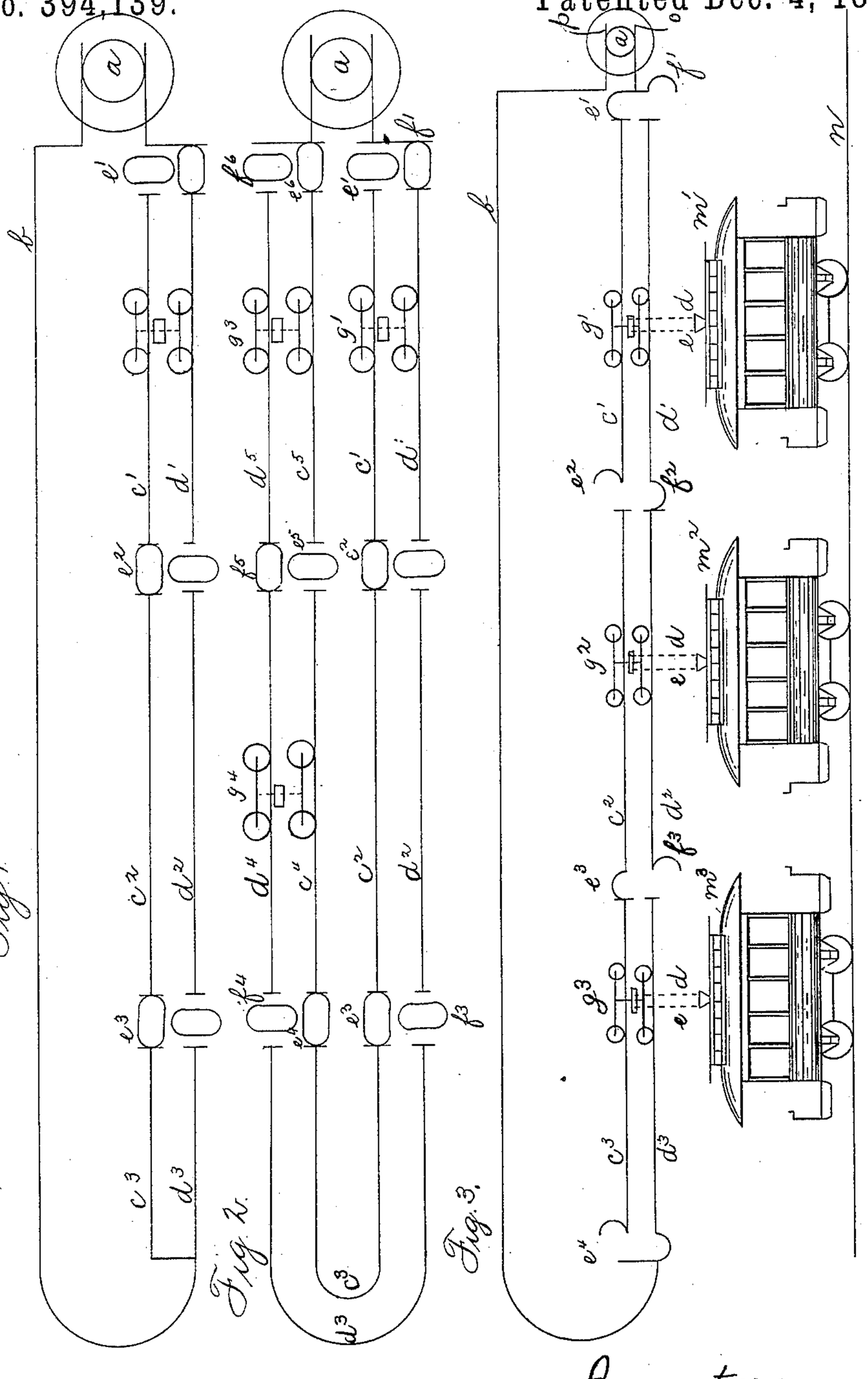
(No Model.) 2 Sheets—Sheet 1.

S. H. SHORT.

SECTIONAL DOUBLE LINE ELECTRIC RAILWAY.

No. 394,139. Patented Dec. 4, 1888.



Witnesses.
John P. Wright.
Arnold Hidg.

Inventor.
Sidney H. Short,
by his attorney
Edward P. Thompson.

(No Model.) 2 Sheets—Sheet 2.

