

No. 844,651.

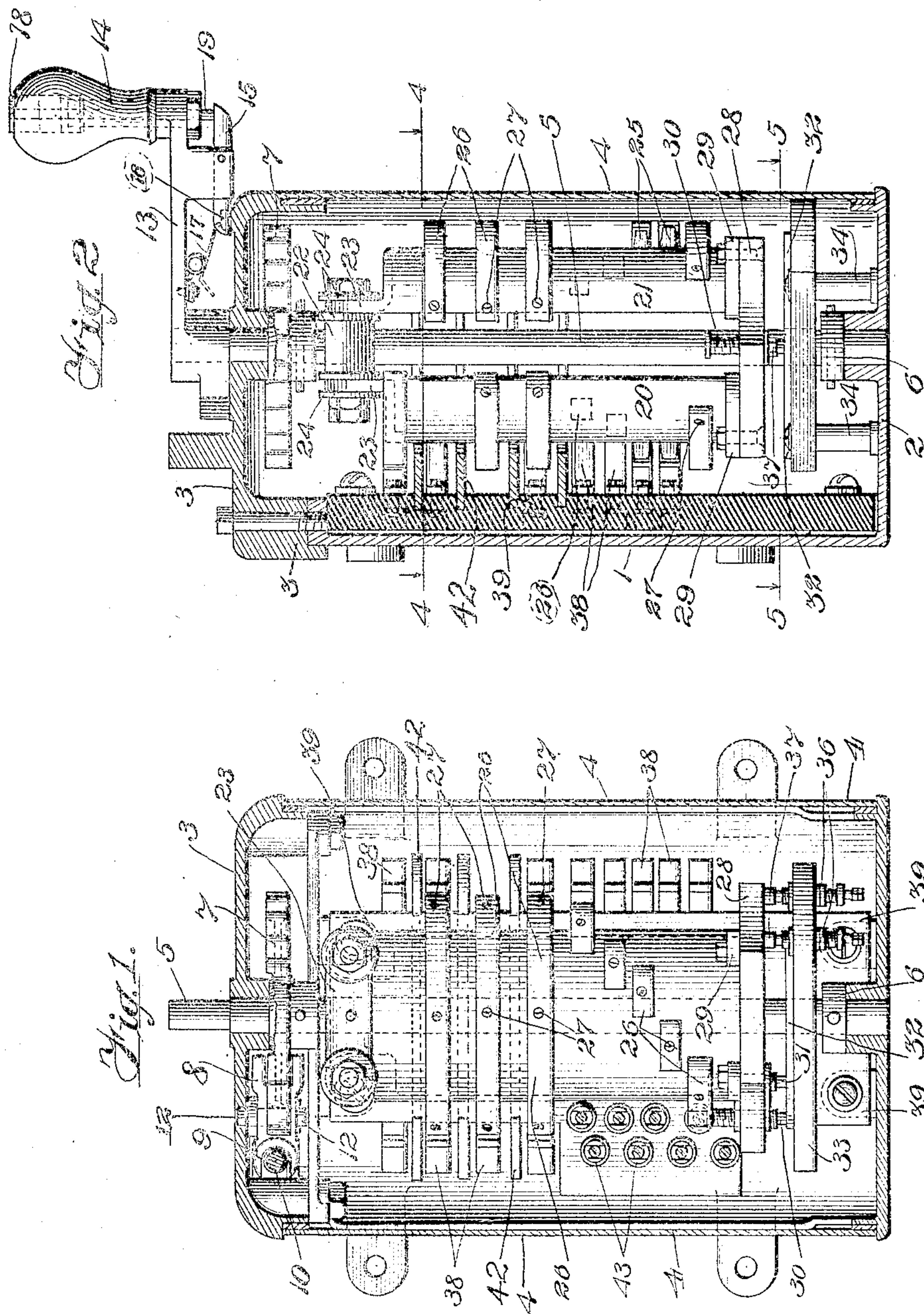
PATENTED FEB. 19, 1907.

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DRUM CONTROLLER FOR ELECTRIC MOTORS.

APPLICATION FILED NOV. 9, 1903.

