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M. A. LAZAREFF.

ELECTRIC RAILWAY.

APPLICATION FILED FEB. 6, 1907.

Fig. 1,

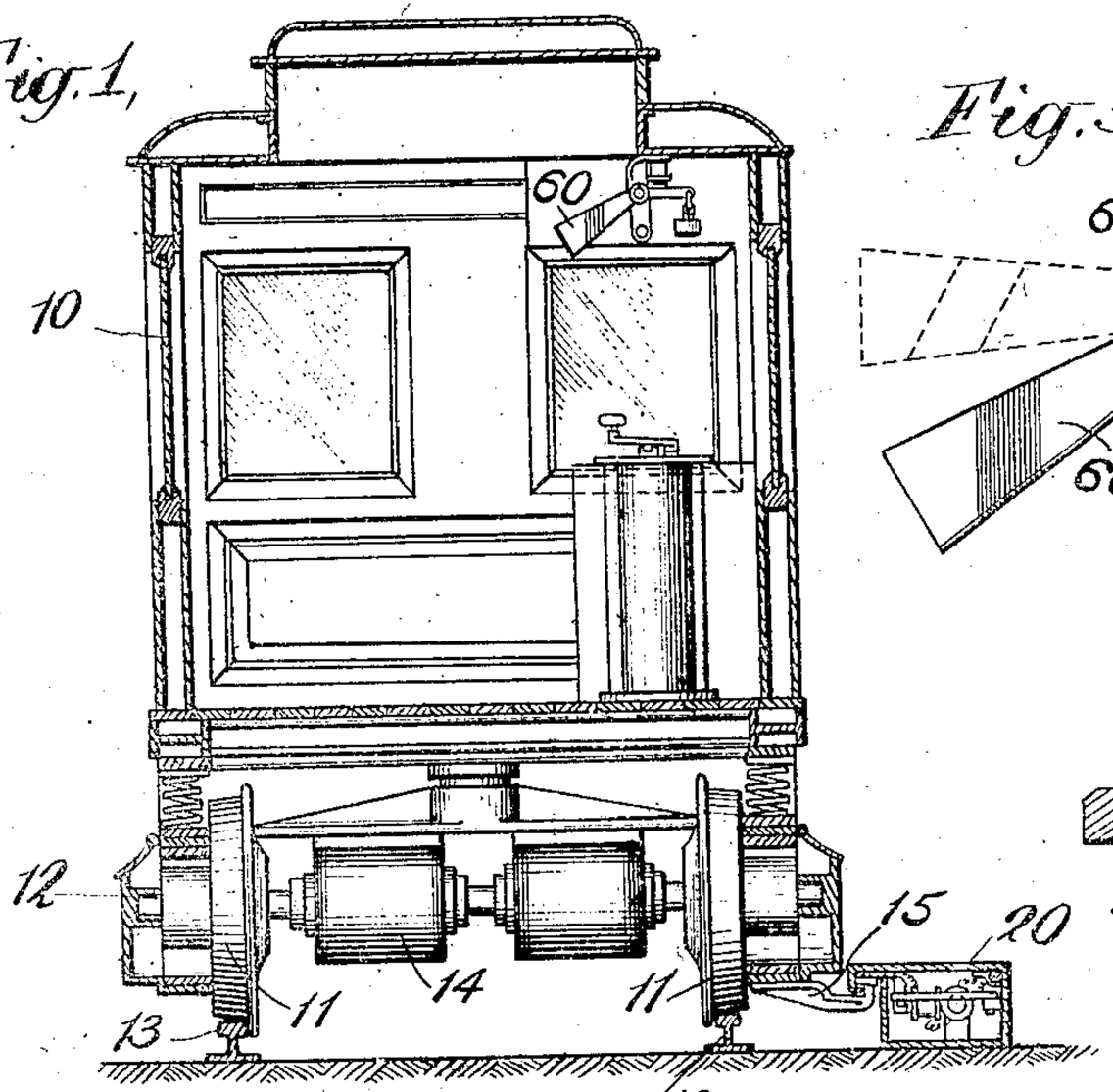


Fig. 5,

