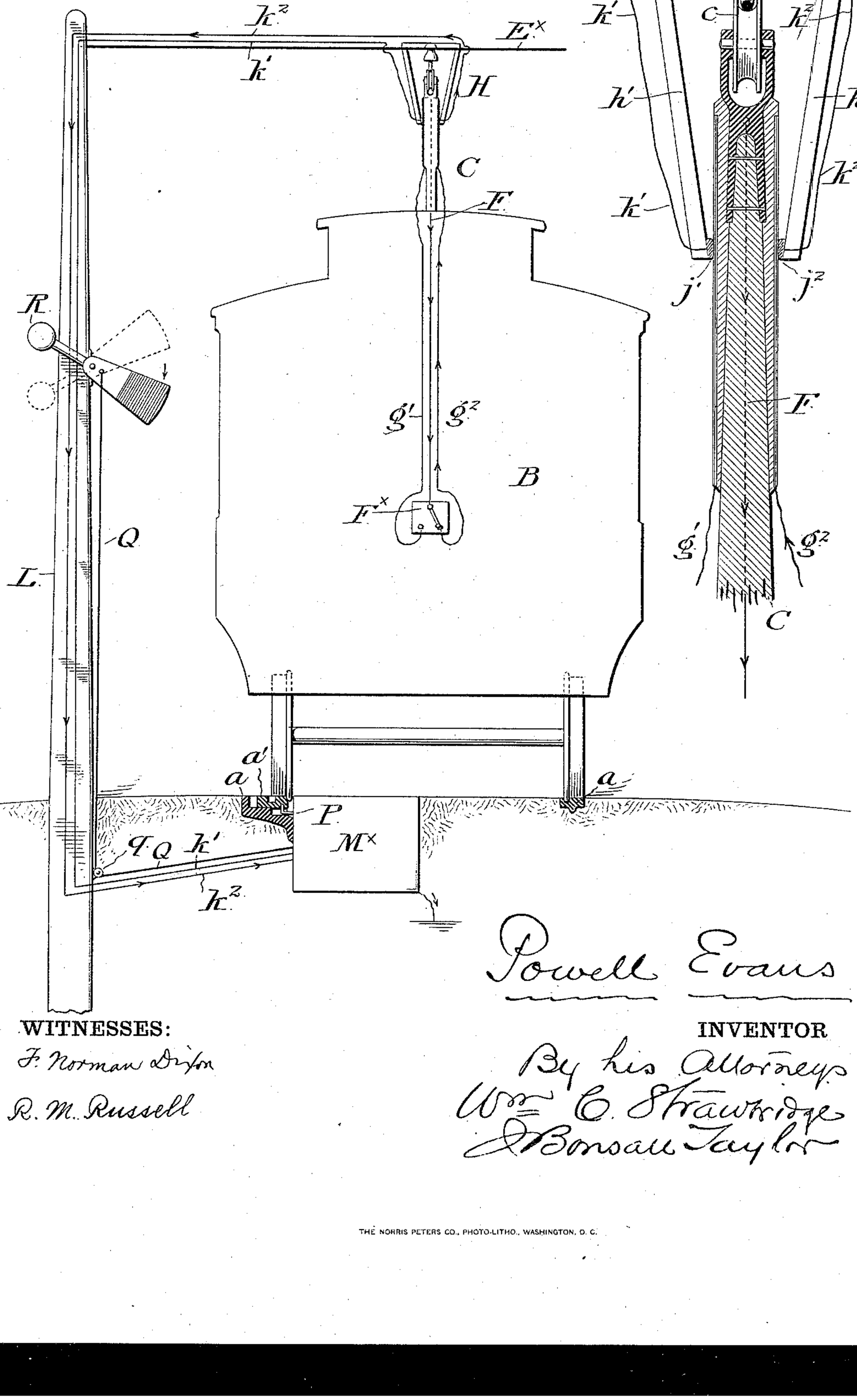

FIG. 2.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

