No. 789,411. PATENTED MAY 9, 1905.

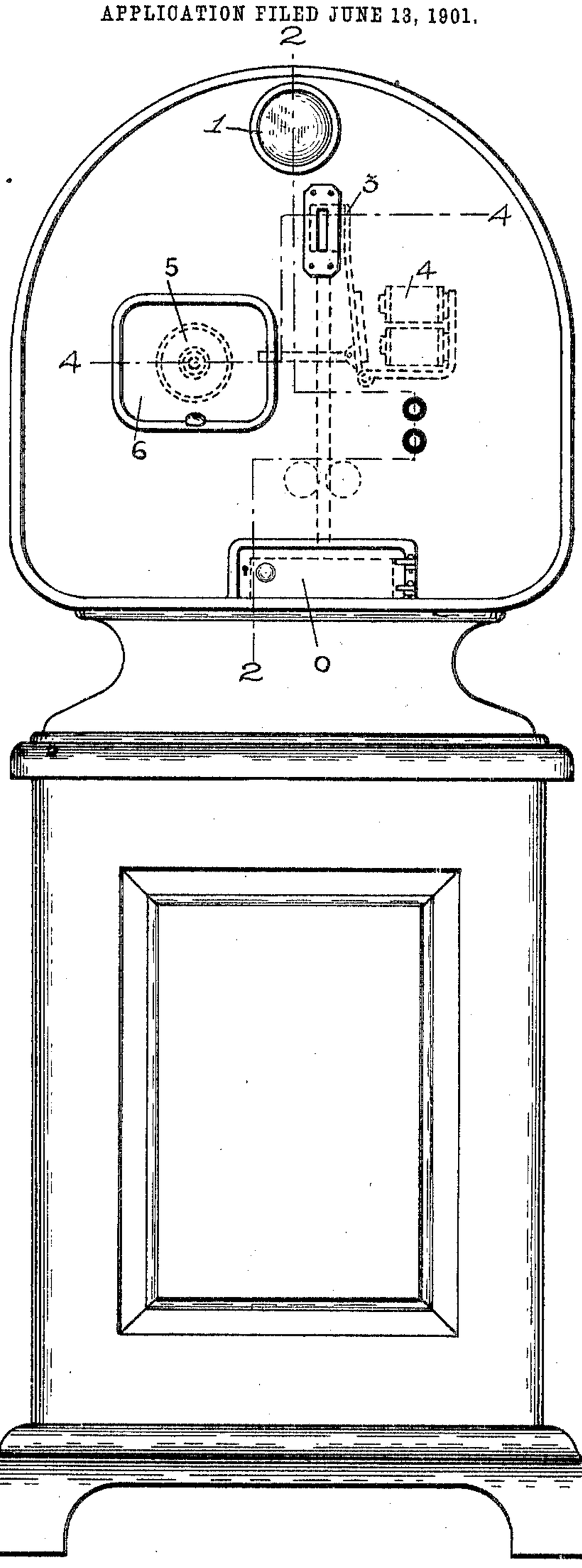
F. P. COX & C. E. HOLMES.

CHARGING STATION FOR ELECTRICALLY PROPELLED VEHICLES.

APPLICATION FILED JUNE 13, 1901.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

