No. 748,053. PATENTED DEC. 29, 1903.

H. DOLTER.

BAR FOR COLLECTING ELECTRICITY FOR SECTIONAL CIRCUITS.

APPLICATION FILED FEB. 19, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

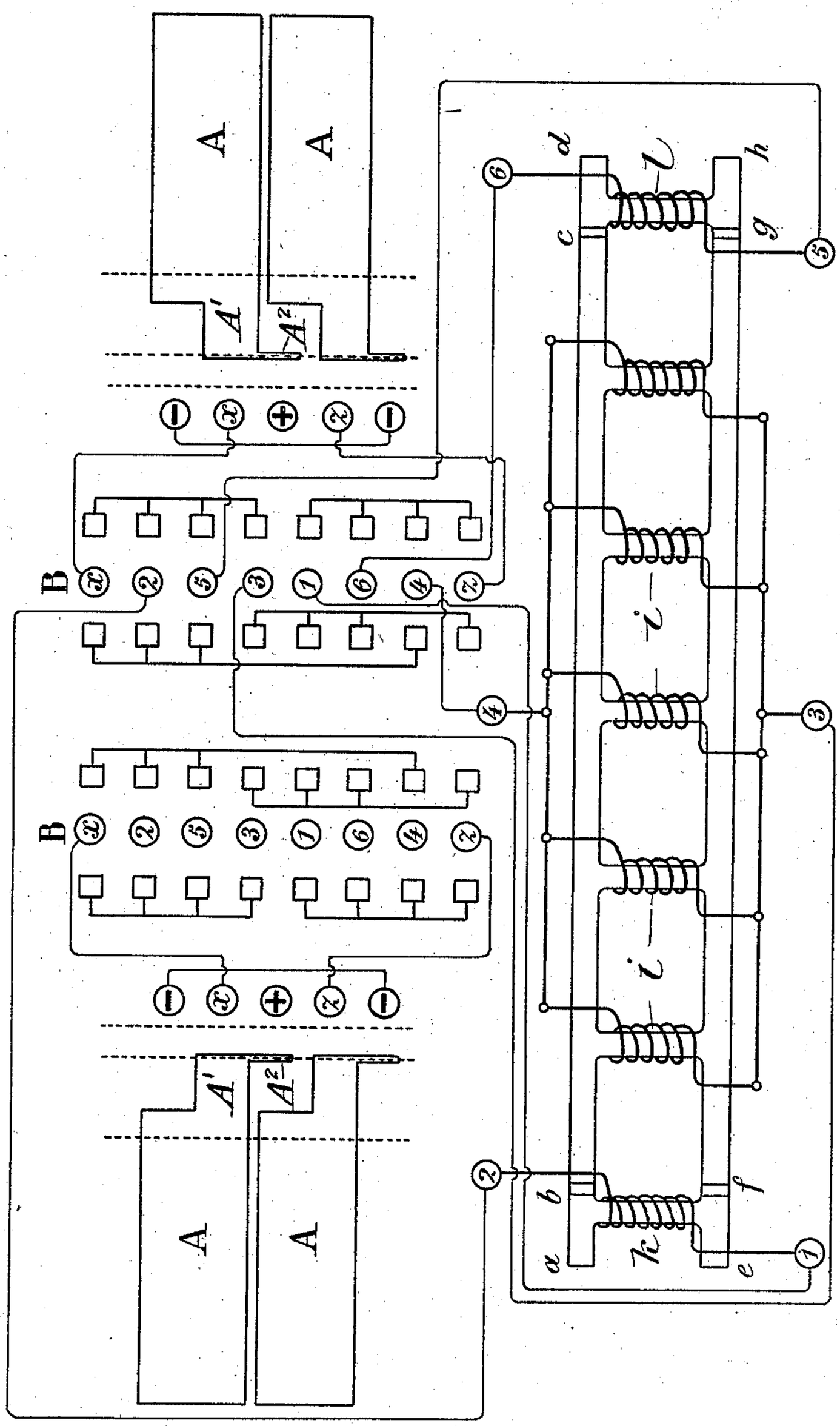

Fig. 1.

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NO MODEL. 4 SHEETS—SHEET 2.