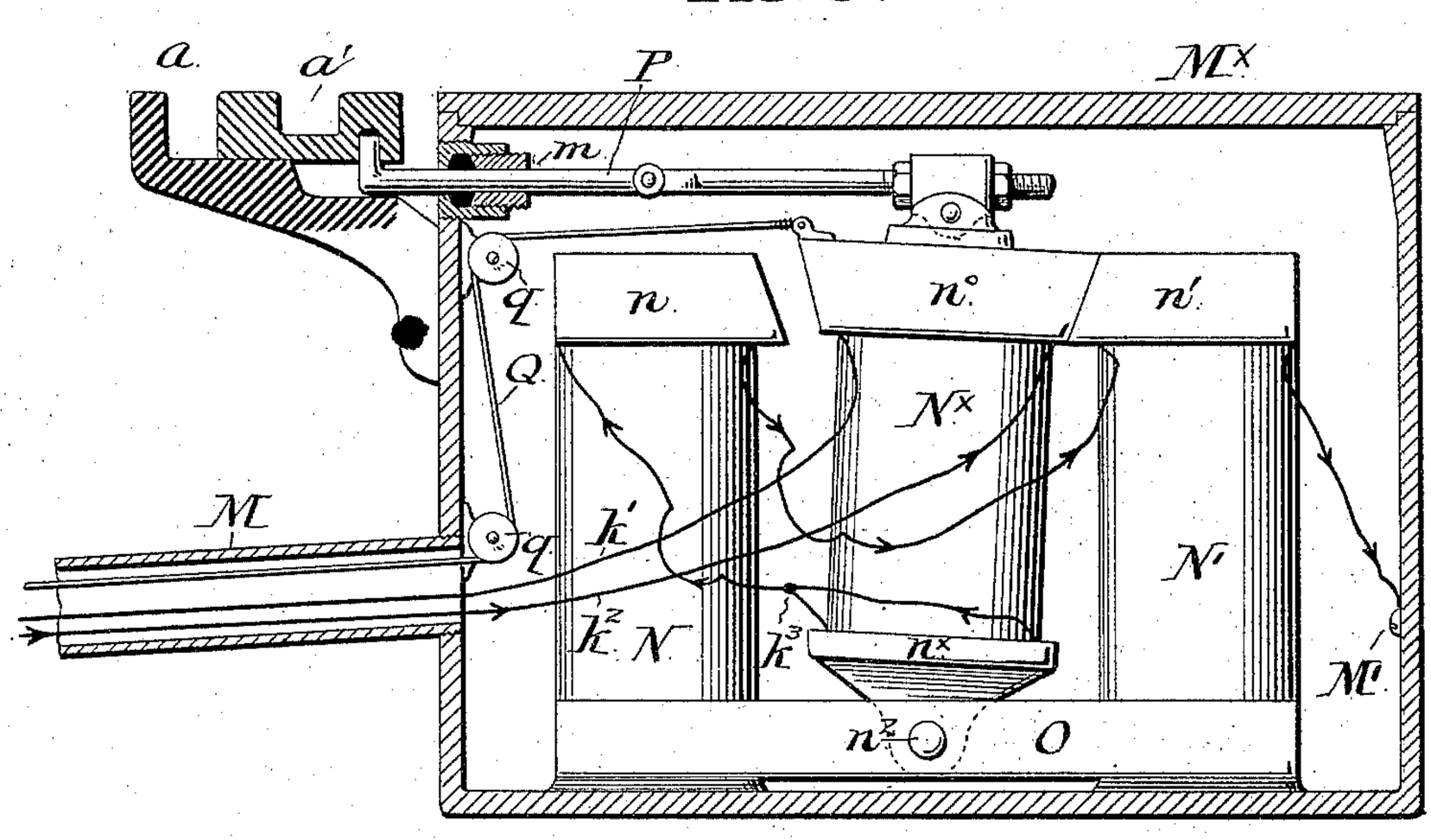
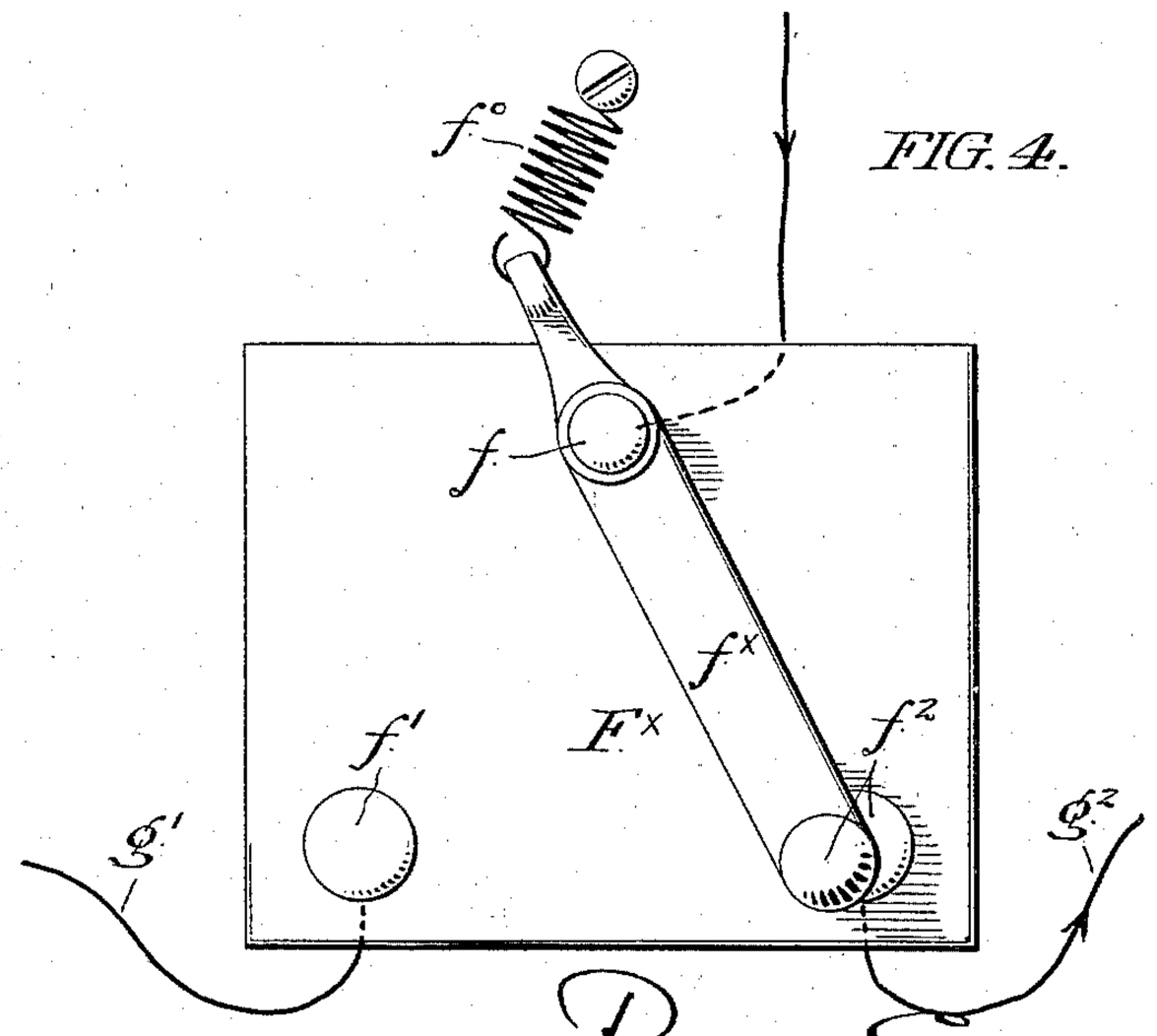


