(No Model.) 2 Sheets—Sheet 1.

# C. E. EGAN.

## ELECTRIC MOTOR.

No. 458,545. Patented Aug. 25, 1891.

FIG. 1

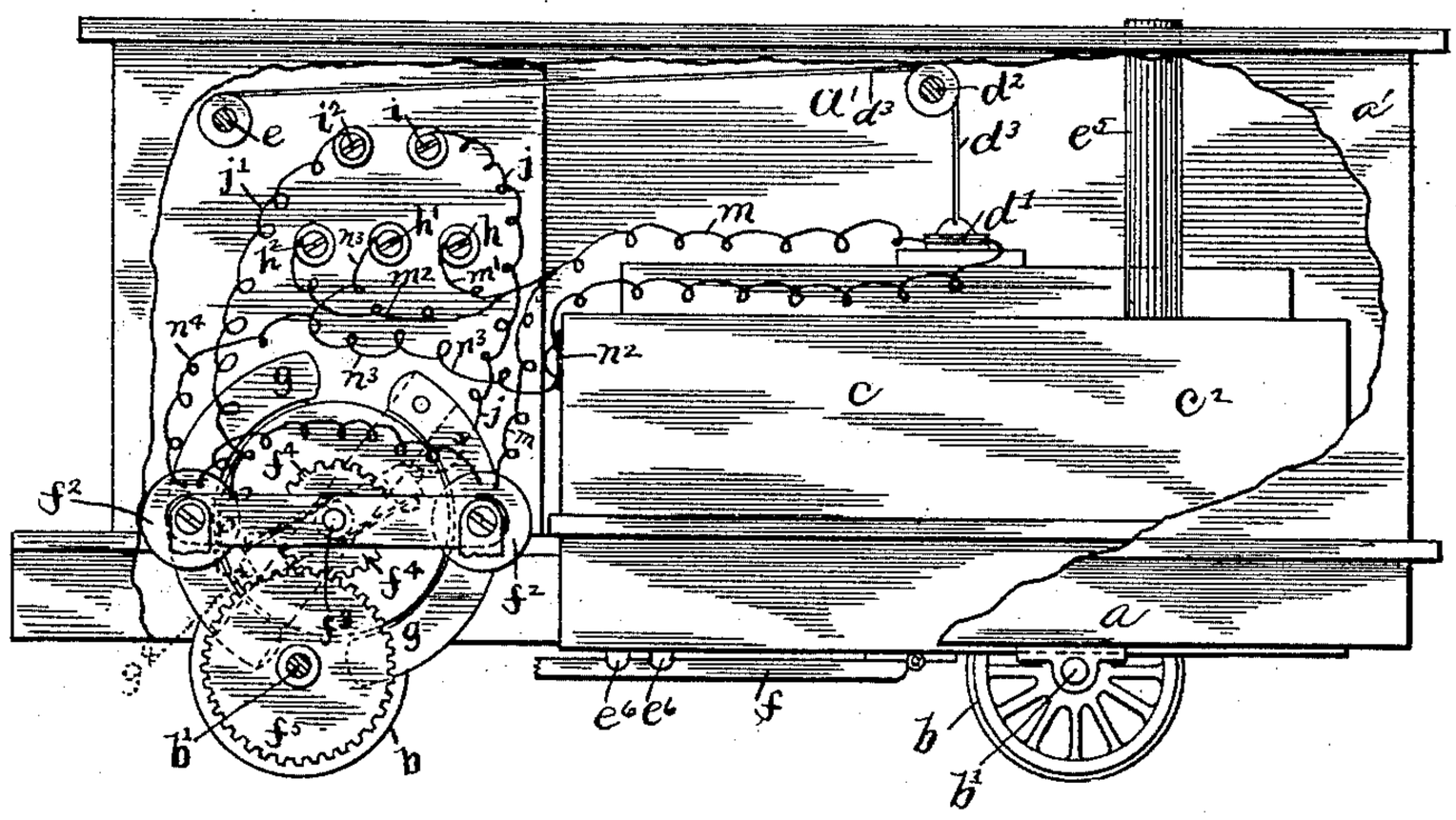
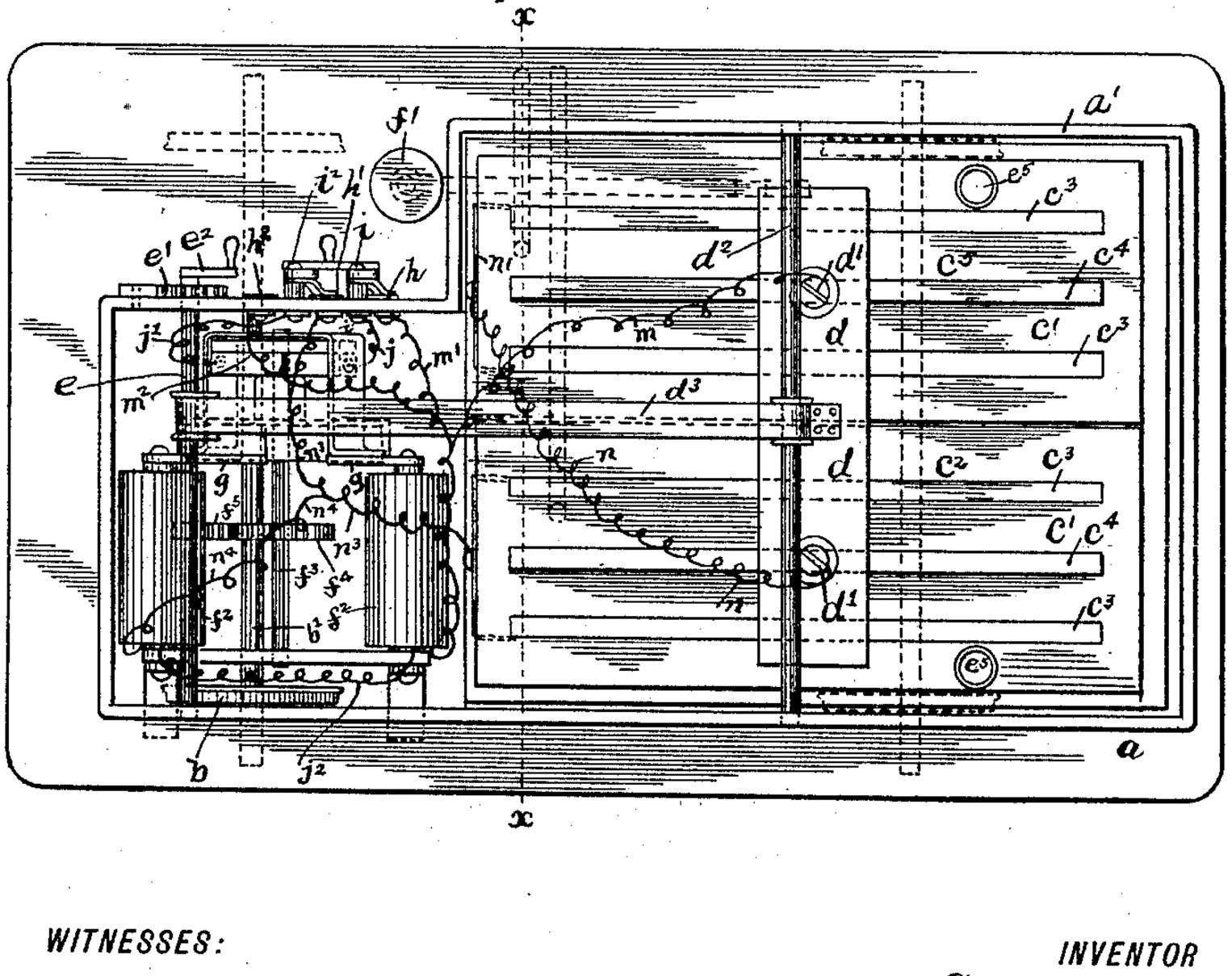



