

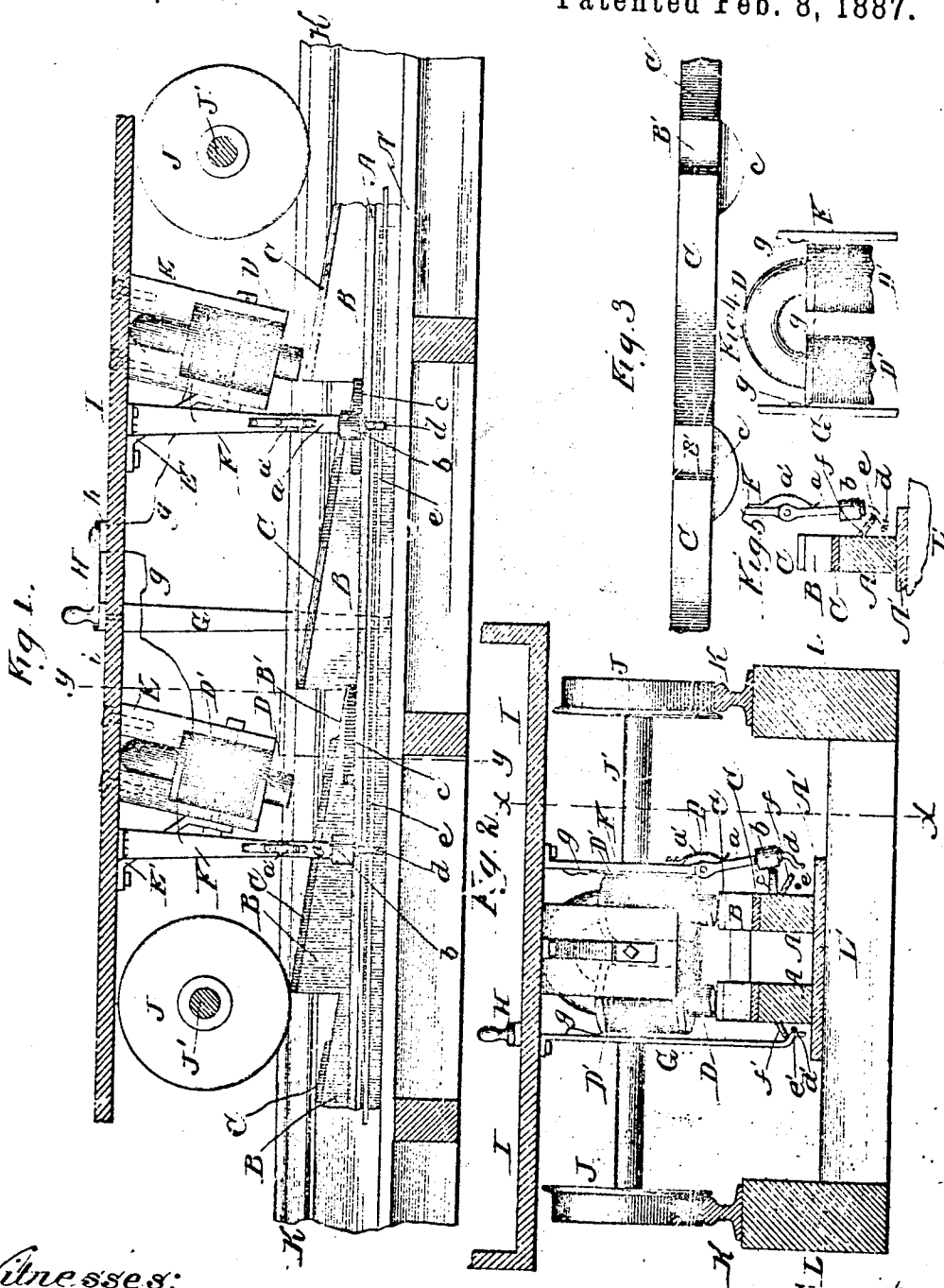
(No Model.)

J. B. ATWATER.

ELECTRO MAGNETIC ATTRACTION DEVICE FOR CARS.

No. 357,516.

Patented Feb. 8, 1887.



Witnesses:

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ELECTRO-MAGNETIC ATTRACTION DEVICE FOR CARS.

SPECIFICATION forming part of Letters Patent No. 357,516, dated February 8, 1887.

