

T. A. EDISON.  
ELECTRIC LOCOMOTIVE.

No. 475,493.

Patented May 24, 1892.

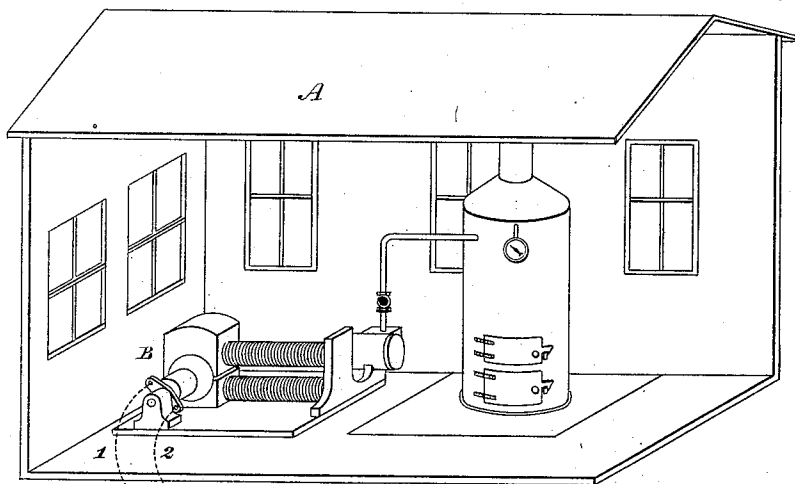
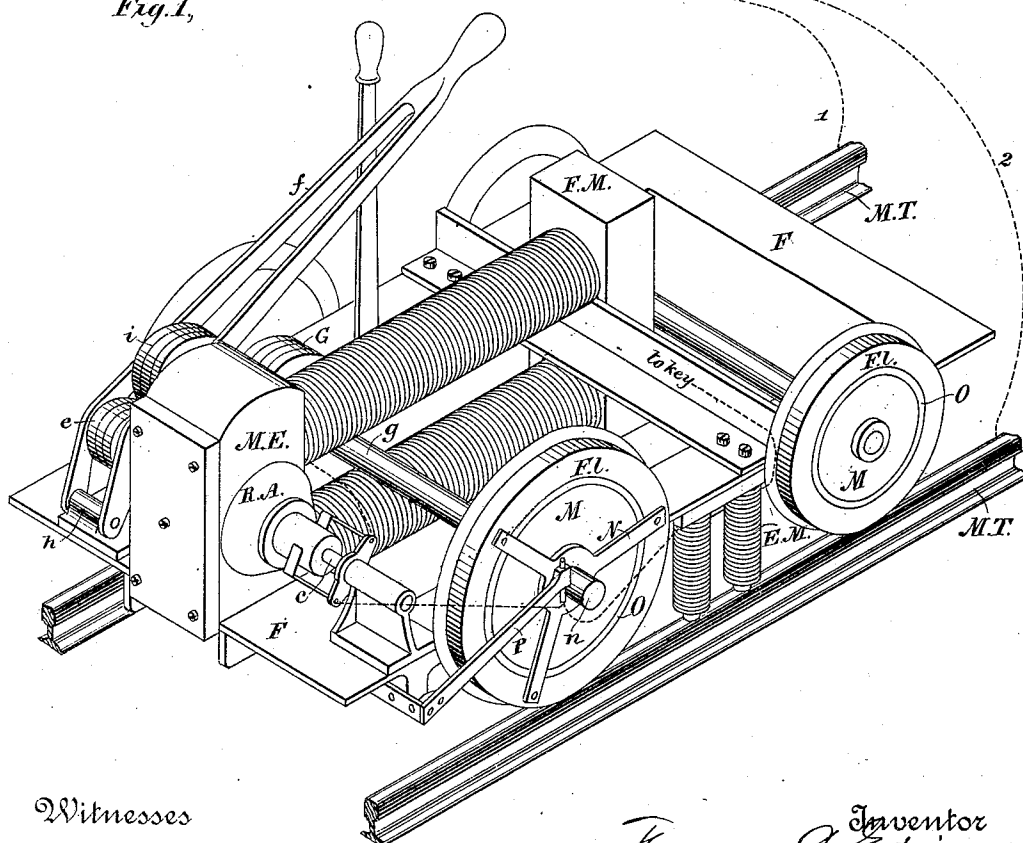


Fig. 1,



Witnesses  
Edward Thorpe  
William Rieck.

