(No Model.)

T. B. & H. WILCOX.

ELECTRIC RAILWAY SYSTEM.

No. 524,368. Patented Aug. 14, 1894.

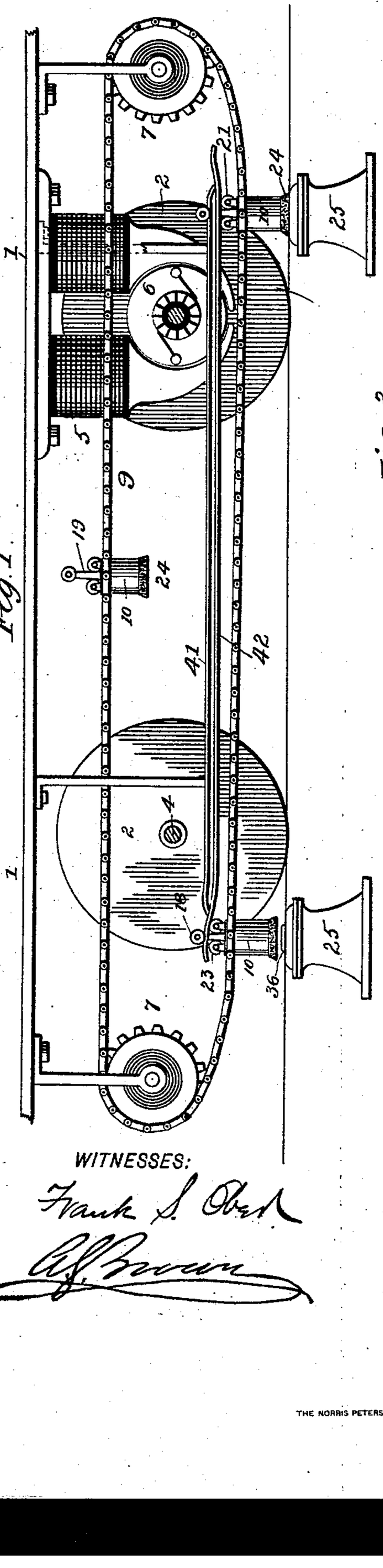

Fig. 1.

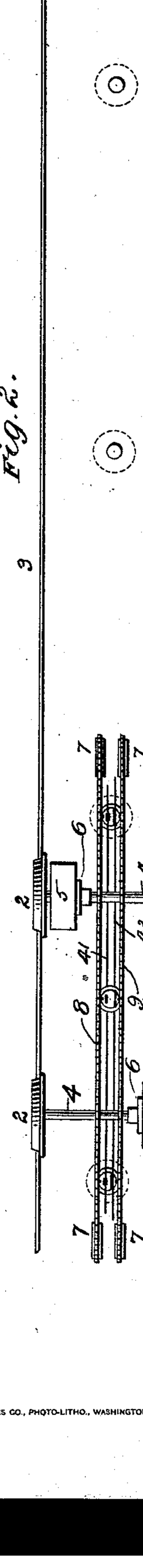

Fig. 2.

