

No. 699,506.

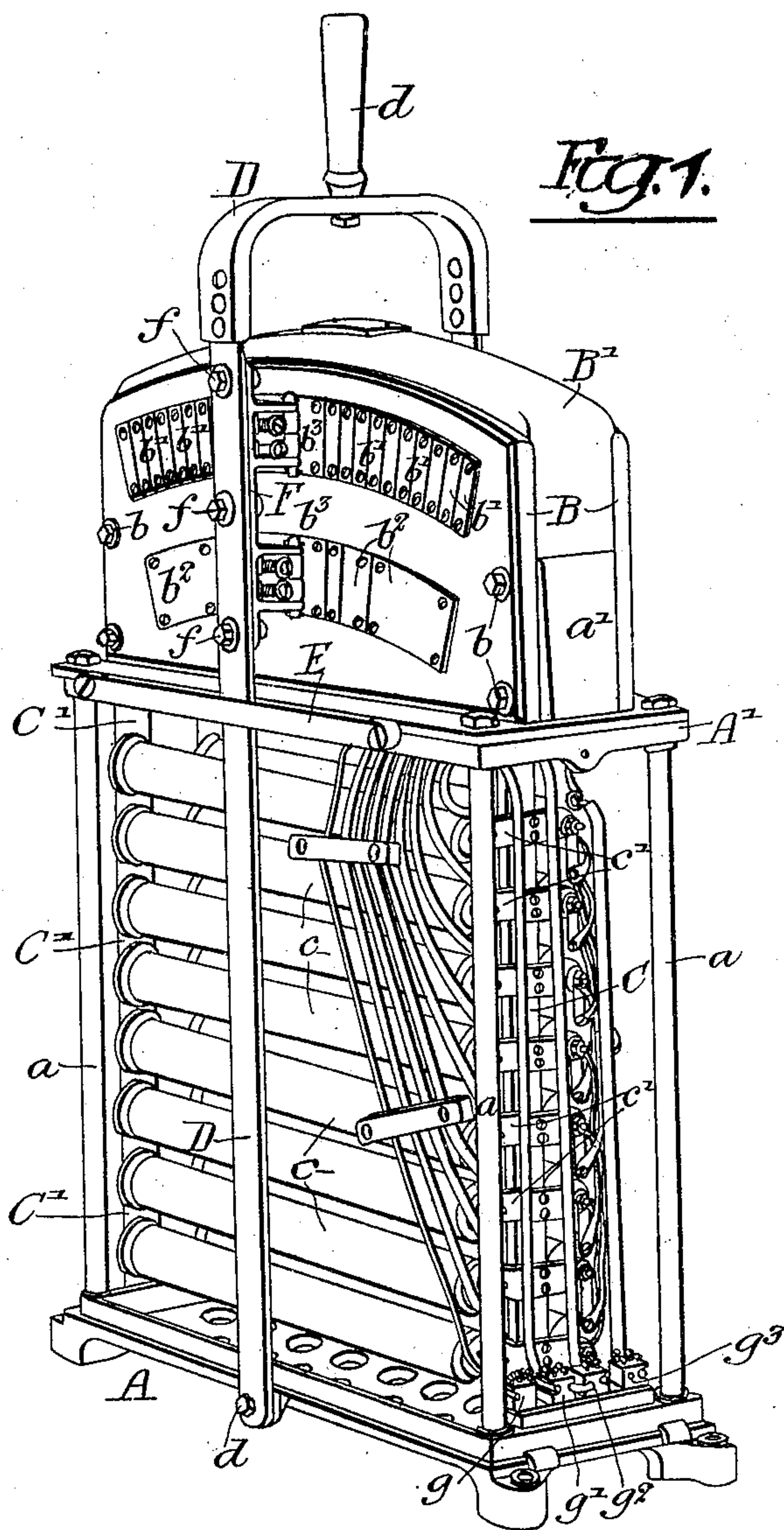
Patented May 6, 1902.