3 SHEETS—SHEET 1.



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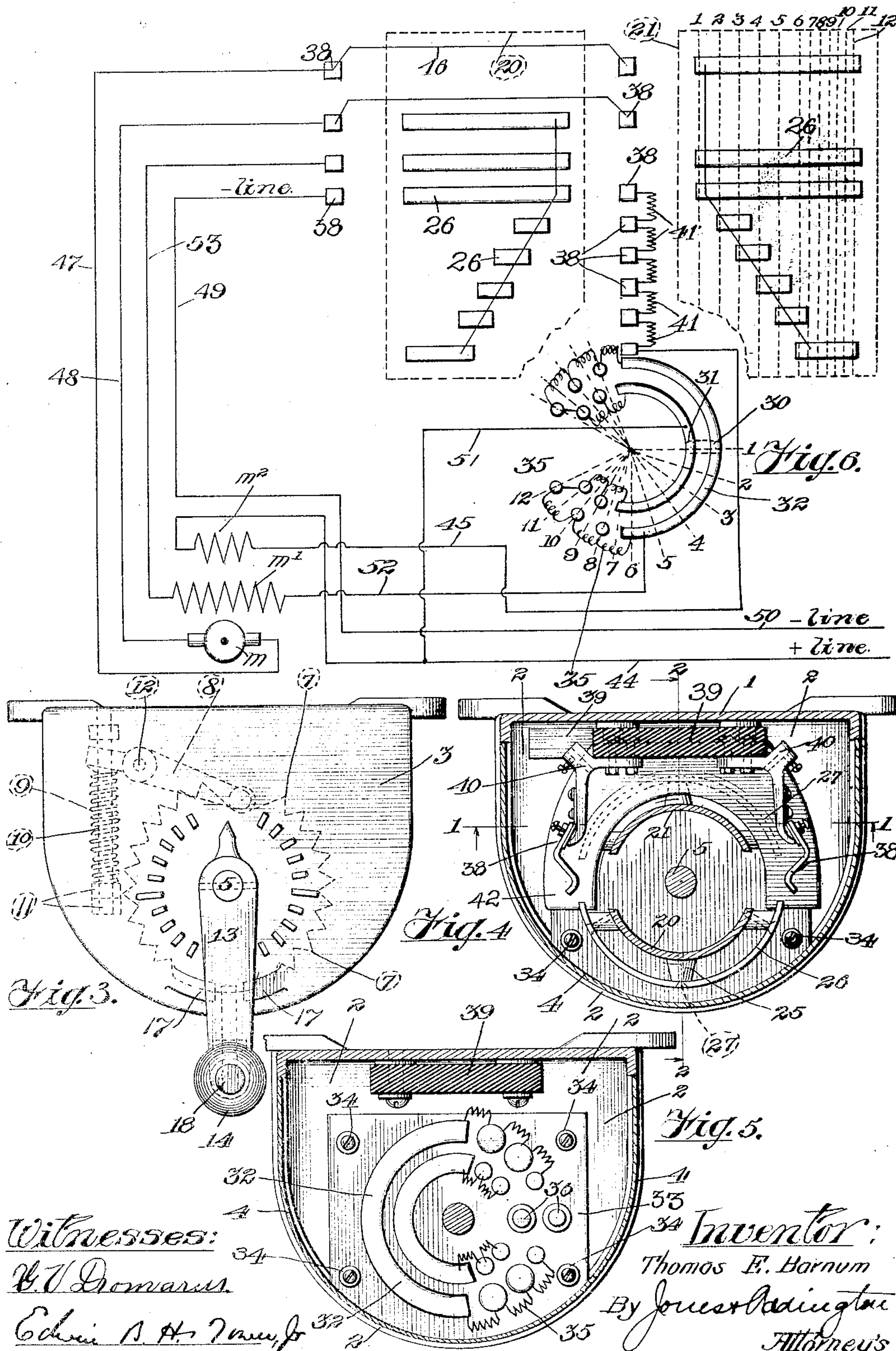
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3 SHEETS—SHEET 2.



