(No Model.) 3 Sheets—Sheet 1.

J. J. COACHMAN.

ELECTRIC DENTAL ENGINE CONTROLLER.

No. 603,524. Patented May 3, 1898.

Fig. 2,

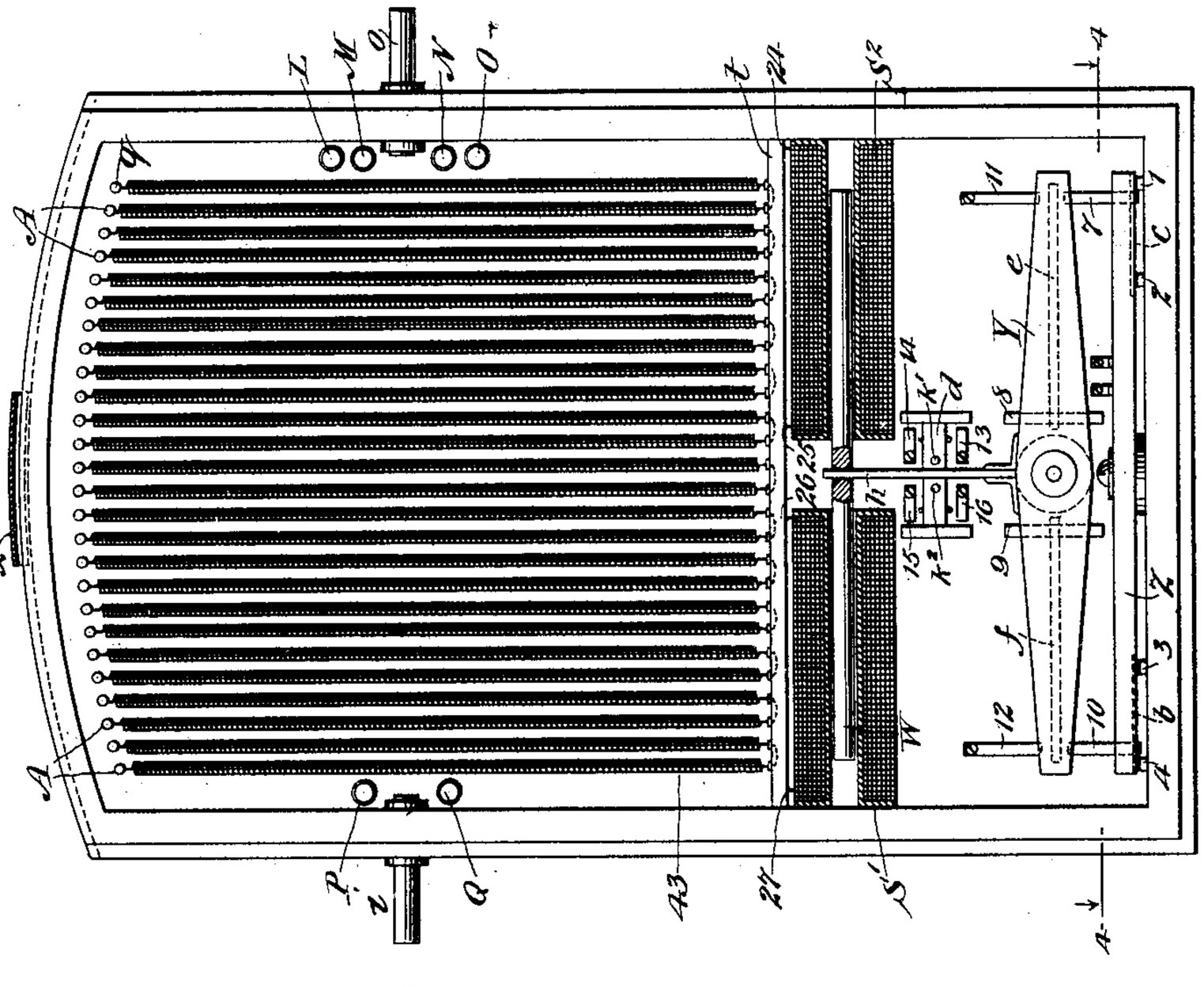
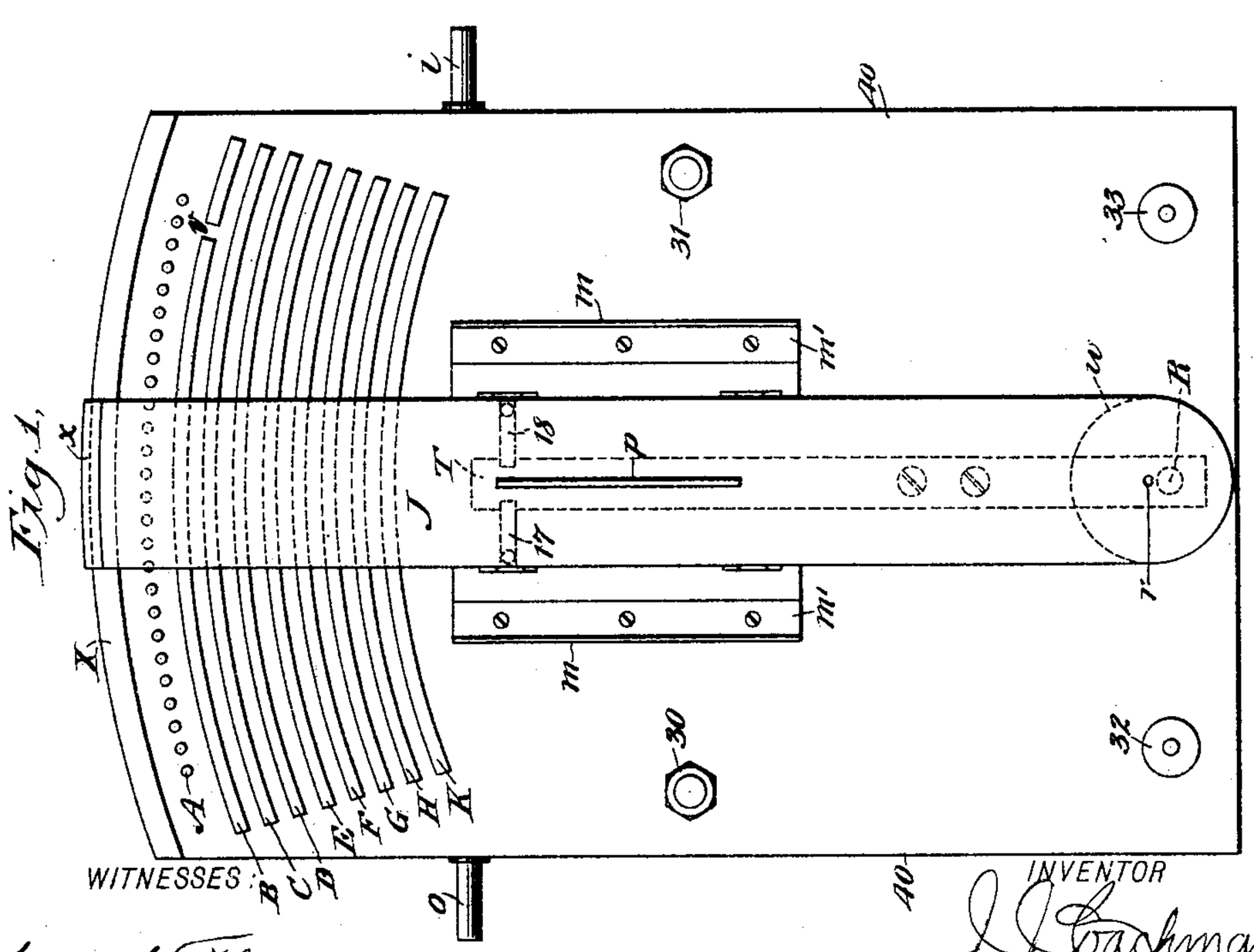