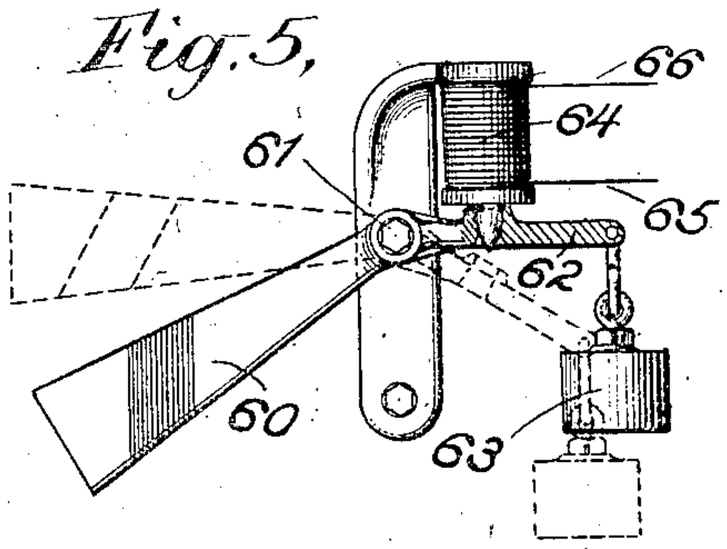


Fig. 6,

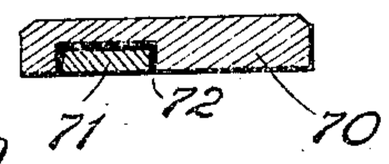


Fig. 2,

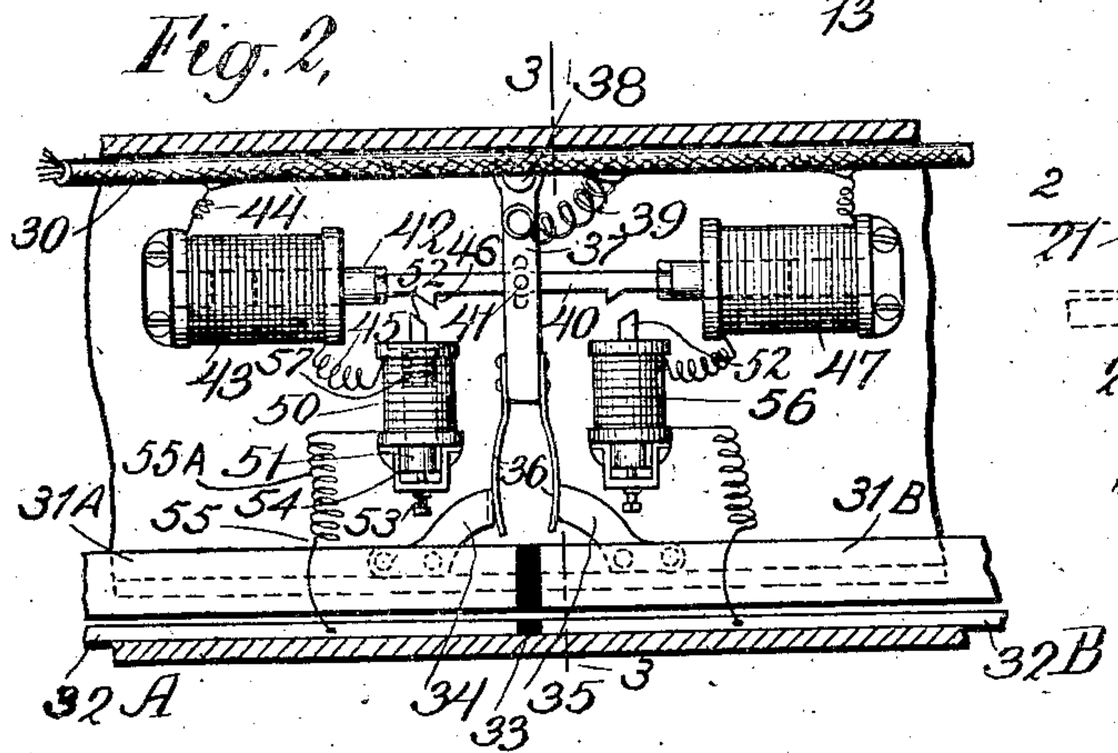
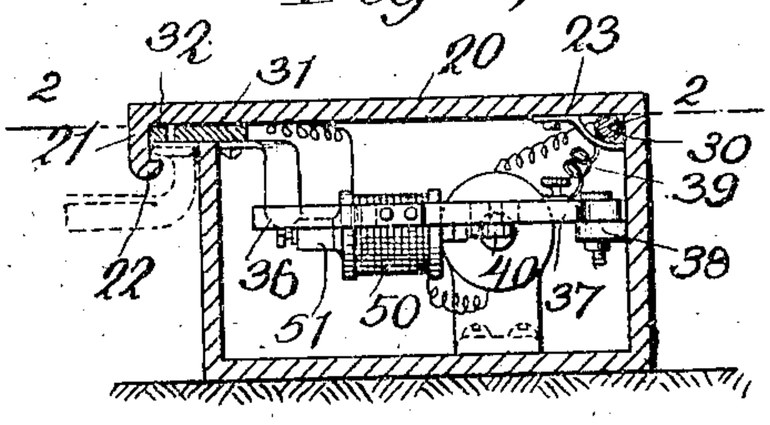


