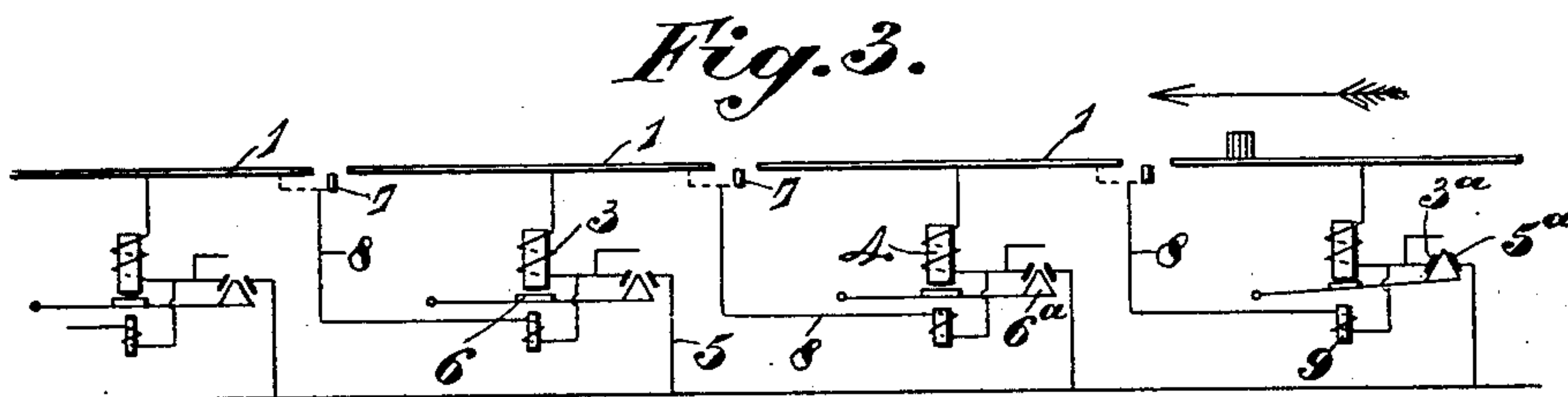
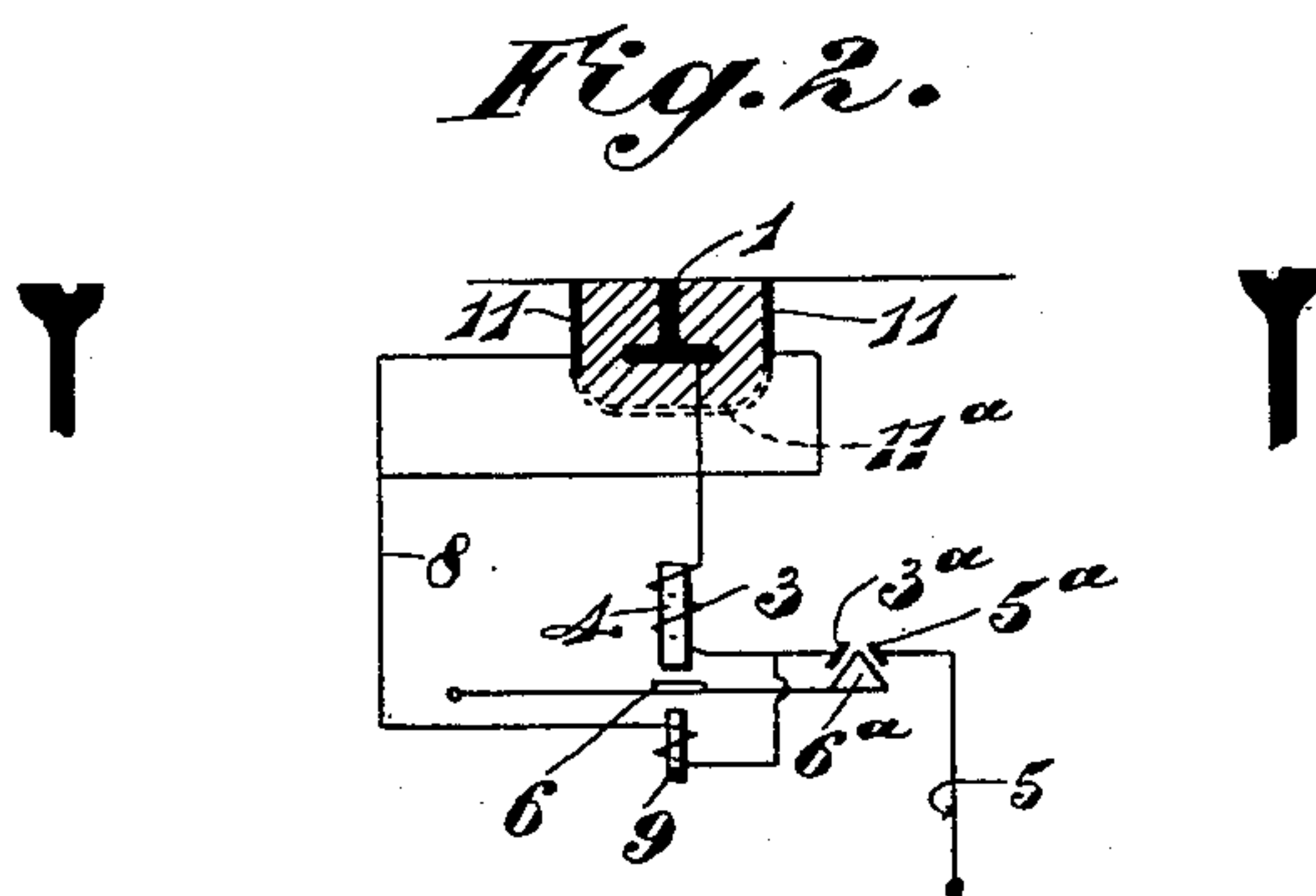
