(No Model.) 3 Sheets—Sheet 1.

A. MÉGROZ.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

No. 592,524. Patented Oct. 26, 1897.

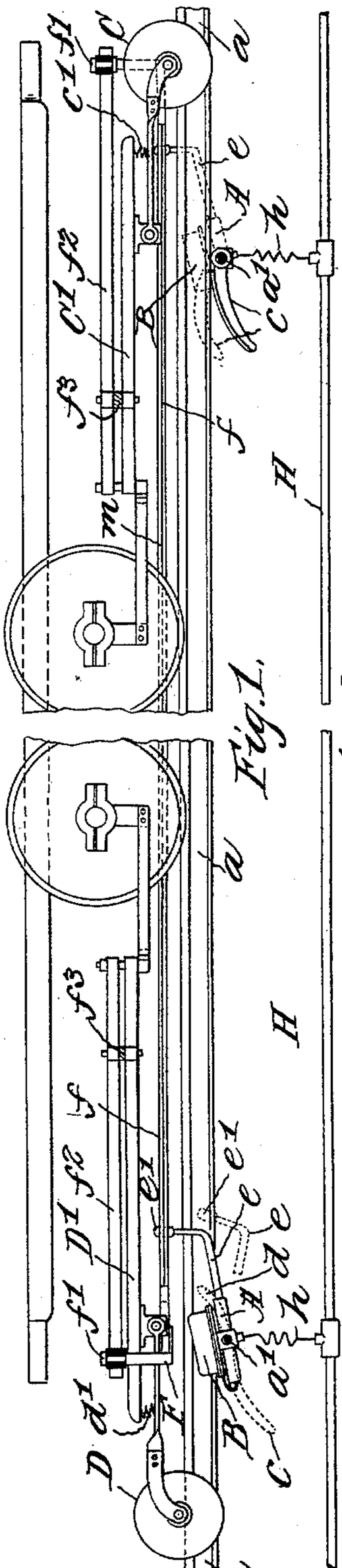

Fig. 1.

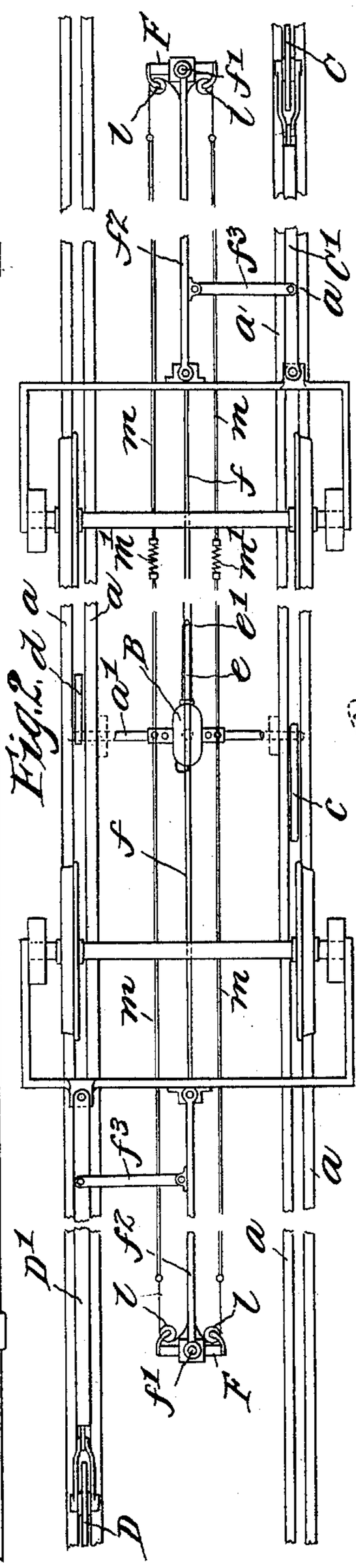

Fig. 2, 2a

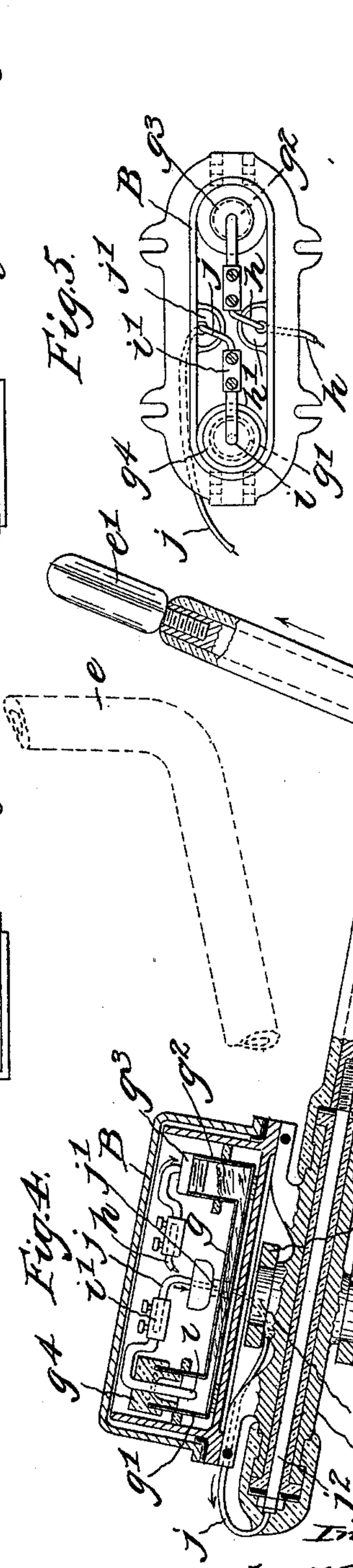

Fig. 3.

Fig. 4.

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(No Model.) 3 Sheets—Sheet 2.