Fig. 3,



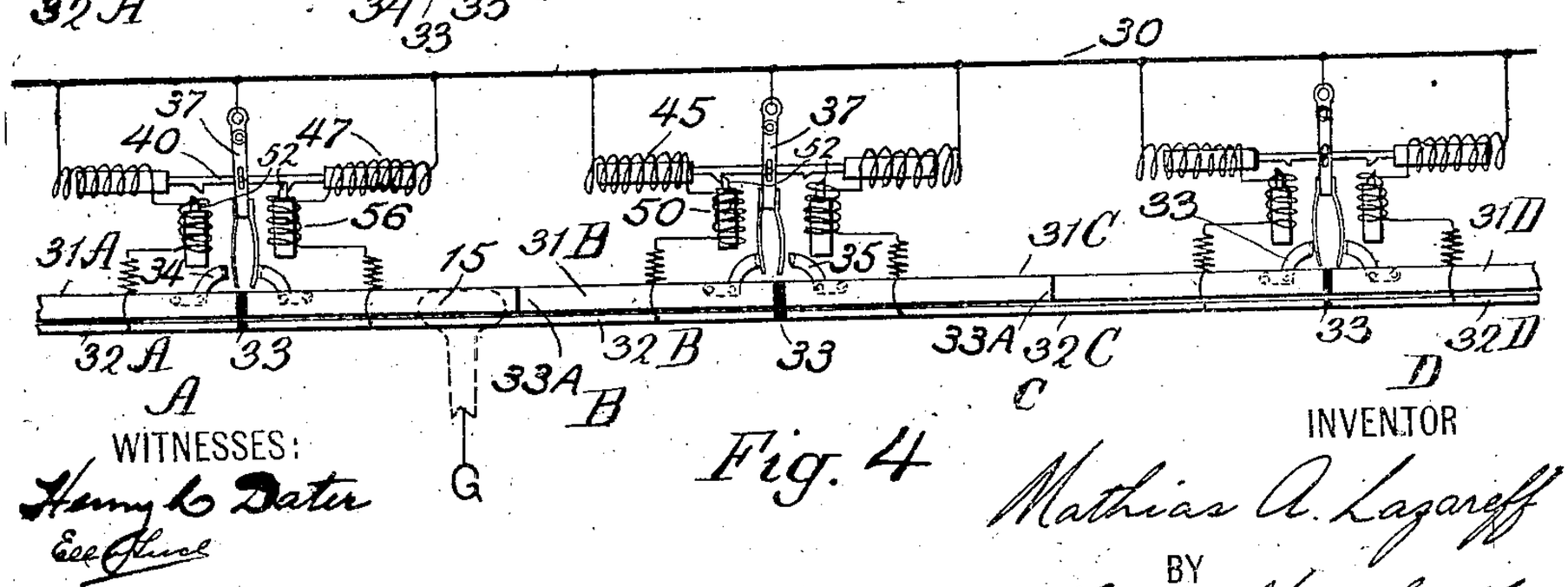


Fig. 4

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ELECTRIC RAILWAY.

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Application filed February 6, 1907. Serial No. 355,972.