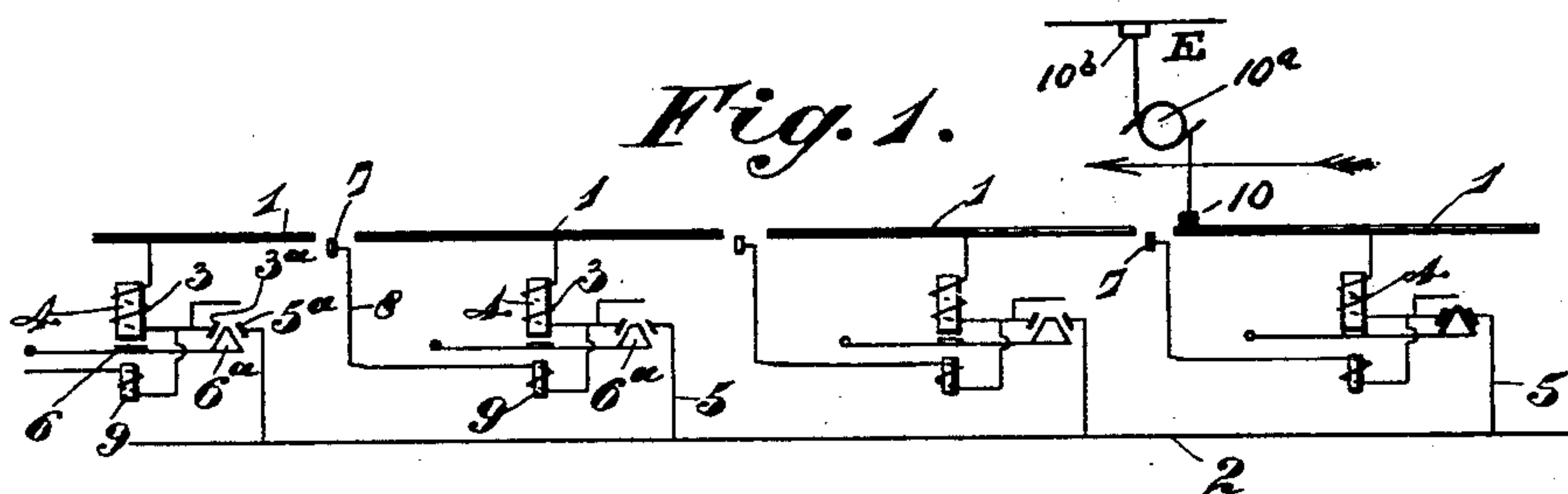