A. C. EASTWOOD.  
ELECTRIC CONTROLLER.

(Application filed Dec. 28, 1901.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:-

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*Chas. W. Elroy*

Inventor:-

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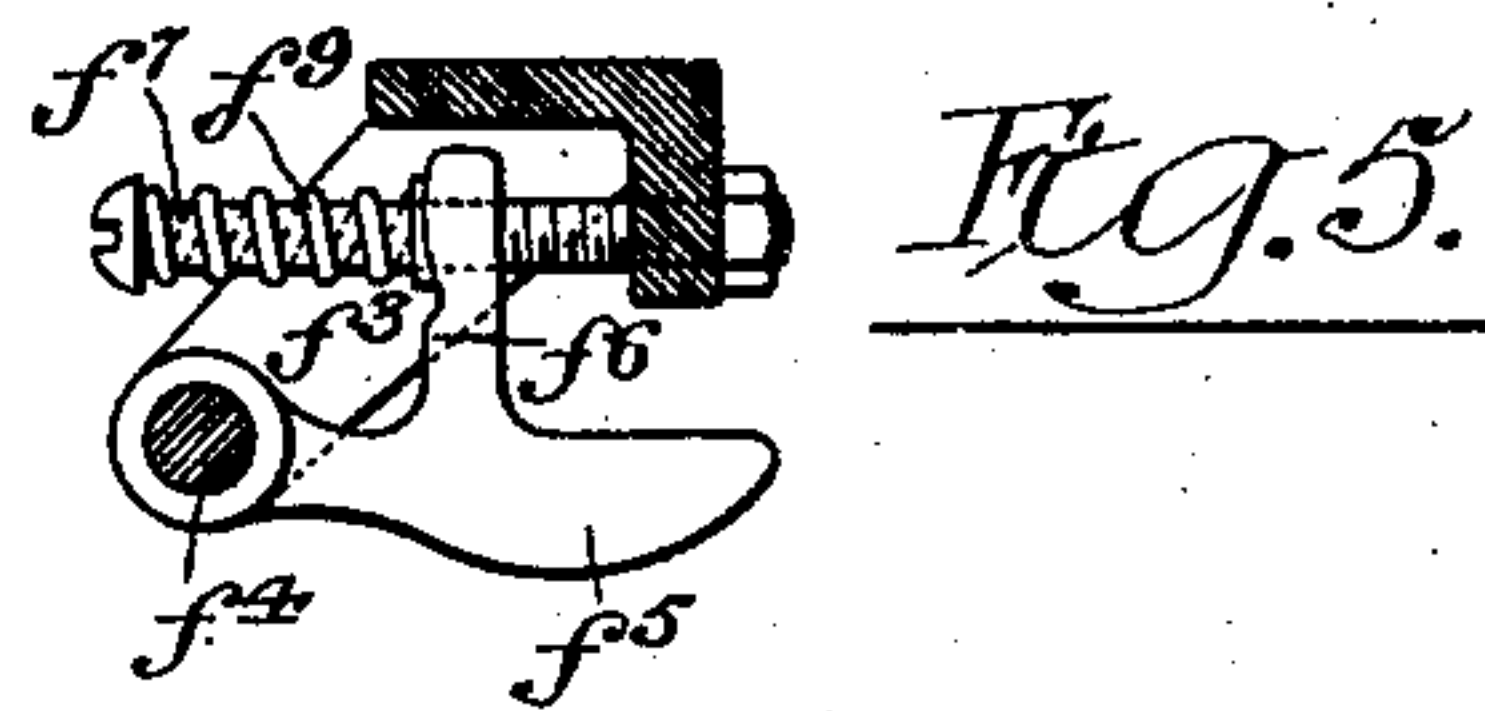
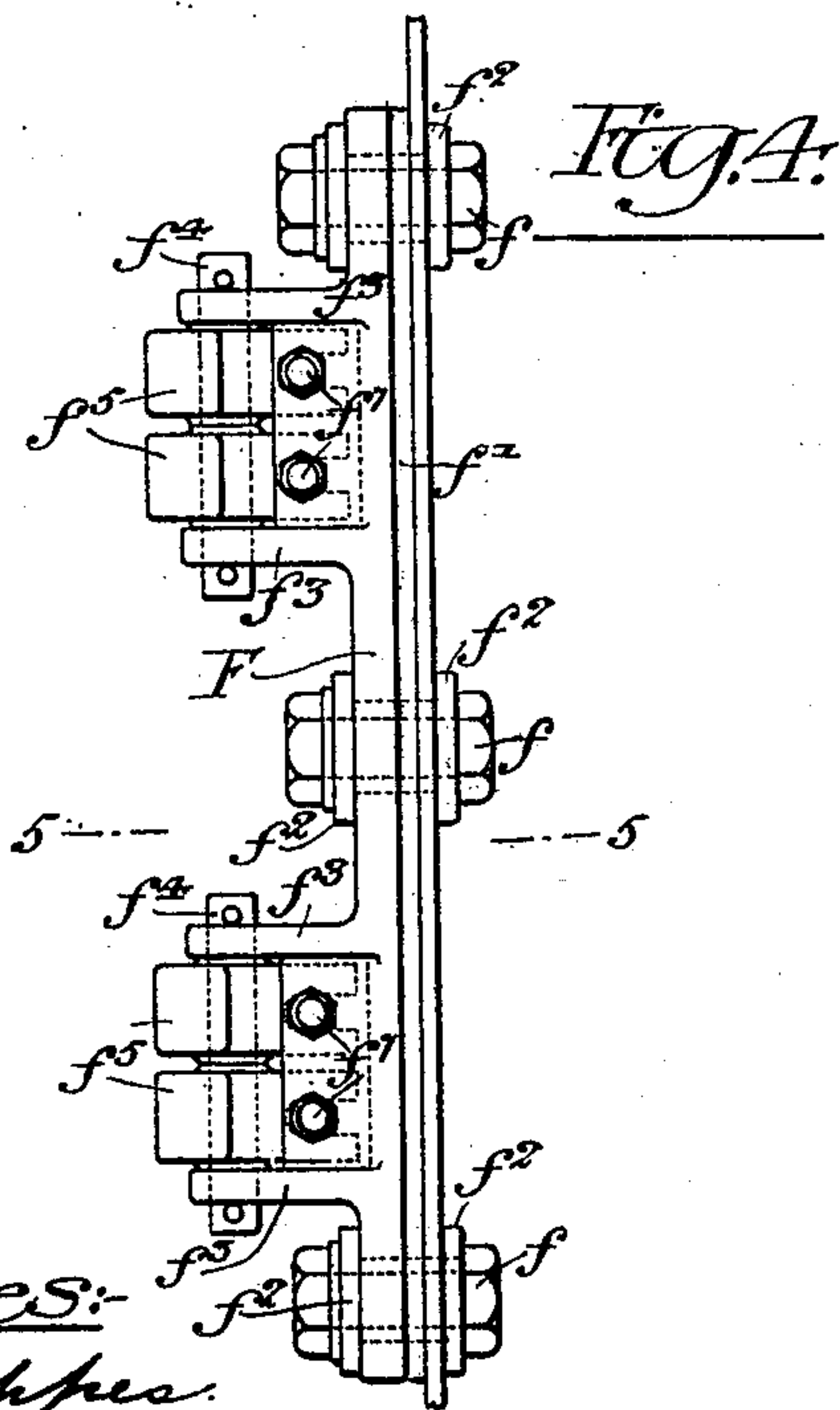