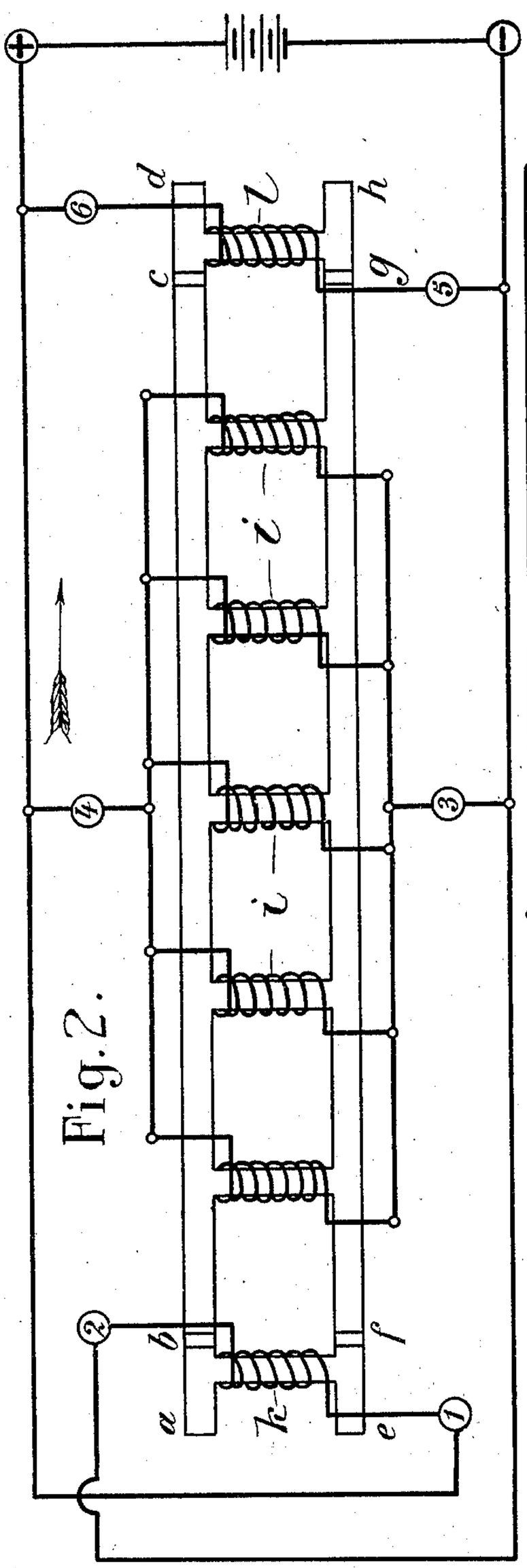

Fig. 2.

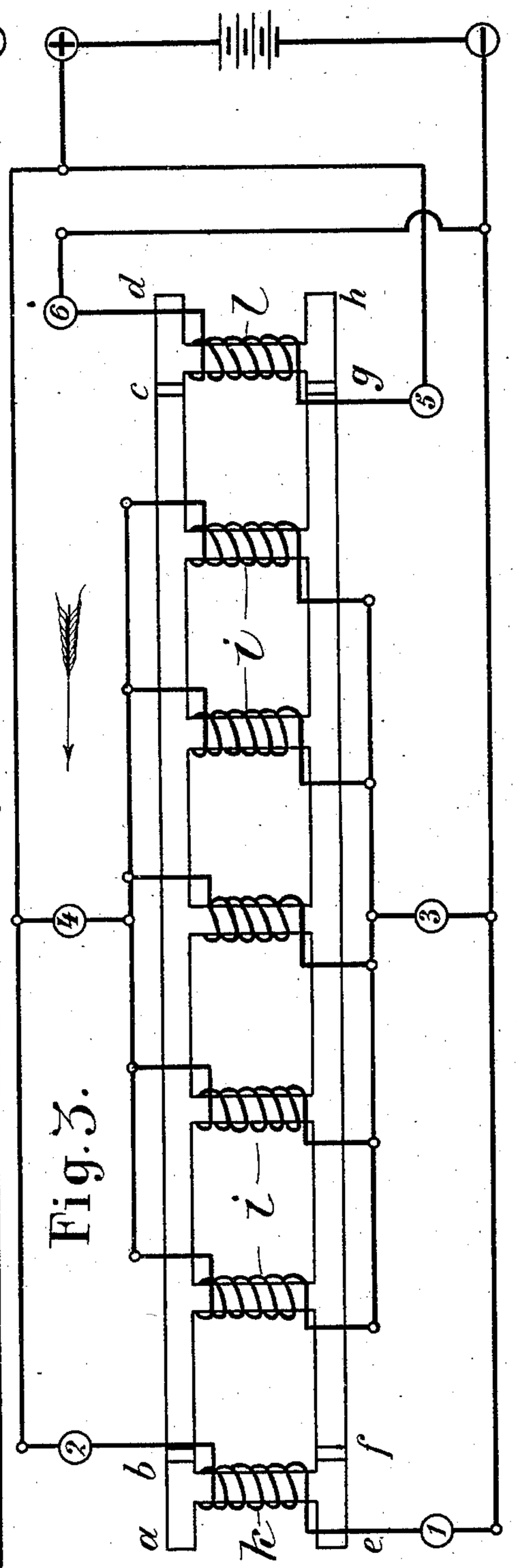

Fig. 3.