FIG. 2

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(No Model.) 2 Sheets—Sheet 2.

# C. E. EGAN.

## ELECTRIC MOTOR.

No. 458,545. Patented Aug. 25, 1891.

FIG. 3

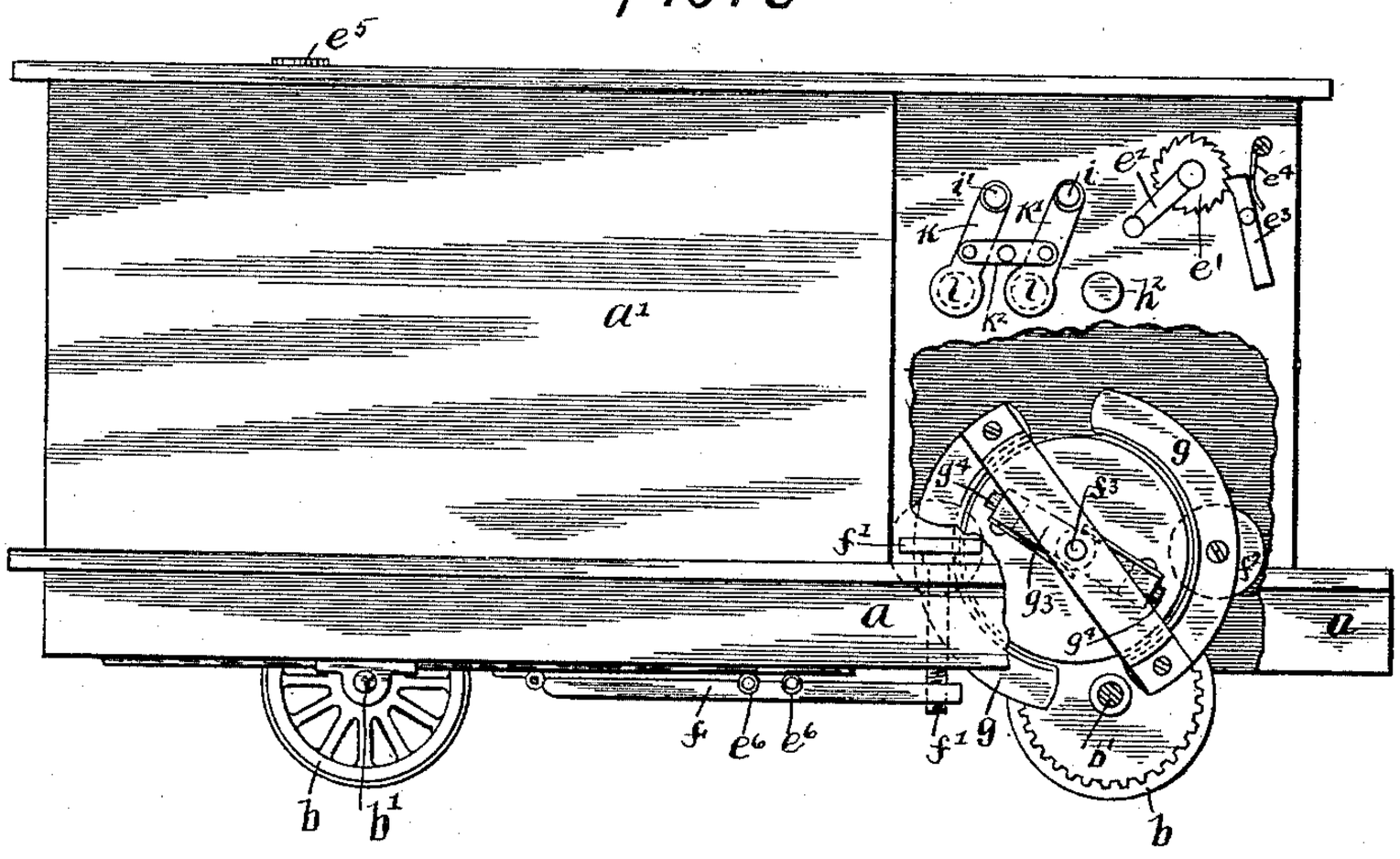


FIG. 4

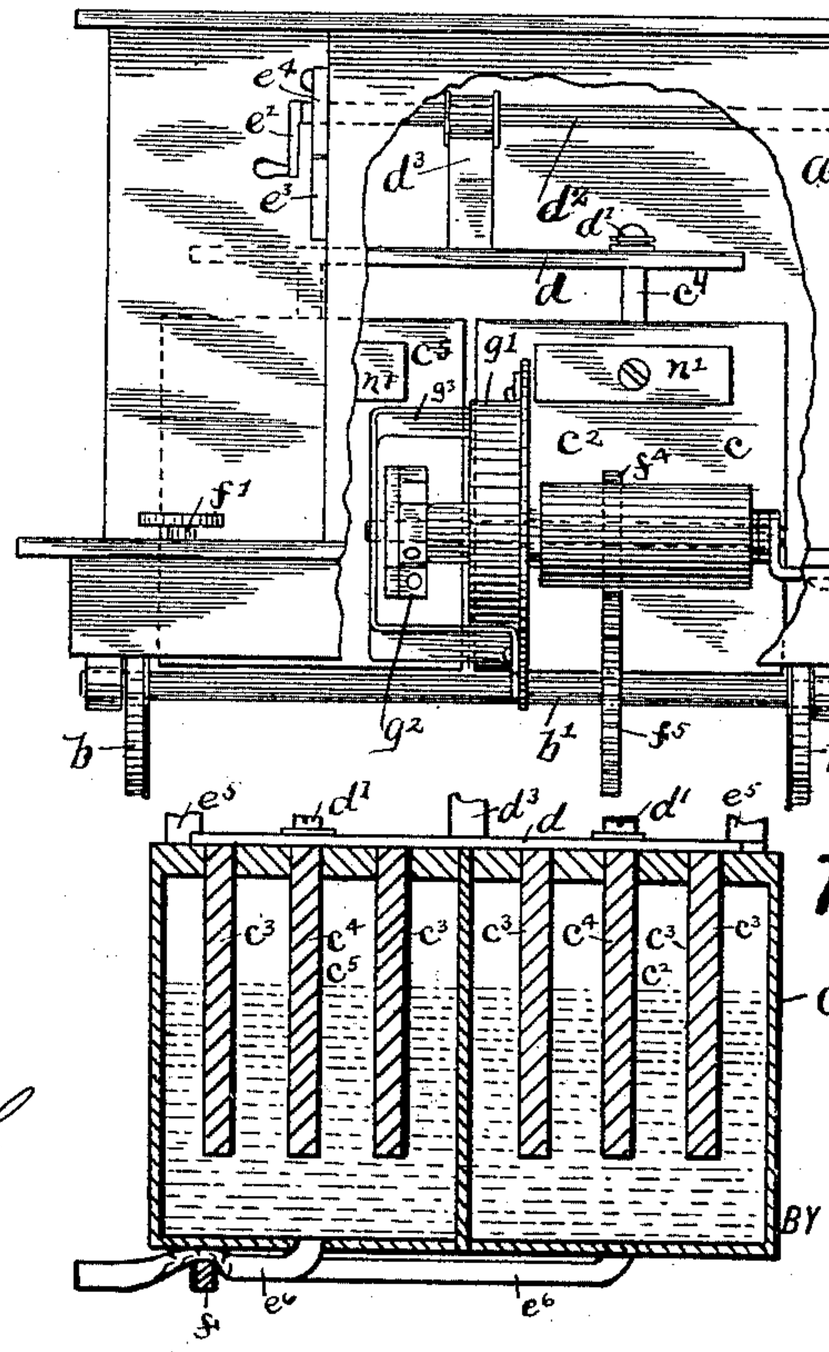


FIG. 5.

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# UNITED STATES PATENT OFFICE.

CHARLES E. EGAN, OF COLUMBUS, ASSIGNOR OF THREE-FOURTHS TO WILLIAM H. WEITZELL, OF LOGAN, AND J. F. CASEY, OF ZANESVILLE, OHIO.

## ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 458,545, dated August 25, 1891.

Application filed November 28, 1890. Serial No. 372,943. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. EGAN, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Electric Motors, of which the following is a specification.