FIG. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

POWELL EVANS, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRICALLY-OPERATED RAILWAY-SWITCH.

SPECIFICATION forming part of Letters Patent No. 493,918, dated March 21, 1893.

Application filed December 7, 1891. Serial No. 414,275. (No model.)

To all whom it may concern:

Be it known that I, POWELL EVANS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Railroads, of which the following is a specification.

My invention relates generally to railway switches and to the mechanism by which the same are operated, and especially to the switches employed in connection with railway or street car lines operated by what is known as the trolley system, or by any system utilizing a stationary current conductor co-extensive with the track.

It is the object of my invention to provide in connection with a switch employed at the point where two lines of rails converge, switch opening and closing mechanism adapted to be electrically operated,—and further to provide conducting appliances part of which are stationary and located in the vicinity of the switch, and part of which are portable and mounted upon and movable with the car, and which being in circuit with the working conductor of the trolley system, or with any suitable source of electric energy, are so arranged as to make contact with and regulate discharge into the stationary conductors, whereby electric energy or force is by the stationary conductors derived from the portable conductors and led to and utilized for the actuation of the switch-operating devices.

The foregoing objects may be attained by resort to various devices, which although mechanically different are yet essentially similar.

The apparatus represented in the drawings and herein described, is a type of such devices conveniently embodying my invention, of which the particular subject matter claimed as novel is hereinafter definitely specified.

In the drawings Figure 1 is an end elevational diagrammatic view of apparatus embodying my invention, representing a car with its trolley arm in contact with the stationary contacts for the purpose of completing the circuit between the working conductor and the switch-operating mechanism. Fig. 2 is an elevational detail of the supporting cage or bracket in which the stationary contacts are mounted. Fig. 3 is a similar view of the switch-operating mechanism. Fig. 4 is a similar view of a circuit controller, being a two-point electrical switch carried by the car.

Similar letters of reference indicate corresponding parts.