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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 4.

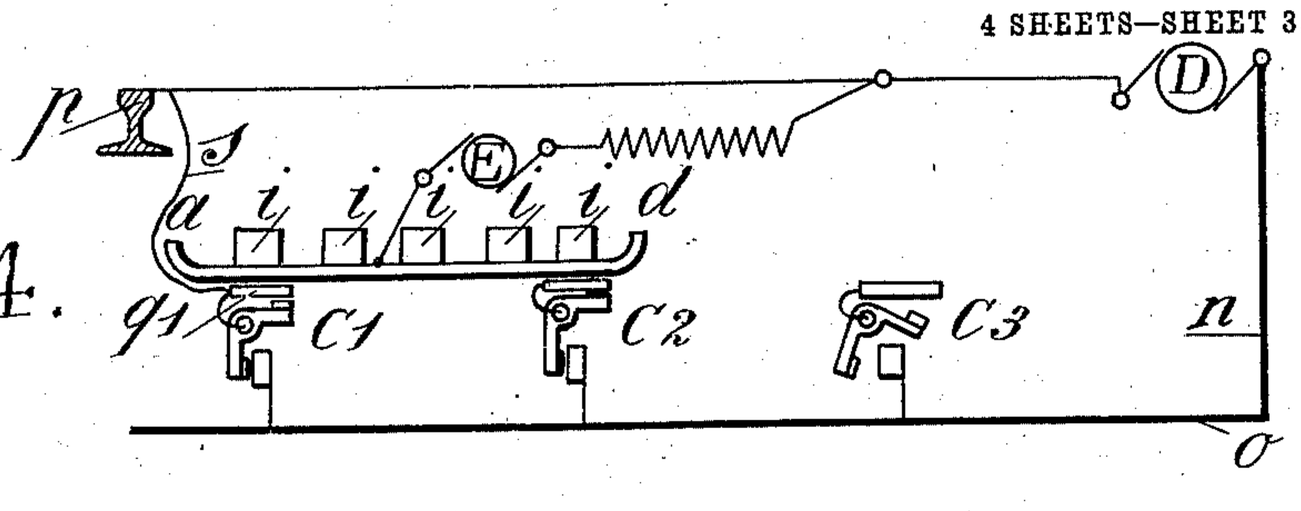


Fig. 5.

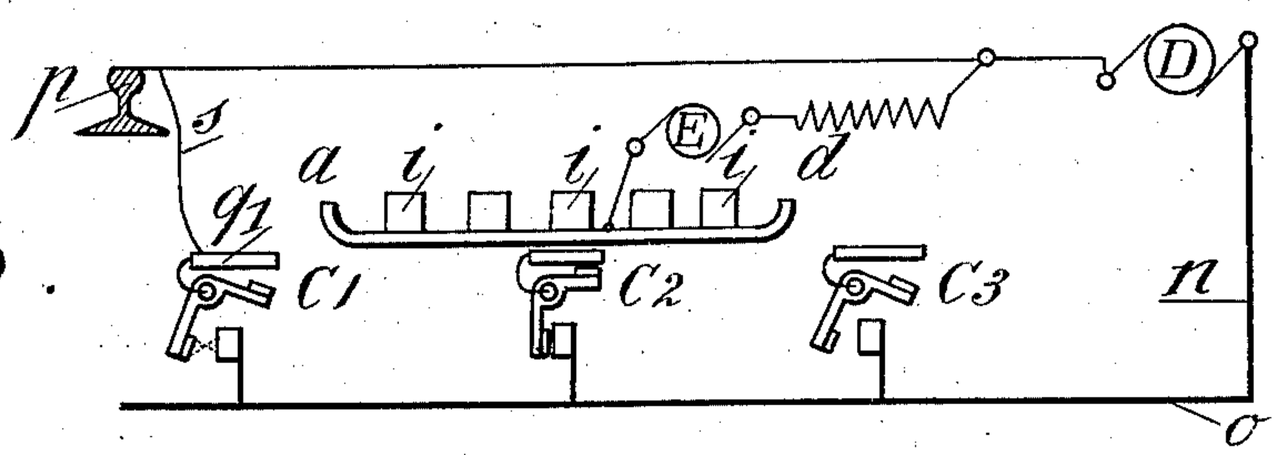


Fig. 6.