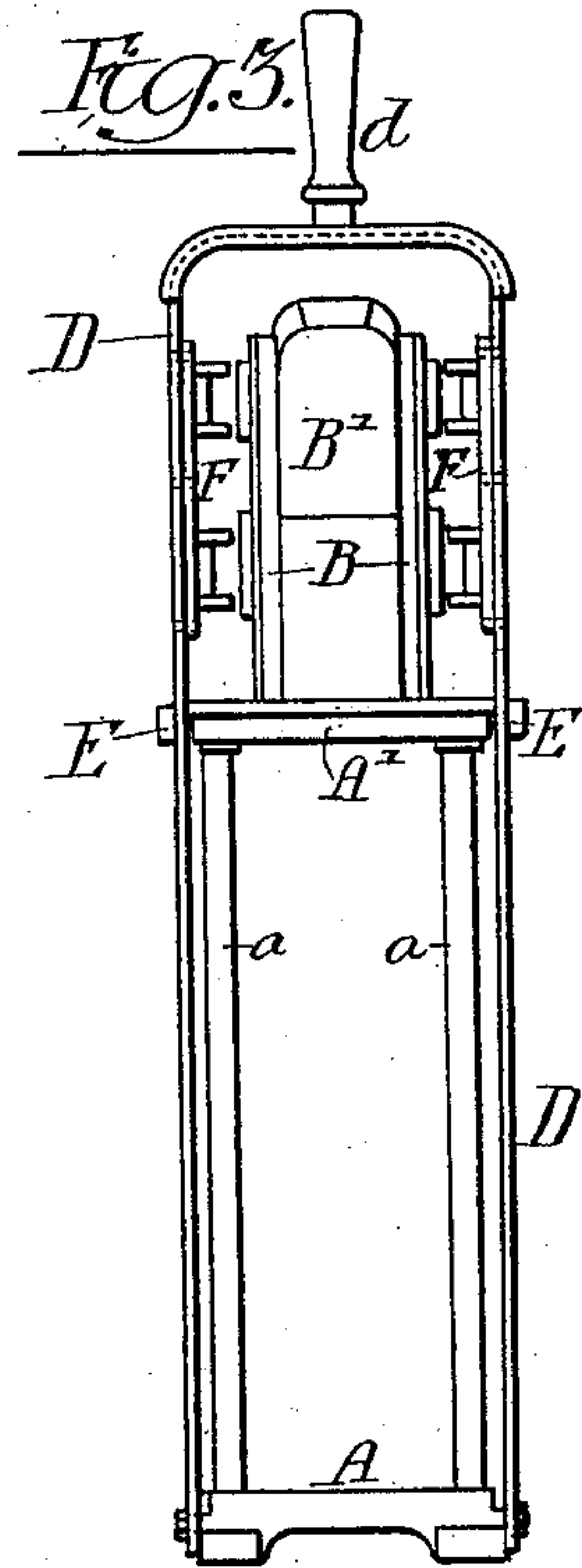
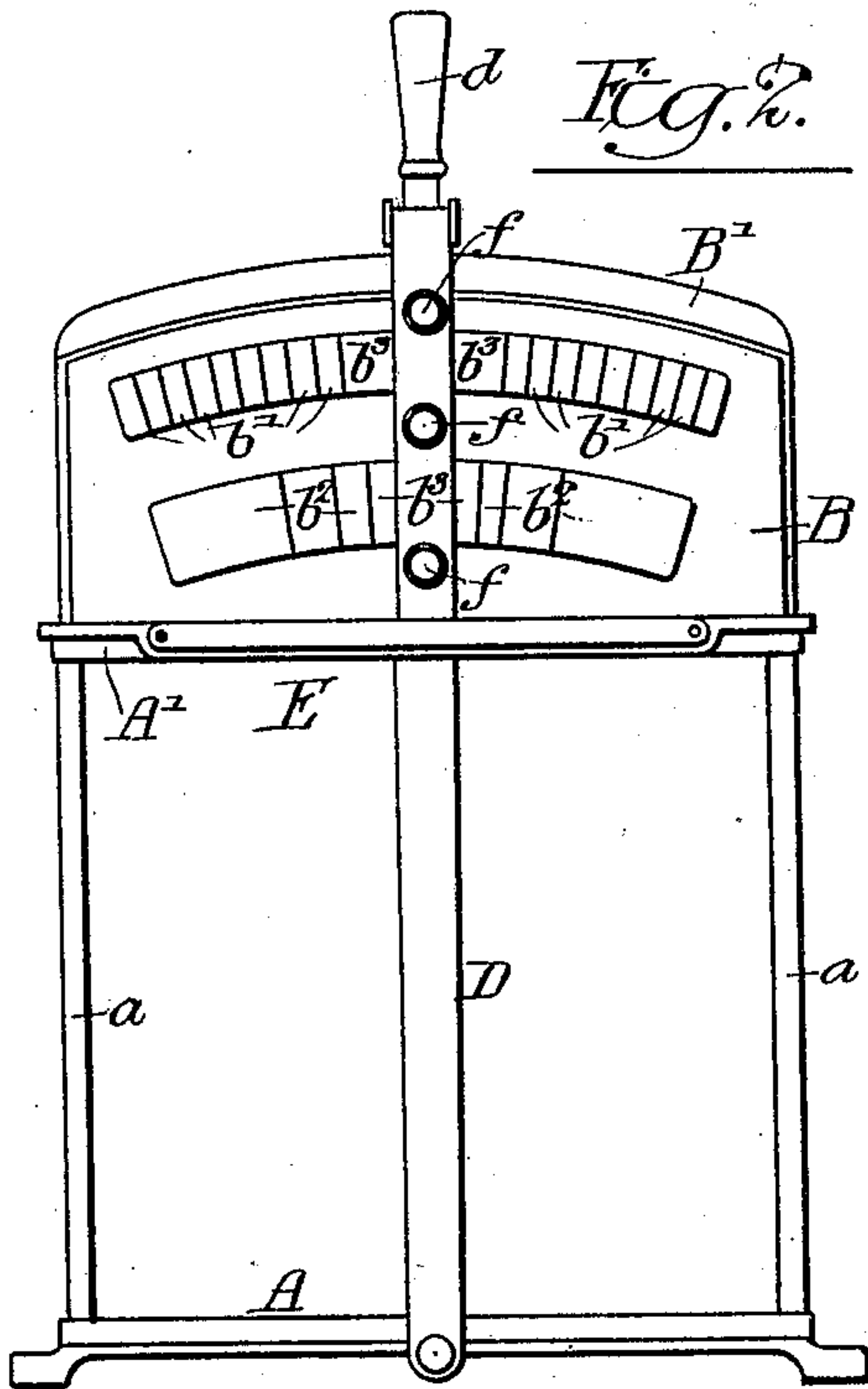
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3 Sheets—Sheet 2.