A. MÉGROZ.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

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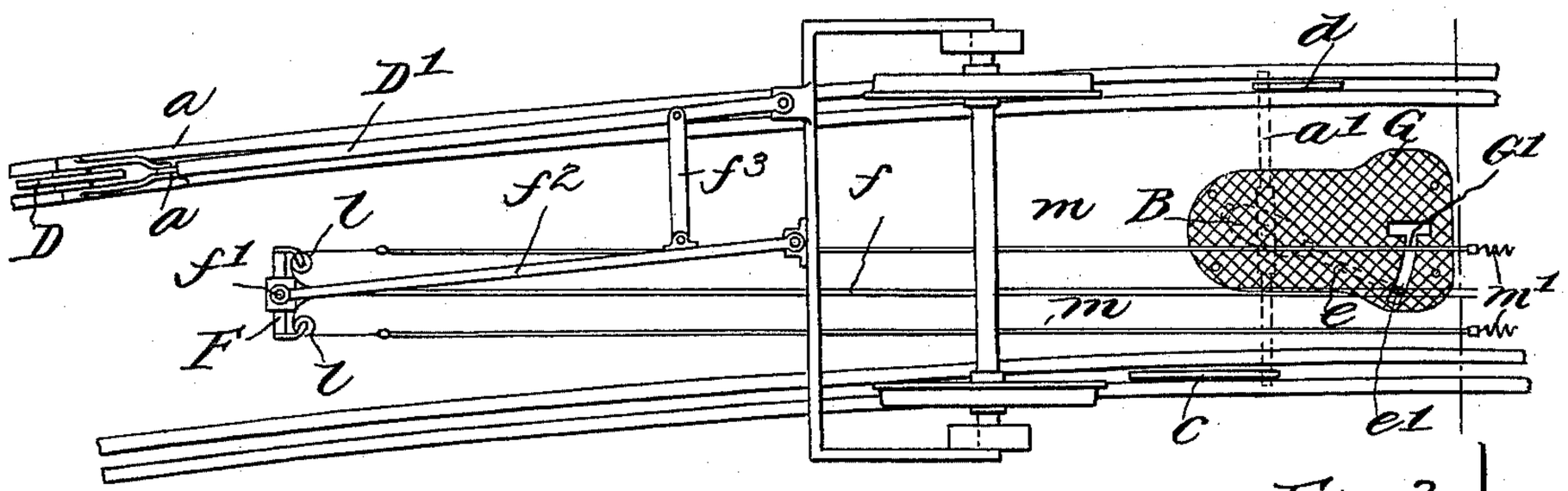


Fig. 3.

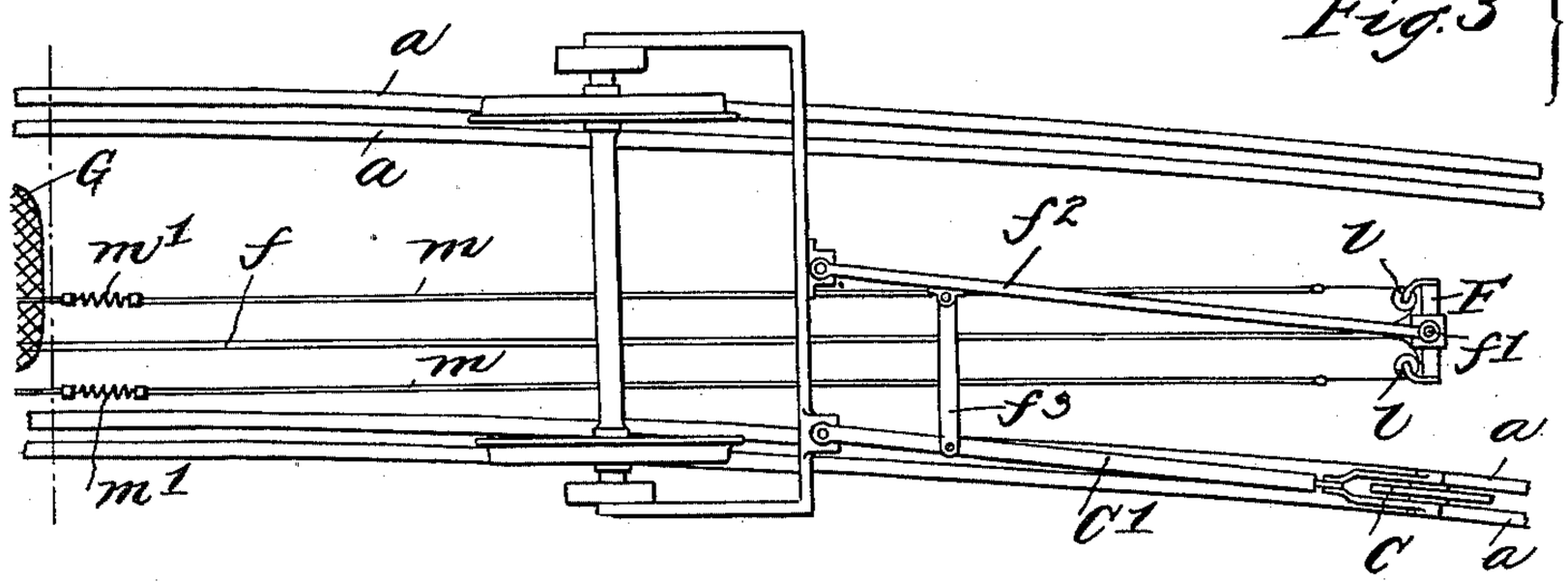


Fig. 10.

