No. 638,186. Patented Nov. 28, 1899.

D. ROBERTSON, JR.

SURFACE CONTACT ELECTRIC RAILWAY.

(Application filed June 9, 1899.)

(No Model.)

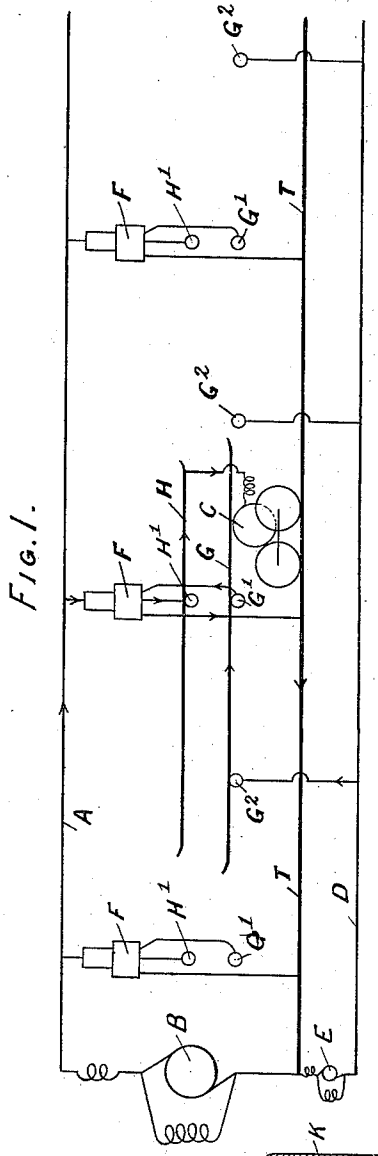

FIG. 1.

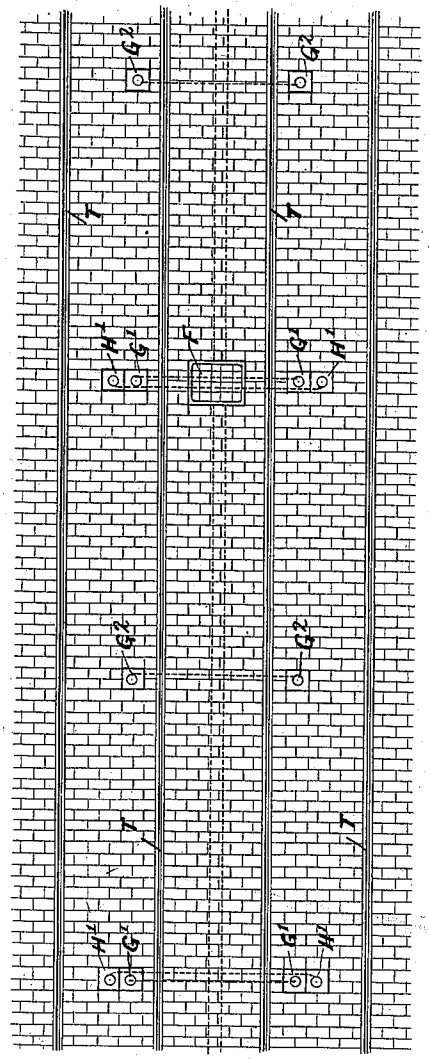

FIG. 2.

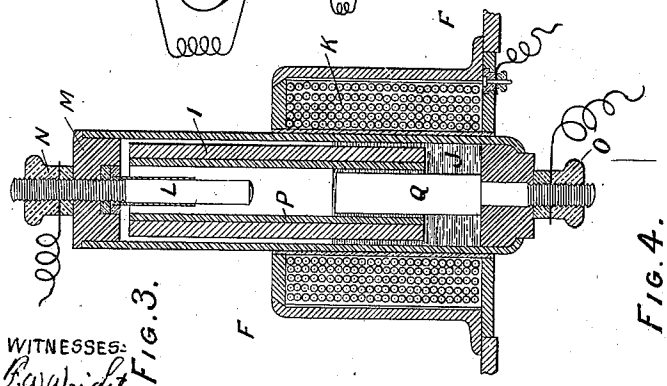

FIG. 3.

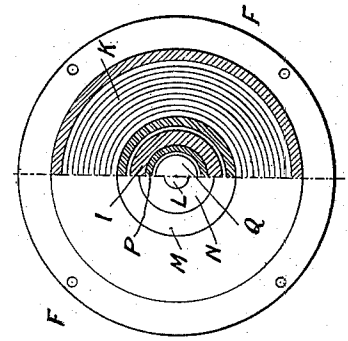

FIG. 4.

WITNESSES:
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UNITED STATES PATENT OFFICE.

DAVID ROBERTSON, JR., OF UDDINGSTON, SCOTLAND.

SURFACE-CONTACT ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 638,186, dated November 28, 1899.

Application filed June 9, 1899. Serial No. 719,967. (No model.)

To all whom it may concern:

Be it known that I, DAVID ROBERTSON, Jr., electrician, a subject of the Queen of Great Britain and Ireland, and a resident of Uddingston, in the county of Lanark, Scotland, have invented certain new and useful Improvements in the Electrical Propulsion of Tramway-Cars and Railway-Carriages, of which the following is a specification.