To all whom it may concern:

Be it known that I, MATHIAS A. LAZAREFF, a citizen of the United States, and a resident of the city of New York, in the county of New York and State of New York, United States of America, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

My invention relates to new and useful improvements in electric railways and consists in the novel arrangement and construction of parts herein shown and described. Its particular object is to provide means for increasing the safety of electric railways and especially to prevent collisions.

I will describe my invention in the following specification and point out the novel features thereof in claims.

Referring to the drawings, Figure 1 is a sectional elevation of a railway-car showing my invention applied thereto. Fig. 2 is a plan view of certain parts of my invention which are arranged within a housing, this view showing the upper portion of the housing removed or sectioned, the section being taken through the line 2—2 of Fig. 3. Fig. 3 is an end elevation, in section, of some of the parts shown in Fig. 2, the section being taken through the line 3—3 of Fig. 2. Fig. 4 is a diagram of electrical circuits and certain parts which are used in conjunction therewith showing a preferred system of electrical connections between the various parts of my apparatus. Fig. 5 is a front elevation of a semaphore or signal device which I use in conjunction with my invention. Fig. 6 shows in cross-section a modified form of my third-rail and an electrical contact strip which may be used in carrying out my invention.

Like characters of reference designate corresponding parts in all the figures.

10 designates a railway-car of any desired form of construction. 11, 11 are its wheels which are journaled to the car as shown at 12.

13, 13 designates the rails over which the car is arranged to run. Motors on the car are designated by 14.

15 is a contact-shoe carried by the car.

20 designates a housing which is arranged to cover and inclose a main-line conductor and various other apparatus which I will describe. This housing may be of wood or other non-conducting material and is arranged to be supported along side of and parallel with the rails 13 which form the track as shown in Fig. 1.

31 designates a third-rail or conductor which is supported by the housing and partly inclosed thereby.

32 is an independent contact strip which may be used in conjunction with the rail 31. The upper portion of the housing covers these two contact rails and the depending lip 21 extends down across these two contacts and partly under them at 22 as is clearly shown in Fig. 3.

30 designates a main-line conductor from a power house or other suitable source of electrical supply. This conductor may be placed within the housing and secured in place by means of brackets such as 23.

The third-rail 31 and the contact strip 32 are arranged to be divided up into sections of a predetermined length. These sections are designated in Fig. 4 by A, B, C and D, and the sections of the strip which forms the third-rail are designated by 31^A, 31^B, 31^C and 31^D, and the contact strip in these sections is designated by 32^A, 32^B, 32^C and 32^D These various sections are separated from each other and divided electrically by means of insulation 33.

Situated at or near the points at which the insulation 33 divides the adjoining sections of the third-rail and contact strip I place electromagnetically actuated switching and locking devices which are arranged to be automatically operated by the movement of the collector-shoe of a car over the third-rail and contact strip. These switching and locking devices comprise a plurality of electromagnets and associated parts which I will now describe, referring especially to Figs. 2 and 3. In these figures 34 and 35 designate brackets which are connected with the adjacent ends of two sections 31^A and 31^B of the third-rail, the outer ends of which form stationary contacts upon which spring-contacts 36 are arranged to bear. These spring-contacts are attached to the ends of a lever 37 which is pivoted at 38 to the housing and which is connected to the main-line conductor 30 by means of an auxiliary flexible conductor 39.

At a point intermediate the pivoted connection 38 and the spring-contact 36 a reciprocating rod 40 is connected as at 41. At the left-hand end of the reciprocating rod 40 a core or plunger 42 is attached and this core or

plunger is arranged to be attracted by a solenoid coil or winding 43. This core and winding forms an actuating magnet. One end of this solenoid is connected to the main-line conductor 30 by a wire 44, and its other end is connected by a conductor 45 through the winding of a solenoid 50 and conductor 55 to the conducting strip 32^A.

The solenoid 50 constitutes a part of a locking magnet of which 51 designates the core. A locking member or pawl 52 is attached to the upper end of this core and is arranged to engage with a projection 46 upon the reciprocating rod 40. A spring 57 is arranged to hold the pawl normally out of its locking position. The lower movement of the core 51 may be limited by means of an adjusting screw 53 which is held in place by a bracket 54.