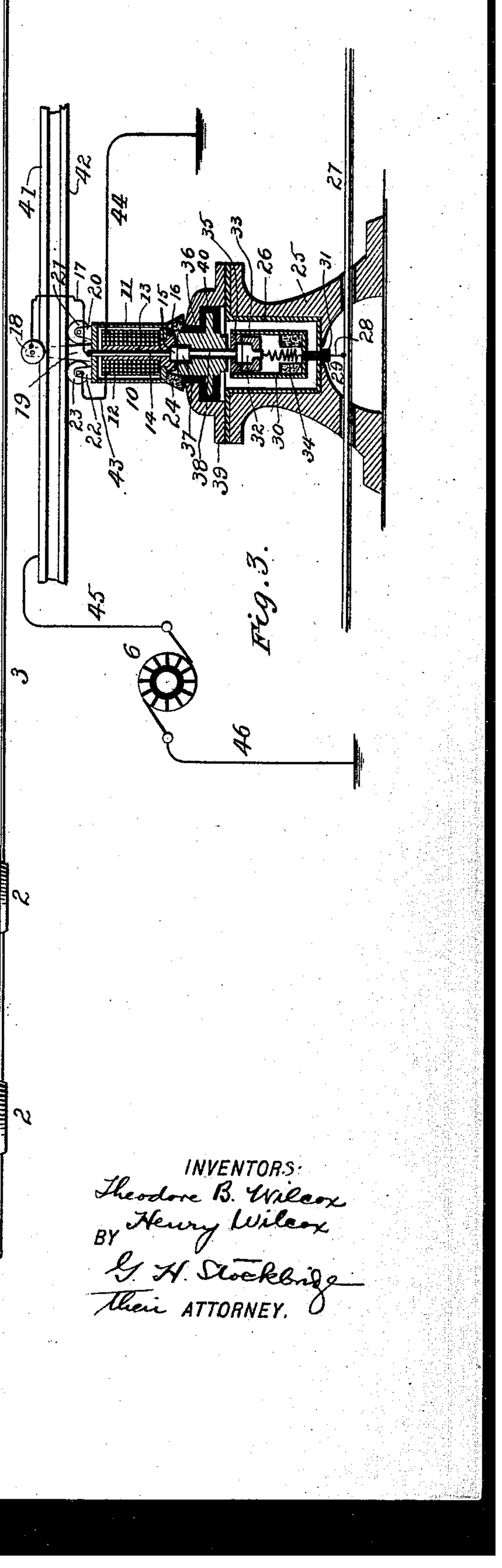

Fig. 3.

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ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 524,368, dated August 14, 1894.

Application filed August 16, 1892. Renewed August 1, 1893. Serial No. 482,098. (No model.)

To all whom it may concern:

Be it known that we, THEODORE B. WILCOX and HENRY WILCOX, citizens of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electric-Railway Systems; 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 that class of electric railway systems in which exposed surface conducting plates are employed, the said plates being commonly located between the rails of the track, and being successively cut into and out of the electric circuit by means of electro-magnetic devices, which are brought into operation by the movement of the car. Hitherto, it has been proposed to maintain a large number of such surface plates (the distance of the plates apart always being less than the length of a car), and to use an electro-magnetic appliance in connection with every plate. By reason of this arrangement, it would become necessary in the construction of a working road to have so many magnets as to make the road very expensive, to say nothing of the cost of the necessary apparatus for protecting the magnets from the effects of moisture and from the other dangers to which they would be exposed.

It has been our aim in making the invention herein described, to obviate this large expense and, at the same time, to do away with such dangers from leakage, and other causes, as necessarily appertain to the systems wherein a large number of electro-magnetic appliances are maintained under ground along a railway track.

The means which we have devised for overcoming the described defects and dangers, and for removing the great expense which attaches to the old systems, consist of a series of electro-magnetic devices carried by the car itself, the said electro-magnetic devices being just as far apart as the road plates and so supported as to be capable of being brought successively into contact with the plates along the roadbed. In other words, in place of a large number of switches arranged along the track, each of which is operated by a separate electro-magnet, we employ a small number of electro-magnets upon the car itself, while the road switches are comparatively inexpensive, having no electro-magnets in them. It is thus entirely possible to have a permanent structure which is comparatively cheap and free from the liability to get out of order, while the number of magnets will be reduced from about five hundred to the mile to whatever convenient number one may carry upon the car, multiplied by the number of cars per mile. We prefer to use three magnets on every car and, assuming four cars per mile, this would make the difference between twelve and five hundred in favor of our system.

We purpose making the magnets and their boxes easily replaceable, so that if one gets our of order another can be quickly substituted.

The surface plates will be placed along the track at about the same distances, say, ten feet apart, as in the systems proposed by other inventors. The magnets and magnet boxes, preferably three in number on each car, will be carried upon a sprocket chain which is mounted so as to form an endless chain, one part of which is stretched along under the car, not far away from the surface plates. The chain rotates freely, being mounted on loosely pivoted sprocket wheels, one at each end of the car. The magnet-boxes are so spaced as to be just as far apart along the length of the sprocket chain as the surface plates are from each other. Consequently, if one magnet, with its box, is brought into contact with one of the surface plates, then the next magnet will, in its turn, make contact with the next plate, and so on. It is, of course, understood that the magnet, on reaching a new plate, is charged and attracted to the said plate at the same time that the magnet which has preceded it is de-energized and released. The action of the charged magnet upon the surface plate is to attract a movable magnetic piece within the said plate, and thus create an electric contact, and form a new path for the electric current, in a way which will be fully explained hereinafter.

Our invention will be clearly understood by referring to the accompanying drawings, in connection with the subjoined description.

In the drawings, Figure 1, is an elevation

of the principal parts of our invention. Fig. 2, is a plan; and Fig. 3, is a vertical section of the magnet-box and surface-plate, combined with certain other details.

Referring to the drawings, and designating the several parts by reference characters, 1, is a portion of a car body, and 2, 2, are car wheels adapted to run upon the track rails, 3, 3. Upon the axles, 4, 4, of the car, we have shown electric motors, 5, 5, and for convenience of illustration, we have shown their armatures, 6, 6, mounted directly upon the car axle. It is obvious that these motors may be of any type, and may be geared to the axle in any of the well known ways.