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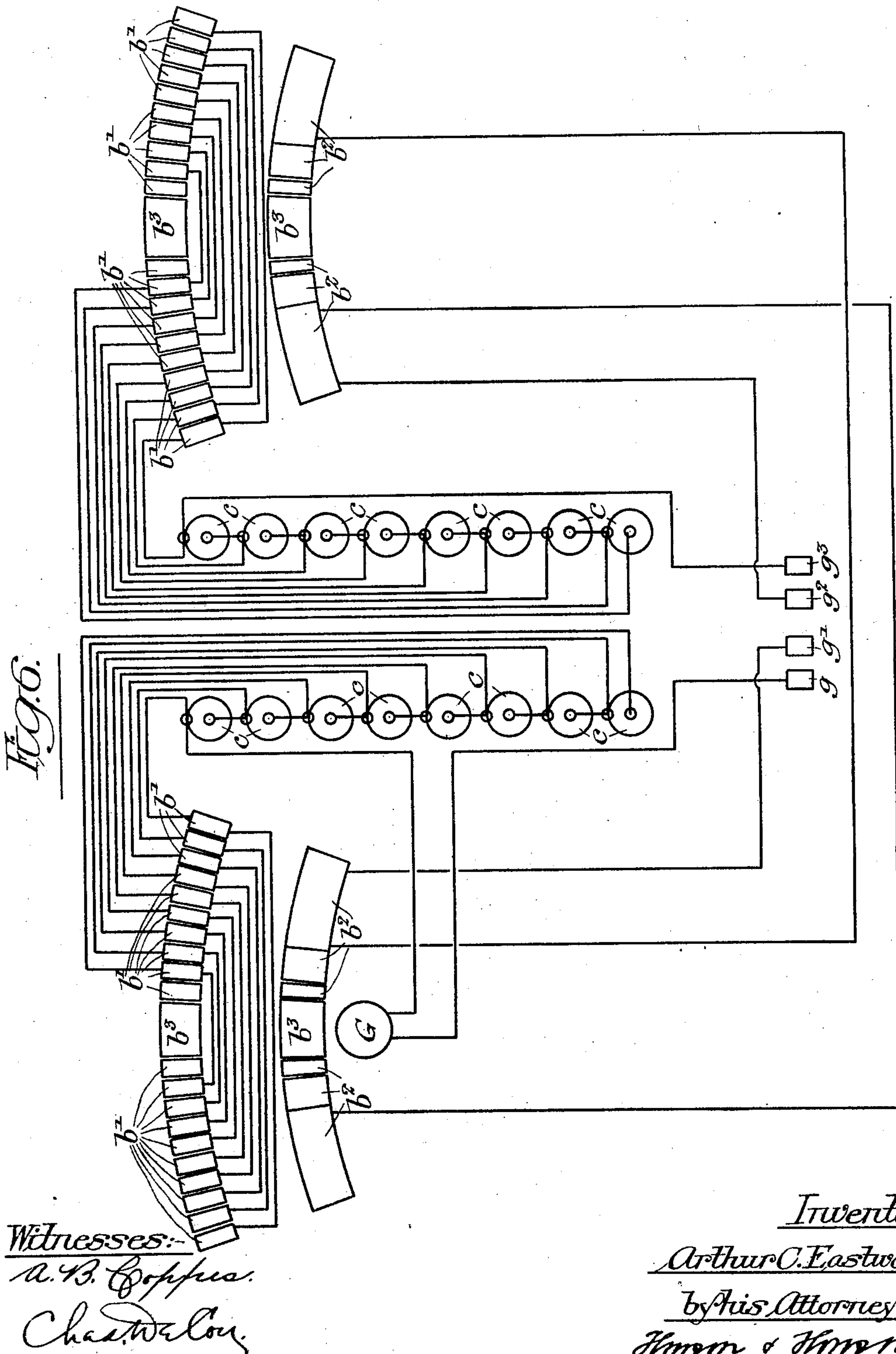
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(Application filed Dec. 28, 1901.)