S. H. SHORT.

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No. 394,139. Patented Dec. 4, 1888.

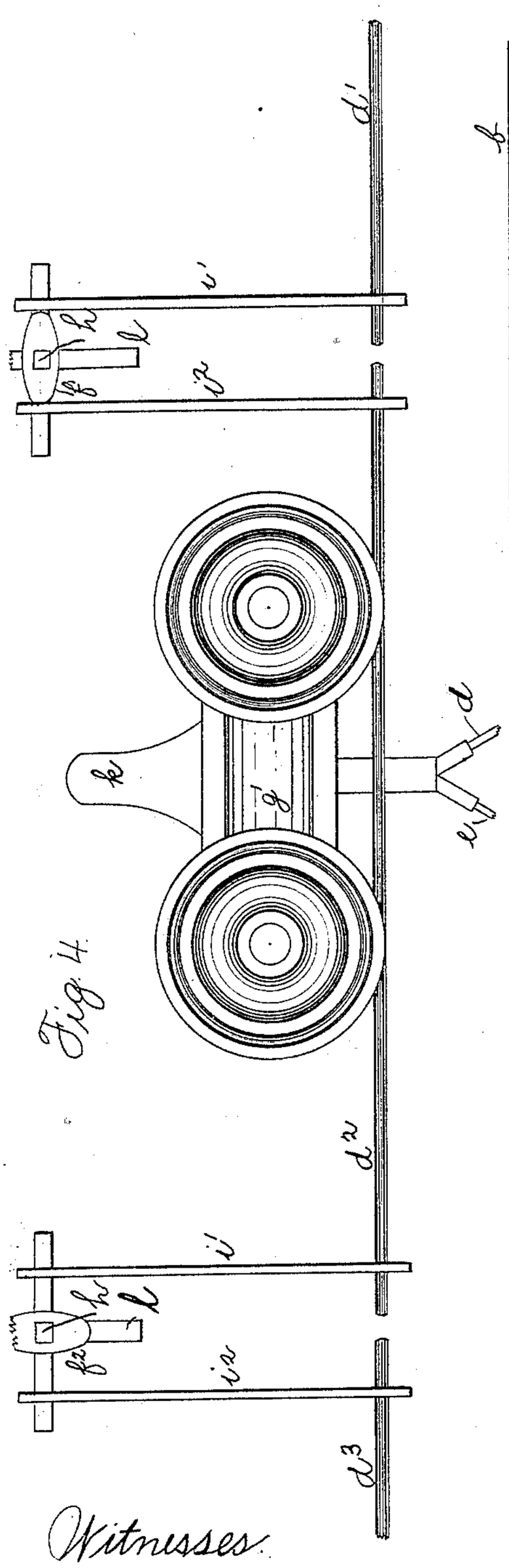

Fig. 4.

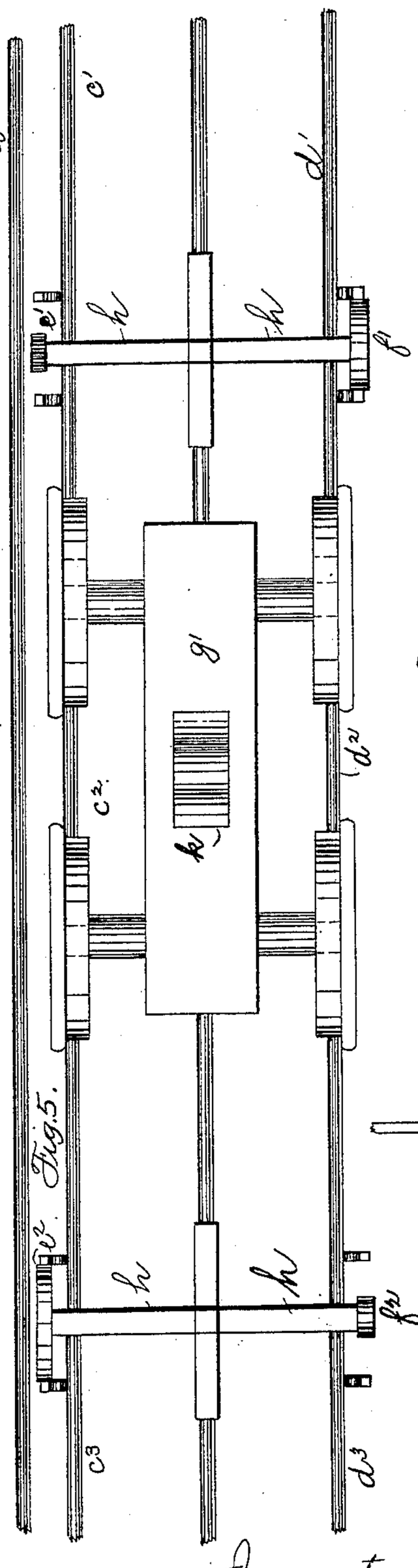

Fig. 5.