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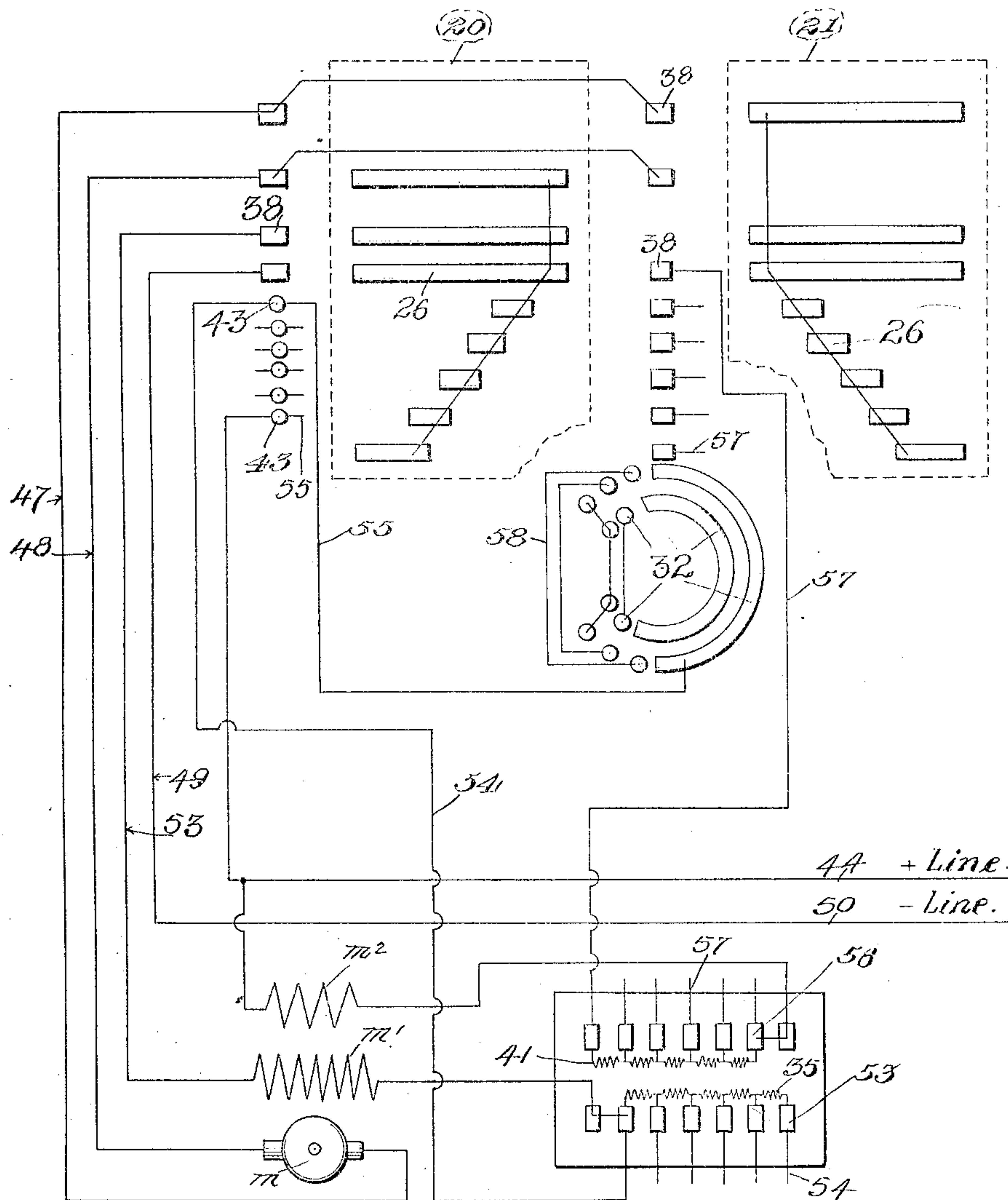
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3 SHEETS-SHEET 3.

Fig. 7.



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UNITED STATES PATENT OFFICE.

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DRUM-CONTROLLER FOR ELECTRIC MOTORS.

No. 844,651.

Specification of Letters Patent.

Patented Feb. 19, 1907.

Application filed November 9, 1903. Serial No. 180,469.

To all whom it may concern:

Be it known that I, THOMAS E. BARNUM, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Drum-Controllers for Electric Motors, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electric-motor controllers.

There have been some devices of this character designed in which contacts for controlling both an armature resistance and a field resistance are arranged upon the cylindrical surface of a drum, so that while a single device the motor may be started and its speed regulated. In such a device the drum must necessarily be made very long in order to accommodate all the contacts, and therefore the parts of the controller cannot be compactly assembled.

The present invention has for one of its objects to reduce the size of the controller. In the accomplishment of this end in the preferred embodiment of my invention one set of contacts is arranged upon the cylindrical surface of the drum, while another set of contacts is arranged in a plane perpendicular to the axis of said drum.

Besides producing a controller in which parts are compactly assembled, it is a further object of this invention to construct a device which will be simple in construction, easy to manipulate, efficient and durable in use, and cheap to manufacture.