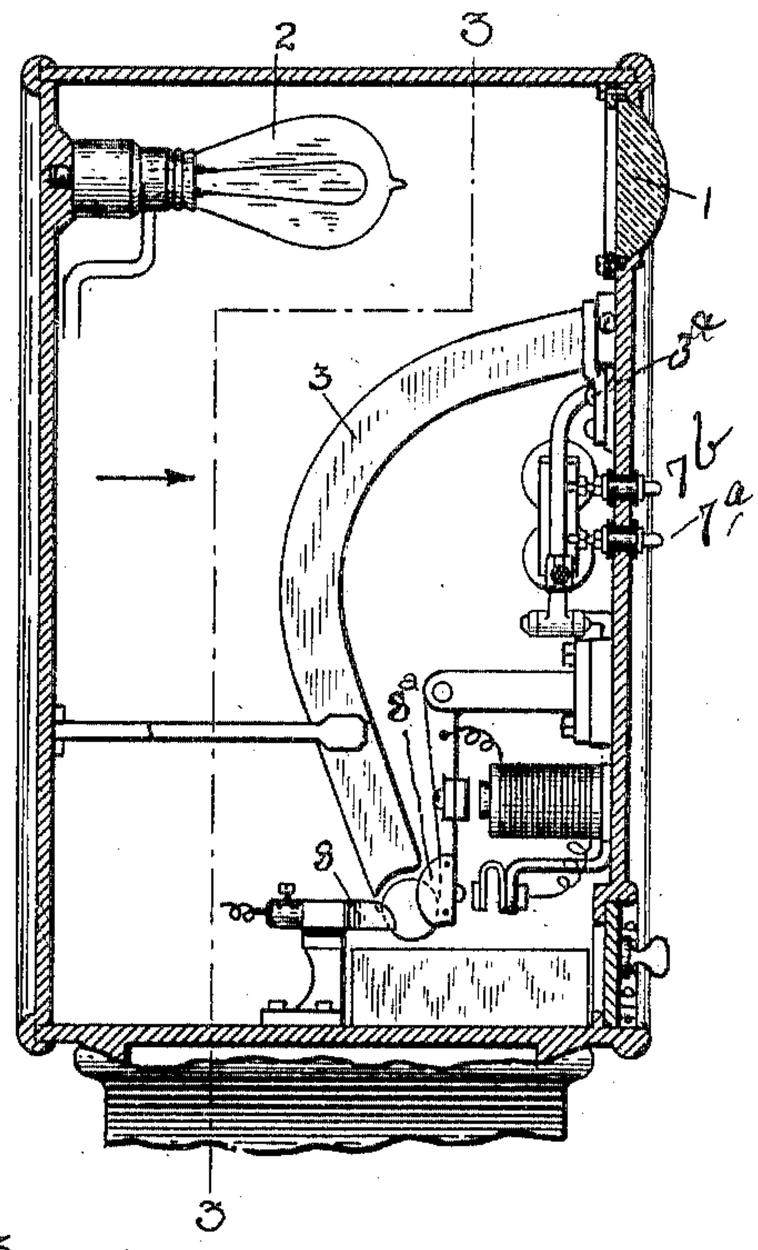
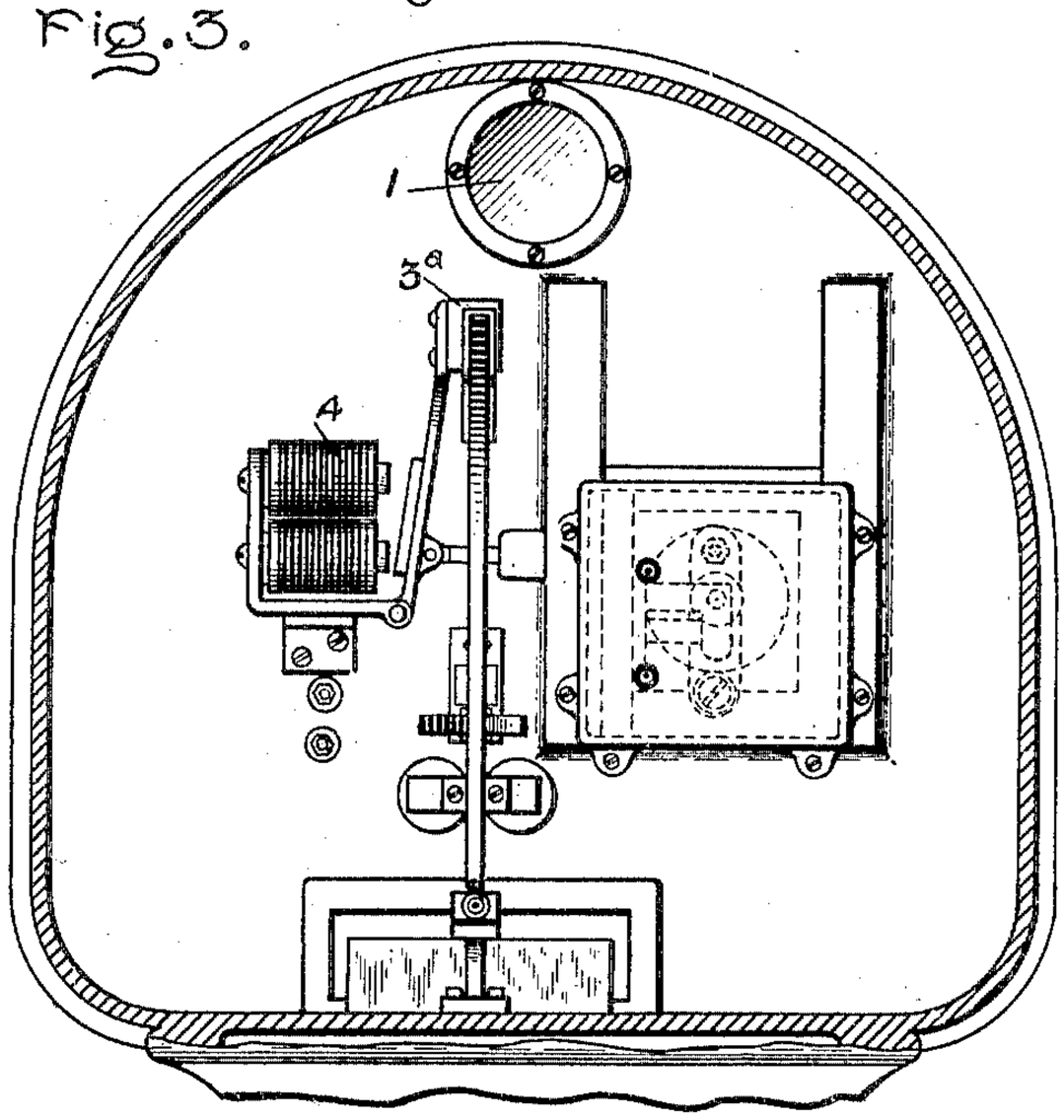