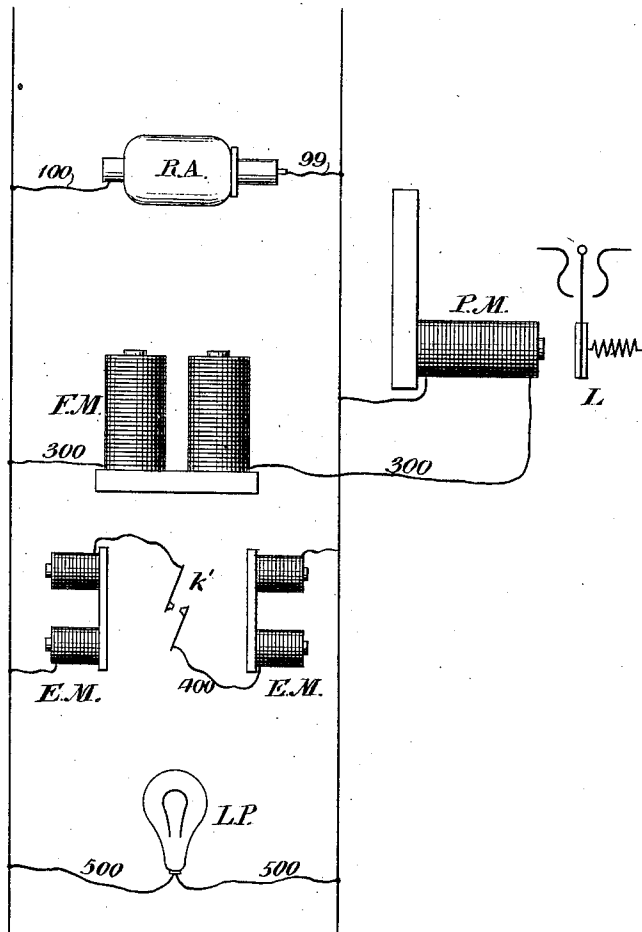
Inventor  
Thomas A. Edison  
By his Attorney *Wm. B. Van Sice*

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Fig. 2.



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# UNITED STATES PATENT OFFICE.

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## ELECTRIC LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 475,493, dated May 24, 1892.

Original application filed June 3, 1880, Serial No. 11,243. Divided and application filed May 20, 1882, Serial No. 61,955. Again divided and this application filed June 9, 1891. Serial No. 395,703. (No model.) Patented in England September 25, 1880, No. 3,894; in Canada March 31, 1881, No. 12,568; in India May 3, 1881, No. 341; in Victoria May 12, 1881, No. 3,012; in France May 27, 1881, No. 141,752; in New South Wales June 25, 1881, No. 948, in Queensland June 30, 1881, No. 21/299, and in New Zealand August 2, 1881, No. 542.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Electro-Magnetic Rail-  
way Systems, (for which I have obtained Letters Patent in Great Britain, No. 3,894, dated September 25, 1880; in Canada, No. 12,568, dated March 31, 1881; in India, No. 341, dated May 3, 1881; in Victoria, No. 3,012, dated May 12, 1881; in France, No. 141,752, dated May 27, 1881; in New South Wales, No. 948, dated June 25, 1881; in Queensland, No. 21/299, dated June 30, 1881, and in New Zealand, No. 542, dated August 2, 1881;) and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

This specification is a division of my application, Serial No. 61,955, filed May 20, 1882, which was a division of my application, Serial No. 11,243, filed June 3, 1880.

