No. 699,029. Patented Apr. 29, 1902.

A. L. SIMPSON & H. B. PALMER.

CONTROLLER FOR ELECTRIC VEHICLES.

(Application filed Dec. 13, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

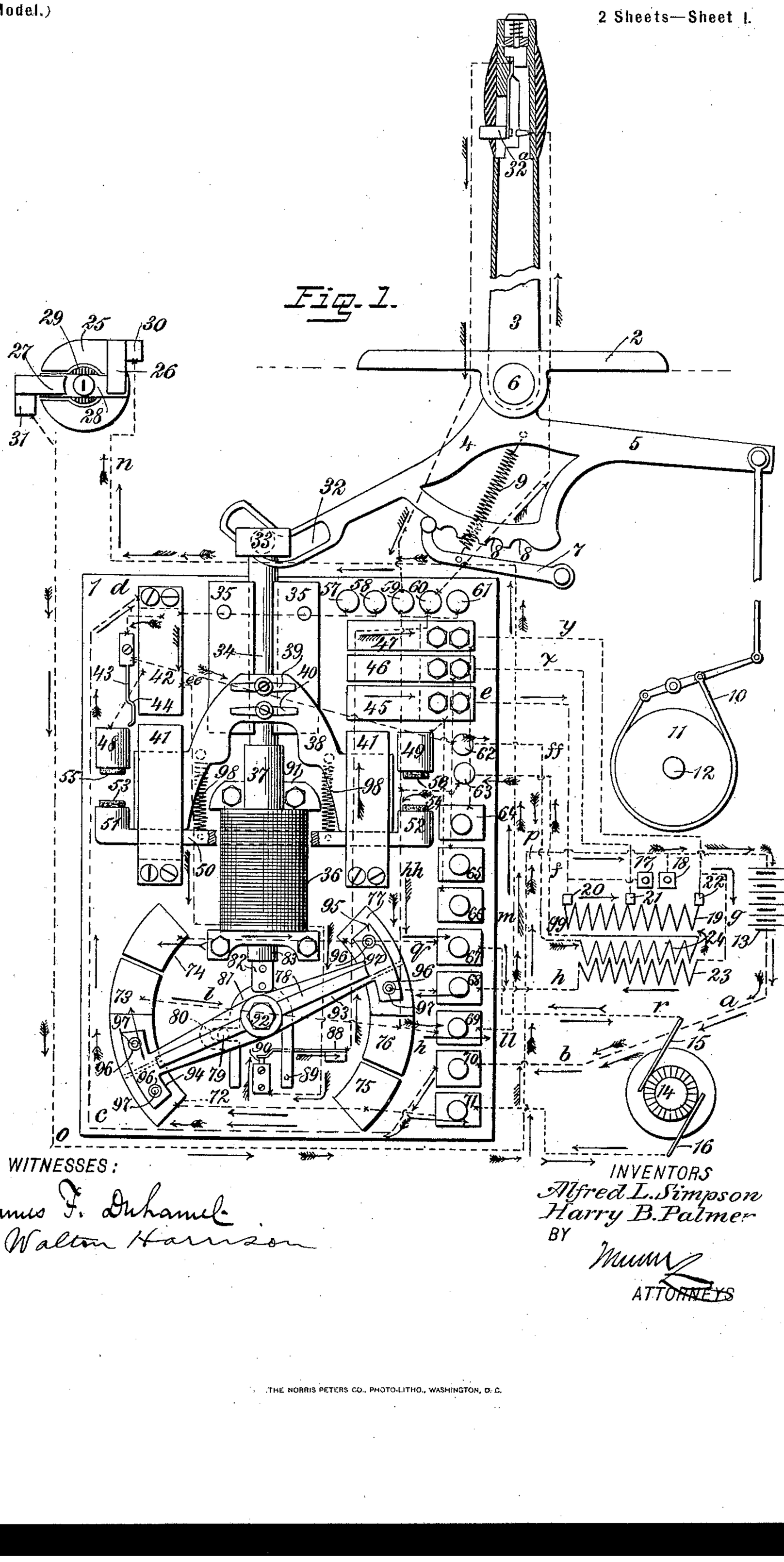

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Fig. 2.