Near each end of the car body are supported on suitable brackets sprocket wheels, 7, 7, two such wheels being arranged at each end of the car. These sprocket wheels support two sprocket chains, 8, and 9, and are so loosely mounted as to allow to the said chains great freedom of movement longitudinally. The said chains are attached to opposite sides of magnet-boxes, 10, 10, 10, the details of which are shown in Fig. 3. The casing, 11, is of metal, and within it is a coil, 12, surrounding an iron core, 13. Through the iron core, with an air space between, projects a rod, 14, of aluminium bronze, or other good conducting material. At its lower end, this rod is provided with a head, 15, which is set into a depression in a piece of iron, 16, which forms a continuation of the core, 13, of magnet, 12. The rod, 14, projects through the top of the casing, 11, and is there joined to a wire, 17, which is in electrical connection with a trolley, 18, supported on a standard, 19, projecting from the top of the case. On another standard, 20, similarly supported, is a second trolley, 21, and on still another standard, 22, is a third trolley, 23, the function of which will be explained hereinafter. At the bottom of the magnet-box, we have attached a rim, 24, of soft rubber, for a purpose which will soon appear. Now, there co-operates with the magnet-box aforesaid, a device which we have called a surface plate, but which consists of a variety of parts now to be described. Supporting the whole, is a frame or standard, 25, consisting of a metallic casting with a cylindrical opening in it. Within this opening is placed an insulating box, 26, of vulcabeston, or other good insulating material, shaped to fit the opening, and also to cover the top of the rim around the edge of the casting.

At 27, we show the main wire or conductor, and we lead from it a branch, 28, through a tube, 29, which passes through the box, 26, and enters an inner box, 30, also of insulating material, and separated from the box, 26, by a space. We place a nut, 31, on the lower end of the tube, 29 and pass the wire, 28, which is covered with an insulating covering, through the said nut, and through the tube, 29, into the interior of the box, 30. The box 30, and the box 26, are, as we have said, separated by a space, and the said space is filled with oil, and forms an oil reservoir. After entering the box, 30, the wire, 28, is formed into a take-up coil, and connected to a piece of aluminium bronze, 32, which is set into and united with a piece of iron, 33, which normally rests upon a ring, 34, of soft rubber in the bottom of box, 30. In the top of the said box, is an iron piece, 35, closely adjoining a piece of iron, 36, which projects upward and, at the top, forms the surface plate proper, which is exposed above the pavement between the rails, 3, 3. Within the face of the plate, above the surface of the street, appears the enlarged end, 37, of a rod, 38, of aluminium bronze, which passes through both the iron piece, 36, and the iron piece, 35, with interposed insulating material, causing an electrical separation. Outside the iron piece, 36, is a casting of iron, 39, which forms a cap for the whole surface structure, and is joined to the casting 25, through the rim of the box, 26, by a flanged joint.

At 40, is shown insulating material for isolating the part 36, from the cap.

Now, the circuit through the parts last described, is normally broken; but when the magnet, 12, is in a charged condition, and is, in that condition, and by virtue thereof, drawn down against the plate, 36, the contact, 33, is brought against the contact, 35, thereby effectuating an electrical contact between the parts 32, and 38, so that there is a continuity from the main wire, 27, through 28, and 32, to 38, and 37, and 15, and thence by rod, 14, and wire, 17, to the upper trolley, 18. This trolley bears upon a rail, 41, which is formed in one piece with a rail, 42, bearing on the trolleys, 21, and 23. Now, these trolleys are joined by a wire, 43, to the magnet, 12, and beyond the said magnet by a wire, 44, to ground. At the same time, a circuit leads from the rail, 41, by way of wire 45, to the motor, and from the motor, by way of wire 46, to ground. Accordingly, when the current reaches the rail, 41, a part of it goes through the motor and another part through the magnet, 12, to ground. In case the rails, 41, and 42, are in contact with more than one of the magnet-boxes, there will be a circuit through two magnets at the same time. The rail, 42, being longer than the rail, 41, will make its contact sooner than the latter, and will bring the magnet-box into an upright position, ready to make good contact with rail 41.

In practice, the magnet-boxes are arranged upon the sprocket chains so that one of them stands above one of the plates, 36, pains being taken to start out from the station with the circuit continuous, and the magnet charged. Being charged, it maintains its contact with the plate and as the car moves forward under the influence of the motor, the traction of the magnet causes the sprocket wheels to revolve and release the sprocket chain. In this way, the magnet-boxes are brought successively into line with succeeding surface plates. When the next magnet

is almost at the point where it is just above the next plate, contact is made through the rails in such a manner as to close the circuit of the said magnet, and charge it. It, consequently, drops into contact with the plate below, and attracts the movable contact piece, 33, thus completing the circuit in the manner already described.