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To all whom it may concern:

Be it known that I, JOHN B. ATWATER, residing at Chicago, in the county of Cook and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement in Electro-Magnetic Attraction Devices for Cars, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section on line *x x* of Fig. 2; Fig. 2, a cross section on line *y y* of Fig. 1; Fig. 3, a detail of the positive side of the armature-bed, showing the projections for breaking the circuit on the positive side; Fig. 4, a detail of the magnet and connections; Fig. 5, a detail of the brush in contact with the positive wire.

This invention relates to the propulsion of cars by the employment of electricity as the motive power, and has for its object to construct a simple and effective electro-magnetic attachment which, when applied to the car, in connection with current-wires and conductors, will operate to propel the car forward, the electro-magnets and their coacting armatures being so arranged in relation one to the other and to the current-wires and conductors that when one set is magnetized the other will be demagnetized, and the magnets and armatures are in such relation that as a magnet is disconnected from the current and becomes demagnetized it will be non-acting on the armature which it is leaving and until it is in position to coact with the next preceding armature, the disconnection and non-action being positive, thereby leaving the working-magnet to exert its full force without any backward draw from the demagnetized magnet; and its nature consists in the several parts and combination of parts hereinafter described, and pointed out in the claims as new.

In the drawings, A represents stringers, of wood or other non-conducting material, located in a foundation or support, A', of boards or other non-conducting material in the construction shown, the support being placed on cross-pieces between the rail-stringers.

B represents blocks formed with or suitably seen to the stringers A, each block having its upper face inclined, the incline of one block terminating at the starting-point of the incline for the next block, the terminal point being in a higher plane than the starting-point,

leaving a clear break between the terminal point and the starting, as shown in Fig. 1. These blocks B are of wood or other non-conducting material.

C represents the armatures or plates, one secured in any suitable manner to the inclined face of each block B. The length of the plate C is less than that of the inclined face, and the plate starts from a point forward of the starting-point of the incline, and terminates at the terminal point of the incline, leaving a space between the starting-point of one plate and the terminal point of another plate, which constitutes a non-acting or dead space.

D represents the magnets. The blocks B, with the plates C, are located equidistant apart, and the magnets D are arranged in such relation to each other and the armatures or plates C as that one magnet will always be in use or acting on the armatures, as hereinafter described. The magnets D are each of the ordinary U or horseshoe shape, each arm or pole having wound thereon a coil, D', and the distance between the poles corresponds to the distance between the parallel blocks B and plates, so that one pole of the magnet coacts with one series of armatures or plates C and the other pole with the other series, as shown in Fig. 2.

E represents the supports for the magnets. Each support is formed in two parts, bolted or otherwise secured together to clamp the magnet firmly between them. The support is made of wood or other non-conducting material, and is bolted or otherwise fastened to the bottom of the car or other support, to locate the end of the magnet in proper relation to the armatures or plates C, and, as shown, a brace, F, is provided, running forward and upward from the support E to the bottom of the car, to resist the forward pull on the magnets.

F represents the standards or hangers, one located adjacent to each magnet on the positive side, and bolted or otherwise secured at the upper end to the bottom of the car or other support. Each hanger at its lower end has pivoted or hinged thereto an arm, G, the swing of which is controlled by a spring, A', one end of which is secured to the hanger, to have the free end bear against the arm G and hold the arm against a too free outward swing. The arm G has mounted thereon, near its lower end, an anti-friction roller, H, which roller, as the car is drawn forward, successively strikes