In the drawings, a are car rails, and a' a movable rail section or "point" of the rail switch for the operation of which the mechanism represented is employed.

B is a car adapted to run upon the rails and provided with a trolley arm C equipped with a contact roller c making electrical contact with a working conductor D supported by a suitable insulating bracket E suspended from a permanent rod or wire $E^{\times}$ extending across the roadway.

A conductor F in circuit with the contact rollar c extends down the trolley arm to the pivot or main terminal f of a circuit controller $F^{\times}$ located at a point convenient for operation by the driver in charge of the car. The pivot f is in circuit with a switch arm $f^{\times}$ adapted to make alternate contact with two branch contacts or terminals f' f^2, from which in turn lead the two conductors g' g^2. To the upper extremity of the switch arm is connected a spiral balance spring f°, which, being secured to a permanent portion of the frame work, tends to maintain the switch arm in vertical position midway between the terminals f' and f^2, with either of which it may be manually moved into electrical contact.

The conductors g' g^2 extend upward along the trolley arm and conveniently terminate respectively in contact plates or castings respectively located on opposite sides of the arm, and insulated from each other and from the conductor F.

H is a supporting cage, as I term it, conveniently depending from the supporting rod $E^{\times}$, being a fixture in the vicinity of the switch, and being provided with conductors with which the conductors of a trolley car can make brief contact in passing. This cage may be of any preferred form or arrangement. It is shown as consisting of a horizontal frame h, from which upon opposite sides of the working conductor D depend two arms h' h^2 which gradually converge until the space between their lower extremities, which are abreast the contact plates g' g^2 of the trolley

arm, is narrow enough for the trolley arm in passing between them to make contact with both. To facilitate this result, the inner faces of the said arms h' h^2 are respectively equipped with lateral contact plates j' j^2 from which lead conductors k' k^2 extending to one side of the roadway to and downward along a suitable pole or standard L to a point beneath the surface of the ground, where they conveniently enter and pass through a conduit M leading from said pole to the switch-operating mechanism, and slightly inclined away from said mechanism to discharge by gravity any water gaining access to it, and prevent any such access.

The conductors k' k^2 are employed to energize field magnets to occasion the alternate throw of an armature which by its physical connection with the switch in turn operates the switch. The arrangement of devices employed for the purpose, as illustrated especially in Fig. 3 of the drawings, is as follows:—

$M^\times$ is a box casing or chamber, with which the inner end of the conduit M makes tight contact, placed in the ground, rigidly connected in suitable manner with the switch casting, and containing an electro-magnet of the following character:—

N N' is a pair of field magnets, and $N^\times$ an armature mounted free for alternate movement from one to the other of said field magnets. This armature is conveniently mounted upon a suitable core-block $n^\times$ pivoted at n^2 upon a common yoke plate O. The field magnets and the armature are provided with pole pieces designated n n° and n' respectively, which in the movement of the armature $N^\times$ prevent the body of the latter from striking the bodies of either of the stationary magnets.

P is a suitably jointed arm rigidly connected with the armature $N^\times$, and extending out through a suitable packing box m in the walls of the magnet chamber $M^\times$ to the switch rail, where its outer end is suitably connected with the switch rail, conveniently as shown.

The packing box is adapted to be introduced from within the magnet chamber.

Q is a flexible cord attached to the armature $N^\times$ and leading therefrom over suitable guide rolls q through the conduit M and up the pole L where it is connected to a counterweighted semaphore R mounted upon said pole. As is obvious, the different positions of the armature $N^\times$ will through the cord control the set of the semaphore and indicate the position of the switch. The conductor k', entering the chamber, is coiled from left to right around the core of the armature $N^\times$, thence passes to and around the core of the field magnet N, thence passes to and around the core of the field magnet N' and is then grounded at M'. The conductor k^2, similarly entering the chamber, is coiled around the armature $N^\times$ in a direction opposite to that of the conductor k', that is, from right to left, and said conductor is then joined at k^3 to the conductor k'. The winding of the coils N and N' is such that when energized said coils are of constant opposite polarity.

The polarity of the armature will alternate according to the establishment of a current through its coil composed of the wire k', or through its coil composed of the wire k^2,—it being obvious that when its polarity is north it will be attracted by the field magnet N', the polarity of which is assumed to be south, and repelled by the field magnet N, the polarity of which is assumed to be north,—and will therefore be tilted on its pivot to the right, carrying with it the switch rail, and setting the semaphore arm accordingly. An opposite polarity will occasion an opposite movement of the aforesaid parts.

The conductor F which leads from the contact roller of the trolley arm down to the circuit controller $F^\times$, may if desired be employed as a conductor between the working conductor and the car motor.

