(No Model.)

M. W. DEWEY.

ELECTRIC RAILWAY.

No. 516,188. Patented Mar. 13, 1894.

Fig. 1.

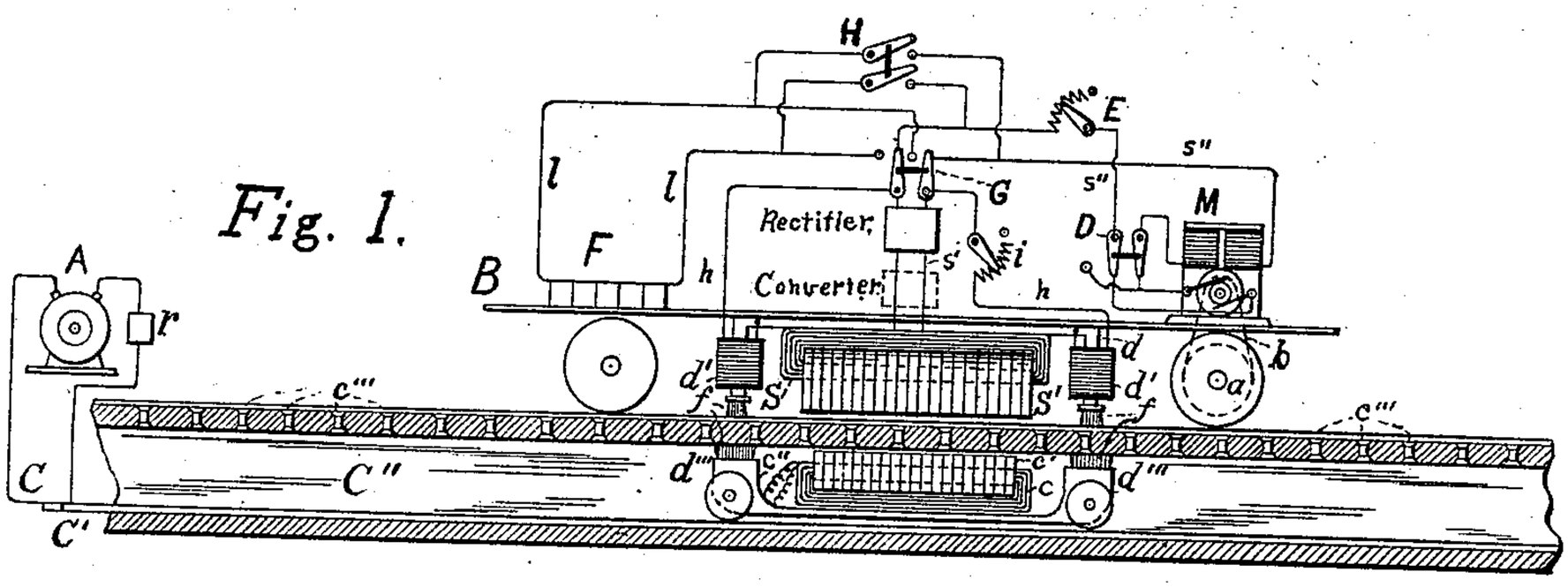


Fig. 2.

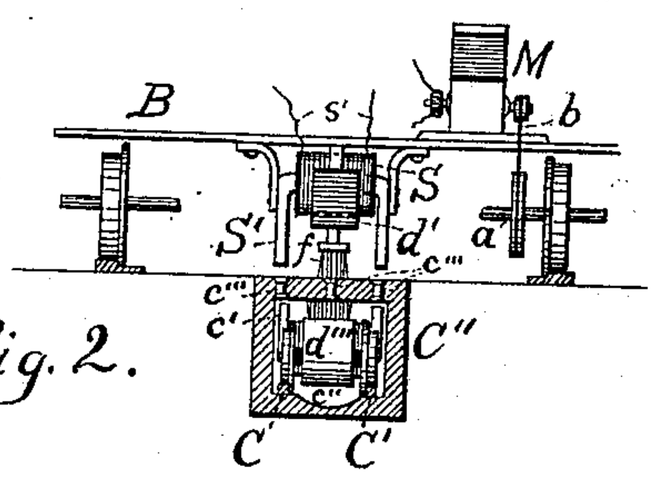


Fig. 3.