(No Model.)

3 Sheets—Sheet 3.





# UNITED STATES PATENT OFFICE.

ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO, ASSIGNOR TO THE ELECTRIC CONTROLLER AND SUPPLY COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

## ELECTRIC CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 699,506, dated May 6, 1902.

Application filed December 28, 1901. Serial No. 87,563. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, and a resident of Cleveland, Ohio, have invented certain Improvements in Electric Controllers, of which the following is a specification.

My invention relates to certain improvements in controlling devices for electric motors, and more particularly to a controller for use in connection with reversing series motors.

The object of my invention is to provide a controller whose parts shall be readily accessible for inspection and repair and whose operating shall be simple in the extreme while entailing a minimum of physical effort on the part of the operator.

A further object of the invention is to reduce the number of moving parts to the greatest possible extent, there being no gearing or expensive parts used in the construction of the controller.

An additional object of the invention is to so place the contacts and brushes that it will be impossible for dirt or dust to collect upon the contact-surface thereof.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of my improved controller, showing the cover of the lower portion removed. Fig. 2 is a side view of the same. Fig. 3 is an end view, both this figure and Fig. 2 having the coils in the interior of the controller removed. Fig. 4 is a side view of a portion of one leg of the operating-lever, showing the method of attaching the brush-holders thereto. Fig. 5 is a sectional plan view of a part of the operating-lever, taken on the line 5 5, Fig. 4; and Fig. 6 is a diagrammatic view illustrating the electrical connections within the controller.

