

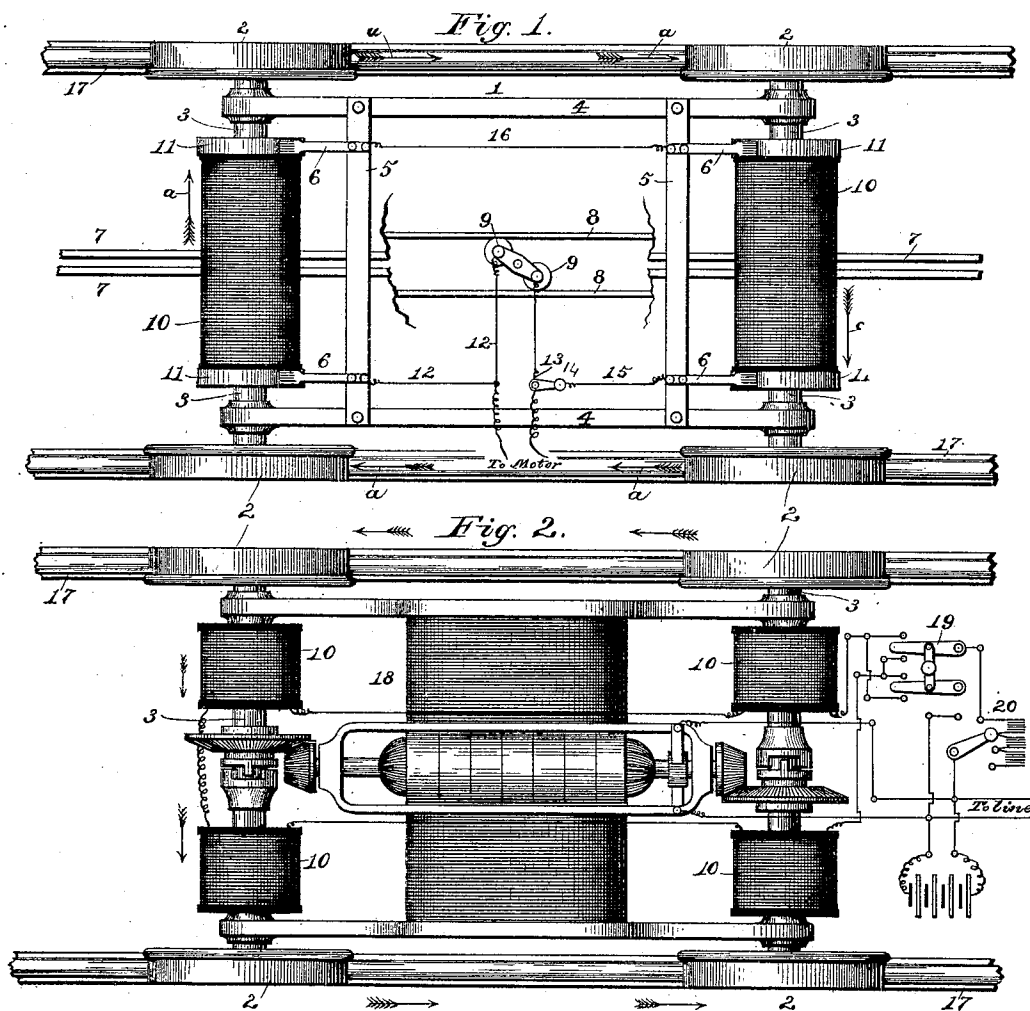
(No Model.)

E. E. RIES & A. H. HENDERSON.

ELECTRO MAGNETIC TRACTION INCREASING APPARATUS.

No. 379,816.

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ATTEST:

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UNITED STATES PATENT OFFICE.

ELIAS E. RIES AND ALBERT H. HENDERSON, OF BALTIMORE, MARYLAND.

ELECTRO-MAGNETIC TRACTION-INCREASING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 379,816, dated March 20, 1888.

Application filed November 7, 1887. Serial No. 254,557. (No model.)

To all whom it may concern:

Be it known that we, ELIAS E. RIES and ALBERT H. HENDERSON, both citizens of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Electro-Magnetic Traction-Increasing Apparatus; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to an electro-magnetic traction system for railways, and has for its object to increase the traction or friction between the wheels of railway-cars and the track-rails by means of magnetism, whereby a greater coefficient of traction or friction is produced between the points of contact between the wheels and rails for the reason that a radical change in the relative position of the molecules of metal composing the respective structures, due to the establishment of a closed magnetic circuit therethrough, obviously increases the tenacity or bearing of the wheels upon the rails, and as in our invention the wheel has the same polarity at all points of its periphery, this tenacity is obtained without discommoding or decreasing the ease of revolution and without adding to the weight of locomotion or occasioning the use of objectionable traction expedients, such as sand, &c.