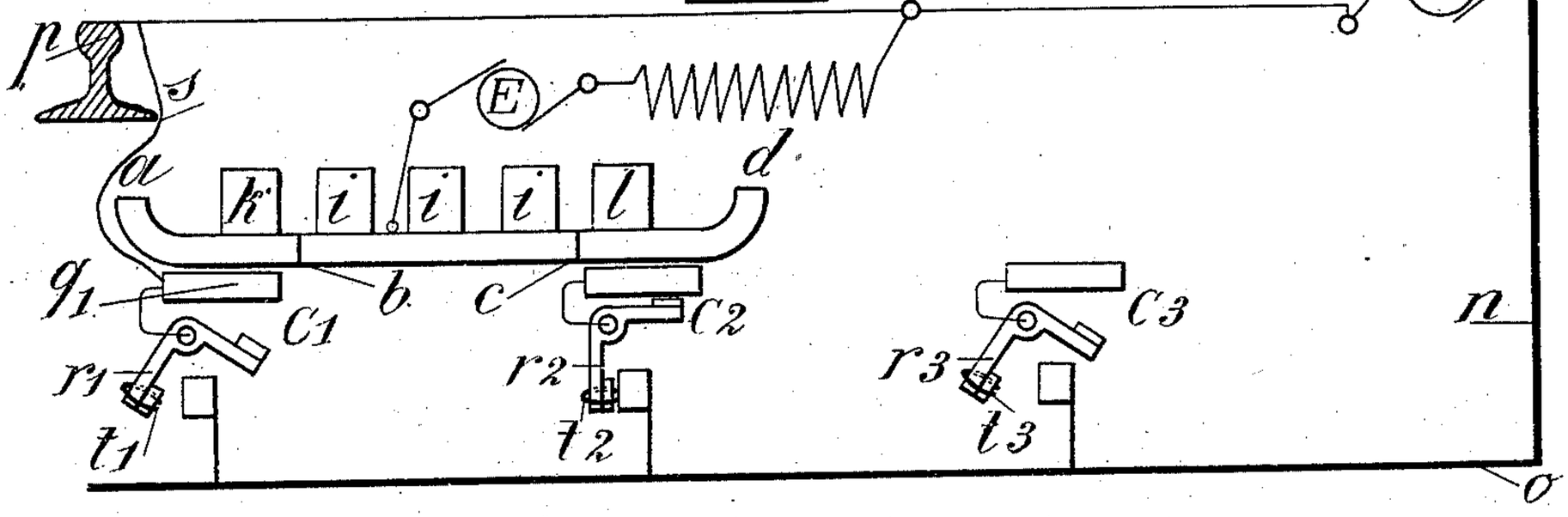
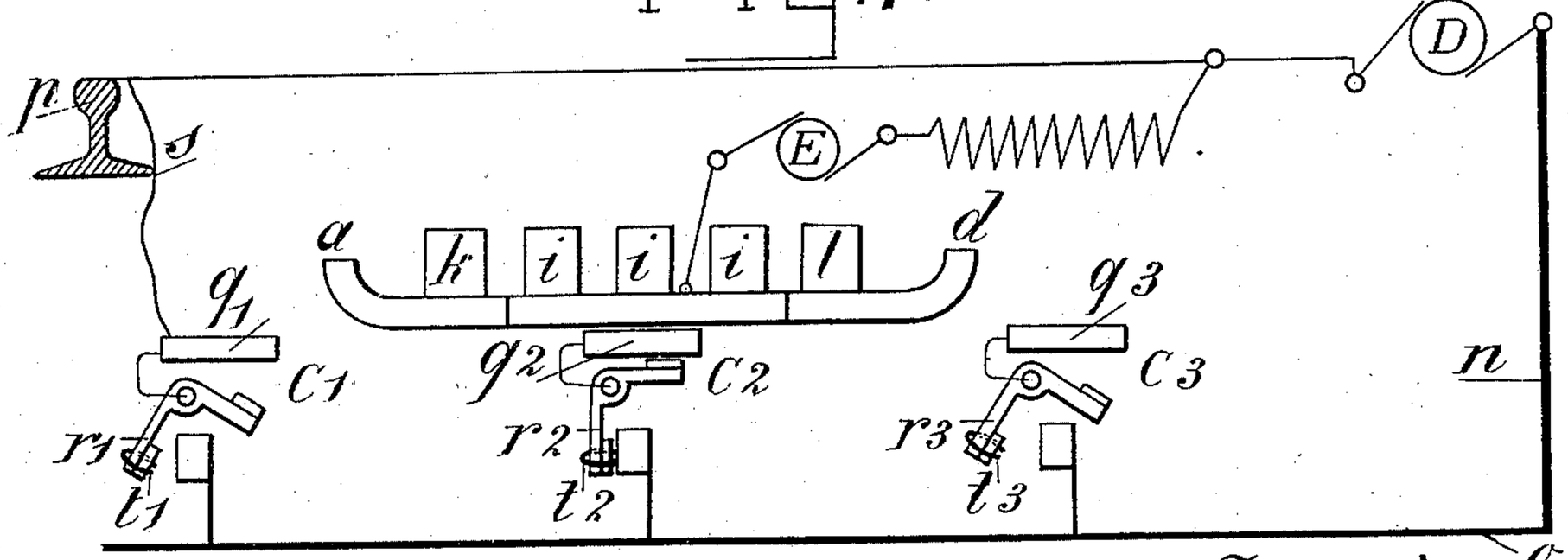


Fig. 7.