In the accompanying drawings, which illustrate the preferred embodiment of my invention, the several views are as follows:

Figure 1 is a front view of the controller with the casing shown in section on the line 1 1 of Fig. 4. Fig. 2 is a side view thereof with parts shown in section on the line 2 2 of Fig. 4. Fig. 3 is a plan view. Figs. 4 and 5 are cross-sectional views on the lines 4 4 and 5 5, respectively, of Fig. 2. Fig. 6 is a simplified diagram of the circuit arrangements employed with this controller, and Fig. 7 is a development of the various contacts and binding-posts of the controller and a diagram of the circuit arrangements.

The casing for the controller has a back 1, a bottom 2, and a top 3. The back and bottom are preferably formed in one piece, while the top is secured to the back by bolts. Suitably fastened to the back, top, and bottom is a shell 4, which constitutes the front and sides of the casing.

The controller-shaft 5 is journaled at its ends in the top and bottom of the casing and provided with a collar 6, which bears upon the bottom. The movement of this shaft is controlled by a notched wheel 7, fixed thereon near the upper end and a lever 8, pressed into engagement with said wheel by a spring 9. For convenience in assembling the parts of the controller the spring and lever are preferably supported from the top of the casing, the spring being carried by a rod 10, provided with nuts 11 for adjusting the tension of the spring, and the lever being pivoted upon a stud 12.

The operating arm or lever 13 for manipulating the controller is fastened to the upper end of the shaft outside of the casing and is provided with a handle 14. In its initial position said arm is normally held against being moved by a latch 15, which is pivoted to said arm and retained between lugs 16 on the top of the casing by a spring 17. This latch may be actuated by a button 18, having a stem 19 extending through the handle and engaging the latch.

The cylindrical member or drum of the controller is preferably composed of two shells or sections 20 and 21, which are supported from a bracket 22, pinned upon the shaft. These shells preferably have lugs 23 formed thereon, which are bolted to said bracket and insulated therefrom by suitable blocks 24 of insulating material. Upon the cylindrical surface of said shells are lugs 25, upon which are carried contact-segments 26, which are preferably detachably secured in position by screws 27 or other means, so that when the same become unfit for service new contact-segments may be readily placed in position.

The lower ends of the shells of the drum are preferably held in their respective positions by a block 28, of fiber or other insulating material, which is bolted to lugs 29, formed upon said shells. This block preferably carries brushes 30 and 31, which are electrically connected to one another and ar-

ranged to sweep over contacts or resistance-
 terminals 32, mounted upon a suitable base
 or plate 33, which is arranged perpendicular
 to the axis of the controller-drum and sup-
 5 ported by posts 34 from the bottom of the
 casing. Between these contacts are con-
 nected the subdivisions of a resistance 35,
 preferably designed to regulate the field of a
 motor. For convenience this resistance is
 10 illustrated in Figs. 5 and 6 as connected di-
 rectly to the contacts; but in practice said re-
 sistance would preferably be connected to
 said contacts in the manner to be hereinaf-
 ter explained. Where in practice the con-
 15 troller is used in connection with a solenoid-
 switch, (not shown herein,) the brushes 36
 are provided to engage electrically-connected
 buttons 37 when the drum is in its initial po-
 sition, and thereby short-circuit a resistance
 20 arranged in series with the solenoid of said
 switch.

The contact-fingers or resistance-terminals
 38 for engaging the contact-segments upon
 the drum are preferably all mounted upon
 25 a board or block 39, of insulating material,
 fastened to the back of the controller-casing.
 These fingers each have a binding-post 40 for
 connecting the circuit-wires and an arma-
 ture resistance 41 thereto in the manner to
 30 be hereinafter set forth. Between said fin-
 gers are arranged insulating-partitions 42,
 which are fastened upon the block 39 and
 have their outer ends embracing the control-
 ler-drum. Also mounted upon said block 39
 35 are binding-posts 43 for connecting the field
 resistance 35 to the contacts 32. By arrang-
 ing the binding-posts and contact-fingers
 upon a single block the same are compactly
 assembled and can readily be placed in posi-
 40 tion and have the circuit-wires and resistance
 connected thereto. Of course it will be un-
 derstood that the field resistances might be
 connected between the contact-fingers 38
 and the armature resistance connected be-
 45 tween the contacts 32.