To the right-hand end of the reciprocating rod 40 a core is attached, similar to that already described which core coöperates with a solenoid magnet 47, the various parts of which are similar to those already described.

56 designates a locking magnet similar to the magnet shown at 50, and the solenoid magnet 47 and the locking magnet 56 are connected between the main-line conductor 30 and the contact strip 32^B in the same manner that the solenoid magnet 47 and the locking magnet 50 are connected between the main-line conductor 30 and the contact strip 32^A.

It may be seen that under usual conditions the pivoted arm 37 will remain in its central position and that it will be held in such position by the action of the springs 36 against the contact brackets 34 and 35. In this manner the sections 31^A and 31^B of the third-rail are in electrical contact with the main-line conductor 30 and are thus supplied with voltage from the source of supply through the flexible conductor 39, the pivoted arm 37, springs 36 and brackets 34 and 35. It may be seen that under usual conditions the solenoid actuating magnets and the locking magnets are not energized, but that they are constantly connected with the main-line conductor 30 and with the sections 32^A and 32^B of the contact strip; thus the third-rail is normally a live rail. The third rail then is normally energized and is always ready for use throughout all parts of the system, except at such sections which are temporarily cut out automatically in the manner which I will describe.

The operation of this device is as follows: Let us, for example, consider that the contact-shoe 15 has been carried by the car until it rests upon section 31^B of the third-rail and 32^B of the contact or conducting strip. It is diagrammatically shown in this position in Fig. 4. The contact-shoe 15 is connected in any of the well known manners through the various parts of the electrical apparatus on the car with the ground which is designated by G in Fig. 4. It may be seen that when in this position a circuit is closed through actuating magnet 47, locking magnet 56, conducting strip 32^B and the shoe 15 to the ground. Thus the actuating magnet 47 and the locking magnet 56 become energized. These in turn will cause the reciprocating rod 40 to be pulled over to the right and will thus cause the pivoted lever 37 to be moved until its spring contact, which bore upon bracket 34, will be moved away from this bracket. In the left-hand portion of Fig. 4 the parts are shown moved into their new position. It may be seen from this portion of Fig. 4 that the current supply from the section 31^B of the third-rail is thus cut off. The locking magnet 56 is energized and causes the locking-pawl which it controls to be moved up into locking engagement with the right-hand projection 46 on the reciprocating rod 40 so that the parts are thus locked and held in their new operative position. At the same time when the car has reached the position above described, it may be seen that a circuit is also closed through the actuating magnet 45 and locking magnet 50 of the middle set of magnetically actuated switching devices, and that the pivoted lever 37 of this middle set is moved over to the left so that one of its contact springs 36 is moved away from the bracket 35. The electrical supply is thereby cut off from the section 31^C of the third-rail and the movable parts are locked in this new position.

From the above it may be seen that the section of the third-rail over which the car is running is supplied with line potential from which the car and its motors may receive their motive power, but that at the same time the sections of the third-rail which are immediately behind and immediately in front of that upon which the car is present, are cut off from the current supply as they are no longer connected with the main-line conductor 30. If another car should attempt to run onto the section A or the section C it could not receive current from the third rail because the parts are locked in the manner above described. The contact strips are always alive, but the amount of current which may pass through them to the car is limited by the resistance 55^A to an amount only sufficient to energize the magnets, which amount will have practically no effect upon the motors on the cars. By this arrangement it is impossible for a train coming in either direction toward the one which we have been considering to receive motive power and therefore it is impossible for such a car to run into the one upon section B.

It may be seen that in order to perfect this arrangement it is necessary to sub-divide each section of the third-rail sections by means of an insulated strip 33^A in order to

prevent these rails from receiving the current from an end opposite to that from which the current has been cut off by the automatic switching arrangement.

As the car travels toward the right until it is on section C and its contact-shoe is on third-rail section 31^c and conducting strip 32^c, the switching mechanism at the left of the diagram will again assume its normal position, as the locking magnet 56 and the actuating magnet 47 will then have their circuit broken by the contact-shoe 15 running off the conducting strip 32^B, and the spring-contact 36 will cause the pivoted arm 37 to be returned to its central position in which the spring-contacts 36 will rest upon both brackets 34 and 35. At the same time, the automatic switching mechanism in the central part of the figure will be moved from its left-hand position to its right-hand position, and the switching mechanism at the right-hand portion of the figure will be pulled over to the left-hand side, thus cutting off the current from the third-rail section 31^D. This operation will be repeated throughout the travel of the car.