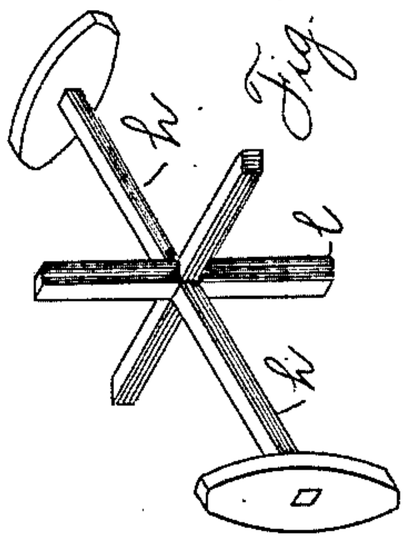

Fig. 7.

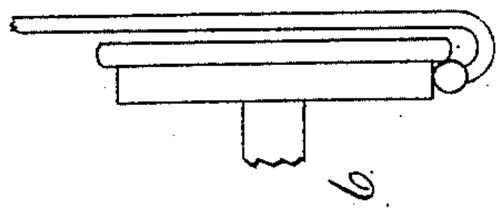

Fig. 6.

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Inventor.
Sidney H. Short.
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Edward P. Thompson.

UNITED STATES PATENT OFFICE.

SIDNEY H. SHORT, OF COLUMBUS, OHIO, ASSIGNOR OF ONE-HALF TO NATHAN B. ABBOTT, OF SAME PLACE.

SECTIONAL DOUBLE-LINE ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 394,139, dated December 4, 1888.

Application filed August 18, 1887. Serial No. 247,228. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY H. SHORT, a citizen of the United States, and a resident of Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Sectional Double-Line Electric-Railway Systems, of which the following is a specification.

All my patents heretofore applied for pertaining to the construction and operation of an electric railway (see, for example, my patents, No. 339,942, April 13, 1886; Nos. 348,476 and 348,477, August 31, 1886, and No. 362,323, May 3, 1887) relate to a sectional single-line conductor with automatic circuit-closing devices connecting the sections of said conductor, combined with an insulating-bar or current-gatherer to operate said circuit-closers.

The invention hereinafter described is absolutely independent in operation and construction of all sectional single-line conductors, for the simple reason that it comprises sectional double-line conductors, and is impossible of construction and operation unless two conductors extend the entire length of the railway and either one or two conductors serve as a return-circuit. If the railway extends from one pole of the generator to the other pole, two conductors, and not less than two, must be employed throughout the circuit from one pole to the other.

My double sectional conductor system may be fully understood by reference to the accompanying drawings.

Figure 1 is a diagram view of a portion of the system in which the return-wire is single. Fig. 2 is a similar view in which the return-wire is double, the outgoing conductor being double in both figures. Fig. 3 is substantially the same as Fig. 1, with the addition of railway-cars electrically connected with the conductors. Fig. 4 is an enlarged side view of what may conveniently be termed the "movable current-controller" and the transfer-switches operated thereby. Fig. 5 is a top view of Fig. 4. Fig. 6 is an end view of a portion of Figs. 4 and 5, showing one of the wheels of the movable current-controller, the conductor on which it moves, and one of the supports of the conductor. Fig. 7 is a two-sided view of the switch adapted to be operated by the movable current-controller.