In Fig. 6 I have illustrated in a simplified
 manner the circuit arrangements for the con-
 troller herein described in connection with a
 motor. For convenience in tracing the cir-
 50 cuits the binding-posts for the armature and
 field resistance have been omitted and said re-
 sistances shown connected directly between
 the fingers and contacts. In dotted lines are
 indicated the shells 20 and 21 of the drum,
 55 upon which are mounted the contact-seg-
 ments 26. Adjacent to said shells are illus-
 trated the contact-fingers 38, and the differ-
 ent positions of said fingers with respect to
 the segments are indicated by the dotted
 60 lines 1 to 12, inclusive, running across said
 segments. A part of said fingers are ar-
 ranged to engage the contacts of the shell 20
 and the rest to engage the contacts of the
 shell 21. Below the shells are illustrated the
 65 contacts 32 for the field resistance, and the

radial dotted lines 1 to 12, inclusive, run-
 ning across said contacts represent the dif-
 ferent positions of the brushes 30 and 31
 upon said contacts as the drum is moved
 from one position to another.

The motor to be controlled by the con-
 70 troller is here represented as having the ar-
 mature m , the shunt-field m' , and the series
 field m^2 . The direction in which the motor
 will operate depends upon the direction in
 75 which the controller-drum is moved. Sup-
 pose the drum to have been turned until the
 contact-fingers 38 arranged between the
 shells rest in the first position upon the con-
 tacts 26 of shell 21. The circuit to the mo-
 80 tor will now be closed and current will pass
 from the positive line 44 through the series
 field m^2 and thence by conductor 45 to the
 contact-fingers 38. Here it will pass through
 all the resistance 41 and then flow from the
 85 shell 21 by conductors 46 and 47 to the motor-
 armature m . After traversing said armature
 the current will flow by conductor 48 to the
 shell 20, from whence it will pass by conductor
 49 to the negative line 50. The shunt-field
 90 m' will be energized by current flowing from
 the positive line 44, through conductor 51,
 across the brushes 31 and 30 and thence
 through conductor 52, shunt-field m' , con-
 ductor 53, shell 20, and conductor 49 to the
 95 negative line 50. As the drum is turned
 from one position to another the contact-
 fingers 38, having the resistance connected
 between the same, are successively engaged
 by the short contacts 26 upon the shell 21
 100 and the subdivision of the resistance 41 thus
 removed one by one from the armature-cir-
 cuit until the drum reaches the sixth posi-
 tion, when all the resistance will be removed
 from the armature-circuit. During all of
 105 this movement of the drum the brushes 30
 and 31 will have ridden upon the long con-
 tacts 32; but now as the drum is turned to
 the seventh, eighth, ninth, tenth, eleventh,
 and twelfth positions the short contacts 32
 110 will be engaged by said brushes, and thus the
 sections of the field resistance 35, connected
 between the contacts 32, will be inserted in
 the circuit of the shunt field to increase the
 speed of the motor. If the drum be moved
 115 in the opposite direction, so that the contact-
 fingers 38 between the shell will engage the
 segments upon the shell 20, and the other fin-
 ger will engage the fingers upon the shell 21,
 the direction of the flow of the current in the
 120 motor-armature will be reversed, the current
 from the positive side of the circuit flowing
 from shell 20 by conductor 48 to the arma-
 ture and thence by conductor 47 to shell 21.
 In other parts of the circuit the current will
 125 flow in the same direction as before.

The diagram shown in Fig. 7 illustrates the
 manner of connecting the resistances to the
 fingers 38 and contacts 32 in practice. The
 sections of the field resistance 35 are each
 130

provided with a binding-post 53, and said binding-posts are connected by conductors 54 to the binding-posts 43, mounted upon the board 39 which correspond thereto. The binding-posts 43 are connected by conductors 55 to the contacts 32. The sections of the armature resistance 41 are also each provided with a binding-post 56, and these binding-posts are connected by conductors 57 to the contact-fingers 38. All of the conductors 54, 55, and 57, save one in each set, are broken away in the drawings. It will be noted that in Fig. 7 the contacts 32 are cross-connected by conductors 58, so that a single resistance will suffice to regulate the field regardless of the direction in which the drum is rotated.

While I have herein described a form of my invention which I have worked out for practical purposes, it will be understood that I am aware that many changes may be made in the details of construction, arrangement, and combination of parts herein set forth which are intended to fall within the purview of the claims appended hereto.

The term "drum" used in the claims to designate the cylindrical member carrying the segmental contacts, it will be understood, contemplates any structure in which a set of contacts is arranged in a cylindrical manner. Furthermore, it will be understood that there will be no departure from the invention which it is intended to cover by the claims to mount the brushes 30 and 31 to remain stationary and arrange the contacts 32 to move with the drum.