the projections *c* on the face of the blocks *B* and lifts the arm *a* from engagement with the circuit-wire *e*, the extreme end *d* of the arm *a* being formed to run in contact with the wire *e*, except when raised therefrom by the projections *c*. The arm *a*, with the anti-friction roller *b*, in conjunction with the projections *c*, form a brush for making and breaking the circuit between the wire *e* and the magnet *D*, and the projections *c* are located at the starting-point of the incline of the block *B*, as shown in Fig. 3, so as to bridge the space *B'* and lap over the starting end of the armature or plate *C*, thus breaking the circuit as the magnet reaches and passes the terminal end of the armature or plate *C*. The projections *c* have a rounded form on the acting edge, to facilitate the riding thereover of the anti-friction rollers, and the projections are located one for each break *B'*, and in such relation to the terminal point of the armature or plate *C* as that the roller will engage the projection and break the circuit as the magnet reaches the point where it ceases to act with a forward pull on the armature, so that the magnet becomes demagnetized and non-acting, instantaneously, preventing any backward draw. The wire *e* is positive and is charged from a dynamo or other current-producing mechanism, and this wire is strung along the stringers *A* above the support *A'*, and as the stringers and support are both formed of non-conducting material the wire is kept insulated. As shown, a guard, *f*, is located above the wire *e*, and in such relation to the wire and the end *d* as to maintain the end *d* in contact with the wire *e* between the projections or bridges *c*, for transmitting the current from the wire *e* to the arm *a*, and the current passes from the arm *a* to the hanger *F*, thence to the coil of the positive arm of the magnet *D*, passing through the wire *g* of the coil, which is attached to the hanger *F*, and, after passing through the coil of the positive arm, the current is carried to the coil of the negative arm by the wire *g*, which connects the two coils *D'*. The wire *g*, after forming the coil of the negative arm, leads, in the construction shown, to a button, *h*. The wires *g* for the respective magnets are connected with the coacting hanger *F*, and these wires *g* for both magnets lead to a common button, *h*, on the negative side, so that the current from both magnets is discharged at a common point.

G represents a hanger or arm, the upper end of which is attached by bolts or otherwise to the bottom of the car or other support for the magnets, and the lower end of which, *d'*, is turned or formed to engage and be in contact with the negative wire *e'*, the wire having a guard, *f'*, thereover, corresponding to the guard *f* of the positive wire *e*. This wire *e'* is supported on the side of the stringer *A*, and is insulated by the stringer *A* and support *A'*, and this wire leads back to the dynamo or other source of supply for the current.

H represents an arm or lever forming a switch between the button *h*, to which it is

pivoted, and a button, *i*, connected with the hanger or arm *G*, so that when the free end of the switch is on the button *i* connection is had between the wires *g* and the wire *e'* through the hanger or arm *G*, allowing the current to pass from the magnets to the wire *e'*, thus completing the circuit.

I represents the support for the magnets *D* and hangers or arms *F* *G* and switch *H*, which can be the bottom of the car, or a piece of wood or other non-conducting material attached to the under side of the car.

J represents the wheels of a car, mounted on axles *J'* in any usual and well-known manner.

K represents the rails on which the wheels run.

L represents the stringers on which the rails are secured, and, as shown, running from stringer to stringer are cross-pieces *L'*, to support the armature-bed formed by the parts *A* *A'* *B*, such bed being wholly independent of the track-bed. The armature-bed is located midway between the rails *K*, and lies in a perfectly horizontal position, with the positive wire on one side and the negative wire on the other, and this bed with its wires extends the whole length of the track.

The operation will be understood from the foregoing description, but briefly is as follows: The wire *e* is charged from a dynamo or other supply with a strong current, and this current is transferred to the magnet *D*. When the end *d* of the arm *a* is in contact with the wire *e*, energizing such magnet and producing an action between the magnet and the armature or plate *C*, over which the magnet is passing, by which the car will be drawn forward, and such action will continue until the magnet reaches the limit of the armature or plate *C*, at which point the roller *b* strikes the projection or bridge *c* and is lifted, thereby breaking the circuit and making the magnet non-acting by being demagnetized. The other magnet *D* at this time is magnetized, as its arm *a* is in contact with the wire *e*, and the magnet is in coacting relation with an armature, the magnets and armatures being in such relation that as one magnet is demagnetized the other is energized, thus keeping up a constant and uninterrupted pull in a forward direction. The current, after passing through the magnets, is conducted by the hanger or arm *G* back to the dynamo or other source of supply.

The switch *H* enables the current to be shut off, if desired for any purpose, from the wire *e'*.

The magnets *D* are set inclined in the construction shown, and their acting ends are cut to lie in a plane parallel with the plane of incline of the armatures or plates *C*.

It will be noticed that before one magnet reaches the point where it ceases to operate, the other magnet has been magnetized and is in coacting relation with its armature, so that for a part of the distance traveled over the coacting armatures of the respective magnets both magnets are energized and working, the

result being that there cannot possibly be any break in the forward pull on the car.