(No Model.)

D. URQUHART & F. WYNNE.
ELECTRIC RAILWAY.

No. 591,706.

Patented Oct. 12. 1897.



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UNITED STATES PATENT OFFICE.

DAVID URQUHART AND FRANK WYNNE, OF LONDON, ENGLAND.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 591,706, dated October 12, 1897.

Application filed November 17, 1896. Serial No. 612,457. (No model.)

To all whom it may concern:

Be it known that we, DAVID URQUHART and FRANK WYNNE, subjects of the Queen of Great Britain and Ireland, residing at Westminster, London, England, have invented Improvements in Electric Railways, of which the following is a specification.

This invention has reference to electric tramways and railways in which the electric energy required is generated at a fixed point or points and conducted to the motor on the vehicle to be electrically propelled (hereinafter called the "car") by means of fixed insulated conductors and a series of suitably insulated short contact-surfaces exposed in the roadway and hereinafter called "road-contacts," such road-contacts being automatically connected by some suitable switch device to the electrical main when the car is over or nearly over them and automatically disconnected from such main when the vehicle has passed them, the car being provided with a brush or collector which rubs on the road-contacts, thus connecting the driving-motor to the electric main. Usually an electromagnet is employed to actuate the switch which is to connect the road-contact over which the vehicle may for the time being be situated to the electric main, this electromagnet when energized attracting an armature or keeper which by its motion closes the switch against the force of gravity or against a spring, or both, so that on the electromagnet ceasing to pull the switch will automatically open and disconnect the road-contact from the electric main, as well understood. In all cases where the electromagnet which actuates the switch has a winding carrying the main current it may happen under certain conditions that there will be sufficient leakage from the road-contact just left to the road-contact ahead to keep the magnet-armature attracted, thus preventing the switch from automatically opening; and this invention has for its object to obviate this disadvantage. For this purpose, according to one arrangement, we place a conducting bar or plate, (hereinafter called a "guard-plate,") preferably sunk in the roadway, in the center of the gap between consecutive road-contacts, and connect it to the main conductor through the switch of a trailing road-

contact, a second or pull-down electromagnet being inserted in the connecting-lead, so that any leakage-current that may flow will then pass principally round this pull-down electromagnet and insure the opening of the switch. 55

Figure 1 of the accompanying drawings shows, diagrammatically, one arrangement of this kind applied in connection with means or apparatus of the kind herein referred to for electrically connecting a motor on a car to an insulated main conductor. Fig. 2 is a cross-section showing, diagrammatically, a modified arrangement. Figs. 3 and 4 are respectively a side elevation and plan showing, diagrammatically, another modification; and Fig. 5 is a plan showing a further modification. 60 65 70

Referring to Fig. 1, 1 1 are insulated road-contacts in the form of short bars arranged longitudinally of the roadway and each adapted to be placed in electrical connection at the proper time with an insulated main conductor 2 through the winding 3 of an electromagnet 4 and a conductor 5 by a spring or gravity switch-lever 6, which forms an armature to the electromagnet and carries an insulated contact-piece 6^a, which bears, when the switch-lever is attracted, against contacts 3^a and 5^a on the normally free ends of the winding 3 and conductor 5, respectively, the said switch-lever automatically moving away from such contacts when the circuit of the electromagnet is broken, as well understood. 75 80 85

7 7 are conducting guard-plates each placed in the gap between the ends of successive road-contacts 1, preferably sunk in the roadway below the level thereof and connected by a conductor 8 to the main conductor 2 through the switch of the adjacent trailing road-contact—that is to say, the switch of the road-contact to the rear of it. In the example shown the conductor 8 is connected to the conductor or winding 3 of the trailing road-contact at a point between the corresponding electromagnet 4 and the contact 3^a, and included in it is an electromagnet 9, arranged below the switch-lever 6, which forms an armature to it. 90 95 100

10 is the car-contact brush arranged to travel on the road-contacts 1 and connected to one pole of the car-motor 10^a, the other

pole of which is connected to a contact 10^b in connection with an earth-action conductor E. With the arrangement described a leakage-current passing round the winding of the electromagnet 9 will energize this magnet and cause it to pull down the switch-lever 6 and break the circuit between the corresponding road-contact and the main conductor 2. Under certain conditions there may also be sufficient leakage from the road-contacts 1 to earth to keep the switch, with main-current winding 3, closed. This we obviate by placing a metal bar or rail 11 on each side of each road-contact, as shown in full lines in Fig. 2, these bars being connected to the main conductor 2 when the corresponding switch is closed, but through the winding of the pull-down magnet 9, as in Fig. 1, and not through the winding of the switch-magnet.

Instead of two bars we sometimes place a curved plate or channeled bar round each road-contact, but insulated therefrom, so as to cut off leakage from it. Such a curved plate or channeled bar, which would inclose the road-contact except on its upper surface, is indicated by the full and dotted lines 11 11^a in Fig. 2, the insulating material in which the road-contact 1 is placed being indicated at 12. The channeled bars 11 11^a may be used to carry the insulated main conductor 2, as indicated at 2^a. In each case the bar 7 or bars 11 or channel 11 11^a, as the case may be, will by the arrangement described be at about the same potential as the corresponding road-contact, so that no leakage-current can pass through or over the insulation 12, and all leakage-current must take place from the bars 7 or 11 through the leads 8 and switch-contact 3^a, and will thus help to open the switch even if no pull-down electromagnets 9 be included in the leads. Each bar 7, placed between two consecutive road-contacts, as in Fig. 1, may be formed with a side projection 7^a, so placed, as shown, for example, in Figs. 3 and 4, that the car-contact brush 10, which in this case will be provided with a short lateral extension, shall touch it after leaving the road-contact to the rear of it, thus insuring the passage of a momentary current through the pull-down magnet 9 corresponding to such road-contact and the disconnection of such road-contact from the main conductor. Such additional forward side projections 7^a might obviously be combined with guard-rails or a channel-bar arranged at the sides of or surrounding the next rearward road-contact, as shown, for example, in plan in Fig. 5, where it is represented as connected to a channeled bar 11 11^a, surrounding the rearward road-contact.