The third-rail sections may be divided up in any predetermined length. It is advisable, however, that these parts be so arranged that it will be impossible for a collision to occur, and of course, the length of sections may vary according to the service to which they are to be adapted. For example, when an apparatus is installed for high speed service the sections should be proportionately longer than for low-speed service, and if an apparatus is to be used in conjunction with electric trains, it is also desirable to have the sections longer than when they are used with single cars.

It may be seen that the operation of this device is not dependent upon the operation of the electrical apparatus upon the car and is just as effective whether the current is connected through the motors or not. For this reason it is possible to install contact-shoes such as 15 upon dead, cars or trailers of a train in order to insure absolute safety of operation.

I have illustrated my automatic switching mechanism as installed within a housing near to the track. This is not necessary, however, as the switching mechanism may be placed in any convenient location and connected with the third-rails and contact strips by means of wires.

The particular form of housing which I have shown and described is of great importance, however, as the third-rail and conducting strip are entirely protected from snow or sleet and are also inaccessible to workmen upon the track, and therefore a frequent class of accidents is avoided.

While I have shown my invention applied to a third-rail conductor it is, of course, applicable as well to an overhead trolley system, as in the latter case the trolley-wires may be divided into sections and connected with the automatic apparatus in the same manner as that which I have already described. The system which I have invented is operated entirely by the electrical supply from a power house which provides current for the operation of the car or train, and is not dependent in any way upon any auxiliary generators or batteries.

In conjunction with my system I have invented a signal-device which is illustrated in Fig. 5, and which may be placed in a car directly in front of the motorman or operator. This device comprises a semaphore 60 which is pivoted at 61. An armature of magnetic material 62 is connected with this semaphore, and the outer end of this armature may be provided with a weight 63 which will move the semaphore into horizontal or danger position, as shown in dotted lines in Fig. 5, whenever the car or train runs onto a dead section of the third-rail. A magnet 64 is provided for maintaining this semaphore in its lower position whenever the line is clear and there is current present in the third-rail. One of the terminals 65 of this magnet may be connected with the car and the other terminal 66 may be connected with the contact-shoe 15, and if desired, a resistance may be included in this circuit for the purpose of reducing the current which passes through the magnet 64. The effectiveness of this device is made possible by the fact that the third-rail is normally alive so that the indicating device will not operate to show danger unless there is a car ahead to cut off the current from some of the sections.

In Fig. 6 I have illustrated a modified form of third-rail and conducting strip. In this case the third-rail is designated by 70. A longitudinal groove may be cut away in this third-rail and a conducting strip 71 may be placed within this longitudinal groove, separated from the third-rail portion 70 by means of suitable insulation 72.

This system differs materially from any of those known in the art, for it contemplates the use of a third-rail which is normally alive and under usual conditions connected directly with the source of power supply. But in this system, as soon as a car or train is present upon one of the sections, its adjoining sections may be cut off from the source of current supply, thus becoming dead and preventing collisions.

I have illustrated a simple form of wiring for my invention, but this I have done merely to illustrate it and wish to be understood as not confining myself at all to the precise arrangement of circuits and other parts which I have shown, for it is entirely within the scope of my invention to modify this construction.

What I claim is—

1. In an electric railway, a main-line conductor from a suitable source of electrical supply, a series of insulated sectional conductors, a plurality of switches arranged to connect and disconnect said sectional conductors to and from the main-line conductor, said switches being normally in their closed position, electroresponsive devices automatically actuated by a car coming in operative relation with said sectional conductors and arranged to move the switches to cut off the connection between the main-line conductor and the adjacent sectional conductors to that with which the car is in operative relation, and electromagnetic locking devices for said switches.