It is evident that it makes no difference which direction the car is moving in, as the structure is duplicated at opposite ends of the car, and will work equally well at either end. Neither do we wish to confine ourselves to the use of sprocket devices alone, but any endless belt or chain, having a positive movement, will be equivalent to the sprocket.

The function of the soft rubber, 34, around the base of the magnet-boxes, will, doubtless, be understood without special mention; but it may be well to say that it will aid in securing perfect insulation of the plates, even though the latter should be covered with water. The rubber rings also serve to steady the magnet-boxes, a function which is further assisted by the fact that the trolleys, 21, and 23, are mounted upon a horizontal line, and that the rail, 42, is adapted to bear upon both of them at the same time.

What we claim is—

1. In an electric railway system, an insulated main conductor, in combination with a series of exposed insulated contact plates arranged along the track and normally disconnected from the said main conductor, a motor car, and electro-magnets carried by the car for connecting the said contact plates to the said main conductor, the said electro-magnets having a continuous movement with relation to the car while the said car is in motion, and the said electro-magnets being just as far apart as the said contact plates are distant from each other, as and for the purpose set forth.

2. In an electric railway system, an insulated main conductor, in combination with a series of exposed insulated contact plates normally disconnected from the said main conductor and arranged along the track, magnetic contact pieces within operative distances from the said plate, a motor car, and electro-magnets carried by the said car and having a continuous movement with relation thereto while the said car is in motion, the said electro-magnets being just as far apart as the said contact plates are distant from each other, as and for the purpose set forth.

3. In an electric railway, an insulated main conductor a series of branch conductors leading therefrom to movable magnetic contacts, in combination with a motor car having an incomplete branch circuit through its motor and carrying magnets for moving the said magnetic contacts and thereby completing the motor branch circuit, the said magnets having a continuous movement with relation to the car while the said car is in motion and being just as far apart as the said contacts are distant from each other, as and for the purpose set forth.

4. In an electric railway system, a series of exposed magnetic surface plates arranged along the railway track, in combination with a motor car carrying a series of electro-magnetic devices adapted to co-operate with the said plates successively, the said electro-magnetic devices having a continuous movement with relation to the car while the said car is in motion and being just as far apart as the said contact plates are distant from each other, as and for the purpose set forth.

5. In an electric railway system, a traveling electro-motor, and an insulated main conductor, in combination with a series of exposed contact plates, the branch circuits to which are open through magnetic contact terminals, and electro magnetic devices carried by the car for operating the said magnetic contact terminals, the said electro-magnetic devices having a continuous movement with relation to the car and being just as far apart as the said contact plates are distant from each other, as and for the purpose set forth.

6. In an electric railway system, a series of exposed magnetic surface plates arranged along the railway track, in combination with a motor car carrying an endless chain, a portion of which is in proximity to the said series of surface plates, and a series of magnetic devices supported upon the said chain, the said magnetic devices being just as far apart along the length of the said chain as the said surface plates are distant from each other, as and for the purpose set forth.

7. In an electric railway system a motor car carrying an endless chain on which are mounted magnet boxes containing electro-magnets, in combination with a series of trolleys upon the said magnet boxes, and a bar engaging with the said trolleys, the said bar being electrically connected with the motor circuit, and one or more of the said trolleys being joined to the magnet circuit, as and for the purpose set forth.

8. In an electric railway system, the motor car carrying an endless chain on which are mounted magnet boxes containing electro-magnets, in combination with a series of trolleys upon the said magnet boxes, and a bar engaging with the said trolleys, the said bar being electrically connected with the motor circuit, and one or more of the said trolleys being joined to the magnet circuit, the said bar being long enough to span the distance from one magnet box to the next in the series, whereby a new magnet will be brought into the circuit at or before the time when one that has already been energized will be cut out, as and for the purpose set forth.

9. In an electric railway system, a motor car carrying an endless sprocket chain on loosely mounted sprocket wheels, in combination with magnetic devices mounted on the said sprocket chain and a series of magnetic plates exposed along the surface of the rail-

way track at the same distance apart as the said magnetic devices, as and for the purpose set forth.

10. In an electric railway system, a motor car carrying a freely moving endless sprocket chain on which are mounted electro-magnetic devices contained in suitable boxes, a pair of trolley terminals on the said boxes arranged at the same level, and a bar making contact with the said terminals, and simultaneously pressing upon them to steady the boxes and their magnets, as and for the purpose set forth.

In testimony whereof we have signed our names, in the presence of two witnesses, this 11th day of August, A. D 1892.

THEODORE B. WILCOX.
HENRY WILCOX.

Witnesses
ALFRED F. STEVENS,
ALEX. S. BROWN.