R. R. ROOT.

ELECTRIC CONTROLLER.

APPLICATION FILED FEB. 8, 1906.

905,588.

Patented Dec. 1, 1908.

2 SHEETS—SHEET 1.

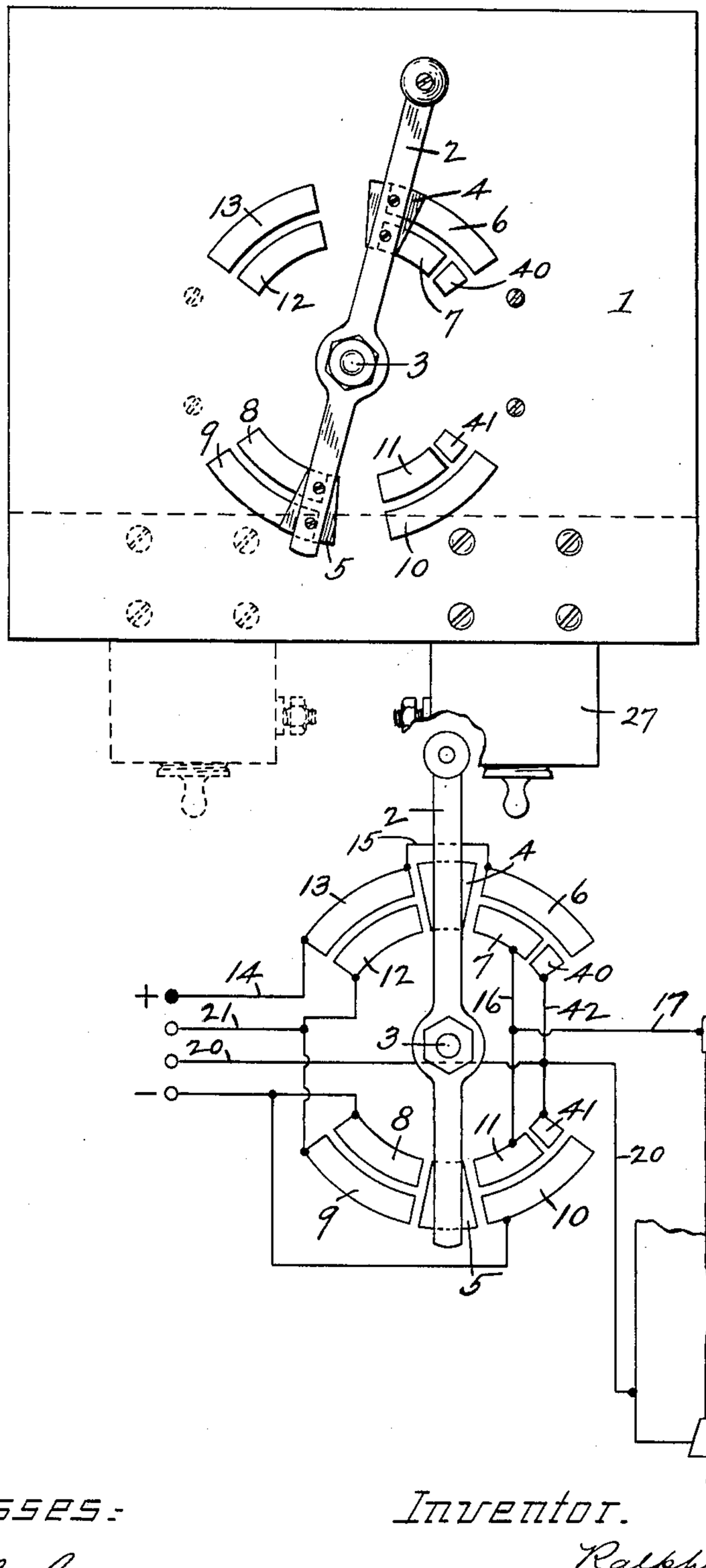

Fig. 1.

Fig. 2.