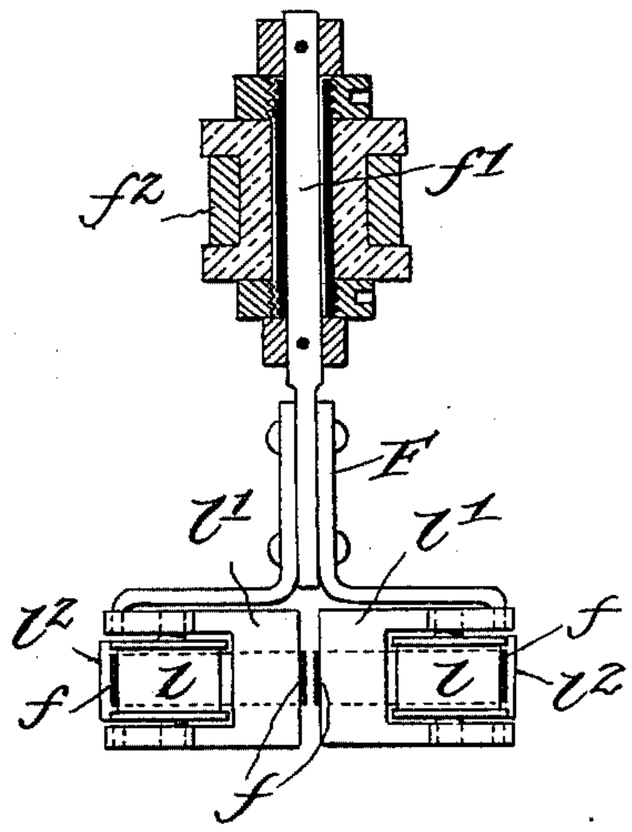
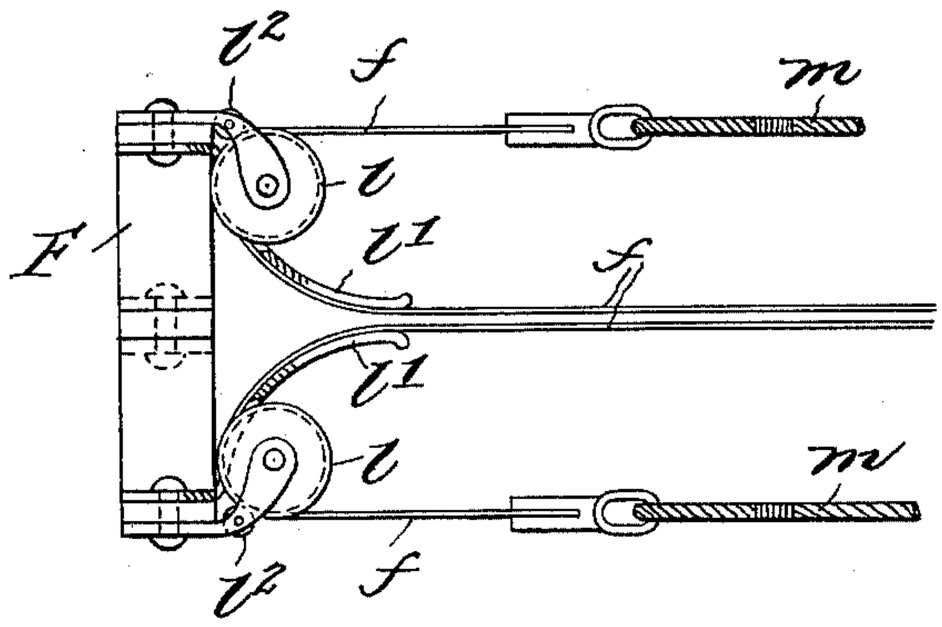


Fig. 11.



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(No Model.) 3 Sheets—Sheet 3.

A. MÉGROZ.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

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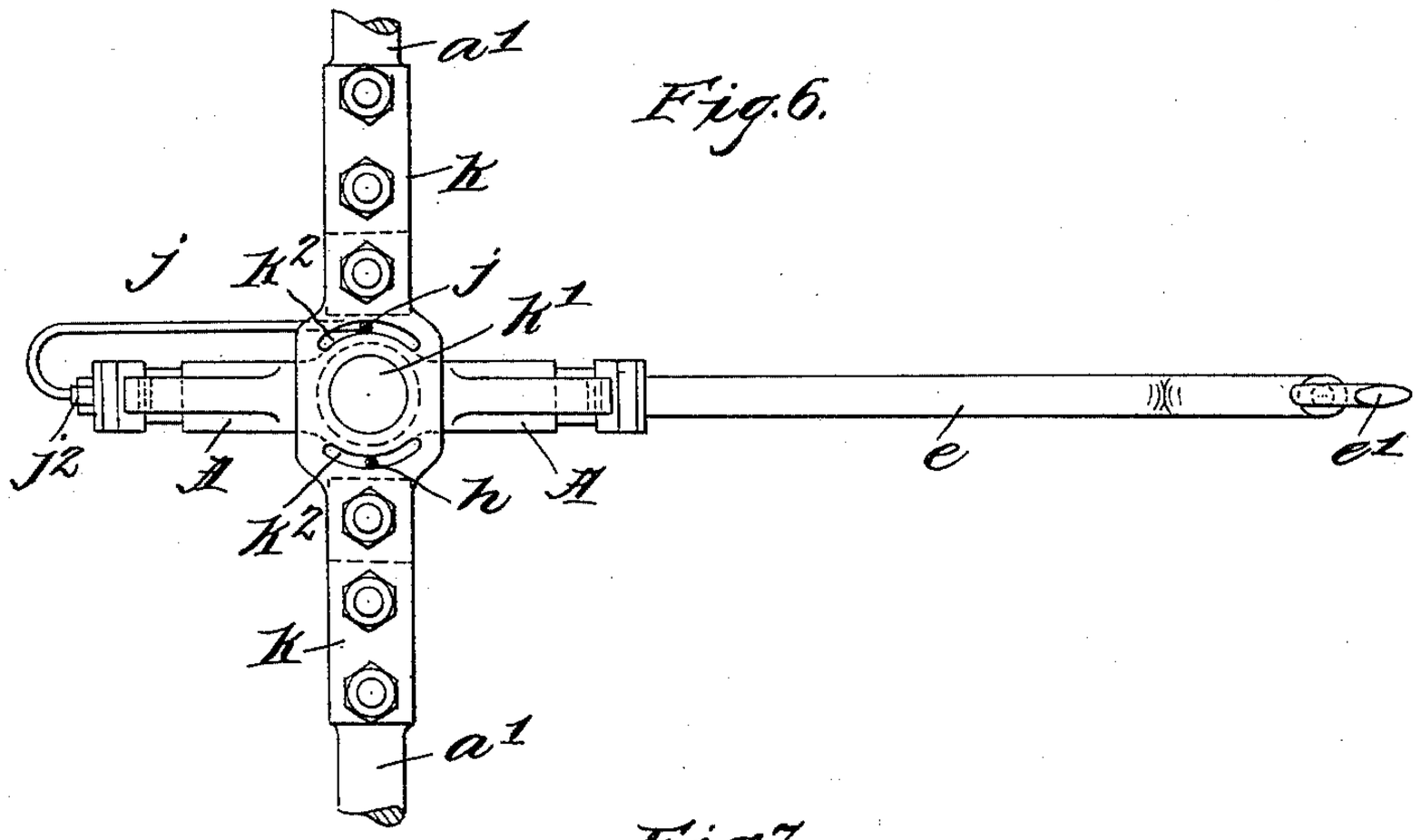