The object of this invention is to furnish an economical system of electro-magnetic railways or tramways which, while useful in any locality, shall be particularly adapted to regions where the traffic is too light for ordinary steam-railways or where the main bulk of the traffic is limited to certain seasons or where the difficulties or expense of grading render ordinary steam-roads impracticable.

To this end the invention consists in a complete electro-magnetic railway system embracing the generation, distribution, and utilization of electric currents as a motive power and in the novel devices and combination of devices therefor, as more particularly described and claimed.

In carrying my invention into effect the rails of the track are electrically connected, so that each line of rails form a part of the circuit. For the traveling motor or locomotive an electro-magnetic engine is mounted upon a suitable frame supported upon the axles of the driving and other wheels. In order that the circuit from one line of rails to the other be not directly through the wheels

and axles, but be through the motor, each car is, so to speak, electrically cut in two by the interposition of insulating material somewhere in its structure, the poles of the motor being connected one to each division. A preferable method is to form the hub and flange of a wheel of separate metallic parts uniting them by bolting each to a wooden web which insulates the two, whereby the body of the car and the axles are insulated from the track. Contact-springs bear against the flanges or preferably against hubs secured thereto by cross-bars or "spiders" whose outer ends are bolted to the flanges. The contacts are connected to the brushes of the motor, one to each, respectively, through the reversing-key and contacts hereinafter spoken of.

In the accompanying drawings I show more in detail how this invention may be carried into effect. It is to be remembered, however, that these details may be varied or equivalents used, and that therefore I do not limit myself generally in such cases to the precise details therein illustrated.

Figure 1 is a perspective of an engine-car in operative relation with respect to the source of electricity. Fig. 2 is a diagram showing the connection of electrical devices on the car in multiple arc.

B is any suitable stationary dynamo-electric machine driven by any suitable source of power. From the generator B connection through conductors 1 and 2 is made to the rails of the main track M T, respectively. The current is utilized as a motive agent by an electro-magnetic engine M E, constructed as shown in the drawings, in which F is any suitable frame-work suspended from the main driving-axle and placed upon the other axle.

The wheels used under the engine-car and all other cars are constructed as shown. The flange F' and hub M are made separately and connected by a wooden web O, to which they are bolted, the wheel then consisting of a metallic hub, a metallic flange, and an intervening wooden or insulating web. By this means

the axle and body of the car are insulated from the flanges and track and the current cannot pass therethrough from one rail to the other.

5 On the engine-car a spider or frame N is secured to the flange F', so as to be in electrical contact therewith, but not touching or forming contact with the hub M. Upon the center of N is a boss or spindle *n*, on which  
10 bears a contact-brush held by an arm P. Current passes from the line of rails through one flange F', frame N, boss or spindle *n*, brush P, through the armature of the electric engine M E and the other translating devices,  
15 hereinafter described, in parallel circuit, thence by the other arm P on the opposite side of the car, spindle-frame, and flange to the other line of rails. Between the contacts, with conductors on opposite sides of the car,  
20 as described, the rotating armature R A is in branch circuit 99 100. The field-magnets F M of the motor are in a parallel branch 300, and an electric lamp L P is in a third parallel or multiple-arc branch 500.

25 In Fig. 1, E M is a pair of ordinary electro-magnets located vertically and presenting their poles in close proximity to the track-rail. They are used to give a better or an increased traction to avoid slipping and are an  
30 aid to brake the vehicle. There are one or more pairs on each side of the car. The magnets are suspended from the car-frame so that their poles are over and in direct contiguity to the rails. From them and including the  
35 coils thereof and a circuit-breaker *k'* a circuit extends to the arms P, so that they are in a branch circuit 400 between the tracks in parallel or multiple arc with the other devices for running, controlling, or lighting the car, as  
40 described.