Witnesses:-

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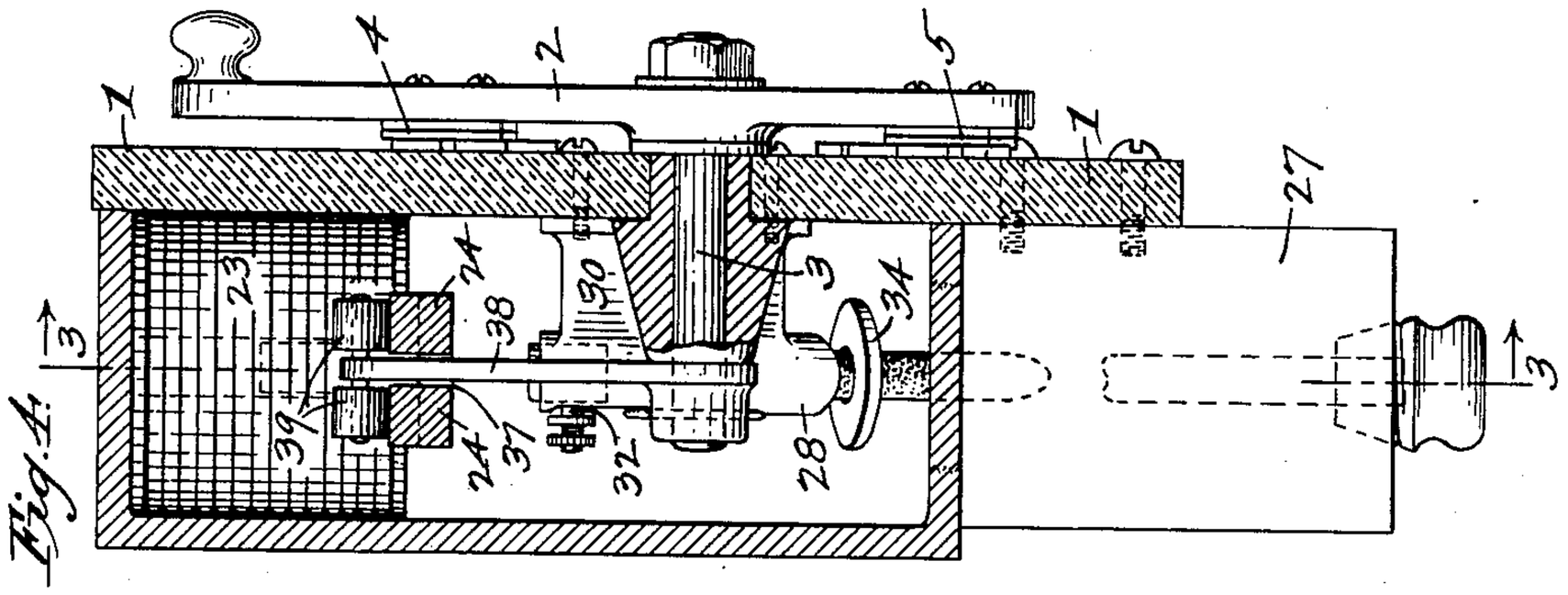

Fig. 4.