Fig. 6.

Fig. 7.

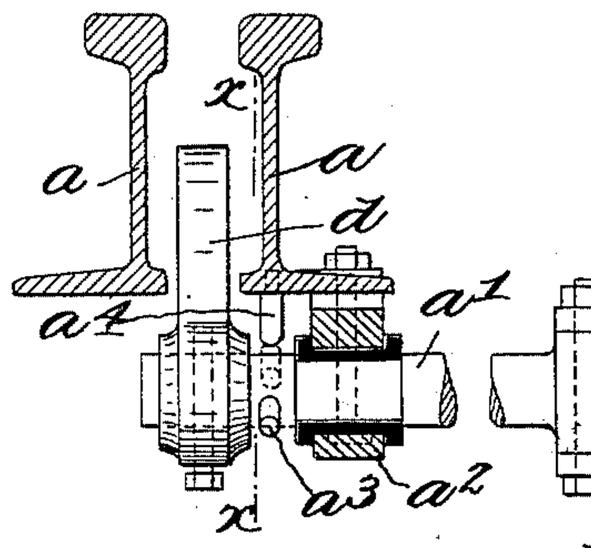


Fig. 9.

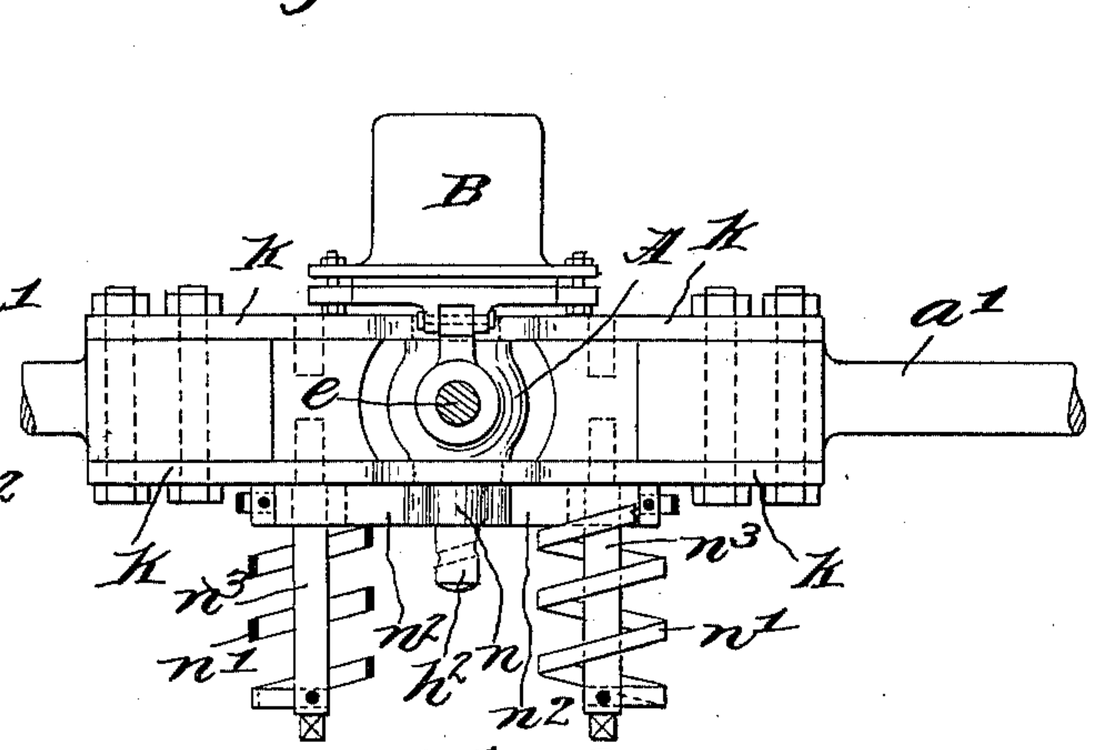
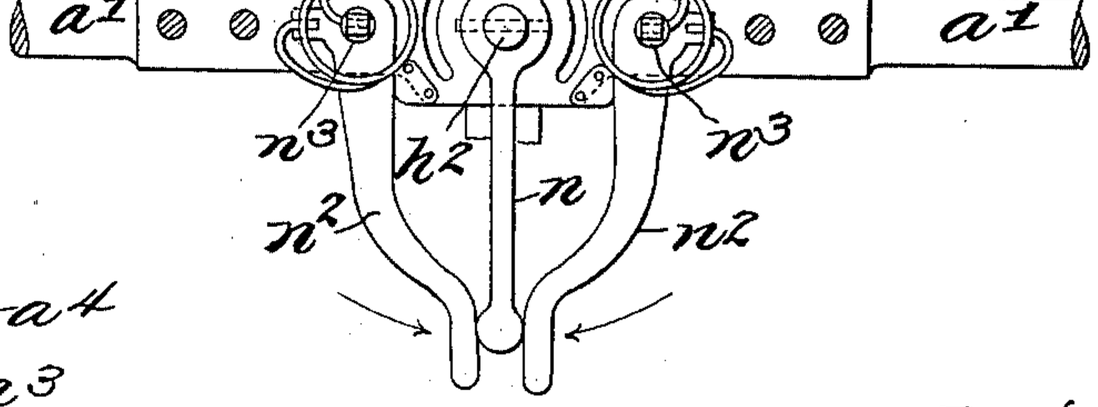