Fig. 1,



WITNESSES:

Edward Thorpe.

C. R. Ferguson

INVENTOR

J. J. Coachman

BY

Munn & Co

ATTORNEYS.

(No Model.)

3 Sheets—Sheet 2.

J. J. COACHMAN.

ELECTRIC DENTAL ENGINE CONTROLLER.

No. 603,524. Patented May 3, 1898.

Fig. 4.

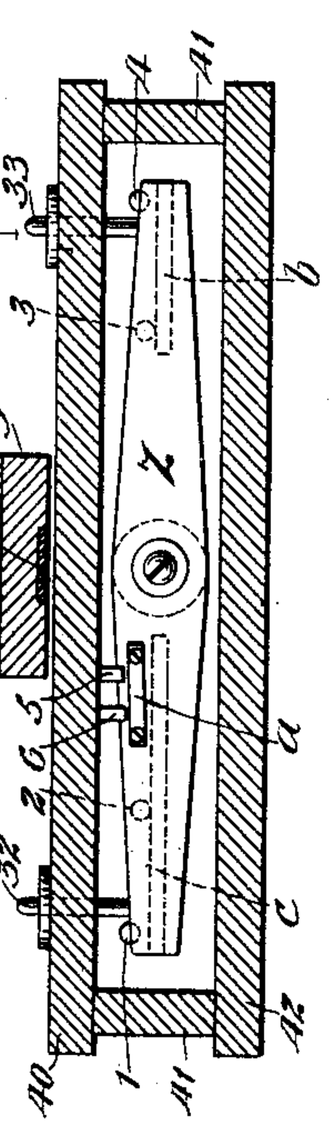


Fig. 5.

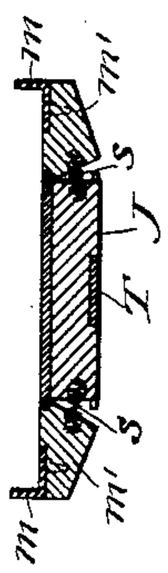
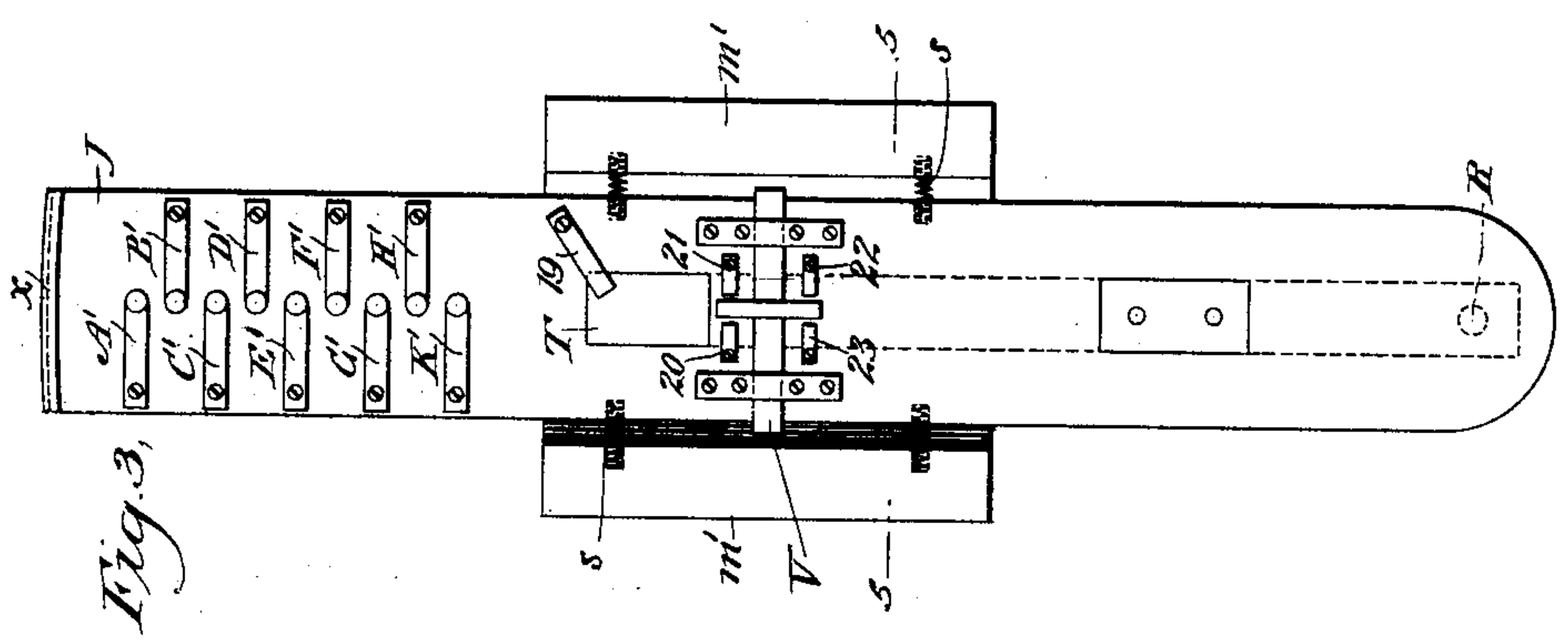


Fig. 3.