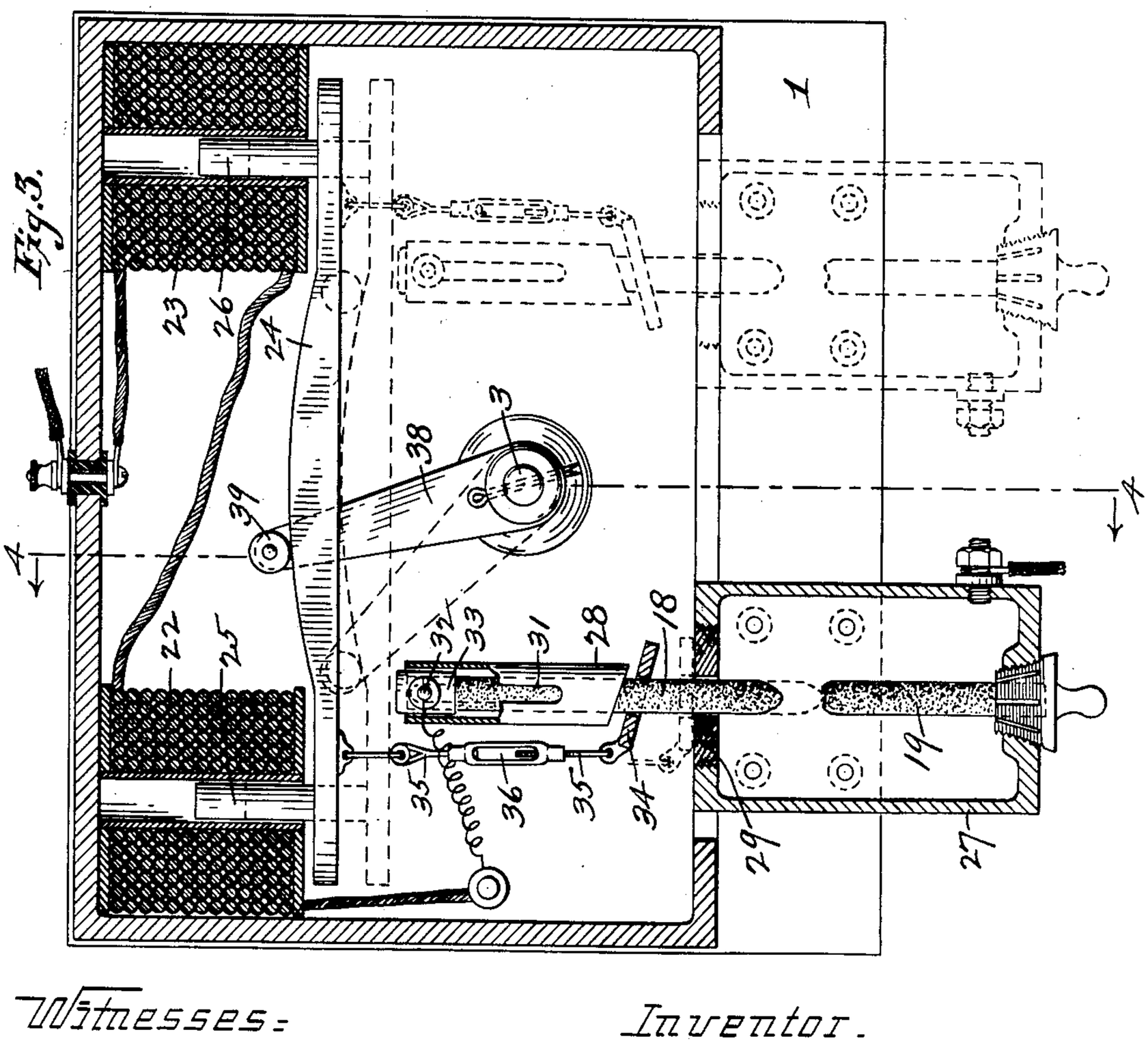

Fig. 3.

Witnesses:-

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UNITED STATES PATENT OFFICE.

RALPH R. ROOT, OF CLEVELAND, OHIO.

ELECTRIC CONTROLLER.

No. 905,588. Specification of Letters Patent. Patented Dec. 1, 1908.

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To all whom it may concern:

Be it known that I, RALPH R. ROOT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Electric Controllers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to electric controllers, and it has for its object the production of a device of this character that will be simpler and cheaper in construction, more economical in operation, and less liable to damage from excessive currents and from usage than those heretofore constructed.

In carrying out my construction, I utilize the principles of the electric arc, it being well known that the resistance to a current flowing across an arc varies with the length thereof.

In the accompanying drawings, forming a part of this application, Figure 1 is a front view of a controller having my invention applied thereto; Fig. 2 is a diagrammatic view showing the arrangement of the electric circuits employed; Fig. 3 is a sectional view taken through the controller substantially on the line 3—3 of Fig. 4, certain of the parts being shown in elevation for purpose of clearness; and Fig. 4 is a transverse sectional view taken substantially on the line 4—4 of Fig. 3, and looking to the left.

Like reference characters designate like parts throughout the several views of the drawings, in which

1 represents the front plate of the controller box, said plate being preferably formed of slate as is usual in these constructions.

2 is a controller lever which is pivoted near the center of plate 1, being secured to the outer end of a bolt 3. The lever 2 carries on the opposite sides of its pivot metallic contact plates 4 and 5, said plates being insulated from the lever, and adapted, when the lever is moved in one direction, to electrically connect respective pairs of segments 6 and 7, and 8 and 9. When the lever is moved in the opposite direction, these contact plates electrically connect respective pairs of segments which are shown at 10 and 11, and 12 and 13.

As will be seen from Fig. 2, one of the segments as 13, is connected with one of the terminals leading to a source of electric energy, said terminal being represented at 14, and the segments 13 and 6 are joined electrically by a conductor 15. The segments 7 and 11 are joined by a conductor 16, to which conductor the carbon pencil 18 is joined by means of conductor 17. The carbon pencil 19 is in electrical circuit, through the conductor 20, with one brush of the electric motor, the current to said motor returning through the conductor 21 to the segments 9 or 12, depending upon the position of the controller arm. Assuming that the lever is turned so as to connect the segments 8 and 9, the current will flow from the segment 9 to the segment 8 and thence back to the dynamo or other source of power. From this description it will be seen that the carbon pencils form a part of the electric circuit; and it will be understood that as the gap between these carbons varies, the resistance will be correspondingly varied. For heavy currents a plurality of sets of carbon pencils,—arranged in parallel, may be employed, and Fig. 3 shows, in dotted lines at the right-hand side, a second set of said pencils.