The stationary conductors and their contact pieces j' j^2, as will be understood, are normally out of circuit, while the conductor F, which terminates at the pivot f of the circuit controller $F^\times$ is normally in circuit with a source of electric supply or energy, such source being, in the construction under consideration, the current existing in the working conductor D. The conductors g' g^2 which extend from the terminals f' f^2 of the circuit controller to such position that they will in the travel of the car be carried into contact with the contact plates j' j^2, are normally out of circuit, but are respectively adapted to be placed in circuit with the working conductor E through the conductor F, by the setting of the switch arm $f^\times$ in contact with one or the other of the terminals f' f^2. When either of said conductors therefore is in the circuit with the conductor F, said conductor becomes in effect a continuation of said conductor F and for the time being in circuit with the working conductor E as explained.

The operation of the device will be readily understood: The driver of the car perceives in advance by the set of the semaphore arm whether the switch is set in the desired position. If it then happens to be correctly set, the switch arm $f^\times$ is allowed to remain in a vertical position, and the conductors g' and g^2 being out of circuit with the conductor F, are in the passage of the trolley arm between the arms h' h^2 of the cage, carried into contact with, but without affecting, the conductors k' k^2 or their connections. If on the contrary the switch requires to be moved, for instance to the right, the driver moves the switch arm $f^\times$ into contact with the terminal f^2 and thereupon the current of the conductor F is directed up along the wire g^2 and its terminal plate, so that when the trolley arm moves into contact with the cage the current of the conductor g^2 will be continued through the contact piece j^2 and wire k^2, and will in-

duce, for instance, north polarity in the armature $N^{\times}$ and thereby occasion, as explained, the shifting of the armature and switch to the right. The operation of moving the switch to the left is correspondingly opposite to that above described.

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

1. In combination with a relatively stationary structure a depending portion of which forms a guide for a trolley arm or kindred device,—conductors independent of each other mounted upon said structure and having contact pieces laterally disposed with respect to said depending portion, said conductors being adapted to form parts of independent circuits, and being each electrically connected with mechanism adapted to be operated upon the closing of the circuit,—as a means for closing, from a traveling device, a selected one of the several circuits of which said conductors form parts,—a traveling device, such as a trolley arm, equipped intermediate of its length with laterally disposed independent conductors, which latter are, in the travel of the movable device past the stationary structure, carried into contact with the contact pieces of said stationary structure,—and means for electrically connecting the conductors of the traveling device with a source of electricity, substantially as set forth.

2. In combination with a movable device such as a trolley arm,—conductors, out of circuit with each other, mounted upon said arm, and having contact pieces intermediate of the length of the arm,—a relatively stationary structure embodying a passage way through and in contact with the sides of which said arm passes in its travel, and conductors mounted upon the stationary structure in such position as to be encountered each by an appropriate contact piece of the trolley arm, substantially as set forth.

3. In combination with a movable device such as a trolley arm mounted upon a vehicle and equipped with two conductors out of circuit with each other and existing respectively on opposite sides of said arm,—a relatively stationary structure comprising a pair of arms between and in contact with both of which said trolley arm passes in the travel of the vehicle,—and conductors mounted one upon each of said stationary arms and existing respectively on the inner faces of said arms for contact with the conductors of the trolley arm, substantially as set forth.

4. In an apparatus for the control of a switch, in combination with switch operative mechanism contained in a closed casing, as a means for communicating the regulated movement of the operative mechanism to the switch, a rigid shaft bar or pitman passing through and suitably packed with respect to the wall of the said casing, substantially as set forth.

5. In an apparatus for the control of a switch, in combination with electrically operated switch controlling mechanism in communication with a source of electric supply, and contained in a closed casing, as a means for communicating the desired movement of said mechanism to the switch, a horizontally disposed rigid shaft bar or pitman passing through and packed with respect to the wall of the casing, and having an outer end adapted for engagement with the switch rail, substantially as set forth.

6. In combination with a car carrying conductors in regulated contact with a source of electrical supply, a switch-operating mechanism consisting of a movable armature, means for connecting said armature with a switch, a pair of electro-magnets situated respectively on opposite sides of the armature, and a pair of conductors, the upper portions of which are adapted to be encountered by the conductors on the car, and the lower portions of which are wound oppositely around the armature and then connected with each other and continued as a single conductor to and around both magnets in a common direction, substantially as set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 4th day of November, A. D. 1891.

POWELL EVANS.

In presence of—

F. NORMAN DIXON,

R. M. RUSSELL.