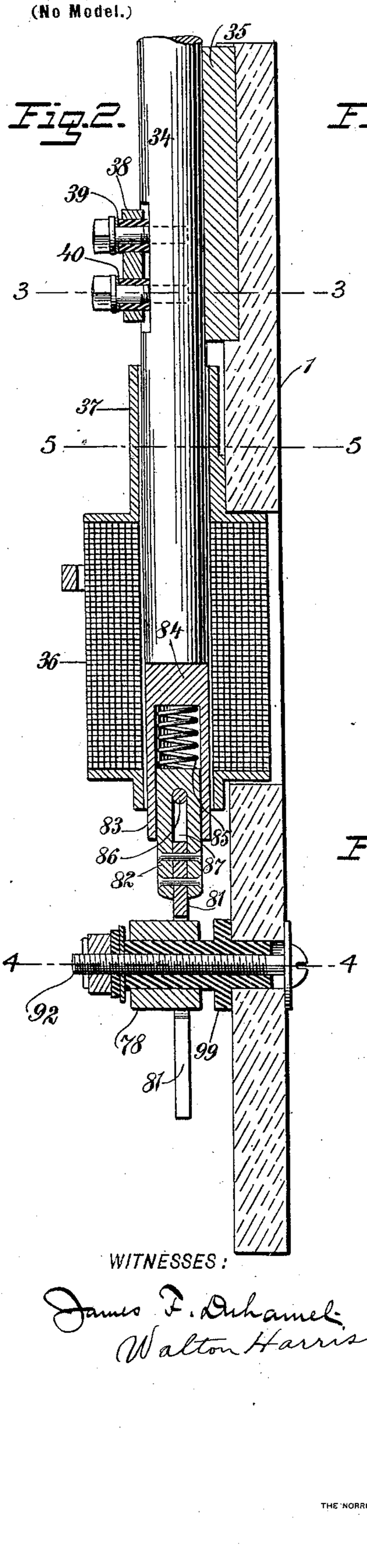

Fig. 3.

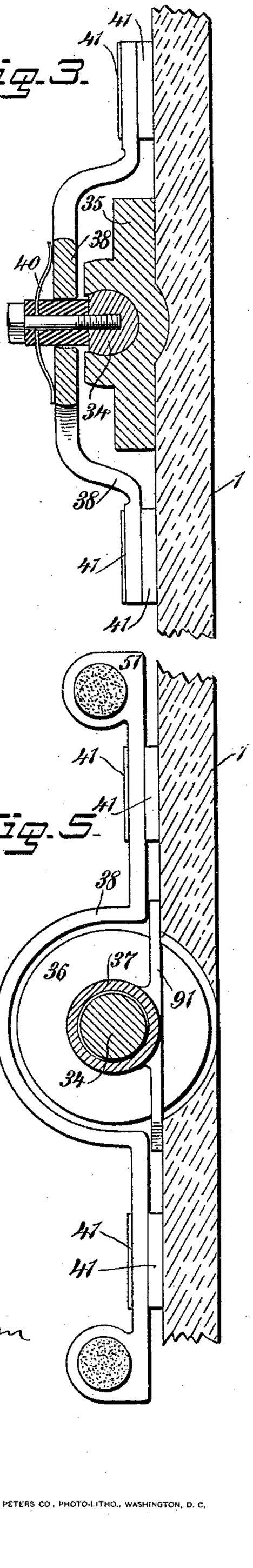

Fig. 4.