My invention relates to that class of motors for running cars, vehicles, or other conveyances wherein a battery is used to generate the electric current; and the objects of my invention are to provide improved means for stopping and starting and regulating the speed of motor-cars of this class, to provide for the reversal of the motor, to so construct the battery therefor as to admit of its being readily charged with the desired solution, to provide improved means for the discharge of said solution from said battery and for cleaning the same, to so construct said apparatus as to prevent the wearing action of the battery-solution upon the battery elements when the car is not in motion, and to construct said apparatus in such manner and of such form as to admit of its being easily controlled and operated and to produce and run the same at a low cost. These objects I attain in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my improved motor-car, showing a portion of the side frame broken away. Fig. 2 is a plan view with the car-top removed. Fig. 3 is a view in elevation of the opposite side of the car from that shown in Fig. 1 and showing a portion of the car-frame broken away. Fig. 4 is a front end view of the car with a portion of the framework broken away; and Fig. 5 is a detail view showing a transverse section of the battery-tank, taken on line $x\,x$ of Fig. 2.

Similar letters refer to similar parts throughout the several views.

$a$ represents the bottom frame of the car-body, $a'$ the side walls thereof, and $b$ the supporting track-wheels, the latter being supported or carried upon suitable transverse shafts $b'$, which are journaled in suitable bearings depending from the car-frame. Supported between the side walls of the car and having its bottom or floor approximately flush with the lower side of the base-frame $a$ of said car is a battery-tank, which is separated, as shown, into cells $c^5$ $c^2$. The upper sides of these cells are provided with suitable covers $c'$, in which are formed parallel slots, as shown. Each alternate slot has fixed thereto and depending therefrom within the tank a carbon plate $c^3$, while the remaining slots have supported loosely therein, as hereinafter described, zinc plates $c^4$. The upper sides of the zinc plates of each cell are connected by a transverse non-conducting bar $d$, through which projects from each of the zincs a metallic binding-post $d'$. Supported between the side walls of the car-body at a distance above the upper side of the battery-tank and in a position parallel with the cross-bar $d$ is a suitable rod $d^2$. Secured to the center of the length of the cross-bar $d$ is one end of a strap or cord $d^3$, which passing upward over the cross-rod $d^2$ extends to the forward end of the car beyond the front end of the battery-tank, where it is secured to and adapted to be wound upon a transverse reel-shaft $e$, the latter being journaled between the side walls of the car-body and having an outwardly-extended end, which carries on the outer side of the car-wall a ratchet-wheel $e'$ and on the outer side of said ratchet-wheel a suitable crank-handle $e^2$. Pivoted to the car-wall near the wheel $e'$ is a pawl-arm $e^3$, the upper end of which is supported in engagement with the teeth of said ratchet-wheel by the free end of a spring-strip $e^4$.

$e^5$ represents vertical feed-pipes, one of which leads to each of the cells $c^5$ of the battery through the covers thereof and which have their upper ends extending through the car-top.

$e^6$ represents rubber outlet-pipes, one of which leads from each of the battery-cells through the bottom thereof and both of which extend laterally outward to one side of the car-frame.

$f$ represents a clamping or binding arm, which, extending beneath one side of the car, has its rear end hinged to the bottom of the tank and has its forward end adjustably supported on the lower end of a vertical screw $f'$, which extends through the frame $a$. The outer end portions of the rubber tubes $e^6$ are normally clamped between the under

side of the tank and the upper side of the clamping-arm *f*, the latter thus serving to close communication with the battery-cells through said tubes.

$f^2$ represents the field-magnets, which are supported from one of the inner walls of the car in the forward and lower portion thereof.

$f^3$ represents the motor-shaft, which is journaled parallel with and between said field-magnets, said motor-shaft carrying said field-magnets and pinion-wheel $f^4$, which gears with a gear-wheel $f^5$, carried by the forward shaft $b'$.

*g* represents the magnet pole-pieces, $g'$ the armature-ring, $g^2$ the commutator, and $g^3$ the brush-holding arm, said armature-ring, commutator, and brush-holding arm being mounted upon and rotated by the shaft $f^3$ in the usual manner.

$g^4$ represents the commutator-brushes, which are supported by the arm $g^3$ in frictional contact with the commutator-surface.

Passing through one of the side walls of the car and arranged in a horizontal row are three horizontal binding-posts or contact-pins $h$ $h'$ $h^2$. Above these binding-posts are similarly located in the side car-wall posts $i$ $i'$.