Fig. 3.



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3 SHEETS—SHEET 3.

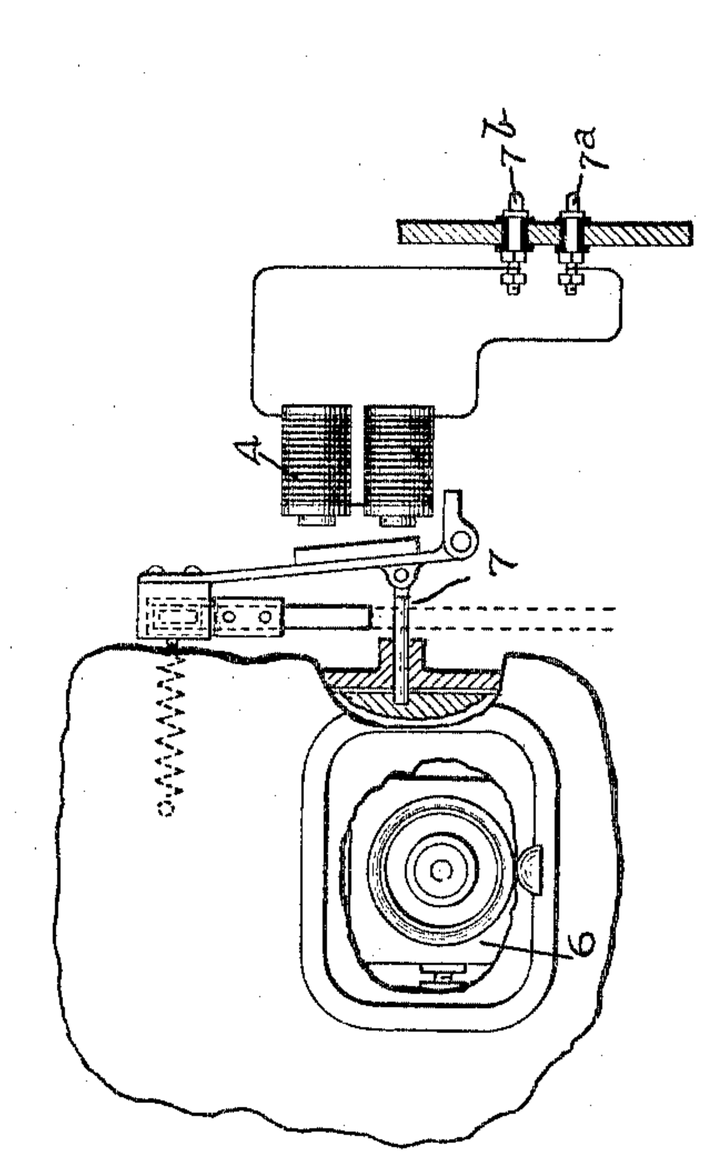

Fig. 5.

