(No Model.)

S. D. FIELD.

ELECTRIC RAILWAY.

No. 393,224. Patented Nov. 20, 1888.

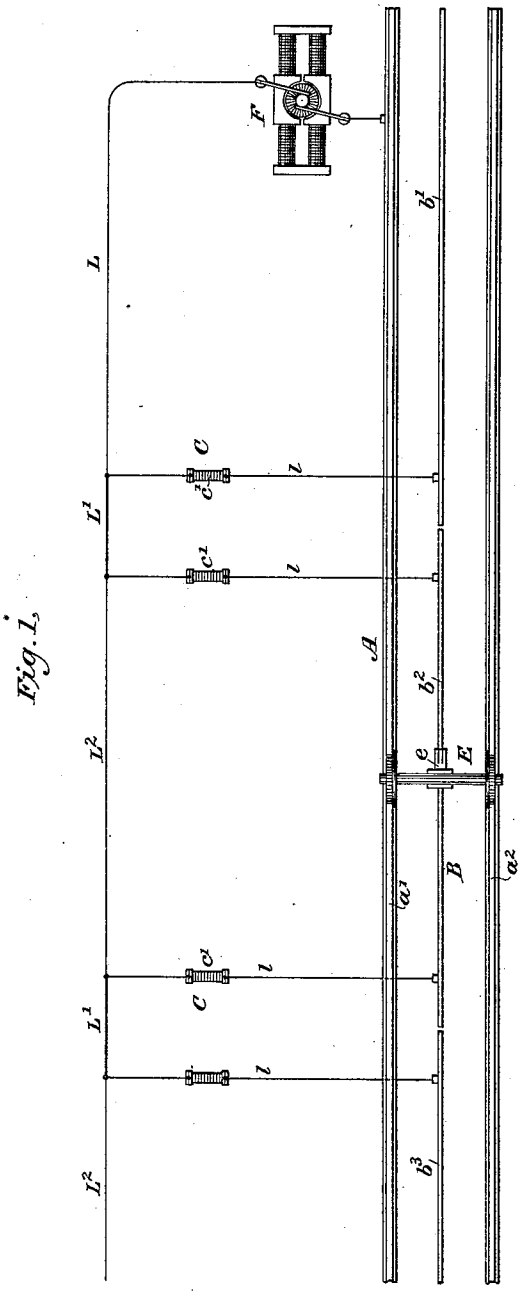

Fig. 1.

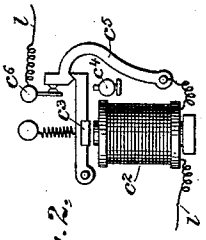

Fig. 2.

WITNESSES,

Wm. A. Skinkle

Jos. S. Latimer

INVENTOR,

Stephen D. Field,

By his Attorneys

Pope Edgecomb & Butler

UNITED STATES PATENT OFFICE.

STEPHEN D. FIELD, OF NEW YORK, N. Y.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 393,224, dated November 20, 1888.

Application filed April 5, 1884. Serial No. 126,722. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN D. FIELD, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

My invention relates to electric railways and apparatus employed in connection therewith for propelling moving vehicles by means of electricity supplied from a fixed distant point.

In operating movable electric motors it is usual to supply electric currents thereto by transmitting the same from a suitable generator or source either through the metallic rails of the track upon which the vehicles move or else through an independent rail or other conductor provided for that special purpose. In the latter case the return-circuit is either through the earth or through one or both of the ordinary rails. Considerable inconvenience has been experienced in operating railways of this character, due to the accidental or malicious short-circuiting of the conductors—as, for instance, a heavy bar of iron being placed in contact with the conducting-rail and the return-circuit. The portion of the track lying beyond the connection thus formed would be deprived of its electric supply to a degree proportionate to the conductivity of the short circuit thus formed. It is apparent, therefore, that a motor depending for its motive power upon electric currents supplied from a given point might be rendered powerless by simply short-circuiting the conductors between the train and the generator.

The object of the invention is to so organize the circuits and to supply the required electric currents to the moving train or motor in such manner that it will be impossible for the movements of the train to be interfered with by the formation of a short circuit between the conducting-rail and the return-conductor.

The invention consists in constructing a railway with an intermediate or central line of rails designed to supply the currents to the moving train and in dividing this central rail into short detached insulated sections, which are supplied with electricity from a stationary generator by means of an electric conductor extending along the entire line, which is connected at intervals with the separate sections through branch conductors. In each of these branches is included a device for interrupting the connections with the particular section to which it leads, provided a current of too great strength is caused to traverse the same. The sections of insulated rail may for this purpose each be constructed of about five hundred feet in length. From points near their respective extremities conductors are provided which lead to the line which extends from the generator. The devices included in these conductors may be operated, for the purpose of interrupting the circuit, either by the action of heat induced by an excess of current or through the agency of electro-magnetic devices adapted to respond to any abnormal increase in current strength. So long, however, as the line of railway is in its normal and operative condition the currents supplied thereto will not be sufficient to affect these devices; neither will the normal currents which flow through the same for the purpose of actuating the motor as it traverses the successive sections be of such strength as to disconnect the circuit-connections. If, however, by chance or through intent a short circuit of but small resistance is established at any point between one of the sections, conducting-rails, and the return-conductor, sufficient current will pass therethrough to actuate the interrupting device, and thereby to immediately disconnect that particular section of the rail from the main or supply conductor.