Fig. 8.



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UNITED STATES PATENT OFFICE.

AUGUSTE MÉGROZ, OF BUDA-PESTH, AUSTRIA-HUNGARY.

SUPPLY SYSTEM FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 592,524, dated October 26, 1897.

Application filed April 13, 1896. Serial No. 587,326. (No model.) Patented in Switzerland March 24, 1896, No. 11,980; in Belgium April 15, 1896, No. 120,534; in Italy May 11, 1896, LXXX, 447; in Spain May 29, 1896, No. 24/311; in France July 3, 1896, No. 255,052; in Sweden July 8, 1896, No. 8,086; in Austria July 21, 1896, No. 46/2,950; in Hungary September 30, 1896, No. 5,856; in Germany November 9, 1896, No. 90,226; in England December 12, 1896, No. 6,481, and in Denmark December 31, 1896, No. 906.

To all whom it may concern:

Be it known that I, AUGUSTE MÉGROZ, a citizen of Switzerland, residing at Buda-Pesth, in the Kingdom of Hungary, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Apparatus for Supplying Current to Electrically-Propelled Vehicles, (for which patents have been obtained in the following countries, to wit: Hungary, No. 5,856, dated September 30, 1896; Austria, No. 46/2,950, dated July 21, 1896; Germany, No. 90,226, dated November 9, 1896; Switzerland, No. 11,980, dated March 24, 1896; France, No. 255,052, dated July 3, 1896; Belgium, No. 120,534, dated April 15, 1896; Italy, LXXX, 447, dated May 11, 1896; Spain, No. 24/311, dated May 29, 1896; England, No. 6,481, dated December 12, 1896; Sweden, No. 8,086, dated July 8, 1896, and Denmark, No. 906, dated December 31, 1896;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to apparatus for supplying electricity from the underground conductors of electric railways and tramways to the motors of vehicles to be electrically propelled thereon. According thereto the supply of electricity is effected through contact-making devices distributed along the track and each of which comprises a rotary contact-arm which in its normal position is without current and situated below the level of the road, but which on the approach of a motor-vehicle is caused by the mechanical action of the latter to turn its current-giving end up above the level of the road and is simultaneously placed in electrical connection with the underground conductor. Each vehicle carries a collecting device comprising two metal strips stretched parallel to each other and adapted to engage with the projecting end of each contact-arm, and thus facilitates the transmission of the working current to the motor of the vehicle. As soon as the vehicle has left a contact device of this kind the contact-arm is turned down again into its initial position and is at the same time placed out of conductive connection with the underground conductor. The contact devices are distributed along the track at intervals of distance such that a device situated at the front of a vehicle is placed in operation before the collecting-strips of the vehicle have left the contact device at the rear thereof.

The accompanying drawings illustrate an arrangement of current-supply apparatus in accordance with this invention.

Figure 1 shows diagrammatically a vertical section of the track and a motor-vehicle situate thereon. Fig. 2 is a plan corresponding thereto; and Fig. 3 is a view similar to Fig. 2, showing a motor-vehicle located on a curved portion of track. Fig. 4 represents a contact device, partly in vertical section and partly in elevation. Fig. 5 is a plan of its switch, the cover being removed; and Fig. 6 is a partial plan of the contact device without its switch. Fig. 7 shows a front elevation through a contact device and one of its supports, the device shown being one of those employed at curved portions of the track. Fig. 8 is a partial under side view of the contact device shown in Fig. 7, and Fig. 9 is a section on the line $x\,x$ of Fig. 7. Figs. 10 and 11 illustrate in cross-section and plan, respectively, details of the collecting device. Figs. 1, 2, and 3 are to a smaller scale than the remaining figures.

Below the track, composed of double rails $a\,a$, there are mounted at suitable distances apart horizontal shafts a', each of which carries a contact device comprising a case A, provided with a switch contained within a box B. On the shaft a' there are fixed bent arms c and d, Figs. 1, 2, and 3, which are each located between two rails $a\,a$, constituting a pair, and point in opposite directions. As soon as a motor-vehicle has come suitably near to the contact device the arm c is turned downward by the action of the switching-in

roller C, which is carried by an arm C′ of the motor-vehicle, so as to move along in the space between the right-hand pair of rails *a a*, Figs. 2 and 3, and is constantly pressed downward by a spring *c′*, Fig. 1. This turning downward of the arm *c* causes an arm *e* of the case A to turn upward and effect the transmission of the current. Similarly the bent arm *d* of the shaft *a′* is adapted to be operated by a switching-off roller D, which is carried at the rear of the vehicle by an arm D′, is pressed down by a spring *d′*, Fig. 1, and runs between the left-hand pair of rails *a a*, Figs. 2 and 3, the result of this operation of the arm *d* being to turn the arm *e* of the contact device down again into its normal position.