Referring to the figures, the system consists of the combination of a suitable electric generator, a, having its circuit b divided through a portion of its length into two branches, each of which is divided into sections c', c^2, c^3, c^4, and c^5, and d', d^2, d^3, d^4, and d^5, respectively, switches e', e^2, e^3, e^4, and e^5 between the first-named sections, and switches f', f^2, f^3, f^4, and f^5 between the second-named sections, movable current-controllers g', g^2, and g^3, having wheels, two of which are mounted upon one of the sections d' d^2 d^3, &c., and two of which are mounted upon one of the sections c' c^2 c^3, &c., the pairs of wheels being insulated from each other and electrically connected, respectively, to the conductors d and e, which lead to the car, the car containing a suitable motor, (which is not shown,) a rigid and insulating piece, h, connecting any two switches, f' and e', or f^2 and e^2, or f^3 and e^3, &c., the connection between the same being rigid, upright conductors i' and i^2, connecting the ends of the sections and forming the terminals of any one of the switches above named, a cross centrally located upon the part h, and adapted, when rotated through an angle of from eighty to ninety degrees, to operate any pair of switches f' or e' or f^2 or e^2 in a reciprocal manner, and a projection, k, upon the movable current-controller g, and located in the path of that arm l of the cross which hangs downward, and suitable cars, m', m^2, and m^3, located upon the track n.

The *modus operandi* of the system is as follows: The normal condition of the system is obtained by turning the several crosses to such a position that all the switches e' e^2 e^3, &c., are closed, while all the switches f' f^2 f^3, &c., are open. This condition is not shown in the drawings, but can be easily imagined. Fig. 3 shows the system in actual operation with three cars. It may be noticed that the complete circuit passes through the switch e', the section c', the movable current-controller g', car m', the section d', the switch f^2, the section d^2, the current-controller g^2, the car

m^2, the section c^2, the switch e^3, the section c^3, the controller g^3, the car m^3, the section d^3, and thence to the opposite pole of the generator from which it started. When the current passes through the car m', for instance, it propels the same in the ordinary manner, and the car in turn pulls the controller g' by means of the conductors d and e, which act as a mechanical connection between the car and the controller. When the controller comes to the ends of the sections c' and d', the projection k (shown in Figs. 4 and 5) operates the arm l, which closes the switch e^2 and simultaneously opens the switch f^2.

It is practically impossible for an accident by collision to occur with this system. Suppose, for instance, in Fig. 2, that the operator of the car (not shown) belonging to controller g^4 should run his car to the left. Then by the time that the controllers both arrive upon any pair of sections, as c^2 d^2, the circuit would be cut out from both of the cars, although it would still be complete through the remaining part of the system. The same phenomenon may be noticed by reference to Fig. 3. Suppose the controller g^2 to pass from the section formed of the conductors c^2 d^2 and to enter upon the section formed of the conductors c' d'. Then will the current not pass through either one of the cars m' and m^2, because, all the switches f' f^2 f^3 being open and e' e^2 e^3 being closed, the current will pass directly through the car m^3 without passing through either of the conductors d' or d^2. It may be well to notice in this connection that the length of the sections is several hundred feet, while the distance between the ends of the sections is only a fraction of an inch. For this reason there would be practically no possibility of the cars accidentally approaching exactly at ends of two different sections.

I claim as my invention—

1. In a sectional double-line electric-railway system, the combination of two conductors cut at intervals into sections, switches between the sections, all the switches in one conductor being normally closed and all the switches in the other conductor being normally open, and an electric generator in circuit with said conductors.

2. In a sectional double-line electric-railway system, the combination of two conductors cut at intervals into sections, switches between the sections, all the switches in one conductor being normally closed and all the switches in the other conductor being normally open, an electric generator in circuit with said conductors, and an electric car in circuit with said conductors and said generator, and adapted to open and close the switches in the two conductors alternately as it travels over the road.

3. An electric switch consisting of the combination of a spindle or similar shaft, projections extending at right angles to said shaft and at right angles to each other, and two electric contact-rods at opposite ends of said spindle and located in parallel planes and at right angles to each other, the planes being at right angles to the spindle.

4. In a double-line electric-railway system, two conductors extending from pole to pole of an electric generator and cut at intervals into sections which are provided with switches in pairs, the two switches of each pair being connected together and so arranged that when one is open the other will be closed.

5. In a double-line electric-railway system, the two conductors extending from pole to pole of an electric generator, and divided at intervals into sections which are provided with switches in pairs, the two switches of each pair being so arranged that when one is open the other will be closed.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 12th day of August, 1887.

SIDNEY H. SHORT.

Witnesses:

HI BANCROFT,

M. VERCOE.