WITNESSES:

Edward Thorpe.
C. R. Ferguson

INVENTOR

J. J. Coachman

BY

ATTORNEYS.

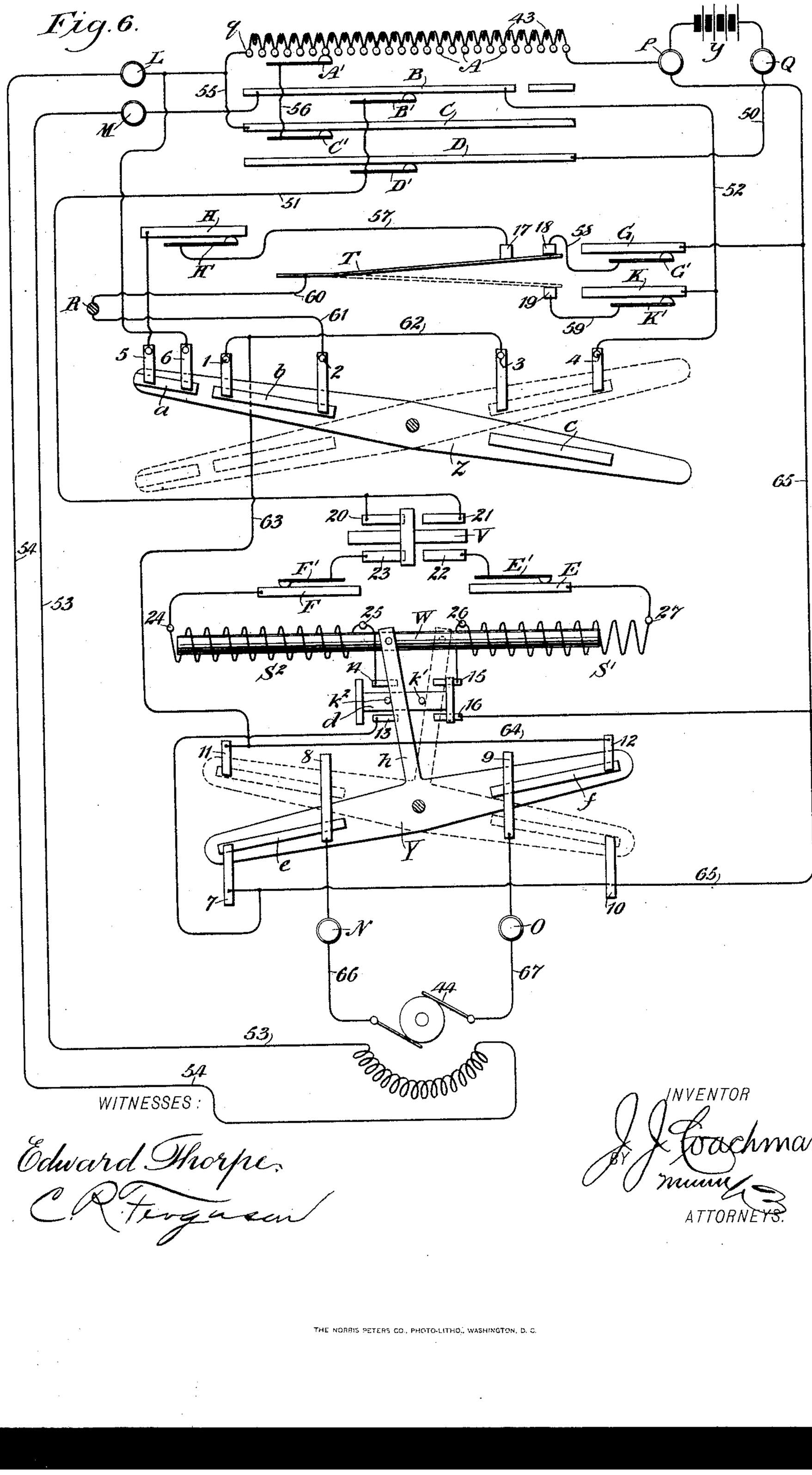
(No Model.) 3 Sheets—Sheet 3.