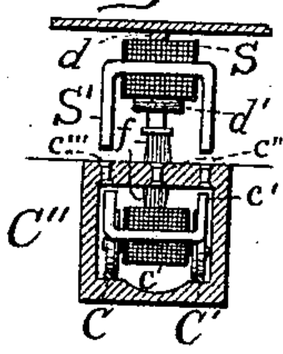


Fig. 4.

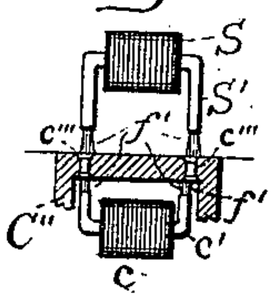


Fig. 5.

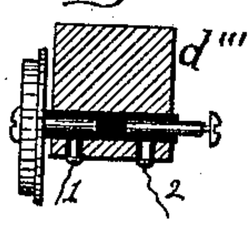


Fig. 6.

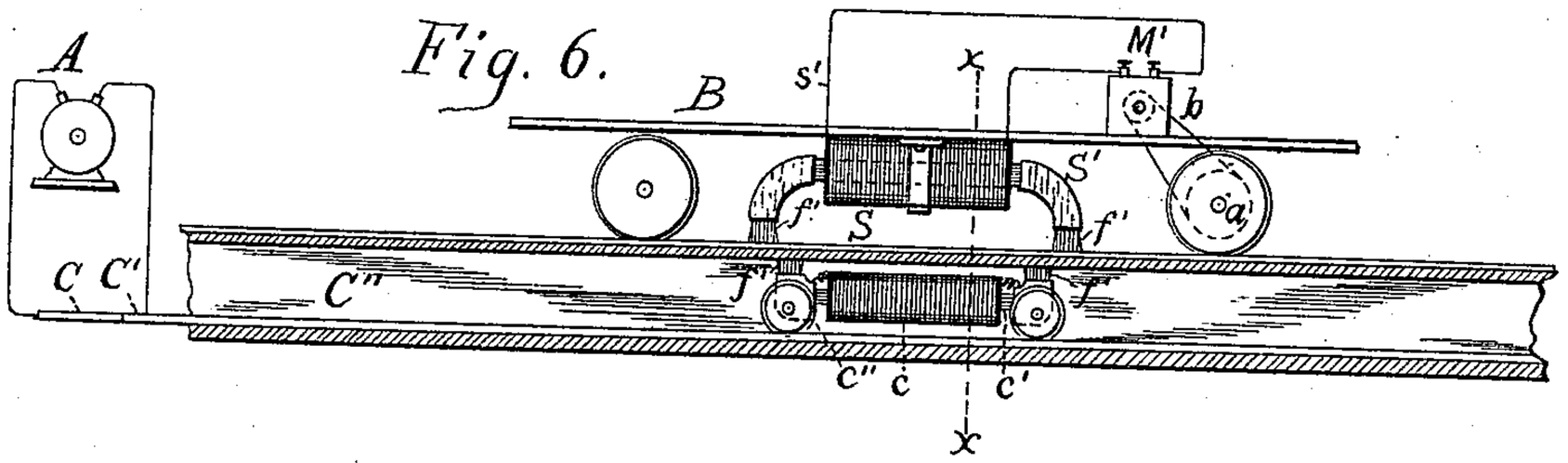


Fig. 7.

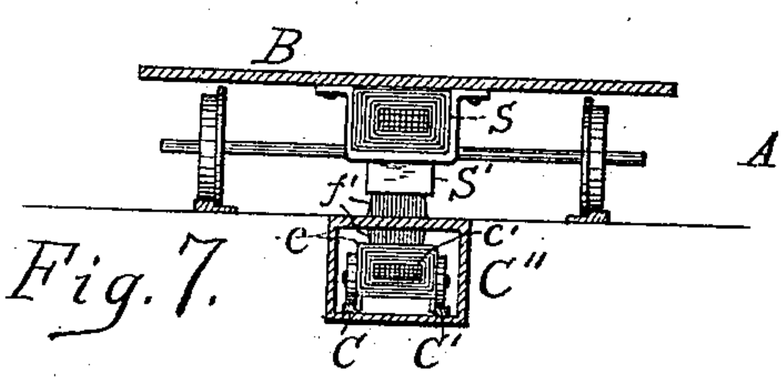


Fig. 8.