We have described our invention as applied to cars carrying a relatively short collecting brush or brushes rubbing on relatively long road-contacts, or, it may be, groups of road-contacts, the contacts in each group being electrically connected together; but our invention can be equally applied to cars

provided with a long contact bar or brush rubbing on short studs or plates placed in the roadway. Any known or suitable means may be used for energizing the electromagnets of the switches in succession as the vehicle to be propelled travels along the track.

What we claim is—

1. In apparatus of the kind herein referred to for supplying electricity to electrically-propelled vehicles, the combination with road-contacts, a main conductor, and electromagnetic devices or switches for successively placing said road-contacts in connection with said main conductor, of conducting guard plates or rails located in proximity to the road-contacts and adapted to be connected to the main conductor by the switch of the corresponding road-contact and to be then placed in parallel with the electromagnetic winding of the said switch substantially as described for the purpose specified.

2. In apparatus of the kind herein referred to for supplying electricity to electrically-propelled vehicles, the combination with road-contacts, a main conductor, and electromagnetic devices or switches for successively placing said road-contacts in connection with said main conductor, of conducting guard plates or rails located in proximity to the road-contacts and each connected to a conductor adapted to be placed by the switch of the corresponding road-contact in direct connection with said main conductor when said switch is closed, and electromagnetic devices arranged in the conductors connected to the guard plates or rails and each adapted when excited to open or assist in opening the corresponding switch, substantially as described.

3. In apparatus of the kind herein referred to for supplying electricity to electrically-propelled vehicles, the combination with road-contacts, a main conductor, and electromagnetic devices or switches for successively placing said road-contacts in connection with said main conductor, of conducting guard plates or rails and connected leads arranged in parallel with said switches; and adapted to be directly connected with said main conductor when the corresponding switch is closed and electromagnetic devices included in said leads and adapted when energized to open the corresponding switches, said conducting guard plates or rails being arranged in proximity to said road-contacts and having a part exposed in the roadway so as to come into electrical connection with the car-contact moving over the same substantially as described for the purpose specified.

4. In apparatus of the kind herein referred to for supplying electricity to electrically-propelled vehicles, the combination with road-contacts, a main conductor, and electromagnetic devices or switches for successively placing said road-contacts in connection with said main conductor, of channeled bars surrounding said road-contacts but insulated therefrom, and leads connected to said chan-

neled bars and adapted to be placed in direct connection with said main conductor when the corresponding switch is closed, substantially as described.

5 5. In apparatus of the kind herein referred to for supplying electricity to electrically-propelled vehicles, the combination with road-contacts, a main conductor, and electromagnetic devices or switches for successively
10 placing said road-contacts in connection with said main conductor, of channeled bars surrounding said road-contacts but insulated therefrom, leads connected to said channeled bars and adapted to be placed in direct con-
15 nection with said main conductor when the corresponding switch is closed, and electromagnetic devices arranged in said leads and adapted when energized to open or assist in opening said switches, substantially as de-
20 scribed.

6. The combination with road-contacts 1, a main conductor 2, and switches each comprising a magnet-winding 3 connected with a road-contact and with a contact 3^a a magnet-
25 core 4 on which said winding is coiled, a conductor 5 connected with said main conductor and with a contact 5^a and a switch-lever serving as an armature to said magnet-core and adapted when in its closed position to elec-
30 trically connect said contacts 3^a and 5^a, of channeled bars 11, 11^a containing insulating material in which said road-contacts are em-

bedded, leads 8 connected with the winding 3 between the corresponding cores 4 and con-
tacts 3^a, and electromagnets 9 arranged in 35 the leads 8 and adapted to assist in the opening of the corresponding switch-levers, substantially as described for the purpose specified.

7. The combination with road-contacts, a 40 main conductor, and switches adapted to successively place said road-contacts in connection with said main conductor of channeled bars 11, 11^a containing insulating material in which said road-contacts are embedded, leads 45 8 connected with the winding 3 between the corresponding cores 4 and contacts 3^a, electromagnets 9 arranged in the leads 8 and adapted to assist in the opening of the corresponding switch-levers, and forward projections 7^a ex- 50 posed in the roadway, each of said projections being arranged in proximity to a road-contact and connected with the channeled bar of the road-contact to the rear of it, substan-
tially as described for the purpose specified. 55

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

DAVID URQUHART.
FRANK WYNNE.

Witnesses:

JAMES M. SMALL,
WM. HATES.