2. In an electric railway, a main-line conductor from a suitable source of electrical supply, a series of insulated sectional conductors, a housing arranged to support and to protect said sectional conductors, a plurality of switches arranged to connect and disconnect said sectional conductors to and from the main-line conductor, said switches being normally in their closed position, electroresponsive devices automatically actuated by a car coming in operative relation with said sectional conductors and arranged to move the switches to cut off the connection between the main-line conductor and the adjacent sectional conductors to that with which the car is in operative relation, and electromagnetic locking devices for said switches, said switches, electroresponsive devices and locking devices being within the housing.

3. In an electric railway, a main-line conductor from a suitable source of electrical supply, a series of insulated sectional third-rail conductors, a plurality of switches arranged to connect and disconnect said sectional third-rail conductors to and from the main-line conductor, said switches being normally in their closed position, a plurality of conducting strips adjacent to but insulated from the third-rail conductors, and a plurality of switch-controlling magnets permanently connected with the main-line conductor and with said conducting strips, said magnets being arranged to open and thereby cut off connection between the main line conductor and the third-rail sections immediately in front of and behind a car, whenever the circuits of the magnets are closed by a car being in operative relation to one of the conducting strips.

4. In an electric railway, a main-line conductor from a suitable source of electrical supply, a car, a series of insulated sectional third-rail conductors, a plurality of switches arranged to connect and disconnect said sectional third-rail conductors to and from the main-line conductor, said switches being normally in their closed position, a plurality of conducting strips adjacent to but insulated from the third-rail conductors, a plurality of switch-controlling magnets permanently connected with the main-line conductor and with said conducting strips, said magnets being arranged to open and thereby cut off connection between the main-line conductor and the third-rail sections immediately in front of and behind the car, whenever the circuits of the magnets are closed by a car being in operative relation to one of the conducting strips, and an electrically actuated indicating device in the car.

5. In an electric railway, a car, a contact-shoe carried by the car, a track, a main-line conductor, an insulated third-rail divided up into a plurality of sections, all of which sections are normally connected with said main-line conductor, a conducting strip divided up into sections, electromagnetic switching mechanism connected with said main-line conductor and with each of said sections of conducting strip, the contact-shoe on a car being arranged to pass over the third-rail and conducting strips, and the switching mechanism being arranged to automatically disconnect from the main-line conductor the sections of the third-rail which are immediately in front of and behind the car as the car passes along the track.

6. In an electric railway, a track, a car, a contact-shoe carried by the car, a main-line conductor from a suitable source of electrical supply, an insulated third-rail divided into a plurality of sections, an insulated conducting strip divided into sections, a housing arranged to support and protect said third-rail and conducting strip, the contact-shoe being arranged to pass over the third-rail and conducting strip within a portion of the housing, switching mechanism within said housing between the various sections of third-rail and conducting strip, said mechanism comprising a pivoted lever carrying spring contacts, said lever being connected to the main-line conductor and its contacts arranged to connect with two adjacent sections of the third-rail, a pair of actuating magnets, one of which magnets is arranged to move the lever out of contact with one of the third-rail sections, and the other of which is arranged to move the lever out of contact with the other of the third-rail sections, a locking device for said lever, a pair of electromagnets for actuating the locking device, said locking magnets being in series with the actuating magnets, one of said actuating magnets and one of the locking magnets being connected between the main-line conductor and one section of the conducting strip, the other actuating magnet and locking magnet being connected between the main-line conductor and another section of the conducting strip, said switching mechanism and magnets being arranged to automatically disconnect and

maintain in disconnection from the main-line conductor one of the sections of the third-rail when one of the sections of the conducting strip is in operative relation to the car.

7. In an electric railway, a main-line conductor from a suitable source of electrical supply, a track, a car, a motor therefor, a series of insulated sectional third-rail conductors, a plurality of switches arranged to connect and disconnect said sectional conductors to and from the main-line conductor, means for normally holding said switches in closed position, electroresponsive devices automatically actuated by the car coming into operative relation with said sectional conductors and arranged to move said switches to cut off the connection between the main-line conductor and the adjacent sectional conductors to that with which the car is in operative relation, regardless of whether the motor on the car is receiving current from said sectional conductors or not, and means for locking said switches in their open position until the car passes out of operative relation with said sectional conductors.

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

MATHIAS A. LAZAREFF.

Witnesses:
ERNEST W. MARSHALL,
ELLA TUCH.