In the above drawings, A and A' are the base-casting and top casting, respectively, of the controller, and they are rigidly connected by four vertical rods or standards *a*. Upon the top casting A' are mounted plates B, of slate, marble, or other insulating material, these resting upon one edge and being in parallel vertical planes. A cover B' extends be-

tween the plates B, which are held in position by means of bolts *b*, passing into upwardly-projecting portions *a'* of the top casting A'. Upon each of the said insulated plates B are groups of metal contact-plates *b'* and *b''*, arranged on arcs of two concentric circles, and between the two groups of each arc are dead-blocks *b'''*, of insulating material. Bars C and C' are bolted to and extend between the top and the base castings, and upon these are supported resistance-coils *c*, preferably of the form shown and described in a United States Patent granted to me under date of February 19, 1901, No. 668,442. These are constructed so that both terminals of each coil are at one end, and, as described in the above-mentioned patent, the rear ends of the coils rest in holes or openings in the bar C', their front ends being provided with supporting-pieces *c'*, preferably of insulating material, which are screwed or bolted to the bar C, and are thus held rigidly in position.

Pivoted by means of bolts *d* on either side of the base-casting A is an operating-lever D, made, as shown, in the form of an inverted U and provided with an operating-handle *d'* on its top. There are guides E attached to the sides of the upper casting A' for the purpose of preventing lateral play of this lever, and it is to be noted that the circles upon the arcs on which the rows of contact-plates are arranged are struck from the pivots *d* as centers.

As shown in detail in Fig. 4, there is a brush-holder casting F carried upon the inside of each of the vertical legs of the lever, these pieces being held to the lever by bolts *f* and are electrically insulated from the same and from each other by means of plates *f'* and bushings with washers *f''* of insulating material. Projecting horizontally from each of the brush-holder castings F are lugs *f'''*, each pair of these being provided with a pivotal pin *f''''*, upon which brushes or fingers *f'''''* are allowed to swing within certain confined limits.

From Fig. 5 it will be seen that the fingers are preferably of the shape of a T, there being a recess or hole through the stem *f'''''* for the reception of a bolt *f''''''*. This enters a hole



in the web of the brush-holder casting and is provided with a nut  $f^8$  and a spring  $f^9$ , the latter being confined between its head and the stem-section  $f^6$  of the finger or brush.

5 There are preferably a pair of fingers to each line of contacts, arranged as shown in Fig. 4, and it will be seen that the springs  $f^9$  constantly tend to press their respective fingers tightly upon said contacts.

10 When not in use, the operating-lever stands vertical, the contact-fingers resting on the dead-blocks of insulating material  $b^3$ . As will be understood by those skilled in the art and as indicated in Figs. 1 and 6, the four  
15 sets of contacts are connected to each other and to the resistance-coils, so that as the lever is moved in one direction from its mid-position and the fingers made to contact with the various segments the resistance, at first  
20 all in circuit, is gradually cut out and the motor speeded up as the handle is moved farther from the vertical position.

As may be seen from the diagram illustrated in Fig. 6, the connections between the con-  
25 tact-plates are so made that by moving the operating-lever in the direction opposite from that indicated above and on the other side of its vertical position the direction of rotation of the motor will be reversed in the well-known  
30 way. In the said figure,  $g$ ,  $g'$ ,  $g^2$ , and  $g^3$  are the terminals of the controller, to which are attached the leads from the motor and from the current-supply mains. In this style of  
35 apparatus I also preferably employ a blow-magnet  $G$  to minimize the arcing between the brushes and contact-plates, which usually takes place when the current is broken.

It is to be noted that by this particular arrangement of contact-plates in vertical planes,  
40 dust and particles of dirt cannot possibly remain upon the contact-plates and fingers, so as to interfere with their best operation. Further, the brush-holders are connected directly to the operating-lever without interpo-  
45 sition of gearing or other relatively complicated mechanism, and it will be seen that the parts required are few in number and of simple construction.

I claim as my invention—

50 1. In an electric controller, the combination of substantially parallel plates of insulating material, series of contact-pieces supported thereon, a lever having a member or  
55 members extending adjacent to said plates and contact-brushes carried by said members, said brushes being placed and connected so that they form electrical connection between certain of the contact-pieces when the lever is operated, substantially as described.