Just before the vehicle reaches a contact device the right-hand forward switching-in roller C turns the arm *e* upward, so that its knife-edge-shaped end *e′* enters the space between a pair of metallic collecting-strips *f f*, stretched parallel to each other on the under side of the vehicle, and thus transmits the current thereto. The strips *f f* slide along the end *e′*, which on passing out of the space between the said strips is turned down, together with the arm *e*, by the action of the left-hand rear switching-off roller D.

The switch of each contact device comprises a closed box B, Figs. 4 and 5, which is fixed on the case A, Figs. 4 and 5, carrying the contact-arm *e*, so as to move with this arm *e*. Inside the box there are arranged two vessels *g′* and g^2, which communicate with each other by means of a pipe *g*. These vessels, which are made of conducting material and are insulated from the walls of the box B, contain a certain amount of mercury. The vessel g^2 is connected to the main conductor H, Fig. 1, by means of a screwed-on cover g^3 and an insulated conductor *h*, which passes through a hole *h′*, Fig. 5, in the wall of the box B and also through a hole in the lower pin h^2 of the case A. The cover g^4 of the receptacle *g′* consists of non-conducting material and carries a contact-pin *i*, which projects into the vessel *g′* and is connected by means of a clamp *i′* to an insulated conductor *j*. The conductor *j* passes through a hole *j′*, Fig. 5, in the wall of the box B to the outside thereof and connects the contact-pin *i* with an insulated rod j^2, which is situated in the case A and is screwed to the contact-arm *e*. The arm *e* is surrounded with insulating material and carries at its upwardly-bent end the contact-knife *e′* already referred to.

The case A is pivoted by its journals *k′ k′* in plates *k k*, bolted at both sides to the corresponding shaft *a′*, which consists of two symmetrical pieces and carries the arms *c* and *d*. The plates *k* are provided with curved slots k^2, Fig. 6, through which the conductors *h* and *j* are passed.

As will be seen from the foregoing description, each contact-arm *e*, together with the corresponding case A and the switch-box B, is mounted in such a manner as to rotate with the shaft *a′* and at the same time to rotate sidewise about the axis of the journals *k′*.

The shaft *a′* is mounted at both ends below the rails *a* in bearings a^2, as shown in Figs. 7 and 9, and carries studs a^3, which, in combination with studs a^4, fixed on one of the corresponding rails *a*, serve to limit the rotation of the shaft *a′* in each direction.

When the device is in the position shown in Fig. 4, the vessel g^2 is full of mercury, whereas the vessel *g′* is empty, so that there is no electrical connection between the vessel *g′* and the contact-stud *i;* but an electrical connection is established between these parts so soon as the arm *e* is rocked upward into the operative position indicated by dotted lines in Fig. 4, the mercury flowing quickly into the vessel *g′* and filling the same. The electric current now flows through the conductor *h*, the two vessels *g′* and g^2, also the connecting-pipe *g*, and the mercury contained therein to the contact-pin *i*, and thence by the conductor *j*, the rod j^2, and the arm *e* to the contact-knife *e′*, whence it is taken by the two collecting-strips *f*, and passes to the motor on the vehicle.

The contact-strips *f*, which are preferably of steel, extend along the vehicle and are held and guided at both ends by head-pieces F, Figs. 2, 3, 10, and 11. Each of these head-pieces F is carried by a vertical insulated shaft *f′*, which is rotatably mounted in a guide-rod f^2, fixed to the frame of the vehicle, and is connected to the switch of the vehicle-motor.

Each head-piece F carries two guide-pulleys *l*, around which the collecting-strips *f* are passed, and also two curved guide-bars *l′*, over whose mutually-facing surfaces the strips are passed, so as to be kept taut at a small distance from each other. Rollers l^2, Fig. 11, prevent the strips from leaving the guide-pulleys *l*. The outer ends of each of the collecting-strips *f* are connected together by means of a wire rope *m*, in which a spring *m′*, Figs. 1, 2, 3, and 11, is inserted for the purpose of keeping the strip *f* always taut and of enabling it to yield more readily to side pressure.

It will be obvious that special arrangements are necessary to keep the current-supplying apparatus in proper action when a vehicle is moving along curved portions of the track. Now as the sliding contact-knife *e′* is always normally situated at the central plane of the line of rails, the head-pieces F, that carry the collecting-strips *f*, must be guided by means of their axles *f′* in such a manner that the knife *e′* can enter between the strips *f*. For this purpose the front guide-rod f^2, Figs. 2 and 3, is connected by means of a link f^3 with the arm C′, which is pivoted to the vehicle-frame and carries the switching-in roller C, the arrangement being such as to constitute a parallel motion, so that the guide-rod f^2 is always held parallel to the

arm C′. Similarly the arm D′, carrying the switching-out roller D, is also connected to the rear guide-rod f^2. Furthermore, since the strips f are stretched straight, it is necessary, as will be clear from Fig. 3, that the knife e', with the arm e and the switch-box B, shall be able to turn laterally, as otherwise the strips f would be torn. This turning can take place, since the arm e, together with the case A, is mounted in the way hereinbefore described, so that it can partly rotate about the approximately vertical axis of the journals k', and the cast plate G, Fig. 3, fixed over and covering the contact apparatus, is provided with a curved slot G′, that extends toward the center of curvature of the curved portion of the track and in which the knife e' or the adjacent end of the arm e can move. Finally, it is further necessary that the laterally-deflected arm e and together with it the whole device shall be automatically brought back to its normal position in the middle of the track. For this purpose there is fastened to the lower pin h^2 of the case A, Figs. 7 and 8, an arm n, arranged parallel to the arm e, and against opposite sides of which there are pressed by springs n' arms n^2, which are rotatable on bolts n^3, fastened to the lower plate k. Each of the springs n' is fastened by one end to the corresponding bolt n^3 and by the other to the adjacent part of the corresponding arm n^2.