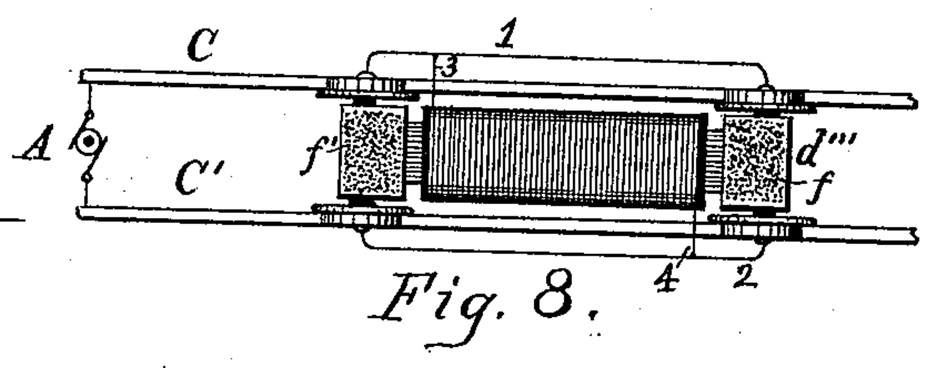
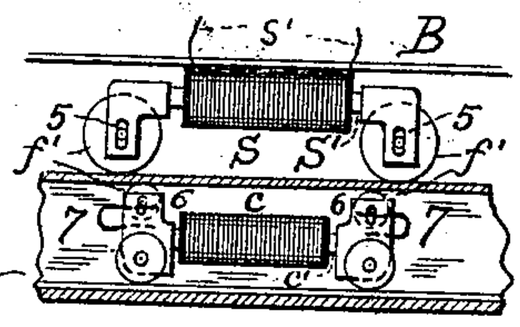


Fig. 9.



WITNESSES:

C. L. Bendixon

H. M. Seamans

INVENTOR

Mark W. Dewey

BY

Dodd, Lasse & Dodd

ATTORNEYS

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

MARK W. DEWEY, OF SYRACUSE, NEW YORK, ASSIGNOR TO THE DEWEY CORPORATION, OF SAME PLACE.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 516,188, dated March 13, 1894.

Application filed July 6, 1889. Renewed April 28, 1890. Serial No. 349,729. (No model.)

To all whom it may concern:

Be it known that I, MARK W. DEWEY, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Electric Railways, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to propelling or moving vehicles such as cars and boats, electrically, and the object is to dispense with contact brushes, wheels, &c., in electric connection with a conductor along the route of the vehicle, to allow the employment of currents of great strength, and to avoid the necessity of employing heavy and expensive batteries on the vehicle.

The invention consists in improved means for electrically communicating with a vehicle to propel the same or to supply other translating devices thereon with current by induction and without contact with the line conductor.

The invention consists further, in employing a movable or traveling primary coil in electric connection with the line conductor or conductors, moving said coil with and maintaining the same at, beneath or in the vicinity of the vehicle carrying a secondary coil, by magnetic power, and inclosing the said primary coil in a closed conduit along the roadway, preferably beneath the same. The traveling coil is preferably provided with a laminated paramagnetic iron core or body to increase its effect and may be connected with the line conductor either in series or parallel.

In the accompanying drawings, Figure 1 shows a diagrammatic view of circuits on a vehicle or car, and a sectional view of the conduit inclosing the primary or traveling coil. Fig. 2 is an end elevation of same. Fig. 3 is a cross sectional view of the primary and secondary coils. Fig. 4 shows a closed magnetic circuit formed by the cores of the two coils. Fig. 5 shows a plan for insulating the wheels from each other. Fig. 6 is a modification of Fig. 1. Fig. 7 is a cross sectional view of the same. Fig. 8 is a plan view of the primary coil, carriage and diagrammatic view of the electrical connections, and Fig. 9 is a side elevation of a modification of a primary and secondary coil.