$k$ $k'$ represent switch-arms, which are pivotally connected at their lower end portions by a cross-piece $k^2$ and which have their upper ends jointedly connected with the outer ends of the upper binding-posts $i$ $i'$. Each of these switch-arms is provided at its lower end with a contact extension-piece *l*, said contact-extensions adapted to be brought to bear upon the desired pair of contact-pins or binding-posts $h$ $h'$ or $h'$ $h^2$. The inner ends of the binding-posts or pins $i$ $i'$ are respectively connected with the outer ends of the brushes by wires $j$ $j'$. The field-magnets are connected by a wire $j^2$.

The zinc $c^4$ of the cell $c^5$ has its post $d'$ connected by a wire *m* with one of the field-magnets $f^2$. This wire *m* is also connected by wires $m'$ $m^2$ with the wall binding-posts $h$ $h^2$. The zinc $c^4$ of the cell $c^2$ has its post $d'$ connected by a wire *n* with a metallic strip $n'$ on the front of the battery-tank, said strip $n'$ being connected, as shown, with the carbons $c^3$ of the cell $c^5$. The carbons of the cell $c^2$ are connected by a metallic strip $n^2$, said metallic strip being connected by a wire $n^3$ with the central-wall contact-post $h'$, said wire $n^3$ also connecting through a wire $n^4$ with the remaining or unconnected field-magnet $f^2$.

From the construction and arrangement of wires herein described it will be seen that a circuit is complete from the battery through the magnets and that when the lower contact ends of the switch-arms are connected with two of the series of posts $h$ $h'$ $h^2$ the connection is continued through the commutator-brushes. In case the connection of the switch-arms is with the posts $h^2$ $h'$, the current will be in such direction through the brushes as to so rotate the shaft $f^3$ as to impart through the gear-wheels $f^4$ $f^5$ and shaft $b'$ a forward motion to the track-wheels *b* and car. In case the switch-arms are so changed as to be brought into contact with the posts $h$ $h'$, it will be seen that the polarity of the armature will be changed, resulting in the revolution of the motor-shaft and its gear in the opposite direction. In order to decrease the speed of the motor, the reel-shaft *e* is so rotated by turning the handle $e^2$ as to take up and wind thereon the zinc-supporting strap $d^3$. This taking up of the strap $d^3$ will result in the drawing upward from the solution contained in the battery-cells of the zincs. As the area of zinc-surface which is immersed in the solution contained in the tank is thus decreased, the force of the current generated thereby will decrease, thus resulting in a lower speed being imparted to the motor-shaft and car. In case it is desired to stop the car, the zincs are elevated completely from the solution. It will thus be seen that when the car is at rest the battery elements will be freed from the action of the solution and that the wearing action of said battery will be in proportion to the speed of the car, thus imparting a longer life to the battery. In charging the battery, the cells are supplied with the desired solution by pouring the same into the feed-pipes $e^5$, thus obviating the necessity of removing the car-top or cell-tops. When it is desired to withdraw the solution from the cells, the adjusting-screw is turned until the clamping-arm *f* is sufficiently lowered to release and open the ends of the tubes $e^6$, through which the solution will be discharged. In cleansing the cells, the water or cleaning mixture may be passed through said cells by pouring the same in the feed-pipes and allowing it to escape through the outlet-tubes $e^6$. These tubes being of rubber will resist any action of the battery-solution.

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

1. In an electric-motor car, the combination, with the car-body and a battery-tank supported therein, of feed-pipes $e^5$, leading into said tank through the car-frame, and outlet-tubes $e^6$, of rubber, leading from said tank, and means for closing and opening said tubes, as and for the purpose set forth.

2. In an electric-motor car, the combination, with the car-body, of a battery-tank supported therein, feed-pipes $e^5$, leading to said tank, outlet-tubes $e^6$, leading from the bottom of said tank, and clamping-arm *f*, having one end hinged to the car-body and its remaining end adjustably supported by screw *f* from said body, said clamping-arm being adapted to close against the car-frame, substantially as described.

CHARLES E. EGAN.

In presence of—
BARTON GRIFFITH,
C. C. SHEPHERD.