J. J. COACHMAN.

ELECTRIC DENTAL ENGINE CONTROLLER.

No. 603,524. Patented May 3, 1898.

Fig. 6.



WITNESSES:

Edward Thorpe.

C. R. Ferguson

INVENTOR

J. J. Coachman

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JAMES JOSEPH COACHMAN, OF RIO JANEIRO, BRAZIL.

ELECTRIC DENTAL-ENGINE CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 603,524, dated May 3, 1898.

Application filed August 21, 1897. Serial No. 649,018. (No model.)

To all whom it may concern:

Be it known that I, JAMES JOSEPH COACHMAN, of Rio de Janeiro, Brazil, have invented a new and Improved Electric Dental-Engine Controller, of which the following is a full, clear, and exact description.

This invention relates to an apparatus for controlling small electric shunt-wound motors, especially dental-engine motors; and the object is to provide a simple means wherewith said motors can be started, run forward or backward, and stopped instantly when so required.

I will describe an electric-motor controller embodying my invention, and then point out the novel features in the appended claims.

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 views.

Figure 1 is a top plan view of a controller embodying my invention. Fig. 2 is a bottom plan view with the bottom of the casing removed. Fig. 3 is a bottom plan view of a treadle or operating lever employed. Fig. 4 is a section through the line 4 4 of Fig. 2. Fig. 5 is a section through the line 5 5 of Fig. 3, and Fig. 6 is a diagrammatic view showing the circuits.

The invention comprises a base 40 of insulating material—such, for instance, as wood, vulcanite, or the like—and this base 40 is mounted on side pieces 41, to the lower edges of which a cover 42 is attached. Thus the parts 40, 41, and 42 and the end boards will form a casing. On the upper side of the base 40 at one end a number of curved metallic contact-strips B C D E F G H K are arranged. These contact-strips are concentric, and their common center of curvature is at R. A number of metallic pegs A are extended through the base 40 outward of the strip B, these pegs being arranged concentric to the curved metallic strips, and also have their common center of curvature at R. These pins and strips are contacts for different electrical connections, as will hereinafter appear.

Mounted to swing on the base 40 and pivoted at R is a pedal-lever J. Situated on either side of the base are pegs 30 and 31, normally fixed to limit the lateral travel of the pedal J, but one of which pegs is made removable to allow of the detachment of the pedal from the base. Near the lower end of the base and extended through the same are two vertically-movable pegs 32 and 33, which are used to change the position of a lever Z, mounted to swing in the casing below the base 40. On the lower side of the base, as shown in Fig. 2, resistance-coils 43 are extended from the pins A to a connection with a metal cross-strip *t*.

P and Q are suitable terminals for attaching the leading-in wires which supply the current. The wires enter through the tube *i*.

L and M are suitable terminals, to which are attached the wires which enter through the tube *o* from the field-terminals of the motor 44.

N and O are similar contacts for the armature-terminals of the motor.

S′ and S² are solenoids arranged in the casing, which, acting on the movable core W, change the position of a lever Y, mounted to swing in the casing. This movement of the lever is made through the medium of an arm *h*, extended from the lever and connected to the core W. The solenoids are connected to the cross-strip *t* by the terminals 24, 25, 26, and 27.

a, *b*, *c*, *e*, and *f* are metallic strips fixed to the levers Y and Z, the strips *e* and *f* being fixed to the lever Y and the strips *a*, *b*, and *c* fixed to the lever Z. The lever Y is pivoted to have a horizontal movement, while the lever Z is pivoted to have a vertical movement. (See Fig. 2.)

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16 are metallic contacts suitably arranged and fixed in the casing.

d is a movable metallic plate actuated by the arm *h* of the lever Y. This plate *d* is a circuit-closer and is designed to be engaged, respectively, with the contacts 13 and 14 and 15 and 16 and connect the same.

To the opposite sides of the pedal-lever J wings *m*′ are hinged, and these wings at the outer edge have upwardly-extended flanges *m*, designed to prevent an operator's foot from sliding off the pedal-lever when moving the same from side to side. The free end of the pedal-lever J is provided with a clip *x*, which

engages over a strip X on the curved end of the base 40. This clip *x* will prevent an upward movement of the free end of the pedal.