It will be obvious that the apparatus may be widely varied without departing from the spirit of my invention herein set forth, and therefore I do not desire to be limited to the specific arrangements shown and described.

Referring specifically to Figs. 1, 2, 3, 4 and 5 of the drawings, A— indicates a suitable source of irregular or alternating electric currents, as an alternating dynamo. *r*— is a current regulator; —C— and —C′— represent line conductors extending therefrom along the roadway, and forming the rails of a track on the bottom of the interior of the closed conduit—C″. *c*— is the movable primary coil and —*c*′— the laminated iron core of the same, both located on a carriage —*c*″— having wheels running on and in electric contact with the conductors or rails—C—and—C′. Although the core of the coil may be a common straight and solid core, it is preferably constructed as shown, that is, it is laminated to prevent cross-currents and is bent and extended in length so as to bring its poles in contact with or in proximity to the interior surface or roof of the conduit. The conduit is constructed of wood, cement or other non-magnetic material but may have iron plates, sections or plugs—*c*‴— distributed along and extending through the top or roof of the conduit. The conduit should be either well drained or kept watertight, and the conductors therein are insulated from the ground. The magnetic device upon the vehicle may be greatly varied. The said device shown in the annexed drawings causes the primary coil carriage—*c*″— within the conduit —C″— to travel along with the vehicle B and consists of an electro-magnet which is shown depending from beneath the vehicle —B. *d*— is the core of the said magnet and —*d*′—*d*′— are the coils thereof, the brushes —*f*—*f*— constituting the pole pieces, from which the magnetism extends to the iron portion —*d*‴— of the carriage. The core —*d*— is constantly magnetized by means of the coils —*d*′— which are of high resistance and in a shunt circuit of vehicle conductor —*s*″— containing the main secondary coil —S—, consequently there will be a cur-

rent flowing through the magnetizing coils —*d'*— continually and the core —*d*— will form a powerful electro-magnet, the pole pieces of which are the contact brushes —*f*. Yielding rollers may be substituted for the brushes. This magnet will exert such attractive force upon the iron part —*d'''*— of the carriage, that as the vehicle is moved by its motor, the carriage with its coil and core will travel in the conduit, following the movements of the magnetized exterior core and keeping its coil and core directly beneath the secondary coil and core on the vehicle or in close inductional relation and proximity to the same. As alternating currents flow through the line conductors and primary coil, alternating currents are induced in the secondary coil and conductor on the vehicle. Although an alternating current motor may be connected in the circuit on the vehicle to move the same, and the carriage in the conduit attracted and moved by an alternating current of large volume in a conductor as shown and described in a prior application for Letters Patent on electric traction filed by me, June 25, 1889, Serial No. 315,457. I prefer, in this case, to straighten or rectify the currents in the vehicle conductor by means of a suitable rectifier the same or similar to that shown and described in patent to G. Westinghouse, Jr., No. 373,035, so that a continuous or direct current motor may be employed to move the car, and a common magnetic device of great attractive power on the car to move the primary coil. S— is the secondary coil carried on the vehicle —B—; —S'— is the laminated iron core or body therefor, bent so as to extend its poles to or in contact with, or in proximity to the top or the exterior surface of the conduit. *s'*— represents the conductors of the said coil leading to the rectifier, and —M— is the motor to propel the vehicle, in the circuit. D— represents the current reverser for reversing the current through the armature, thereby reversing the direction of rotation of the armature which in turn changes the direction of movement of the vehicle, and —E— is an adjustable rheostat for regulating the strength of the current flowing through the motor. For the purpose of supplying the motor with current in case there is none flowing through the main line, or the movable coil, for a time, for some reason or other, a secondary battery —F— is provided on the car and arranged to be charged or connected with the vehicle conductor alternately with the motor or whenever the motor circuit is opened, as when the vehicle is at rest, or, may be arranged to be charged simultaneously with the operation of the motor or the flow of current therethrough. The secondary battery may be employed for charging the magnetic device magnet or for supplying other electric translating devices on the vehicle such as lamps or heaters. G— is a switch in the vehicle conductor —*s'*— leading from the rectifier for connecting either the motor —M— or secondary battery —F— in circuit and is shown connected with the motor circuit or conductor —*s''*— the secondary battery circuit —*l*— being open. H— is a switch for connecting the battery with the motor circuit, or magnetic device circuit —*h*—, and —*i*— is an adjustable resistance in the magnetic device circuit for regulating the current therein. The latter circuit extends from the rectifier to the coils —*d'*—*d'*— and is completed between the coils by the core —*d*. A suitable inductional transformer or converter may be located in circuit on vehicle as indicated by the dotted square, to change the character of the current before passing through the rectifier. Although brushes or yielding iron rollers *f'* on the poles of the magnets are not absolutely necessary, in order to obtain an increased and maximum effect, a closed magnetic circuit is formed by means of the brushes or wheels and the plugs of iron *c'''* in the top plate of the conduit, as shown particularly in Figs. 1 and 4. The wheels on each side of the coil carriage are insulated from each other and from the iron portion of the carriage by dividing the axles in the middle and setting the same in insulating material in holes extending through the iron portion —*d'''*— at each end of the carriage, as shown very clearly in Fig. 5; it will be obvious that this may be greatly modified and I do not therefore limit myself to the precise construction shown.