With this object in view our invention consists in a certain organization of apparatus, arrangements of circuits, and combination of parts, all of which will be more fully and accurately described hereinafter, and the specific points of novelty in which will be designated in the appended claims.

In the accompanying drawings we have shown certain appliances and modifications thereof which are deemed to be advantageous in carrying out our invention, but wish it understood that we do not limit ourselves to any particular form of construction, so long as the inherent and novel features hereinafter set forth are embodied therein.

Figure 1 is a diagrammatical view showing a skeleton truck of a street-car, the helix of wire wound upon each axle, and electrically connected by brushes with a branch circuit from the current-collecting wheels, which de-

rive their current from the line, which in turn is arranged below in a conduit, the two helices being in series, as shown, and preferably connected in such a manner as to induce magnetic lines of force to flow in a continuous direction around the magnetic circuit formed by the axles, driving-wheels, and track-rails, as hereinafter described. Fig. 2 is a similar view showing the manner of arranging the helices upon a street-car truck where an electric motor is used as the propelling-power, there being in this instance four helices instead of two, arranged similarly in series, the energizing-current being obtained from a source separate to that of the motor.

Like numbers of reference indicate corresponding or like parts in both the views.

For carrying out our invention we employ a helix of wire permanently wound concentrically around a suitable core, said core being magnetically in circuit or contact with the said wheels—say, for example, the axle, which carries a pair of wheels, one on each side. A current of electricity derived from some convenient and constantly-available source is passed through said helix, instantaneously energizing the axle and converting its respective extremities (the wheels) into magnetic poles of opposite polarity, and consequently imparting magnetism to the rails upon which said wheels are bearing, the magnetic circuit being completed through the rails intervening between the front and rear car-wheels on each side, thus forming a complete magnetic circuit.

In Fig. 1, which shows the arrangement as applied to an underground conduit-railway, 1 indicates the car-truck, consisting of the flange-wheels 2 2, the axles 3 3, and the brace-rods 4 4, supporting the cross-bars 5 5, which carry each a pair of metal contact-brushes, 6 6.

7 7 are the slot-rails of the conduit, shown broken away underneath the truck 1 for the purpose of exposing to view the ordinary current-conducting rails, 8 8, and 9 designates the current-collecting wheels or traveling contacts, (shown conventionally,) which make contact with the rails 8 8 as the car proceeds along the line of way.

10 10 are the helices, wound, respectively, around the axles 3 3, and having their terminals (not shown) electrically connected, re-

spectively, with the metallic disks 11 11, which are each insulated from the body of its respective helix 10 and from the axle 3.

From the circuit which extends from the collectors 9 to the motor a branch or shunt, 12 13, is taken, one wire, 12, leading to the brush 6 on the lower rear side and the other wire, 13, passing to the lever-switch 14, the contact-point of which is electrically connected by wire 15 with the corresponding brush 6 on the lower front side of the car. 16 is the wire connecting the two remaining brushes 6 6 with each other. Thus, as the car proceeds, should it be desired to increase the tractive effects between the wheels 2 2 and the rails 17 17, the motor-man adjusts the lever-switch 14 upon its contact-point, thereby closing the circuit through the helices 10 10, magnetizing the axles, and converting the wheels 2 2 into enlarged pole-pieces of opposite polarity. Now, commencing at the switch 14, the current flows over its circuit through the helices in the direction of the arrows. When these helices are thus energized, they induce magnetic lines of force in the iron axles and wheels in the direction of the arrows *a a*, these lines being conducted along the iron rails intervening between the rear and front axles, forming thereby a complete and unbroken magnetic circuit. It will be fairly apparent that these magnetic lines of force must pass serially and successively through all the wheels 2 2 before the magnetic circuit is complete. Therefore a powerful attraction or adhesion of the different molecular structures will be produced at the points of contact between the rails and wheels, at which point the degree of magnetic saturation is greater, owing to the relative difference in the mass of magnetic metal and the position of the molecules of iron in the said rails and wheels, which are thus of uniform direction throughout the circuit.

Referring, now, to Fig. 2, the arrangement is substantially the same, except that, owing to the construction and gearing of the motor 18, there must be four helices instead of two—a pair for each axle—the neutral line of magnetism being preferably midway between the two helices on each axle. In order to prevent diffusion of the lines of force from the magnetic circuit in Fig. 2, the motor and its supporting-frame are magnetically insulated from the axles. As in Fig. 1, these helices are connected in series, as shown, but are in this instance energized from a separate source from that of the motive current, which source is conventionally shown as a battery, either of the primary or storage type. Again, another difference between these arrangements is that there is shown a regulating-switch, 19, whereby it can be shifted so as to change the direction of the current through the several helices; furthermore, an adjustable resistance, 20, is intermediately in the circuit from the battery for the obvious purpose of graduating the resistance of the circuit.