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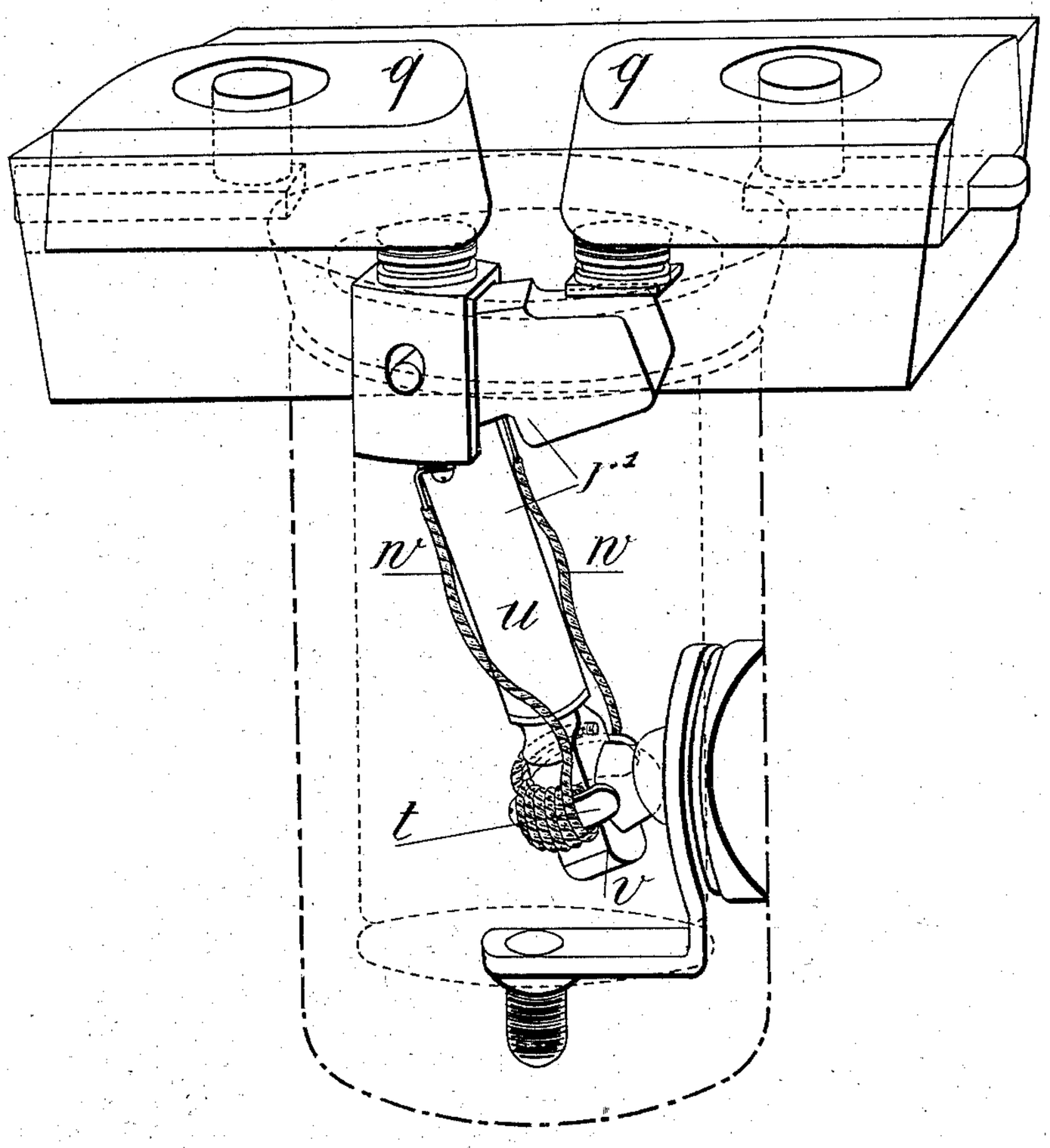
APPLICATION FILED FEB. 19, 1902.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 8.



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UNITED STATES PATENT OFFICE.

HENRI DOLTER, OF PARIS, FRANCE.

BAR FOR COLLECTING ELECTRICITY FOR SECTIONAL CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 748,053, dated December 29, 1903.

Application filed February 19, 1902. Serial No. 94,723. (No model.)