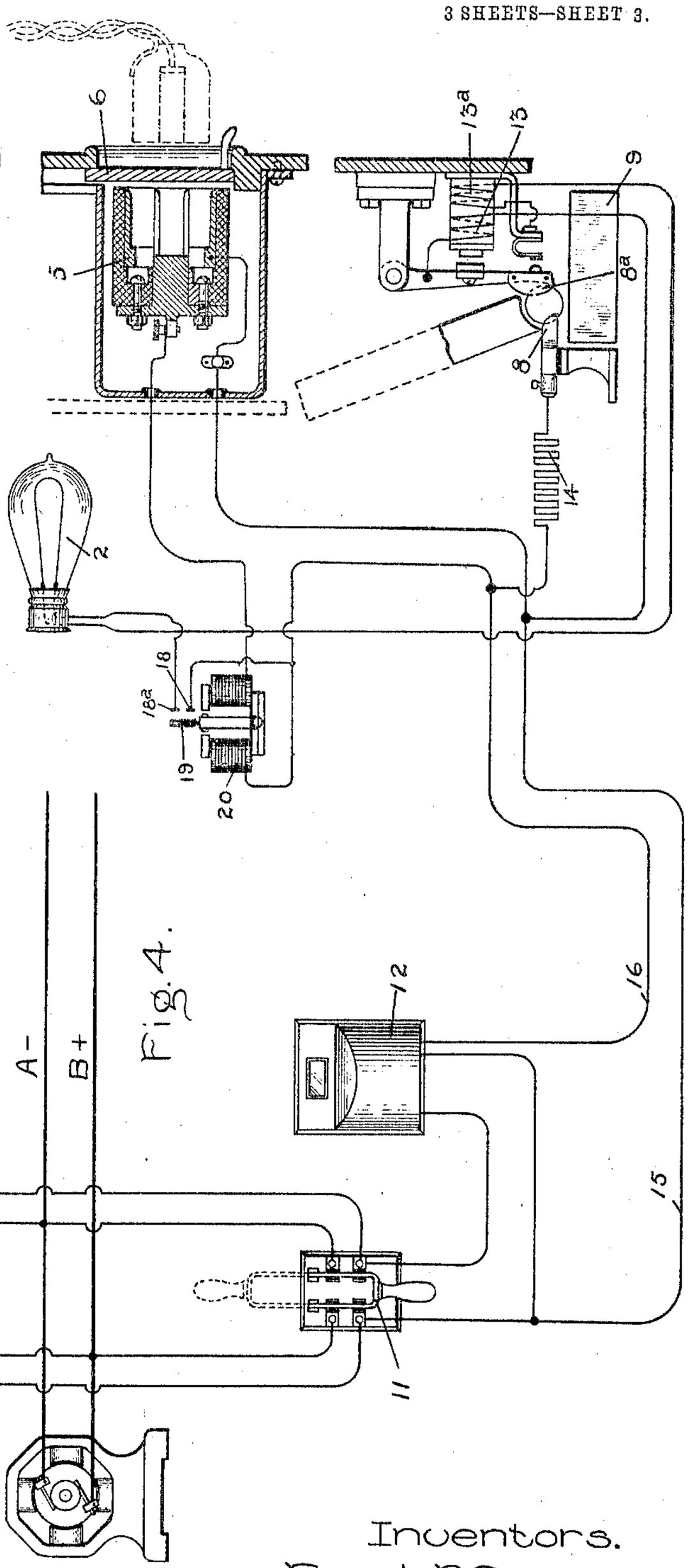

Fig. 4.

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UNITED STATES PATENT OFFICE.