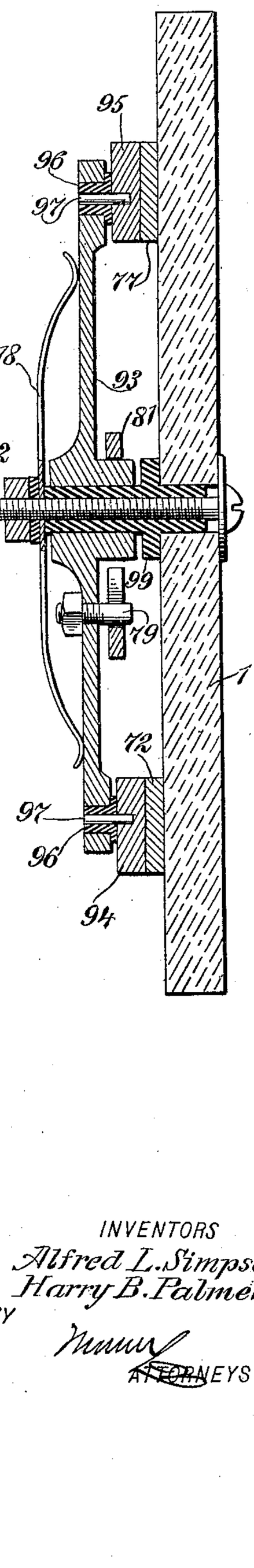

Fig. 5.

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CONTROLLER FOR ELECTRIC VEHICLES.

SPECIFICATION forming part of Letters Patent No. 699,029, dated April 29, 1902.

Application filed December 13, 1901. Serial No. 85,831. (No model.)

To all whom it may concern:

Be it known that we, ALFRED LISSACH SIMPSON and HARRY BUCHANAN PALMER, citizens of the United States, and residents of the city of New York, borough of Manhattan, in the county and State of New York, have invented new and useful Improvements in Controllers for Electric Vehicles, of which the following is a full, clear, and exact description.

Our invention relates to controllers of the type used in electric vehicles, such as automobiles and street-cars.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a diagrammatic elevation showing our invention in its entirety, the motor-current being indicated by plain arrows, the reversing-current by semifeathered arrows, and the shunt-current by feathered arrows. Fig. 2 is a fragmentary vertical section of the magnetic reversing device. Fig. 3 is a horizontal section upon the line 3 3 of Fig. 2. Fig. 4 is a horizontal section upon the line 4 4 of Fig. 2, and Fig. 5 is a horizontal section upon the line 5 5 of Fig. 2.

The principal portions of our device are mounted upon an insulating-slab 1, preferably of slate and located within easy reach of the operative. Pivoted upon a bearing 2 is a hand-lever 3, provided with branching members 4 and 5 integral therewith, the pivot being shown at 6 and located upon the vehicle at the usual point selected for the location of the same. A blunt pawl 7 engages the ratchet 8 and is normally pressed against the ratchet by a spring 9. The object of this arrangement is to enable the operative to feel the movement of the pawl as he gradually withdraws the lever and also to afford him means for determining to what point the lever is withdrawn at any given moment.

The extreme outer end of the branching member 5 is connected with a band-brake 10 of the ordinary pattern, the same engaging a disk 11, mounted upon a revoluble axis 12, for the purpose of checking the speed of the vehicle.

The storage battery is shown at 13, the armature of the motor is shown at 14, and the brushes for supplying the current of the same are shown at 15 16, and at 17 18 are shown a pair of plugs used in charging the storage battery. A resistance-coil 19 is provided with terminals 20 21 22, said coil being connected serially with the motor field-coil 23. A shunt-coil 24, having a comparatively high resistance, is also provided and is independent of the resistance-coil. At 25 is shown a combination-lock for the purpose of holding the circuit open or closed, as the case may be, thereby preventing unauthorized persons from tampering with the current.

Spring-contacts 26 27 are engaged by a contact-bar 28, which is revolubly mounted and is connected with the barrel 29 of an ordinary Yale lock. The spring-contacts are provided with terminals 30 and 31 for securing the wires thereto, the idea being that in order to move the contact-bar 28 it is necessary to first work the combination of the lock, leaving said bar free to rock upon its center.

The branching member 4 of the lever is provided with an arc-shaped slot 32, which engages the head 33 of a rod 34, slidably mounted in a plate 35, as shown more particularly in Fig. 3. A solenoid 36 is provided with an iron sleeve 37, the rod 34 entering said sleeve and said solenoid. A movable electrode 38 is connected with the slidably-mounted rod 34 and is constantly pressed upon by spring-clasps 39 40. The stationary guards 41 have no electrical connection with any of the parts and merely serve to retain the movable electrode 38 in position.