The helices 10 10 in Fig. 2 may be either

mounted loosely on their axles or may revolve therewith, as in Fig. 1, and may be connected in series or in any other convenient or effective manner, whereby the lines of force will pass serially and successively through all the wheels, rails, and axles, as is well known and obvious to those skilled in this art.

From the foregoing description it will be apparent that both the method and apparatus for accomplishing increased traction have been disclosed. However, only the apparatus for attaining this end will be claimed herein, as the method of producing this result forms the subject-matter of a concurrent application, Serial No. 242,122, filed June 22, 1887.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. Means for increasing the traction of a vehicle provided with magnetizable wheels traveling upon rails of magnetizable metal, comprising a closed magnetic system including four wheels of said vehicle, all of that portion of the axle between any two wheels, and the sections of rails extending from wheel to wheel, the said rails and wheels and the said axles and wheels, respectively, being magnetically in contact, in combination with magnetizing-coils having for their respective cores two or more axles, an inducing electric circuit for charging said coils, and a source of electricity for charging said circuit independently of the motive power of said vehicle.

2. Means for increasing the traction of a vehicle provided with magnetizable wheels traveling upon rails of magnetizable metal, comprising a closed magnetic system including four wheels of said vehicle, all of that portion of axle between any two wheels, and the sections of rails extending from wheel to wheel, the said rails and wheels and the said axles and wheels, respectively, being magnetically in contact, in combination with magnetizing-coils having for their respective cores two or more axles, an inducing electric circuit for charging said coils, means for varying the magnetic influence of said circuit, and a source of electricity for charging said circuit independently of the motive power of said vehicle.

3. Means for increasing the traction of a vehicle provided with magnetizable wheels traveling upon rails of magnetizable metal, comprising a closed magnetic system including four wheels of said vehicle and all of the axles and rails, respectively, between any two wheels, magnetizing-coils in inductive proximity to said magnetic system, having for their respective cores all of the axles of said vehicle, and a source of electricity independent of the motive power of said vehicle for charging said coils.

4. Means for increasing the traction of a vehicle provided with wheels of magnetizable metal traveling upon rails of magnetizable metal, comprising a closed magnetic system including four wheels of said vehicle and all of the axles and rails, respectively, between

any two wheels, magnetizing-coils in inductive proximity to said magnetic system, having for their respective cores two or more axles, an electric circuit including said magnetizing-coils, means for varying the magnetic influence of said electric circuit, and a source of electricity feeding said circuit independently of the motive power of said vehicle.

5. In combination, two helices of wire located in inductive proximity to their respective cores and in circuit with each other and included in an independent electric circuit, two car-axles forming the magnetic cores of their respective helices, wheels entirely of magnetizable metal forming the respective poles of said cores, an independent electric circuit including said helices, and a source of electricity for charging said coils independently of the motive power of said vehicle.

6. The combination, with two helices of wire wound around and insulated from their respective cores, two car-axles forming the magnetic cores of their respective helices, four car-wheels magnetically in circuit with their respective cores and formed entirely of magnetizable metal, sections of track-rails extending from wheel to wheel, and means for varying the magnetic saturation of the axles, wheels, and rails.

7. The combination, with car-axles and a motor mounted upon the car-truck and geared to the axles, of a divided helix of wire ar-

ranged on each side of the motor gearing upon the axle, for the purpose set forth.

8. The combination, with a complete magnetic system including four wheels of a vehicle and the axles and rails, respectively, between any two wheels, of divided magnetizing-coils upon the axles, a motor geared to the axles, and electric circuit for charging said coils.

9. In a self-propelled vehicle, the combination, with means for increasing the traction of said vehicle traveling upon rails of magnetizable metal, comprising a closed magnetic system including four wheels of said vehicle and the axles and rails, respectively, extending between any two wheels, the said rails and wheels and the said axles and wheels being respectively magnetically in contact, and magnetizing-coils in inductive proximity to said magnetic system and having for their respective cores the axles of said vehicle, of an electric motor for propelling said vehicle and two circuits severally including the said magnetizing-coils and motor.

In testimony whereof we affix our signatures in presence of two witnesses.

ELIAS E. RIES.

ALBERT H. HENDERSON.

Witnesses:

WALTER H. GRIFFIN,

W. F. RAND.