Affixed to the under side of the pedal J is a stiff spring T, normally in upward contact with the contacts 17 and 18. Attached to the spring T is a rib *p*, which projects upward through an opening in the pedal-lever and has its upper edge above the plane of said lever, so that it may be operated by a person's foot to cause the depression of the spring T to hold it out of engagement with the contacts 17 and 18 as long as the operator's foot is on the pedal. The rear end of the said spring T is slotted to engage the head of the peg R when the pedal J is placed transversely across the base. By temporarily removing the peg 30 the pedal J will be allowed to be brought to the position shown on the drawings, in which position the spring T can no longer be detached from the head of the peg R, thereby holding the rear end of the pedal J firmly in position against a bearing-surface *w*, which is of the same thickness as the guide-strip X. The small hole *r* seen above the peg or pivot R is for introducing any hard stylus with a view of depressing the spring T to allow it to be moved into engagement with the peg or pivot R.

On the under side of the pedal J are affixed contact-strips A′, B′, C′, D′, E′, F′, G′, H′, and K′. These several strips are curved or bent downward and are somewhat resilient and are designed to slide upon and make contact with the pegs A and the strips B to K, inclusive—that is, the contacts are so arranged that the contact A′ will be engaged with the pins A, the contact B′ with the strip B, the contact C′ with the strip C, and so on to the end.

19 is a metallic contact, against which the spring T bears as long as the operator's foot is on the pedal.

V is a movable piece of metal which alternately connects contact 20 with 23 and 21 with 22. Motion is imparted to the part V by means of the hinged wings *m*′. As shown in Fig. 5, the edges of the wings *m*′ adjacent to the pedal J are inclined downward and inward, and when one of these wings is pressed downward it will engage with its end the plate V and force the plate laterally. The wings are held normally out of engagement with the ends of the plate V by means of springs *s*.

Fig. 4 is an inside end view of the controller, with all parts removed excepting the lever Z and its contacts. The pegs 32 and 33 engage with the ends of the lever Z, and by the alternate depression of the pegs 32 and 33 the lever Z by means of the metallic strips *a b c* establishes connection between the contacts 3 and 4 when the lever is in one position, or between 5 and 6 and 1 and 2 when the lever is in the other position.

The contact-strips *e* and *f*, which are attached on the under side of the lever Y, (see Fig. 2,) alternately establish connections between the contacts 8 and 11 or 9 and 10, or between 8 and 7 or 9 and 12, depending upon the position of the lever.

Having described the several parts of my controller, I shall now explain its action. When not in use, the pedal J is left in the position at the extreme right of the base. The operator wishing to start his motor moves the pedal-lever J toward the left. The first action may be described as follows: The operator's foot bearing on the pedal-lever will keep the spring T depressed and bearing against the contact 19, and then by depressing the peg 33 the lever Z will be placed in position to establish connection between contacts 5 and 6 and 1 and 2. The following results: As the pedal-lever J is moved toward the left and as soon as the tongue or contact-strip B′ crosses the gap *v* in the strip B electrical connections are established between the terminals P and Q through the armature and field of the motor as follows: The armature-current path is terminal Q, strip D, tongue D′, tongue B′, strip B, strip K, tongue K′, contact 19, spring T, peg or pivot R, contact 2, strip *b*, contact 1, contact 12, strip *f*, contact 9, terminal O, armature of the motor, terminal N, contact 8, strip *e*, contact 7, terminal P. The field-current path is through the terminal Q, strip D, tongue D′, tongue B′, strip B, terminal M, field-coil, terminal L, peg *q*, resistance, and terminal P, or from the terminal L to the strip C, tongue C′, tongue A′ to some other peg of the row A and through the remaining resistance to the terminal P. By this it will be seen that according to the position of the tongue A′ or pedal J more or less of the resistance is short-circuited, thus changing the armature speed by the alteration of the field strength of the motor. If the operator removes the pressure of his foot from the spring T, allowing the spring to rise and touch the contacts 17 and 18, the motor will stop instantaneously, owing to the armature becoming disconnected and short-circuited at the same time that the field resistance is totally short-circuited, thus creating a field of maximum strength. The path of the field-circuit will be in this case as follows: through the terminal Q, strip D, tongue D′, tongue B′, strip B, terminal M, field-coil, terminal L, contact 6, strip *a*, contact 5, strip H, tongue H′, contact 17, spring T, contact 18, tongue G, and terminal P. The armature-circuit arriving, as before, at 19 is broken throughout. Starting now at terminal O the armature is short-circuited as follows: terminal O, contact 9, strip *f*, contact 12, contact 1, strip *b*, contact 2, peg or pivot R, spring T, contact 18, tongue G′, strip G, contact 7, strip *e*, contact 8, terminal N, armature of the motor, and terminal O. The lever Y being the pole-changer does not alter the case, as far as this action is concerned, in either of the two positions.