Referring to Figs. 6, 7 and 8, A— as before represents the stationary alternating current dynamo, —C— and —C'— the conductors extending along the road within the conduit —C''—, —*c*— the primary coil and —*c'*— the laminated iron core of the same, located on the carriage —*c''*. It will be unnecessary to describe fully all the parts of these figures as most of them are the same or substantially the same as those in figures hereinbefore described, but will proceed directly to point out and describe the differentiating features thereof. Both the primary coil —*c*— and core —*c'*— on the carriage —*c''*— in the conduit, and the secondary coil and core on the vehicle or car, are arranged with their axes extending parallel to and in the same direction as the track or movement of the vehicle, while in Fig. 1 they are shown transversely thereto. The currents on the car are not rectified in this case, but an alternating current motor —M'— is provided in the circuit with the vehicle or secondary coil to propel the vehicle, —*b*— representing a belt or chain connecting said motor with the driving axle —*a*— of the vehicle. The motors may be arranged or connected with the vehicle to propel the same in any other suitable manner. The iron plugs or sections —*c'''*— extending through the top of the conduit are omitted in this figure but may be employed if desired. In some cases I propose to employ a round non-magnetic, metallic pipe in place of a square wooden or earthen conduit. Said metallic pipe may have

its sections insulated from each other or divided in any suitable manner to prevent currents flowing therein. The magnetic device for moving the primary coil is also omitted in Fig. 6, depending upon the attractive or rather repulsive force existing between the poles of the two cores to keep the primary coil in place beneath the secondary. It will be noticed that the poles of the primary core are inside of the poles of the secondary, so that there will be no difference of position of the primary when the direction of movement of the car is changed, the poles of the said primary repelling strongly the poles of the secondary, tend to maintain the primary in a central position between the poles of the secondary, its proper position. It will be apparent that the poles of the secondary may be inside of the poles of the primary, with like result.

Fig. 8 shows a plan for electrically connecting the primary coil with the line conductors. Many ways may be employed but I prefer to provide the carriage with metallic wheels and axles insulated from the body of the carriage as shown in Fig. 5, then connect respectively the axles on each side of the carriage together by electric conductors 1 and 2 and then connect the terminals 3 and 4 of the coil conductors to the conductors 1 and 2. The coil will then be connected with the conductors —C— and —C′— in multiple arc, and each terminal of said coil will have two contacts so there will be no liability of the circuit being broken by the jumping of the wheels on the rails or line conductors.

Fig. 9 shows wheels or rollers *f′* on the poles of both the primary and secondary cores to make contact with the top of the conduit. The axles of the rollers revolve in slots —5—5— and —6—6— so that they may be in yielding contact with the conduit. Springs —7—7— bear upward the axles of the rollers on the primary core poles to insure good contact.