To all whom it may concern:

Be it known that I, HENRI DOLTER, a citizen of the Republic of France, residing at Paris, France, have invented a new and useful Improvement in Bars for Collecting Electricity for Sectional Circuits, which improvement is fully set forth in the following specification.

My invention has relation to a collecting-bar or brush carried by the car traveling over an electric railway, in which railway the current is supplied from a main cable to a series of track-plates or section-contacts arranged to be automatically charged as the car reaches the section, the collecting-bar or brush rubbing over each track-plate or section-contact successively to derive the current necessary to propel the car. In such connection the present invention relates to the construction and arrangement of the collecting-bar or brush, whereby said bar or brush not only serves to receive the current from the track-plates or contacts, but also serves to automatically cut out or disconnect each track-plate or contact from the main cable, preferably slightly before the bar or brush leaves said track-plate or contact.

An electric-railway system wherein the current from a main cable is arranged to be supplied successively to a series of track-plates or contacts as the car with its collecting-bars approaches said track-plates or contacts is well known in the art. Such a system, for instance, is described and illustrated in United States Letters Patent No. 662,921, granted to me under date of December 4, 1900. In such a system as heretofore constructed and operated there was placed beneath or adjacent to each track-plate a circuit making or breaking device, and the collecting-bar or brush while in electric connection with the motor of the car was also magnetized throughout its length, so that it could control magnetically the operation of the circuit-making device adjacent to the track-plate toward which and over which the collecting-bar or brush was traveling.

There have been found certain defects or disadvantages arising in the old form of collecting-bars or brushes which were magnetized throughout their entire contacting surface either positively or negatively, as the case might be. One defect was that the influence of the magnetic bar upon the circuit making and breaking device adjacent to the track-plate over which the magnetic bar was traveling only ceased when the bar completely left the track-plate, so that the circuit was not interrupted until an instant later. Another defect depending on the tardy interruption of the circuit is the tendency of the current to arc between the contacts of the track-plate in case there is any accidental path for leakage of the current from the track-plate to the return-rail, due to water on the surface of the track or other causes. Such an arc when established tends to thereafter carry current through the circuit-breaker and along the path of leakage, rendering the track-plate a source of danger, as well as of loss of current.

In my present invention the collecting-bar or brush is preferably made of a plurality of pieces or parts electrically connected together, but insulated or separated magnetically, so that the forward portion of the bar may be magnetized and the rear portion either demagnetized or else magnetized with a polarity opposite to that of the front portion of the collecting-bar. In connection with a collecting-bar constructed as above described there is also used in the circuit making and breaking device adjacent to the track-plate a magnetic blow-out between the contact-carbons of the circuit maker and breaker, said magnetic blow-out being preferably excited by an electromagnet energized by a winding interposed in the circuit of the carbon contacts, as hereinafter more fully described.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a view illustrating diagrammatically the collector-bars or brushes embodying main features of my invention, the connection and arrangement of the auxiliary parts of the system, and the arrangement of the commutators at the two ends of the car. Fig. 2 is a diagrammatic view illustrating the connections with the collector-bars when the car travels from left to right. Fig. 3 is a view

similar to Fig. 2, but illustrating the connections with the bars when the car travels from right to left. Figs. 4 and 5 are views, partly in diagram and partly in side elevation, illustrating the movement of a collector-bar in the old system and its influence upon the magnetic circuit opening and closing devices. Figs. 6 and 7 are views corresponding, respectively, to Figs. 4 and 5, but illustrating the movement of the collector-bar of my present invention and its influence upon the magnetic circuit opening and closing devices; and Fig. 8 is a perspective view, enlarged, of a magnetic circuit opening and closing device having a magnetic blow-out.