Often it is convenient to have a motor running without being obliged to keep one's foot

on the pedal J. This can be accomplished by depressing the peg 32, which places the lever Z in position to connect the contacts 3 and 4 and at the same time to disconnect the contact 5 from the contact 6 and contact 1 from contact 2. With the lever Z in this position it will be seen that the armature connections are independent of the spring T and that the field resistance can no longer be short-circuited in any position of the pedal J. This is on account of the gap left between the contacts 5 and 6. The armature-circuit is now completed, as follows: through terminal Q, strip D, tongue D′, tongue B′, strip B, contact 4, strip *c*, contact 3, contact 12, strip *f*, contact 9, terminal O, armature of the motor, terminal N, contact 8, strip *e*, contact 7, and terminal P, back to the terminal Q through the battery *y*. When the lever Z is in the position just described, the spring T may be depressed without in any way affecting the connections of the motor, because the spring T is electrically disconnected from the rest of the circuit by the gap between the contacts 1 and 2. Thus it will be seen that while the lever Z is in this position the instantaneous stop before mentioned cannot take place.

Hitherto nothing has been said about the direction of rotation of the armature. By means of the pole-changing lever Y the direction of rotation can be changed, said lever being acted upon by the solenoids S′ and S². The metallic piece *d*, which is acted upon or operated by the arm *h* of the pole-changing lever, is shown making connection between the contacts 15 and 16 as soon as by the rocking motion of one of the wings *m′* the operator causes the strip V to establish connection from contact 21 to contact 22. The circuit of the solenoid S′ will be completed as follows: from terminal Q through strip D, tongue D′, contact 21, strip V, contact 22, tongue E′, strip E, solenoid S′, contact 15, strip *d*, contact 16, then to the terminal P and through battery *y* to the terminal Q. The solenoid S′ being thus energized acts upon the core W, which will move the lever Y into the changed position indicated in Fig. 6. At the same time the arm *h* by striking against the lug *k′* on the plate *d* will move said plate *d* away from the contacts 15 and 16, connecting 13 and 14, thus opening the circuit of the solenoid S′, which has just acted, and making the connections of the solenoid S² such that its circuit will be completed as soon as the piece or plate *v* establishes connections between contacts 20 and 23.

The object of the action of the strip *d* as described is to break the circuit of the energized solenoid as soon as it has acted, preventing thereby the possibility of heating the solenoid-coil or arcing between the strip V and its contacts. It is thus easy to see that by rocking motion of the operator's foot causing the alternate depression of the wings *m′* the strip V will be moved from one side to the other, establishing connection between contacts 21 and 22 or 20 and 23, resulting in the action of one or the other of the solenoids, which, causing the lever Y to change the polarity of the armature-current, makes the armature rotate in one or the other direction, as desired.