Although the secondaries are shown as suspended from the body of the car or vehicle, I propose and prefer in some cases to suspend them from the truck or axles of the car in a suitable manner to avoid vibrations due to the springs of the car, &c. The conductor forming a secondary coil may be and should be in some cases of greater cross-section or of lower resistance than the line conductor and I therefore do not limit myself to the size or material of said conductors or the length thereof. When a plurality of secondary coils are employed on a vehicle they may be connected in series or parallel according to the character of the transformation of the current required in any suitable and well known manner.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric induction railway, a source of irregular or alternating currents, a conductor extending therefrom along the way, a movable coil in electrical connection with the conductor, a vehicle, a magnetic device on the vehicle to move the movable coil, an electric conductor on the vehicle in suitable inductional relation to the coil, and a translating device connected with the latter conductor.

2. In an electric induction railway, a source of irregular or alternating currents, a conductor extending therefrom, a movable coil in electrical connection with the conductor, a vehicle, a magnetic device on the vehicle to move the movable coil, a secondary circuit on the vehicle in suitable inductional relation to the coil, and an electric motor in the circuit to move the vehicle.

3. In an electric induction railway, a source of irregular or alternating currents, a conductor extending therefrom along the railway, a movable coil in electrical connection with the conductor, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil, an electric motor to move the vehicle, and controlling devices in the secondary circuit.

4. In an electric induction railway, a source of irregular or alternating currents, a conductor extending therefrom along the way, a movable coil in electric connection with the conductor, a paramagnetic or iron core or body for said coil, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, and an electric motor to move the vehicle in the secondary circuit.

5. In an electric induction railway, a source of irregular or alternating currents, a conductor extending therefrom along the way, a movable coil in electric connection with the conductor, a laminated paramagnetic or iron core or body for said coil, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, and an electric motor to move the vehicle, in the secondary circuit.

6. In an electric induction railway, a source of irregular or alternating currents, a conductor extending therefrom along the way, a movable coil in electric connection with the conductor, a laminated paramagnetic or iron core or body for said coil, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, an electric motor to move the vehicle, and controlling devices in the secondary circuit.

7. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the way, a conduit for said conductors, a movable coil in said conduit in electrical connection with the conductors, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional re-

lation to the coil or core, and an electric motor to move the vehicle in the secondary circuit.

8. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the way, a conduit for said conductors, a movable coil in said conduit in electrical connection with the conductors, an iron core for said coil, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, and an electric motor to move the vehicle in the secondary circuit.

9. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the way, a conduit for said conductors, a movable coil in said conduit, in electrical connection with the conductors, an iron core for said coil having poles extended to or in proximity to the interior surface of the conduit, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, and an electric motor to move the vehicle, in the secondary circuit.

10. In an electric induction railway, a source of irregular or alternating currents, a conductor extending therefrom along the way, a movable coil in electric connection with the conductor, a paramagnetic or iron core or body for said coil, a vehicle, a magnetic device on the vehicle to move the coil, a secondary coil upon the vehicle and a core or body of iron for the latter coil in inductional relation to the movable coil and core, and an electric motor to move the vehicle in circuit of the vehicle conductor.

11. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the railway, a conduit for said conductors, a movable coil in said conduit in electrical connection with the conductors, an iron core or body for said coil having poles extending to or in proximity to the interior surface of the conduit, a vehicle, a magnetic device on the vehicle to move the coil, a secondary coil upon the vehicle, a core or body of iron for the latter coil having poles extending to or in proximity to the exterior surface of the conduit, and in inductional relation to the movable core in the conduit, and an electric motor to move the vehicle, in the circuit of the vehicle conductor.

12. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the railway, a conduit for said conductors, a movable coil in said conduit in electrical connection with the conductors, an iron core or body for said coil having poles extending to or in proximity to the interior surface of the conduit, a vehicle, a magnetic device on the vehicle to move the coil, a secondary coil upon the vehicle, a core or body of iron for the latter coil having poles extending to or in proximity to the exterior surface of the conduit, and in inductional relation to the movable core in the conduit, plugs or sections of iron in the top of the conduit, and an electric motor to move the vehicle, in the circuit of the vehicle conductor.

13. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the way, a closed conduit containing said conductors a movable coil in said conduit in multiple arc connection with the conductors, an iron core or body for said coil having poles extending to or in proximity to the interior surface of the conduit, a vehicle, a magnetic device on the vehicle to move the coil, a secondary coil upon the vehicle, a core or body of iron for the latter coil having poles extending to or in proximity to the exterior surface of the conduit, plugs or sections of iron in the top of the conduit, and an electric motor to move the vehicle, or other translating device in the circuit of the vehicle conductor.

14. In an electric induction railway, a source of irregular or alternating currents, a conductor or conductors extending therefrom along the way, a conduit for said conductors, a movable coil and core in said conduit in electric connection with the conductor or conductors, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, a current rectifier in the latter circuit to straighten the currents therein, and an electric motor to move the vehicle or other electric translating device thereon, in the latter circuit.

15. In an electric induction railway, a source of irregular or alternating currents, a conductor or conductors extending therefrom along the way, a conduit for said conductors, a movable coil and core in said conduit in electric connection with the conductor or conductors, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, a current rectifier in the latter circuit to straighten the currents therein, and a continuous or direct current motor to move the vehicle, connected in the latter circuit.

16. In an electric induction railway, a source of irregular or alternating currents, a conductor or conductors extending therefrom along the way, a conduit for said conductors a movable coil and core in said conduit in electric connection with the conductor or conductors, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil or core, a current rectifier in the latter circuit to straighten the currents therein, a continuous or direct current motor to move the vehicle connected in the latter circuit, and a secondary battery on the vehicle adapted to be connected in the latter circuit.

17. In an electric induction railway, a source of irregular or alternating currents, a conduc-

tor or conductors extending therefrom along the way, a conduit for said conductors, a movable coil and core in said conduit in electric connection with the conductor or conductors, a vehicle, a magnetic device on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductive relation to the coil or core, a current rectifier in the latter circuit to straighten the currents therein, a continuous or direct current motor to move the vehicle, a secondary battery on the vehicle, and a switch for including the motor and battery in circuit alternately.

18. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the way, a closed conduit containing said conductors, a movable coil in said conduit in multiple arc connection with the conductors, a laminated iron core or body for said coil having poles extending to or in proximity to the interior surface of the conduit, a vehicle, a magnetic device on the vehicle to move the coil, a secondary coil upon the vehicle, a laminated core or body of iron for the latter coil having poles extending to or in proximity to the exterior surface of the conduit, and opposite the poles of the core in the conduit, plugs or sections of iron extending through the top of the conduit, and an electric motor to move the vehicle or other translating device in the circuit of the vehicle conductor.

19. In an electric induction railway, a source of irregular or alternating currents, conductors extending therefrom along the way, a conduit for said conductors, a movable coil in said conduit in electrical connection with the conductors, a vehicle, means on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil, and an electric motor to move the vehicle in the secondary circuit.

20. In an electric railway, the combination of a source of alternating or other pulsatory electric currents, a normally open circuit thereof closable by a traveling electro-magnet within a subterranean sealed conduit, a surface-track parallel to said conduit, a car adapted to travel on said track, a closed circuit on said car which contains a motor and an electro-magnet in inductive proximity to said conduit-magnet, for the purpose set forth.

21. In an electric railway, a source of electric current, a conduit extending along the way, a movable coil in said conduit in electrical connection with the source, a vehicle, means to cause the movable coil to follow the movement of the vehicle, a secondary circuit on the vehicle in suitable inductional relation to the said coil, and an electric motor to move the vehicle in the secondary circuit.

22. In an electric induction railway, a source of electric currents, conductors extending therefrom along the way, a conduit for said conductors, a movable coil in said conduit in electrical connection with the conductors, a vehicle, means on the vehicle to move the coil, a secondary circuit on the vehicle in suitable inductional relation to the coil, and an electric motor to move the vehicle in the secondary circuit.

In testimony whereof I have hereunto signed my name this 3d day of July, 1889.

MARK W. DEWEY. [L. S.]

Witnesses:
C. H. DUELL,
J. J. LAASS.