As will be obvious, the apparatus hereinbefore described may be variously modified without departing from the essential features of the invention. Thus any other suitable conducting liquid may be used in lieu of mercury, and instead of permanently connecting the vessels g' and g^2 to the underground conductor H and the pin i to the arm e the arrangement may be reversed, the vessels g' and g^2 being permanently connected to the arm e and the pin i to the conductor H.

Current-supply apparatus according to this invention can be employed both for parallel and series working.

I claim—

1. In electric railways, a single insulated main conductor, rocking feeders arranged at suitable distances apart, conductive connections between said feeders and conductor, and circuit-closers interposed in said connections and provided each with a stationary and a gravitating contact, said circuit-closers carried and rocked by their respective feeders to close and interrupt the feeder-circuit; in combination with a traveling current-collector adapted to take current from said feeders, and appliances independent of and traveling with the collector, operating to rock the successive feeders to move the same alternately into and out of contact with the collector and thereby alternately close and interrupt the feeder-circuit, for the purpose set forth.

2. In electric railways, a track, an underground conduit provided with two parallel slots proximate to the track-rails and with openings from distance to distance on a line parallel with but intermediate of said slots, a main conductor extending along said conduit, rocking feeders adapted to be projected through the conduit-openings, arms extending from the feeders in opposite directions and lying within the conduit-slots, a conductive connection between the feeders and main conductor and circuit-closers, carried by said feeders, interposed in said connections and comprising stationary contacts and a gravitating contact coöperating therewith, the normal relation of said contacts being such as to interrupt the electrical connection between a feeder and the main conductor, in combination with a current-collector traveling along the central slot of the conduit and rollers at suitable distances apart and traveling with the current-collector along the conduit-slots, said rollers adapted to impinge upon the feeder-arms and rock the feeders first in one direction and then in another whereby a feeder is moved alternately into and out of contact with the current-collector and the electrical connection between the collector and feeder alternately made and broken for the purpose set forth.

3. In electric railways, a track, an underground conduit provided with two parallel slots proximate to the track-rails and with openings from distance to distance on a line parallel with but intermediate of said slots, a main conductor extending along said conduit, rocking feeders adapted to be projected through the conduit-openings, arms extending from the feeders in opposite directions and lying within the conduit-slots, a conductive connection between the feeders and main conductor, and circuit-closers carried by said feeders, interposed in said connection and comprising stationary contacts and a gravitating contact coöperating therewith, the normal relation of said contacts being such as to interrupt the electrical connection between a feeder and the main conductor, in combination with a current-collector traveling along the central slot of the conduit, rollers at suitable distances apart and traveling with the current-collector along the conduit-slots, said rollers adapted to impinge upon the feeder-arms and rock the feeders first in one direction and then in another whereby a feeder is moved alternately into and out of contact with the current-collector and the electrical connection between the collector and feeder alternately made and broken and means for limiting the rocking movements of the feeders for the purpose set forth.

4. In electric railways, a single insulated main conductor, rocking feeders arranged at suitable distances apart, conductive connections between the feeders and main conductor, and circuit-closers interposed in said connection and provided each with a stationary and a gravitating contact, said circuit-closers carried and rocked by their respective feeders to

close and interrupt the feeder-circuit; in combination with a traveling current-collector adapted to take current from the feeders, appliances independent of and traveling with said collector, adapted to rock the successive feeders alternately into and out of contact with said collector and thereby alternately close and interrupt the feeder-circuit, and means for maintaining such contact when the collector is traveling over a curve, for the purpose set forth.

5. In electric railways, an underground conduit, a main conductor extending centrally along the same, rocking feeders in said conduit at suitable distances apart and adapted to be projected above the surface of the roadbed, conductive connection between the feeders and main conductor, and switches operating automatically to make and break the circuit when said feeders are rocked in one or the other direction, in combination with a traveling current-collector adapted to swing laterally, and appliances connected and traveling with said collector and controlling the swinging movements thereof, said appliances operating to rock the feeders in opposite directions to alternately make and break the main-line circuit, substantially as and for the purpose set forth.

6. In electric railways the combination with a main conductor, a feeder comprising a contact-arm arranged to rock in fixed bearings and provided on opposite sides with actuating-arms extending in opposite directions parallel with the track, a conductive connection between the feeder and the main conductor and a switch carried by the feeder and comprising stationary contacts and a gravitating contact as mercury, coöperating therewith, said switch interposed in the aforesaid conductive connection, of a traveling current-collector comprising a slotted conductor and appliances traveling with said collector and operating on the feeder-actuating arms successively to rock the contact-arm of such feeder in opposite directions, to alternately move the feeder contact-arm into and out of the slot of the collector and to move the gravitating switch-contact to alternately make and break the electrical connection between the feeder and main conductor substantially as and for the purpose set forth.

7. In electric railways the combination with a main conductor, a feeder comprising a contact-arm adapted to rock on horizontal and vertical axes and provided on opposite sides with an actuating-arm extending in opposite directions parallel with the track, a conductive connection between the feeder and main conductor and a switch carried by the feeder, comprising stationary contacts and a gravitating contact coöperating therewith, said switch interposed in the aforesaid conductive connection, of a traveling current-collector comprising two spaced conductive flexible strips and appliances traveling with said collector and operating on the feeder-actuating arms successively to rock the feeder and move its contact-arm alternately into and out of contact with said flexible collecting-strips and to move the gravitating switch-contact to alternately make and break the electrical connection between the feeder and main conductor substantially as and for the purpose set forth.