At 42 is a spring-contact which is engaged by the movable electrode 38 when the latter travels upward. At 43 is another spring-contact, which is provided with a hooked end 44, said end being adapted to engage the movable electrode 38 when the latter is moved a sufficient distance either upward or downward. From the position shown in Fig. 1 if the movable electrode 38 be carried upward to its extreme limit it will first engage and then disengage the hook 44 and will engage the spring-contact 42. Three other spring-contacts 45 46 47 are also provided and are electrically connected with the resistance-coils 19 and 23.

A pair of stationary cups 48 and 49 are dis-

posed oppositely to a pair of movable cups 51 52, which are mounted integrally upon the bridge-bar 50, pressed upward by springs 98. In these four cups are mounted the four carbon points 53 54 55 56, so arranged that the upward movement of the bridge-bar 50 will cause a short circuit between the stationary cups 48 49.

A plurality of terminals 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 are provided for various purposes hereinafter explained.

Upon the lower portion of the slab 1 are mounted the sector-shaped contact-points 72 73 74, arranged oppositely to the contact-points 75, 76, and 77. A bow-shaped spring 78 is secured upon the pivot 92 and normally presses upon the contact-lever 93. This contact-lever is secured upon the movable sector-plates 94 95 by means of bolts 97, passing through insulating-sleeves 96. In the lower side of the contact-lever 93 is a boss 79, which engages the yoke 80 in the horseshoe-shaped member 81. This member is secured rigidly to a cylinder 82. The cylinder loosely engages the hollow portion 83 of an iron armature 84, a spring 85 being interposed between these parts for the purpose of acting as a cushion. The cylinder 82 is provided with a slot 87, engaged by a pin 86, secured rigidly in said armature. The effect of this arrangement is that the armature 84 may be pushed downward slightly toward the bottom of the slab after the horseshoe-shaped member 81 has reached its lowermost limit. A spring member 88 makes contact at 90 with the terminal of the wire, hereinafter more particularly mentioned, for the purpose of opening and closing a local circuit. A bracket 91 holds the sleeve 37 rigidly in position immediately above the solenoid 36. An insulating-sleeve 99 serves to prevent electrical contact between the pivot 92 and the other parts.

The operation of our device is as follows: Supposing that the operative desires to start up the machine and to travel in the forward direction, the parts being in the normal position, (indicated in Fig. 1,) he merely pulls the lever 3 without pressing the button 32^a, (see Fig. 1,) and the result is that the rod 34, which is of iron, is raised upward, carrying with it the movable electrode 38. This electrode soon engages the spring-contact 43, whereupon the circuit traverses the following course, (indicated by the feathered arrows,) to wit: from the battery 13, wires *a b c d*, to the contact-plates 42 43, thence through the wires *e e f f*, through the shunt-coil 24, thence up the wire *g g*, down the wires *h h*, *l l*, *m*, *n*, *o*, and *p*, back to the battery. The effect of this is that the shunt-coil 24 of the motor is thrown into circuit. The movable electrode passes still higher, when the circuit indicated by the unfeathered arrows is established, taking the following course: from the battery 13, wires *a b c d*, to the spring-contact 42, thence through the movable electrode 38 to the spring-contact 45, thence through the wires *e f*, and thence through the resistance-coils 19 and 23, thence through the wires *g h i*, through the sector-plate 95, thence through the wires *q* and *r*, through the brush 15, the armature 14, and brush 16 of the motor, and thence through the contact-plate 71 and the sector-shaped plates 72 and 73, thence through the wire *l* and contact 69, and thence through the wires *l l*, *m*, *n*, *o*, and *p*, back to the battery. The result of this is that in addition to the above-described circuit passing through the shunt-coil there is another circuit passing through two resistance-coils and also through the motor. The movable electrode travels still higher, with the result that the current from it again divides, a part passing through the contact 46 and the wire *x* to the central terminal 21 of the resistance-coil 19, the rest of the circuit being the same as the one first described. The movable electrode travels still higher, with the result that it engages the spring-contact 47, thus sending a third parallel current, the same passing through the wire *y* and the terminal 22, thence following the same path as the other current just mentioned. The movable electrode 38 passes still higher, with the result that it now disengages the spring-contact 44, at the same time cutting out the shunt-winding, while fully engaging all three of the spring-contacts 45 46 47. This speeds the motor to its maximum limit. At the instant when the movable electrode 38 first engages one of the spring-contacts above mentioned the bridge-bar 50 is raised to a degree enabling the carbon points 53 and 55 and also the carbon points 54 and 56 to make contact. The result of this is that a current passes from the spring-contact 42 through the cup 48, carbons 55 53, cup 51, bridge-bar 50, cup 52, carbons 54 56, cup 49 to the spring-contact 45, thence through the wires *e* and *f* to the terminal 20, whence it follows the same course as the other currents, back to the battery. The bridge-bar 50 being pressed upward by the springs 98 normally engages the movable electrode 38; but when the carbon points are in contact the movable electrode continues to move upward, whereas the bridge-bar stops. The object of this arrangement is to avoid burning the parts by the current, which latter is, in effect, made to divide and traverse two separate routes. The current thus divided from the main circuit is not wasted, but ultimately goes through the motor, as will be seen from following the circuit as above described. It will be seen, therefore, that the motor has four separate speeds, these being represented by the four notches 8 of the ratchet, each notch corresponding to a particular speed.