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

1. In an electric-motor controller, in combination, a rotatable member having contacts arranged cylindrically thereon, resistance-terminals adapted to be engaged by said contacts, other resistance-terminals arranged in a plane substantially perpendicular to the axis of said member, one set of said terminals being connected to an armature resistance and the other set of said terminals, being connected to a field resistance and contacts adapted to engage the latter terminals.

2. In an electric-motor controller, in combination, a rotatable member having contacts arranged cylindrically thereon, resistance-terminals adapted to be engaged by said contacts, other resistance-terminals arranged in fixed positions upon a suitable base in a plane substantially perpendicular to the axis of said member, one set of said terminals being connected to an armature resistance and the other set of said terminals being connected to a field resistance and brushes or contacts carried by said member and adapted to engage the latter contacts.

3. In an electric-motor controller, in combination, a rotatable member, having con-

tacts arranged cylindrically thereon, terminals adapted to be engaged by said contacts and having an armature resistance connected thereto, a stationary plate or base, other terminals mounted on said base in a plane substantially perpendicular to the axis of said member and having a field resistance connected thereto, and brushes or contacts carried by said member and adapted to engage the latter terminals.

4. In an electric-motor controller, in combination, a drum having contacts arranged upon the cylindrical surfaces thereof, resistance-terminals adapted to be engaged by said contacts, a stationary block or base, having other resistance-terminals mounted thereon in a plane substantially perpendicular to the axis of said drum and arranged below said drum, one set of said terminals being connected to an armature resistance and the other set of said contacts being connected to a field resistance, and brushes or contacts carried upon the lower end of said drum and adapted to engage the latter resistance-terminals.

5. In an electric-motor controller, in combination, a shaft, shells mounted upon said shaft and insulated from each other, contacts carried by said shells, terminals adapted to engage said contacts, other terminals arranged in a plane substantially perpendicular to the axis of said shaft, and brushes or contacts carried by said drum and adapted to engage the latter terminals.

6. In an electric-motor controller, in combination, a shaft, shells mounted upon said shaft and insulated from each other, contacts carried by said shells, terminals adapted to engage said contacts, a stationary base or block having contacts arranged thereon in a plane substantially perpendicular to the axis of said shaft, an insulating-plate supported by the lower end of said drum, and brushes or contacts carried by said plate and adapted to engage the latter terminals.

7. In a motor-controller, the combination with a suitable shaft, of a drum composed of sections or shells suitably supported at their upper ends from said shaft and insulated from one another, a block of insulating material fastened to said shells at their lower ends to hold the lower ends of said shells in their respective positions, contact-fingers adapted to engage the contact-segments carried by said shells, a suitable base mounted in a plane perpendicular to the axis of said drum and having a set of fixed contacts mounted thereon, and brushes carried by said block and adapted to engage said fixed contacts.

8. In a motor-controller, the combination with a suitable frame, of a shaft journaled therein and having a suitable bracket carried thereby, of a drum composed of shells or sections having lugs at their upper ends secured

to said bracket and insulated therefrom, contact-fingers adapted to engage the contact-segments carried by said shells, a block of insulating material fastened to lugs upon the lower ends of said shells to retain said shells in their respective positions at the lower ends thereof, a base or disk of insulating material mounted upon said frame and arranged in a plane perpendicular to the axis of said drum, a set of contacts mounted in a fixed position upon said base, and brushes carried by said block adapted to engage said fixed contacts.

9. In a motor-controller, the combination with a suitable frame having a plate mounted upon the top thereof and forming therewith a casing, of a drum having contact-segments, contact-fingers adapted to engage said contact-segments, a notched wheel invariable with said drum, a lever pivoted to said top plate and arranged to engage said notched wheel, and a spring carried by said top plate and normally pressing said lever into engagement with said notched wheel.

10. In an electric-motor controller, the combination with an inclosing casing having an integral back and bottom, a top fastened

to said back and a shell forming the sides and front of said casing and joined to the back, bottom and top thereof, of a shaft journaled at its ends to said top and bottom, and carrying contact-carrying parts, a notched wheel carried by said shaft, a lever pivoted to said top plate and arranged to engage said wheel, and a spring carried by said top plate and normally pressing said lever into engagement with said notched wheel.

11. In a motor-controller, the combination with a drum carrying contact-segments for controlling one resistance, of a set of contacts for controlling a second resistance, a base or board carrying contact-fingers adapted to engage with said contact-segments, and binding-posts also carried by said board for connecting said second resistance to the last-mentioned contacts.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

THOMAS E. BARNUM.

Witnesses:

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N. L. HOPKINS.