8. In electric railways the combination with a main conductor, a feeder comprising a contact-arm adapted to rock on horizontal and vertical axes and provided on opposite sides with an actuating-arm extending in opposite directions parallel with the track, a conductive connection between the feeder and main conductor and a switch carried by the feeder, comprising stationary contacts and a gravitating contact coöperating therewith, said switch interposed in the aforesaid conductive connection, of a traveling current-collector comprising two spaced conductive flexible strips, appliances traveling with said collector and operating on the feeder-actuating arms successively to rock the feeder and move its contact-arm alternately into and out of contact with said flexible collector-strips, and to move the gravitating switch-contact to alternately make and break the electrical connection between the feeder and main conductor and a tension device for maintaining the aforesaid flexible strips of the current-collector at a proper tension, substantially as and for the purpose set forth.

9. In electric railways, the combination with a main conductor, a feeder comprising a contact-arm adapted to rock on horizontal and vertical axes and provided on opposite sides with an actuating-arm extending in opposite directions parallel with the track, a conductive connection between the feeder and main conductor and a switch carried by the feeder, comprising stationary contacts and a gravitating contact coöperating therewith, said switch interposed in the aforesaid conductive connection, of a traveling current-collector comprising two spaced conductive flexible strips, yielding appliances traveling with said collector and operating on the feeder-actuating arms successively to rock the feeder and move its contact-arm alternately into and out of contact with said flexible collector-strips and to move the gravitating switch-contact to alternately make and break the electrical connection between the feeder and the main conductor, substantially as and for the purpose set forth.

10. The combination with the main conductor H of a feeder comprising a contact-arm adapted to rock on horizontal axes and a switch carried by the feeder, comprising a casing or housing, two conductive cups g' g^2 therein and in communication with each other through a conductive duct, said parts containing a suitable quantity of mercury and said cups arranged relatively to the contact-arm as to cause the mercury to recede from one cup g' when the arm is in a downwardly-

inclined position, a contact in, but insulated from said cup g', a conductive connection between said contact and the contact-arm of the feeder and a contact electrically connected with cup g^2 and with the main conductor substantially as and for the purpose set forth.

11. The combination with the main conductor H of a feeder comprising a contact-arm adapted to rock on horizontal and vertical axes and a switch carried by the feeder, comprising two conductive cups g' g^2 in communication with each other through a conductive duct said parts containing a suitable quantity of mercury and said cups arranged relatively to the contact-arm as to cause the mercury to recede from one cup g' when the arm is in a downwardly-inclined position, a contact in, but insulated from said cup g', a conductive connection between said contact and the contact-arm of the feeder, and a contact electrically connected with the cup g^2 and with the main conductor substantially as and for the purpose set forth.

12. The combination with a motor-car and a current-collector comprising two flexible parallel conductive strips or bands, means for holding such at a suitable distance apart, and a tension device consisting of rods connected with the opposite ends of the said bands, and springs connecting one end of said rods together; of a feeder of electricity adapted to be moved between and in contact with said bands, substantially as and for the purpose set forth.

13. The combination with a motor-car and a current-collector consisting of two flexible conductive bands, carriers at each end of the bands, rollers on said carriers over which the bands pass, curved converging guides on said carriers for guiding the bands and holding the same at a suitable distance apart, tension devices for maintaining the bands at a suitable tension, and supporting-rods pivotally connected with the car and with the roller-carriers; of current-feeders adapted to be successively moved between the bands as the car travels along, substantially as and for the purpose set forth.

14. The combination with a motor-car, of an arm on each side pivotally connected with the car, said arms extending in opposite directions, a roller at the free end of each arm and a current-collector comprising two flexible parallel conductive strips or bands arranged centrally of the car on its under side, carriers for the opposite ends of said bands, supporting-rods pivotally connected with said carriers, and link connection between said rods and the roller-carrying arms to give a parallel motion; of suitably-spaced rocking feeders on a line with the space between the conductive bands, each of said feeders provided on opposite sides with an actuating-arm, said arms lying in opposite directions in the path of the aforesaid rollers whereby said feeders are successively rocked in opposite directions and alternately moved into and out of contact with the aforesaid bands, substantially as and for the purpose set forth.

15. The combination with the motor-car, two carriers F, the rollers l l^2, the guides l' connected with and arranged on the carriers as described, the spindles f' and supporting swinging rods f^2 pivotally connected with but insulated from said spindles; of the bands f f passing between said rollers l l^2 and over said guides l', and a spring connection between the free ends of the respective bands, substantially as and for the purpose set forth.

16. The combination with a main conductor, a casing A, the insulated conductive rod j^2 therein, the insulated feeder or contact-arm e electrically connected with rod j^2 and provided at its outer end with a bare contact, a carrier for and in which said casing is adapted to rock on horizontal axes; of a switch, consisting of an inclosing casing secured to the casing A, two conductive cups, g' g^2, a like tubular connection, connecting said cups and lying in a plane parallel with the aforesaid feeder-arm, an insulated contact extending into the cup g', electrically connected with the rod j^2, and a conductive connection between cup g^2 and the aforesaid main conductor, substantially as and for the purpose set forth.

17. The combination with the casing A provided with vertical journals and with an arm n secured to one of said journals; of a carrier for said casing adapted to rock on horizontal axes and provided with bearings for the vertical journals of said casing, and the spring-actuated arms n^2 pivoted to the carrier and held in perpetual contact with the aforesaid arm n, substantially as and for the purpose set forth.

18. In an underground electric road, the combination with a curved section thereof, an underground conduit, a main conductor therein and a plate G provided with a T-shaped slot G', the stem of which is curved; of a feeder within the conduit comprising a feeder or contact-arm arranged to rock on horizontal and vertical axes, and to be projected through the slot in said plate; of a slotted traveling current-collector adapted to rock in a horizontal plane, and actuating devices traveling with the collector, arranged to rock the feeder successively in opposite directions and move the same into and out of the collector-slot, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

AUGUSTE MÉGROZ.

Witnesses:

MAURICE BLACK,

S. WILLIAM ORTON.