Referring to the drawings, Figs. 1 to 4 and Figs. 6 and 7, each longitudinal member of the brush or collector-bar is divided into three parts *a b*, *b c*, *c d* and *e f*, *f g*, and *g h*, respectively. The parts *a b*, *c d* and *e f* and *g h* are the end portions of the brush, and when the car is arranged to travel in either direction these end portions are separated by relatively long portions *b c* and *f g*. The two members *a d* and *e h* are united by a series of electromagnets *i i i* and *k* and *l*. The electromagnets *i i i*, which act upon the central parts *b c* and *f g* of the two members, have their coils arranged in parallel and receive the current from the pieces 3 and 4, attached to the contacts similarly lettered of the commutators illustrated in Fig. 1, by means of insulated cables. (Not shown.) The electromagnets *i* are always excited in the same direction during the travel of the car. The magnet *k* or *l*, which connects the front portions *a b*, *e f* or *c d*, *g h* of the bar, according to the direction the car is moving, is likewise excited in the same direction as the magnets *i*, whereas the rear magnet *l k* is preferably excited in a contrary direction. In some instances the rear magnet *l* or *k* need not be excited at all—as, for instance, when the car is traveling at comparatively a low speed. Thus, for example, when the car is traveling from left to right, Figs. 2, 6, and 7, the electromagnet *l*, which is in advance, is excited in the same directions as the electromagnets *i*, whereas the magnet *k* at the rear is either excited in an opposite direction or is not excited by the current. The circuit in this instance may be traced as follows: From the positive pole of the source the current passes to the contacts 4 6 of the electromagnets *i* and *l* and to the contact 1 of the magnet *k*. The current travels in parallel the coils of all the electromagnets and then arrives at the contacts 2, 3, and 5 of the commutator, and thence to the negative pole of the source. The parts *b d* and *e f* of the collector-bar or brush are thus magnetized negatively, whereas the parts *a b* and *f h* are magnetized positively. When the movement of the car is reversed, Fig. 3, the electromagnet *k* and the magnets *i* are excited positively, whereas the magnet *l* is excited negatively. In this instance the circuit may be traced as follows: From the positive pole of the source the current passes to the contacts 2, 3, and 5 of the commutator, then traverses all the coils of the magnets in parallel and arrives at the contacts 1, 4, and 6, from which it passes to the negative pole of the source. The collector-bar in this instance is so magnetized that the parts *a c* and *g h* are negatively excited, whereas the parts *c d* and *e g* are positively magnetized. In Fig. 1 the arrangement of the commutators is illustrated in the usual manner, when the car is provided with commutators at each end. The rings A A of contact are in couple. The contacts of said commutators which are represented by + are united to the positive pole of the source, while those marked — are connected with the negative pole. In operation these contacts + and — are united by the rings A with the contacts *x* and *z*, respectively connected with the similarly-lettered pieces of the auxiliary commutators B. The rings A have portions A′, which couple the minus-pole of the source of current to the contact *x* and the positive pole to the contact *z*, respectively, and offset portions A^2, which couple the positive pole to the contact *x* and the negative pole to the contact *z*, respectively. These auxiliary commutators B are for the purpose of changing the connections with the electromagnets *i*, *k*, and *l* when the direction of travel of the car is to be changed. Besides the contacts *x z* the commutators B are provided with a series of contacts 1 to 6, connected, respectively, with the contacts similarly numbered, with which the coils of the electromagnets *i*, *k*, and *l* are connected. These contacts 1 to 6 of the commutators B may be placed in communication in the desired order with the contacts *x z* by means of a series of fingers suitably arranged, as is well known to those skilled in the art.

When the rear parts of the collector-bar or brush are not to be excited, the connections between these parts and the commutators B may be broken by simply removing the cables of the corresponding contacts of the commutators B.

In the drawings the old brush or collector-bar and its relation to the system is illustrated in Figs. 4 and 5, whereas the new brush or collector-bar and its relation to the system is correspondingly illustrated in Figs. 6 and 7 in order that the objects of the present invention may be more clearly understood. In Figs. 4 and 5 the bar or brush is in one piece and is magnetized uniformly over its entire length. In Figs. 6 and 7, however, the bar or brush is constructed of a plurality of pieces separated or insulated magnetically from each other, but continuous, so far as the electrical conduction is concerned. In Figs. 4 and 6 the brush is illustrated as resting upon two adjacent track-plates or contacts C′ and C^2, whereas in Figs. 5 and 7 it has just left the track-plate C′ and has not yet reached the track-plate C^3, but rests over the track-plate C^2. In these figures the current from the