In the accompanying drawings, which illustrate my invention, Figure 1 is a diagram illustrating the organization of circuits which I prefer to employ, and Fig. 2 illustrates the application thereto of an electro-magnetic circuit-interrupting device.

Referring to the drawings, A represents a line of railway constructed in the usual manner. Between the rails a' and a^2 of this line extends a third or intermediate line of rails, B, the separate sections b' b^2 b^3 of which are insulated from each other. The sections b may be of any convenient length—say five hundred feet, more or less. The traveling electric motor E as it passes along the track is designed to receive the required supply of electricity, by which it is actuated, from the particular

section of the central rail over which it may chance to be through a suitable contact brush, roller, or equivalent device, *e*. The circuit of a suitable electric generator, F, is completed through a conductor, L, (which is designed to be either supported and insulated upon poles extending along the line of track or to be inclosed within a suitable conduit beneath the earth,) to a series of branch conductors, *l l l*, &c., leading to the separated insulated sections of the line of rails B. The circuit is completed through the motor and one of the track-rails, *a'* or a^2, back to the generator. In each conductor *l* is included a device, C, designed to interrupt its connections with the track when an abnormal current is caused to traverse the same. In Fig. 1 I have represented such a device as consisting of a fusible strip of metal, *c'*, which, while capable of conducting electric currents of the strength required to actuate the motor, will become heated by the passage of a current of any greater strength to a sufficient degree to be fused, thereby disconnecting from the supply-conductor L the section of rail to which that conductor leads.

In the drawings I have represented two conductors, *l*, as leading to each separate section of the line of rails B, for the purpose of distributing the currents more perfectly, and also for the additional purpose of avoiding the use of a conductor, L, of very great size, for supplying currents of the required quantity to the motor. The portions L' of the conductor L, however, which lie between the conductors *l*, leading to the respective ends of the adjacent sections *b* of the central line of rails B, are sufficiently increased in size to compensate for the increase in the quantity of current which is compelled to traverse that portion of the conductor above that which traverses the parts L^2 between any two conductors *l* connected with the same rail-section *b*.

It is evident that a motor, E, passing along a track thus organized may receive the required amount of electricity from the separate sections, while the quantity of electricity caused to traverse the conductors *l* will be insufficient to actuate the interrupting device C. If, however, one of the sections *b* should be short-circuited, the increase in the amount of current caused to traverse the corresponding conductors, *l*, will immediately cause an interruption of the connections of the conductor leading to that section, and no current thereafter will be supplied thereto. A train subsequently reaching such a short-circuited section would, if its required momentum be sufficient, pass beyond the section and again be placed in operation by currents supplied through the succeeding section. This organization of track-circuits is of service for preventing any train which has been disabled and caused to stand upon the track from being run into by a train following it upon the same track. Thus, if a train were for any reason to be left standing upon one section of the track, a messenger sent back might short-circuit one or more of the preceding sections, thereby depriving such sections of their supply of current and causing a succeeding train, when upon those sections, to be stopped from the lack of a current.

In Fig. 2 a modification in the form of circuit-interrupting device C, which may be employed, is illustrated. This device consists of an electro-magnet, c^2, having a few convolutions of thick wire, which constitute its helix, and an armature, c^3, which is normally held away from its back contact-stop, c^4, in any suitable manner. While in its normal position the armature c^3 retains a circuit-interrupting device, c^5, in the position shown in the drawings. If, however, the armature c^3 be drawn toward the electro-magnet, the circuit-interrupting device c^5 will be released and will fall away from a circuit-closing point, c^6, against which it is normally held.

The conductor *l*, leading from the supply-conductor L, is designed to be normally connected with the contact-stop c^6, while the circuit-interrupting device or arm c^5 is connected by the coils of the electro-magnet with the corresponding track-sections *b*. The armature c^3 is so adjusted that it will not respond to currents of the strength employed for actuating the motor, but a current of abnormal strength will draw the armature toward its electro-magnet, thereby releasing the circuit-interrupting device, which, by falling away from its contact-point, disconnects the circuit-connections of the conductor *l*, and the track-section will be thus cut out of circuit in the same manner described with reference to the fusible strip.

I claim as my invention—

1. The combination, with a railway-track, of a series of sectional conductors extending along the line of the track, a continuous conductor, normally completed connections between the respective sectional conductors and the continuous conductor, and intervening circuit-interrupting devices.

2. The combination, substantially as hereinbefore set forth, with an electric generator and a railway-track, of a line of insulated sections of conductor adapted to be successively placed in electric contact with an electric motor moving along said track, a supply conductor or main extending along the line of track, one or more branch conductors leading from said supply conductor or main to each of said insulated sections, and an automatic circuit-interrupting device included in each of said branch conductors, which devices are adapted to be operated by the passage of electric currents of abnormal strength.

3. In an electric-railway system, the combination, with a series of insulated working-conductors, of branch conductors containing automatic circuit-breaking devices through which said working-conductors are connected with a common source of electrical supply,

said circuit-breaking devices being normally closed and arranged to operate when traversed by an abnormal current.

4. The combination, substantially as hereinbefore set forth, of a series of insulated electric conductors extending along the line of railway-track, a continuous conductor having portions of its length increased in size or conductivity, and two branch conductors leading from points near the respective ends of said insulated conductors to the respective ends of a corresponding portion of said continuous conductor, which is not of increased conductivity.

In testimony whereof I have hereunto subscribed my name this 4th day of April, A. D. 1884.

STEPHEN D. FIELD.

Witnesses:

DANL. W. EDGECOMB,

CARRIE E. DAVIDSON.