The action of the electrical reversing apparatus will now be described. Starting again from the position shown in Fig. 1, let us suppose that the operative desires to have the vehicle run backward. He presses the button 32^a and pulls the lever 3. The result is a circuit is completed and may be traced by the

semifeathered arrows. This circuit being complete the solenoid 36 is energized, thus rendering the lower end of the iron bar 34 magnetic. This lower end of the iron bar is itself an armature, and it mates the armature 84. When the solenoid is energized, these two armatures are caused to adhere together by their magnetic attraction for each other. The movement of the lever therefore causes the horseshoe-shaped member 81 to travel upward, and the yoke 80, engaging the boss 79, shifts the contact-lever 93 to a different radial position. The result is that instead of the fixed sector-shaped plates 72 and 73 being connected these parts are disconnected and the plates 73 and 74 are connected, while when the plates 76 and 77 are disconnected the plates 75 and 76 are connected. The result is that the current is simply reversed and travels through the armature in a different direction, which causes the machine to run backward. As the rod 34 carries the movable electrode 38, however, it is desirable, as soon as the machine is reversed, that this rod shall be disconnected from the armature 84. This is accomplished in the following manner: When the horseshoe-shaped member 81 travels upward, the pin 89 engages the spring member 88, breaking the connection at 90 and leaving open the circuit which actuates the solenoid. The result is that the armatures instantly relax their hold upon each other and the rod 34 is free to travel upward, carrying with it the movable electrode 38. In other words, the contact-lever 93 is nothing more nor less than a commutator for reversing the direction of the current passing through the motor, and after the motor is thus reversed the commutator is disconnected and the movable electrode 38 passes freely upward, engaging the spring-contacts adjacent to its path.

The direction of the main or propelling current in driving the motor ahead has already been traced. When the commutator is reversed, however, for the purpose of backing the vehicle, the current flows as follows: from the battery 13, following the unfeathered arrows, through the wires *a b c d*, across the bridge 50, through one or more of contacts 45 46 47, according to the speed desired, thence through the terminal 22, the motor field-coil 23, the wire *h* to the plate 76, thence across to the plate 75, whence, following the feathered arrows, it passes through the terminal 71, the brush 16, the motor-armature 14, the brush 15, the terminal 67, the plate 74, across to the plate 73, and thence, following the unfeathered arrows, through the wire *l*, the terminal 69, the wires *m*, *n*, *o*, and *p*, back to the battery. It will be observed, therefore, that in using the normal or go-ahead circuit the current flows downward through the motor-armature, whereas in using the backing-circuit the current flows upward through said armature-circuit, the direction through the field-coil being always the same.

The terminals 57 to 71, above mentioned, are merely for the purpose of utilizing the current for auxiliary purposes, such as signals and lights.

It will be observed that the spring-contacts 45, 46, and 47 are connected with the terminals 66, 65, and 64. This is merely for convenience in attaching the wires to the controller. None of these terminals are essential to the operation of the device, and they may therefore be ignored.