60 2. In an electric controller, the combination of resistance, vertical and parallel plates of insulating material, a series of contact-pieces mounted on each of said plates, a lever having  
65 two side members each adjacent to one of said plates, and carrying brushes, said brushes being placed to electrically connect certain of the contact-pieces on the insulating-plate to

which it is adjacent, substantially as described.

3. In an electric controller, the combination 70 of resistance, parallel plates of insulating material carrying contact-pieces electrically connected with said resistance, a U-shaped lever extending over said plates carrying a brush on each of its side members placed to 75 engage said contact-pieces, substantially as described.

4. The combination of a frame, resistance, two parallel plates of insulating material 80 mounted on the frame, groups of contact-pieces connected to the resistance on each of the insulating-plates, a lever having members adjacent to the surfaces of the insulating-plates, and brushes on each of the said 85 members, the same being insulated therefrom and constructed to electrically connect certain of the contact-pieces on each plate when the lever is operated, substantially as described.

5. In an electric controller, the combination 90 of a frame carrying two plates of insulating material parallel to each other and lying in substantially vertical planes, two series of contact-pieces on each of said plates, an operating-lever having two members of which 95 one extends adjacent to each insulating-plate, brush-holders on each member carrying brushes, the same being constructed to electrically connect the series of contacts on each plate, said brushes being insulated from the 100 lever and from each other, substantially as described.

6. In an electric controller, the combination of a frame carrying two plates of insulating material parallel to each other and supported 105 on the frame in substantially vertical planes, two series of contact-pieces on each of said plates an operating-lever having two members of which one extends adjacent to each plate, a brush-holder fixed to each of said members 110 of the lever but insulated therefrom, two sets of brushes on each holder placed to bear upon the series of contacts of their respective plates, the brushes of each holder being electrically connected to each other, substan- 115 tially as described.

7. The combination of a frame, a U-shaped lever pivoted thereto, insulating-plates carried in vertical planes by the frame and adjacent to the side members of the lever, two 120 series of contact-pieces on each of the plates, the same being arranged on the arcs of circles whose centers are coincident with the pivotal line of the lever, brush-holders with brushes carried by the side members of the 125 lever, the same forming an electrical connection between the series of contacts upon each plate and the levers operated, substantially as described.

8. In an electric controller of the character 130 described, the combination of a frame, a U-shaped lever pivoted to the lower portion of the same, contact-pieces lying in vertical planes carried by the frame and brushes car-



ried by the lever, said frame being provided with guides engaging the side members of the lever whereby lateral motion of the same is prevented, substantially as described.

5 9. In an electric controller of the character described, the combination of a frame, a U-shaped lever pivoted to the lower portion of the same, contacts lying in planes at right angles to the pivot of the lever also carried  
10 by the frame, and brushes carried by the lever, the upper portion of the frame having on each side guide-pieces, the side members of the lever extending between said guide-pieces and the frame and being thereby secured against lateral motion, substantially as  
15 described.

10. The combination with an electric controller of the character described, of a lever pivoted to said controller, a brush-holder  
20 fixed to the lever and movable with it in a plane at right angles to its pivot, a series of brushes pivotally attached to the holder, each of the same having a projecting portion to-

gether with springs carried by the brush-holders and bearing upon said projecting portions of the brushes, substantially as described. 25

11. The combination with an electric controller of the character described, of a lever pivoted to said controller, a brush-holder  
30 fixed to the lever and movable with it in a plane at right angles to its pivot, a series of bolts projecting from the holder, T-shaped brushes pivoted to the holder, each having one of its projecting portions engaging a bolt  
35 with a spring on each bolt bearing upon said projecting portion of its respective brush, with a spring on each brush, substantially as described.

In testimony whereof I have signed my  
40 name to this specification in the presence of two subscribing witnesses.

ARTHUR C. EASTWOOD.

Witnesses:

C. W. COMSTOCK,

HERBERT P. GLIDDEN.