generator D passes by wire n to the line o and thence is distributed to the different track-plates C′ C² C³, &c. When in the old system, Fig. 4, the brush or collector-bar is upon the track-plates C′ and C², the circuit is established through these track-plates and the current passes from both track-plates C′ and C² to the collector-bar and to the motor E of the car. From the motor E it passes by the return-rail p to the generator D. There may also be a derived current or leakage between the rear track-plate C′ and the return-rail p, as indicated at s, such leakage being frequently occasioned by water on the track and other conditions. When the collector-bar passes from the track-plate C′ (see Fig. 5) and the contact q' of said plate is demagnetized, the balance r' of the circuit-closer will fall by its own weight and would rupture or break the circuit through the track-plate C′ but for a derived current or leakage between said track-plate C′ and the return-rail p. As before stated, such a leakage is almost inevitable, and hence a portion of the current brought to the contact q' by the track-plate C′ passes directly to the rail p by line s and continues to pass a moment after the collector-bar has left the track-plate C′. Consequently there will be produced between the fixed and movable contact-carbons of the circuit-closer adjacent to the track-plate C′ at the time of the fall of the balance r' an arc which may remain permanently and destroy the apparatus of the track-plate C′. In practice this frequently occurs. Inasmuch as the contact q' of the track-plate remains thus in communication with the main line o, it will be a source of great danger to persons and animals until it is destroyed or electrically cut out from the main line o. By my present invention this disadvantage or inconvenience is obviated by having the rear part $a\,b$ of the brush isolated magnetically from the rest of the bar, although connected electrically therewith. When now, as in Fig. 6, the small portion a b is upon the rear track-plate C′ and its contact q', the latter is either demagnetized if the part a b is neutral or magnetized reversely if the part a b is magnetically excited reversely to the part $b\,d$ of the bar, and hence the balance r' is permitted and even forced to fall before the collector-bar leaves the contact q'. The derived or short circuit s to the rail p being commutated upon the track-plate C² by the collector-bar, an arc cannot be produced between the fixed and movable contacts of the circuit-closer of the track-plate C′, because the leaking current then flows from the main line o through the closed track-plate C² and the bar $a\,d$ to the plate q' and does not tend to arc between the contacts of the track-plate C′. When the bar leaves the plate C′, (see Fig. 7,) the short or derived circuit is ruptured upon the surface of the contact q', where no bad effects result from the spark produced. It may sometimes happen that the track-plate C² does not operate—as, for instance, when the fuse of its circuit-closing apparatus has been burned out. When such an event occurs, the short or derived circuit, as well as the main circuit, cannot be commutated upon the track-plate C², resulting in the production of an arc or rupture between the carbon contacts upon the fall of the balance r' of its circuit-closing device. To guard against this contingency, there is placed upon the lower end of the balance r', adjacent to the carbon contact carried by said balance, a magnetic blow-out t'. In Fig. 8 the construction of the circuit-closing device employed within each of the track-plates C′ C², &c., is illustrated in detail. A description of the various parts of this circuit-closing device will be found in my former patent, No. 662,921, of December 4, 1900. In addition to the parts therein described the lower end or arm u of the balance r' is formed of insulating material, such as rubber or porcelain, and terminates in a metallic support v, in which the carbon contact is secured. Upon this metallic support v is secured, by screws or otherwise, a blow-out magnet t, preferably horseshoe-shaped. The magnet t may either be a permanent magnet or preferably, as shown, it may be surrounded by a winding interposed in the circuit of the contact or balance r' by fusible connections w w.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A car for surface-contact railways having a collector-bar which is electrically continuous but magnetically discontinuous.

2. A car for surface-contact railways, having a collector-bar comprising successive sections, and means for electrically connecting but magnetically separating said sections.

3. An electric-railway track having surface contacts, a car having a collector-bar with a substantially continuous contact-surface and of sufficient length to bridge adjacent contacts, and means for magnetizing the portion of said bar which bears on one contact differently from the portion which simultaneously bears on the adjacent contact.

4. A car for surface-contact railways having a collector-bar with a substantially continuous contact-surface, and means for magnetizing one contact portion of said bar differently from another contact portion of said bar.

5. A car for surface-contact railways having a collector-bar with a substantially continuous contact-surface, a terminal contact portion of said bar being of opposite magnetic polarity to that of another contact portion of said bar.

6. A car for surface-contact railways having a continuous, magnetized collector-bar, a relatively short terminal contact portion of said bar being of opposite magnetic polarity to the main contact portion of said bar.

7. In an electric-railway system of the

character described, a collector-bar or brush formed of a plurality of contact parts electrically connected with each other, a series of magnets distributed over the series of parts, and means for energizing certain of the series of magnets to thereby form in the bar contact portions differing magnetically from each other, substantially as and for the purposes described.

8. In an electric-railway system of the character described, a collector-bar or brush formed of a plurality of contact parts electrically connected together, said parts insulated magnetically from each other, means for magnetizing said parts with opposite polarities, and means for reversing the magnetization of said parts when the movement of the car is reversed, substantially as and for the purposes described.

9. In an electric-railway system of the character described, a car having a collector-bar which is electrically continuous but magnetically discontinuous, a track-plate from which the current is derived through said collector-bar, a circuit making and breaking device located adjacent to said track-plate, said device comprising a movable and a stationary contact and controlled by the collector-bar, and a magnetic blow-out arranged between the contacts of the circuit making and breaking device, substantially as and for the purposes described.

10. In an electric-railway system wherein the circuit for taking the current is closed by magnetic attraction, a car having a collector-bar which is electrically continuous but magnetically discontinuous, two carbon contacts forming the circuit closing and opening device, and an electromagnet excited by a winding included in the circuit of the contacts and arranged adjacent to said contacts to blow out the arc forming between said contacts, substantially as and for the purposes described.

11. An electric-railway track having surface contacts, a circuit-closer for each contact, a magnetic blow-out adjacent to each circuit-closer, and a car having a collector-bar which is electrically continuous but magnetically discontinuous.

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

HENRI DOLTER.

Witnesses:
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EDWARD P. MACLEAN.