FRANK P. COX AND CHARLES E. HOLMES, OF LYNN, MASSACHUSETTS, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CHARGING-STATION FOR ELECTRICALLY-PROPELLED VEHICLES.

SPECIFICATION forming part of Letters Patent No. 789,411, dated May 9, 1905.

Application filed June 13, 1901. Serial No. 64,353.

To all whom it may concern:

Be it known that we, FRANK P. COX and CHARLES E. HOLMES, citizens of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Charging-Stations for Electrically-Propelled Vehicles, of which the following is a specification.

This invention relates to automatic charging-stations for electrically-propelled vehicles. In the designs of such stations heretofore proposed the construction has been expensive and the controlling mechanism rather complicated by reason of the various automatic switch devices, current-measuring devices, and prepayment mechanism to control the delivery of electric energy and the quantity furnished.

It is the object of our invention to provide a simple organization which will be cheap to instal, the current-measuring devices being located at the distributing-station. Such a type of charging-station may be employed in many cases where it is feasible to run a separate circuit or wire from a station to a convenient point which may be a rendezvous for cabs, as a theater, hotel, or cab-stand. Devices of this character are known in the art as "electrants" and are designed to permit the delivery of electric energy in determinate quantities upon the payment of a coin of defined value or by a deposit of a special token sold by the supply company.

Our invention comprises a type of electrant in which a storage-battery vehicle in which there is a residual charge of current may gain access to a charging-current and no other. We provide the charging plug or station with a coin-chute normally inaccessible, so as to prevent the insertion of strings, wires, twigs, or other fraudulent devices, but adapted to be rendered accessible by the charging-plug of the automobile by means of an electromagnet controlled by the residual charge of the battery. The deposit of a coin then transmits a signal to central station indicating that a vehicle is present at the charging-station and the coin has been deposited. By the closure of a switch by the central-station operator full potential is thrown on the supply-wires to the charging-station through a meter at the central station, and after the value of the coin in current has been delivered the switch at the supply-station is opened. We provide also an electric lamp in the charging-post by which the cabman is apprised of the fact that his signal has been transmitted to the central station and which will indicate when the paid amount of energy has been put into his battery. We provide also means for preventing transmission of a signal to the central-station operator except when a coin has been deposited in the chute. Thus we provide a charging-station having comparatively few operating parts, of simple structure and small liability to get out of order, and cheap to instal.

Our invention therefore comprises a charging-station for storage batteries provided with means under the control of the central-station operator for delivering energy and fixing its quantity and means for indicating to said operator when the prepayment has been made.

It comprises various other features, the novelty of which will be hereinafter described, and definitely indicated in the claims appended to this specification.

In the accompanying drawings, which illustrate our invention, Figure 1 is a front elevation, having the front cover removed, of a charging-station embodying our improvements. Fig. 2 is a sectional view on a plane indicated by the line 2 2 of Fig. 1. Fig. 3 is a sectional view of the operating mechanism on a plane indicated by the line 3 3 of Fig. 2. Fig. 4 is a diagram of the circuit connections, and Fig. 5 is a detail view of the magnetic releasing device controlling admission to the charging-socket.

Our device comprises a cast-iron box in which is housed the operating parts and which seals the mechanism against access of all but