The object of my invention is the electrical propulsion of tramway-cars, railway-carriages, and the like; and it consists of an improved method of and devices for transmitting electric current from underground conductors to the motors of such vehicles by means of contact-studs placed between the rails very slightly above the street-level and connecting and collecting sliders or skates attached to the vehicles.

Referring to the drawings which form a part of this specification, Figure 1 is a diagram illustrating my arrangements for transmitting electric current, and Fig. 2 is a plan of part of a tramway-line, while Figs. 3 and 4 are respectively a sectional elevation and a plan, partly in section, of my new or improved switch.

In carrying into practice the improvements of this invention, as indicated in Figs. 1 and 2, besides the main circuit A, conveying electricity from the generator B to drive the car-motors C, an auxiliary circuit D is used, fed by a small auxiliary dynamo E, working at a low pressure—say about twenty-five volts—and this auxiliary current is used to actuate automatic switches F and make electric connection between the main circuit A and the motors C as the sliders G H of the cars pass over the contact-studs G′ G^2 H′ in the manner to be described, the switches being arranged so that each main contact is alive only when the car is over it.

In addition to the main contact-studs H′, which are laid along the center of the track T, there are other two sets of contact-studs G′ G^2 in line on one side of the center, one set G′ of these being placed alongside the main contacts H′ and the other G^2 midway between them. The former set G′ are connected to the coils for working the corresponding switches F and are herein called the "switch-contacts," while the latter set G^2, called "auxiliary" contacts, are joined permanently to the auxiliary circuit D. Besides the main collecting-skate H each car has a second skate or slider G, which makes contact with these studs and serves to connect the switch-studs G′ to the auxiliary circuit through the studs G^2. Whenever this takes place, a current is passed through the coil of the automatic switch F, which is put on, and the main slider H can pick up current from the corresponding main contact-stud H′, which is then electrically connected to the main circuit A. As soon as the auxiliary slider G leaves the switch-contact G′ the automatic switch F is released and the corresponding main contact H′ is disconnected from the high-pressure mains A. The car is thus always ready to pick up current, and no storage batteries are required, while at the same time the live contacts on the main circuit are always covered by the car.

The auxiliary studs are always alive; but as they are at a very low pressure this cannot cause any danger or inconvenience. It is also quite impossible for the ordinary street traffic to work the switches, since this can only be done by putting two studs ten to twenty feet apart into direct metallic connection. Where necessary, the switch-contacts can be shielded from a leakage of the main current by surrounding them by a metal ring or box connected to the rails which form the return for both the main and auxiliary circuits.

The pitch of or distance between the main contacts H′ will be a little less than the length of the shortest car intended to be run on the route, and the switches can either be placed below their studs or for convenience and economy grouped together in manholes, as indicated in Fig. 2 at F.

It is not necessary to place the main slider and contacts in the center; but in most cases it will be found preferable to do so and to put an auxiliary slider on each side of the main slider, so that the switch and auxiliary contacts may be placed on either side of the center. This facilitates turning sharp curves, where it is best to have the auxiliary studs on the inner side of the curve.

In long lines the auxiliary circuit may with advantage be fed at a few points by a motor-generator driven from the main circuit.

The automatic switch, as shown in Figs. 3 and 4, consists, essentially, of a piece of iron I, (conveniently a tube,) which floats in mercury J, but can be pulled down by a current in a surrounding coil K of wire in the manner of a solenoid. When the iron goes down, the mercury rises by displacement and makes contact with a metal rod L, projecting downward from the insulating-cover M. Current from the main circuit then enters by the terminal N at the top through the metal rod L and the mercury J to the terminal O, whence it is led by a cable to the proper stud, and thence through the slider to the motor, which is connected therewith.

The whole is supported on an insulator, and the necessary connection at the top is conveniently made by a fuse to a bus-bar, supplying all the switches in one manhole.

A thick tube P, of insulating material, is fixed to the inside of the moving iron tube I to make it float higher out of the mercury and also to prevent the possibility of an arc between it and the metal rod L.

The object of the central rod of iron Q projecting from the bottom is principally to save mercury, but also to assist the magnetic effect and reduce the electric resistance.

In order to save wear at the switches, the auxiliary skates are preferably made longer than the main one, so that the current is always broken at the surface contacts, and the switch never has to stop a current in ordinary working.

The sliders may be attached to the cars by springs and may, especially for long cars, be made in several sections jointed together.

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

1. A system of electrical traction of high and low potential consisting of a main skate and an auxiliary skate on the car, studs along the track adapted to make contact with the main skate and connected to an operating-switch and high-potential circuit in combination with switch contact-studs adapted to make contact with the auxiliary skate and connected to the low-potential circuit auxiliary studs so placed that some one of them may make contact through the auxiliary skate with a switch contact-stud, at all times, and thereby operate the switch.

2. An electrically-operated switch consisting of a tube, mercury therein, an iron tube floating in the mercury, an insulating-tube secured to the iron tube and of lighter weight, contact-points within the first said tube, and a surrounding solenoid to sink the tube and cause the contact-points to be electrically connected by the risen mercury upon the passage of current through the solenoid, substantially as described.

3. An electrically-operated switch having a tube, mercury therein, an iron tube floating in the mercury, a lug Q also of iron and a solenoid surrounding that portion of the tube containing the lug Q, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID ROBERTSON, JR.

Witnesses:
R. C. THOMSON,
WM. RUTHERFORD.