The wiring may be described as follows: From one pole of the battery *y* a wire 50 extends through the terminal Q and connects with the strip D. The tongues B′ and D′ are connected by a wire 51, which extends to or has connection with the contact-plates 20 and 21. From one end of the strip B a wire 52 extends to a connection with the strip K and also to a connection with the plate 4. From the other end of the strip B a wire 53 extends through the terminal M to the field of the motor 44, and from this field a wire 54 extends through the terminal L to a wire 55, which connects the pin *q* of the resistance-coil with the strip C. The tongues A′ and C′ are connected by a wire 56. The tongue H′ has a wire connection 57 with the contact 17, and the contact 18 has a wire connection 58 with the tongue G′. The tongue K′ has a wire connection 59 with the contact 19. The spring T has a wire connection 60 with the pivot or pin R, and from this pivot or pin R a wire 61 extends to a connection with the contact-plate 2. The contact-plates 1 and 3 are connected by a wire 62, and from this wire 62 a wire 63 extends to a connection with a wire 64, which connects the contact-plates 11 and 12. The terminal P of the battery has a wire connection 65 with the strip G and the contacts 16, 10, 7, and 13. The tongue E′ has a wire connection with the plate 22, and the tongue F′ has similar connection with the plate 23. The strip E has a connection 27 with one end of the solenoid S′, the other end of said solenoid being connected at 26 with the contact 15. The strip F has a wire connection 24 with one end of the solenoid S², the other end of the solenoid being connected at 25 to the plate 14. One of the brushes of the motor-armature is connected by a wire 66, through the terminal N, with the plate 8, and the other brush of the armature is connected by a wire 67, through the terminal O, with the plate 9.

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

1. A controlling device for an electric motor, comprising in connection with an electric circuit, a series of contact-strips, a pedal movable over the same and carrying contacts, a resistance-coil, a contact-point carried by the pedal for engaging with the resistance-coil, and a pole-changer electrically operated, substantially as specified.

2. A controller for an electric motor, comprising a base, a pedal mounted to swing on said base, a series of contact-plates on said base, contacts carried by the pedal for engaging with the plates, a resistance-coil secured to the base, a contact carried by the pedal for engaging with said resistance-coil,

a spring carried by the pedal and in the electrical circuit, and contact-plates normally in engagement with said spring, substantially as specified.

3. In a controller for an electric motor, the combination with a base and contact devices thereon, of a pedal mounted to swing on the base and carrying contacts, a circuit-closer mounted on the pedal, and hinged wings carried by the pedal for shifting said circuit-closer, substantially as specified.

4. In a controller for an electric motor, the combination with an electric circuit and a resistance, of a controlling-pedal having a circuit-closer on its under side, and having its ends extended beyond the edges of the pedal, and wings hinged to the pedal and adapted to be operated to shift the circuit-closer, substantially as specified.

5. A controller for an electric current, comprising a base, a resistance on the under side thereof, a pedal mounted to swing on the base, a contact on said pedal for engaging with the resistance, pole-changing solenoids, and a pole-changing lever having connection with the core of the solenoids, substantially as specified.

6. A controller for an electric circuit, comprising in combination with a circuit, a base, a pedal mounted to swing on said base, a series of contact-plates on the base concentric with the pivotal point of the pedal, a resistance on said base, a lever mounted to swing relatively to the base, and push-pins extended through the base engaging with said lever at its opposite ends, and an electrically-operated pole-changer, substantially as specified.

7. A circuit-controller, comprising a base, a pedal mounted to swing thereon, a series of contact-strips on the base and concentric with the pivotal point of the pedal, contacts carried by the pedal for engaging with said contact-strips, a resistance-coil mounted on said base, a contact carried by the pedal for engaging with said resistance-coil, two solenoids in the circuit of the resistance-coil, a pole-changing lever, an arm extended from said pole-changing lever to a connection with the core of the solenoids, and a circuit-closer operated by said arm, substantially as specified.

8. A controller for an electric motor, comprising a base, a series of concentric contact-strips on said base, a pedal mounted to swing on the base, contacts carried by said pedal and engaging with the strips, a resistance on the base, means for connecting the resistance and pedal, a spring yielding contact-plate secured to the pedal and having engagement with the pivot of the pedal, said pivot being in the electrical circuit, and a rib on said spring-plate passing upward through an opening in the pedal, substantially as specified.

9. A controller for an electric motor, comprising a base, a pedal mounted to swing on said base, a series of concentric contact-strips on the base, contact-points carried by the pedal and engaging the said strips, a resistance having connection with a contact on the pedal, a spring yielding contact carried by the pedal and having connection with the pivot of the pedal, said pivot being in the electrical circuit, a pole-changing lever, solenoids for and operating said pole-changing lever, a circuit-closer operated by the movements of the pole-changing lever, and another circuit-closing lever having pins extended upward through the base, substantially as specified.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 15th day of March, 1897.

JAMES JOSEPH COACHMAN.

Witnesses:

F. B. GORDON,

CHARLES KEYES.