authorized parties. This box contains a bull's-eye 1, behind which is placed within the box an incandescent lamp 2, which automatically burns as long as the battery is drawing current. The box contains a coin-chute 3, the upper end of which is closed normally by means of a wing-shaped guard 3ª, carried by the armature of a control-magnet 4, which when energized withdraws the guard and permits the insertion of a coin in the slot. 5 is a charging-socket into which the cabman may insert his plug connecting by a flexible cable with the terminals of the battery on his vehicle. The socket is provided with two insulated contacts connecting with the circuit leading to the supply-station, which engage corresponding contacts on the cabman's cable-plug. This socket is guarded by a sliding door 6, provided with a handle on the outside by which it may be lifted, but normally locked by means of a pin 7, connected to the armature of the electromagnet 4, which guards the coin-chute. Thus until this electromagnet is energized the door is locked and no access can be had to the charging-socket. The coils of the magnet 4 connect with two insulated metal knobs or contacts 7ª 7ᵇ on the front of the charging-post set just the proper distance apart to be cross-connected by the contacts of the cabman's charging-plug, so that when touched thereby the residual charge of the battery energizes the magnet and releases the door guarding the charging-socket and at the same time exposes the coin-chute. At the bottom of the coin-chute are two metal contacts 8 8ª, adapted to be bridged by the coin and to hold the latter from dropping into a cash-drawer 9. These contacts form part of a branch circuit from the mains connecting with central station and deliver energy from the supply-circuit to a pair of magnets 10 10ª at the central station (see Fig. 4) which act upon an armature and control an indicator which moves behind a perforated screen. When the current flowing in the coin-controlled circuit is of definite strength, this indicator is held in a position to expose its number showing the number of the charging-station visited, and the operator by the closure of a switch 11 may send a heavy current to that charging-station, which is transmitted through a watt-meter 12. The coin-controlled contacts 8 8ª are separable, so as to permit the coin to drop into the cash-box; but the signaling-current sent by the coin when inserted in the device is insufficient in strength to effect the separation of the contacts. When, however, the central-station switch is closed, a heavier current is transmitted and a control-magnet 13 is energized, drawing up an armature attached to the movable contact 8ª, thereby permitting the coin to drop into the cash-box. When drawn forward, the contact 8ª closes a circuit through an auxiliary coil 13ª, which closes a branch of the supply-circuit through the signal-lamp 2, including two contacts 18 18ª, closed by tongue 19 on the armature of a polarized relay 20. This relay is in series relation to the charging-circuit and under the normal bias given it by a charging-current closes the contacts at 18 18ª, so as to permit the lamp to burn when the battery is drawing current. After the main-station switch 11 is opened, however, a discharge from the battery operates the polarized relay, opening the lamp-circuit at the points 18 18ª, thus extinguishing the lamp, apprising the cabman that the charging-current has been cut off.

The magnets 10 10ª (see Fig. 4) are of high resistance and are included in a shunt-circuit around the switch 11. In the path of the coin-circuit closer which governs the operation of this magnet is inserted a resistance 14, graduated so as to cut down the current transmitted, and thereby prevents a display of the annunciator or indicator except when the coin is deposited.

The signaling-circuit is normally complete from the supply-mains A B through the central station, but open at the control devices in the several charging-stations. As shown in the drawings, a double-pole switch 11 is employed. This, however, is a matter of engineering selection. When the switch is open, as in the dotted position of the drawing Fig. 4, the circuit is closed up to the charging-station from the main B through signaling-magnet 10, one of the switch-contacts, line conductor 15 to the charging-station being open there at two points—one at the plug and the other at the coin-contacts 8 8ª—thence back by line conductor 16 to another switch-contact, through signaling-magnet 10ª to negative main A. If now the cabman wants to draw current, he touches the contact 7ª 7ᵇ with his charging-plug, and the residual battery-current energizes magnet 4. Two operations result—the coin-chute is exposed and the locked door 6 released. If he connects the plug with the socket without depositing a coin, a current is transmitted to central station; but the opposing electromotive force of the battery makes the current so weak that the indicator 7 is not moved. By dropping a coin in the chute, however, contacts 8 8ª are bridged, closing a path across the mains by way of the coin and coil 13 and the resistance 14. This current is insufficient to operate the movable contact 8ª, but is of proper strength to shift the indicator 7 in line with the visual opening 17, thereby notifying the central operator that a coin has been paid. The operator then closes the switch 11, as shown in full lines in Fig. 4, thereby short-circuiting the signal-magnets and putting full potential on the conductors 15 and 16. This is sufficient to operate the movable contact 8ª and free the coin and simultaneously closes a

branch through coil 13[a] and a signal-lamp 2 independent of the coin-contacts, thereby holding the lamp branch closed as long as the switch 11 remains closed. When the wattmeter indicates that the paid amount of energy has been delivered, the central operator opens the switch 11 and current is cut down so that coil 13[a] is no longer able to hold closed the lamp-circuit. The polarized relay 20 prevents a discharge from the battery keeping the lamp burning. If he should withdraw his plug and again insert it, the signal would not be properly transmitted, and the central-station operator will not throw the switch until a proper signal has been delivered by the insertion of a coin.