When the rod 34 is pressed downward by the lever, the armature or lower end of the rod is forced into mechanical engagement with the armature 84. This latter armature, being cushioned by the spring 85, is free to travel downward a slight distance by pressing the spring. The resiliency of the spring therefore acts to allow the lower armature sufficient movement to take up all lost motions.

It will therefore be seen that we have produced a neat and compact controller capable of handling any sort of electrically-propelled vehicles, the action of the same being to avoid the injurious effects of heavy currents to enable the vehicle to be reversed by merely pressing a button, and to speed the motor of the vehicle to four different rates of travel.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A controller for electric vehicles, comprising contacts connected with a resistance, a movable electrode for engaging said contacts, and means for forming a short circuit about said contacts at the instant when the said electrode engages said contacts.

2. A controller for electric vehicles, comprising a commutator for reversing the direction of an electric current and actuated by an armature, a lever provided with an armature mating the armature of said commutator, and a current-controlled device for temporarily exciting both of said armatures, thereby causing them to adhere together.

3. A controller comprising a series of contacts to be connected with variable resistances, a movable electrode for engaging said contacts, electric connections for said electrodes and said resistances, and a movable bridge member flexibly connected with said movable electrode, for the purpose of short-circuiting said stationary contacts at the instant when said movable electrode engages said first-mentioned contacts.

4. A controller comprising an electric circuit for actuating a motor, a movable electrode in said circuit, a plurality of contacts connected in multiple with variable resistances and disposed adjacent to the path of said electrode so as to be successively engaged by said electrode, a contact adjacent to the path of said movable electrode and connected with a shunt-coil of comparatively high resistance, the distribution of said contacts relatively to the path of said movable member

being such that said member in traveling so as to successively engage said contacts connected to said variable resistances, first engages and then disengages the contact connected with the shunt-coil, thus speeding the motor to a maximum limit.

5. A controller comprising a commutator for reversing the direction of an electric current, an armature for actuating said commutator, a lever provided with a movable armature mating the armature of said commutator, a current-controlled magnetic device for causing said armatures to adhere together so that said commutator may be reversed by the aid of said lever, and means for opening and closing the circuit of said current-controlled device.

6. A controller comprising a commutator for reversing the direction of an electric current, an armature for actuating said commutator, a lever provided with a movable armature mating the armature of said commutator, a solenoid, surrounding both armatures and connected with a circuit for actuating the same, means for opening and closing said circuit, an electrode connected with said lever and movable therewith, contacts disposed adjacent to the path of said movable electrode, resistances electrically connected with said contacts, and means for connecting said electrode, said solenoid and said resistances with a source of electric supply and with a motor to be driven.

7. A controller comprising a commutator for reversing the direction of an electric current, a member for actuating said commutator, a cushion interposed between said member and said commutator, and mechanism controllable at will, for engaging and releasing said member for the purpose of actuating said commutator.

8. A controller comprising a commutator for reversing the direction of an electric current, an armature for actuating said commutator, a cushion interposed between said armature and said commutator, a lever provided with a movable armature, and an electromagnetic device for temporarily exciting both of said armatures, thus causing them to adhere firmly together.

9. A controller comprising a commutator for reversing the direction of an electric current, a cylindrical armature mechanically connected therewith, a controlling-lever provided with a cylindrical armature mating said first-mentioned armature, and a solenoid for temporarily exciting said armatures, thus causing them to adhere together.

10. A controller comprising a commutator for reversing the direction of an electric current, a cylindrical armature mechanically connected therewith, a cushion interposed between said armature and said commutator, a controlling-lever provided with a cylindrical armature mating said first-mentioned armature, and a solenoid for temporarily exciting said armatures, thus causing them to adhere together.

11. A cylindrical armature comprising a movable electrode, stationary contacts to be engaged by the same, an electric circuit connected with said contacts, oppositely-disposed stationary contacts tapping said circuits, and a bridge-electrode secured to said movable electrode by springs and normally held thereby in contact with said movable electrode, the arrangement being such that the movement of said movable electrode may cause said bridge-electrode to engage said contacts and disengage said movable electrode at the moment when said movable electrode engages first-mentioned contacts.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ALFRED LISSACH SIMPSON.
HARRY BUCHANAN PALMER.

Witnesses:
JNO. M. RITTER,
WALTON HARRISON.