The magnets D each have a positive and negative pole, and the armatures are provided for each pole, one series being independent of the other, by which double power is produced over a magnet with one pole only.

The charging of the wire *c* by a dynamo is accomplished in the usual manner, and the dynamo can be of any well-known form, and is not, therefore, either shown or described, and the car is not shown as to all its parts, but only sufficiently to illustrate the attachment of the magnets and hangers in their relation to each other and to the armatures or plates.

The armatures or plates being long, a face or surface is provided for the magnet to draw over, and the inclination given the armatures produces a forward draw at all points, which draw, in effect, is a continuous one, without break, as when one armature has been passed another armature is at work with the other magnet.

The switch H enables the circuit to be broken without any trouble or delay, but does not form any part of the complete circuit, except for cutting-out purposes, as the circuit is formed by the connection of the magnets with the wires *c* and *c'*, and the circuit would be complete if the switch were omitted and the wires *g* run direct to the arm G. This construction would complete the circuit, and the break could then be made between the wire *c* and standards F by providing means for raising both arms *a* from their contact with the wire *c* simultaneously, instead of having one arm in contact when the other is raised to maintain the current. The magnet-wire running directly to the arm G is shown in Fig. 4, and in Fig. 5 the arm *a* is shown in contact with the positive wire, Fig. 2 showing the arm *a* raised.

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

1. The combination, with electro-magnets rigidly attached to the bottom of a car, and a non-conducting bed located between the rails of the car-track, separate from and independent of the ties and rails, and having fixedly arranged thereon non-generating longitudinal inclined armatures equidistant apart, of electric-circuit wires and circuit makers and breakers coacting with the electric wires and electro-magnets, substantially as and for the purposes specified.

2. An independent non-conducting armature-bed centrally located between and below the track-rails, and having non-generating inclined armatures rigidly attached and located at equidistances apart, in combination with electric-circuit wires and electric making and breaking brushes carried by a car and connected with electro-magnets on the car, and bridges for breaking the circuit, substantially as and for the purposes specified.

3. The combination, with electro-magnets

fixedly attached to the bottom of a car, and a special non-conducting bed having inclined armatures thereon, of electric-circuit wires carried by the bed, and bridges located on the bed, and circuit-brushes lifted by the bridges at regular intervals to break the connection with the circuit-wire, substantially as and for the purposes specified.

4. The combination, with electric-circuit wires, of electro-magnets attached to the bottom of a car at the center, and an armature-bed having inclined armatures and located between the track-rails, said magnets and armatures having such relation that when one magnet is charged and in operation the other will be demagnetized and non-acting until the bridging-space is passed, whereby the magnetizing and demagnetizing of the magnets are effected alternately at regular intervals, substantially as specified.

5. The combination, with the non-conducting armature-bed A B and armatures or plates C, supported thereon between the track-rails, of the magnets D, carried by a car above said armatures, and electric-circuit wires for passing an electric current through the magnets, substantially as and for the purposes specified.

6. The combination, with a non-conducting armature-bed, A B, armatures or plates C, and magnets D, carried by a car, of the circuit-wire *c*, arms *a*, having ends *d*, and hangers F, connected with the coils D' of the magnets for magnetizing the magnets, substantially as and for the purposes specified.

7. The combination, with a non-conducting armature-bed, A B, armatures or plates C, and magnet D, of the circuit-wire *c*, arm *a*, with end *d*, hanger F, and a connection with the coils D' of the magnet, substantially as and for the purposes specified.

8. The combination, with a non-conducting armature-bed, A B, armatures or plates C, and magnets D, of the hangers F, each having an arm, *a*, wire *c*, hanger G, wire *c'*, and a connection between the hangers F G and the coils D' of the magnets, substantially as and for the purposes specified.

9. The combination, with a non-conducting armature-bed, A B, armatures or plates C, and magnets D, of the hangers F, each having an arm, *a*, with end *d*, bridges *c*, wire *c*, hanger G, wire *c'*, and a connection between the hangers F G and coils D' of the magnets for energizing or demagnetizing the magnets, substantially as and for the purposes specified.

10. A non-conducting armature-bed, A B, provided with bridges *c* and carrying the circuit-wires *c* and *c'*, and armatures or plates C, in combination with the magnets D and a connection between the magnets and the circuit-wires *cc'*, substantially as and for the purposes specified.

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