The resistances of the magnets 10 10[a] 13 13[a] and the resistance 14 should be properly proportioned to effect satisfactory operation. If the potential of the mains be one hundred volts and ninety volts the electromotive force of the batteries to be charged, each of the coils 10 10[a] and the resistance 14 may be a thousand ohms and the coils 13 13[a] be of low resistance relatively thereto. Under these conditions the current which will flow in the cabman's battery before the coils 10 10[a] are short-circuited by the switch 11 will be two hundred divided by one hundred minus ninety, or one two-hundredth of an ampere. This will be insufficient to operate the signal 7 unless a coin be deposited in the chute, in which case there will be a circuit through the electromagnet 10, coil 13, coin, contact 8[a], contact 8, resistance 14, coil 10[a], the resistance of which will be three thousand ohms, thus giving one-thirtieth of an ampere, and the magnetic circuit and the coils 10 10[a] are so wound as to permit this strength of current to actuate the signal 7. The presence or absence of the charging-plug in its receptacle while the coin is in the chute will not affect this result, since the additional branch closed by the battery will only slightly affect the value of the current. On the other hand, if a piece of wire is used surreptitiously to cross-connect the contacts of the receptacle 5 then the current in the magnets 10 10[a] will amount to one-twentieth of an ampere, which will be sufficient to shift the disk beyond the opening through which it appears when properly actuated. When the main switch 11 is closed, the magnets 10 10[a] become short-circuited and a strong charging-current or the full potential of the generator is thrown directly upon the mains.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. A prepayment-station for electric current comprising a closed chamber containing a circuit-controller, means for operating the controller in a predetermined way, a charging-receptacle for battery-terminals, an electric signaling device at the supply-station responsive to the controller, and a switch at said station governing the supply of current.

2. A charging-station for storage batteries comprising a coin-controlled circuit-controller at said station, normally open terminals for delivery of current, a signaling device at central responsive to a definite strength of current developed when the circuit-controller is actuated and a switch at central governing the supply of a strong charging-current.

3. A prepayment electric-supply station provided with a coin-controlled circuit-controller, a supply-socket, a signal-circuit carrying a weak current, said circuit including the mains normally open at the circuit-controller, a signal device at central in the signal-circuit, and a switch at central governing the supply of a strong charging-current.

4. A prepayment electric-supply system for electric current comprising a signal-circuit including the supply-mains normally open at the delivery-station, coin-controlled means for imposing on said circuit a signaling-current of determinate character, a signaling device at central responsive to said signaling-current, a switch at central for transmitting a strong supply-current, and delivery-terminals at the delivery-station for tapping said supply-circuit.

5. A prepayment supply system for electric current comprising an outlying station, mains connecting with central, connections for transmitting a signaling-current of definite character over said mains on deposit of a coin, a supply-socket at the outlying station having terminals for connecting an external translating device with the mains, a switch at central, and an indicator at the outlying station responsive to closure of said switch.

6. A prepayment-station for electric energy comprising an inclosed coin-controlled circuit-closer, a guard normally obstructing the coin-chute, and means controlled by an independent external source of current for removing the obstruction.

7. A prepayment system for sale of electric energy comprising outlying stations containing coin-controlled signaling devices, means at a central station responsive to a determinate signaling-current, a central station containing a switch controlling supply of a stronger current, an energy-meter in circuit, and delivery-terminals at said outlying stations.

8. A prepayment system for sale of electric energy comprising outlying stations containing coin-controlled signaling devices, means at a central station responsive to a determinate signaling-current, a central station containing a switch controlling supply of a stronger current, a wattmeter in circuit at central station, and delivery-terminals at said outlying stations.

9. A prepayment charging-station for stor-

age batteries comprising an outlying station containing coin-controlled signaling devices, a central station containing a switch controlling the supply of current, an indicator at the outlying station which is responsive to closure of said switch under a charging-current, and means for disconnecting the indicator upon discharge of the battery.

In witness whereof we have hereunto set our hands this 10th day of June, 1901.

FRANK P. COX.
CHARLES E. HOLMES.

Witnesses:
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HENRY O. WESTENDARP.