Motion is communicated from the rotating armature-shaft to the axle of the vehicle in the following manner: *g* is the main driving-  
45 axle, upon which is mounted a friction-wheel G. Upon the shaft *c* of the magnetic engine is a friction-pulley *e*, the pulleys *e* and G not being in contact. In a swinging frame *f*, pivoted at *h*, is mounted a friction-pulley *i*. The  
50 frame *f* being depressed bears upon *e* and G and communicates motion from *e* to G, the percentage transferred being proportioned to the frictional contact of *i* upon *e* and G.

The operation of the arrangement of apparatus is as follows: Current being  
55 directed upon and caused to flow in the track or conductors M T passes through the collecting devices, the wheels, and the circuits connected thereto, in the manner hereinbefore described. The lamp L P is caused to glow,  
60 operating as an indicator of the condition of the circuit to those upon the car and to furnish light if artificial light be required. The key *k'* is closed in circuit 400, the traction-magnets E M operate upon the track to increase the traction and aid in the overcoming  
65 of inertia, current flows in circuit 300, the magnetism of the field is established, and

current flows in the branch 99 100 through the armature R A, causing it to rotate. Circuit being established in the various branches  
70 and the different devices described co-operating, the lever *f* is depressed, bringing pulley *i* into connection with *e* and G, communicating the motion of the former to the latter, and the car moves along in a regular gradually-  
75 accelerating progression.

In Fig. 2 there is shown the coil of a magnet P M in circuit with the field-coils of the motor. The lever L of said magnet is polarized and is held in a retracted position by a spring.  
80 The armature-lever is pivoted at its upper end. It is useful as a resistance in said circuit, and may be employed to sound an alarm and for other purposes.

The polarized electro-magnet and its armature-lever L (shown in Fig. 2) form no part of the invention herein described and claimed,  
85 the same being described and claimed in another pending application.

I do not abandon or dedicate to the public  
90 any patentable matter herein described and shown but not claimed, as this forms the subject-matter of my applications, Serial No. 11,243, filed June 3, 1880, and Serial No. 61,955, filed May 20, 1882, or of one of the divisions  
95 thereof, serially numbered 395,700, 395,701, 395,702, 395,704, or 395,705, filed June 3, 1891.

What I claim, and desire to secure by Letters Patent, is—

1. In an electric railway having a suitable  
100 source of current and supply conductors, the combination, with a car, of an electric motor mounted thereon and two derived or multiple-arc circuits, one including the rotating armature of the motor, the other including the  
105 coils of the field-magnets, substantially as set forth.

2. The combination, with the track-rails used as conductors, wheels having insulated  
110 flanges, and means for conveying current therefrom, of several multiple-arc circuits across from rail to rail upon the same car, each containing a device used in running, controlling, or lighting the car, substantially  
115 as set forth.

3. The combination, in an electric-railway system, of a source of current and supply  
120 conductors, a car, an electro-dynamic motor on the car and having connection with the supply-conductors, and other electrical devices also on the car and in separate multiple-arc branches, substantially as described.

4. The combination, in an electric-railway system, of a source of current and supply  
125 conductors, a car, an electro-dynamic motor on the car and having connection with the supply-conductors, and other electrical devices also on the car and in separate multiple-arc branches, substantially as described.

5. The combination, in an electric-railway  
130 system, of a stationary dynamo-electric machine, a moving vehicle, an electro-dynamic motor located on the vehicle by which it is propelled, a circuit, including the dynamo-ma-

chine at the station, the motor on the car and  
a visible indicating device, such as a lamp,  
the field-coils of the motor, the armature-coils,  
and the indicating device being in separate  
5 parallel branches, substantially as described.

6. The combination, in an electric-railway  
system, of a stationary dynamo-electric ma-  
chine, a moving vehicle, an electro-dynamic  
motor located on the vehicle by which it is  
10 propelled, a circuit, including the stationary  
dynamo-machine, the motor on the car and

an electro-magnetic traction device so ar-  
ranged with respect to each other that the  
field-coils of the motor, the armature-coils,  
and the electro-magnetic traction device are  
in separate parallel branches, substantially  
as described.

THOMAS A. EDISON.

Witnesses:

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