In Figs. 3 and 4, I have shown means for varying the length of the gap between the carbon pencils. 22 and 23 are solenoids which are interposed in one or the other of the conductors 17 or 20, said solenoids being in series with each other and also in series with the carbon pencils. Extending between the solenoids, and preferably below the same, is an armature 24, said armature being provided with cores or plungers 25 and 26 for the respective solenoids. The carbon pencil 19 is secured to the lower part of a metallic casing 27 that is fastened to the rear of the front plate 1. The pencil 18 is movable vertically with respect to the pencil 19, and is guided in its movement by a sleeve 28 and an insulator 29 which is screwed into the upper end of the casing 27. The sleeve 28 is supported by means of a bracket 30 from the slate front of the controller, and said sleeve is provided with an elongated slot 31 through which the binding screw 32 extends, said binding screw being secured to a thimble 33 on the upper end of the carbon pencil 18. As will be understood, the slot 31 permits of the vertical movement that is given to the pencil 18, which movement is secured by connecting said pencil to the armature 24. The

connections between the carbon and armature consist of the ring 34 that is adapted to bind the pencil and lift the same as the ring itself is lifted, or to release the same when the ring is lowered to normal position. Connected to said ring is a rod 35 that is secured to the armature, said rod being separated at the center and joined by an ordinary turn-buckle 36, whereby the connections between the ring 34 and armature may be varied in length.

As appears from Fig. 4, the armature 24 is slotted at its center at 37, and through this slot there projects an arm 38 that is secured to the bolt 3 near its inner end. On the upper end of the arm 38, and bearing on the upper surface of the armature, are rollers 39, said rollers being adapted to roll over said armature and bear the same downwardly as the controller lever 2 is moved, the armature being curved on its upper surface so as to secure the desired movement.

When in normal position, the main operating lever stands as shown in Fig. 2 with the contact plates 4 and 5 out of engagement with all of the segments. The solenoids are then deënergized, and the armature rests in the position indicated in dotted lines in Fig. 3, with the carbon pencils in contact. When the lever is moved so as to connect the segments 6 and 7, as shown in Fig. 1, the current is permitted to flow through the solenoids and carbon pencils, with the result that the armature is jerked upwardly so as to separate the carbons to their maximum extent, thus throwing the greatest amount of resistance into the circuit.

As the controller lever continues to be turned to the right as in Fig. 1, the rollers 39 on the lever 38 bear the armature downwardly against the pull of the solenoids and thus gradually close the space between the carbon points, thereby shortening the arc which was formed when the carbons were first separated and thereby cutting out the resistance. The strength of the current therefore increases as the controller lever is turned until the arm 38 reaches the position shown in dotted lines in Fig. 3, when the gap between the carbons is practically closed and the resistance has been substantially cut out. At this point it is desirable to switch the current around the carbon points, as the carbons would otherwise be consumed and the controller would require more attention in order to keep it in proper working condition. For this purpose, I employ segments 40 and 41, which are connected together by a conductor 42, said conductor being joined with the conductor 20 from the resistance device. At the time when the lever has swung so as to practically close the gap between the carbons, the plate 4 or 5 will connect the segment 40 with the plate 6, or the segment 41 with the plate 10, so that the current will be shunted around the resistance device through the conductors 42 and 20.

If preferred, the carbon pencils may be separated by mechanical means rather than by the solenoids. In fact, various details in the construction shown may be made without departing from the spirit of my invention, and I therefore desire it to be understood that I do not intend to limit the following claims any further than is rendered necessary by the specific terms employed or by the prior state of the art.

If the air gap formed between the carbons should prove to be so wide that the current will not arc across the same, the upper carbon can be lowered by the adjustment of the turn-buckle 36 until the arc will form properly. It will be understood that if the arc should refuse to form, the current is simply broken momentarily, with the result that the carbons drop together again and reëstablish the current, the upper carbons simply moving up and down until the proper adjustment is made.

Having thus described my invention, I claim:

1. In a resistance device, a pair of electrical conductors, means whereby relative movement may be effected between said conductors for the purpose of varying the resistance therebetween, electrical means for separating the said conductors, and mechanical means for closing the gap between the conductors said means including a pivoted hand-operated lever.

2. In a resistance device, a pair of carbon pencils, means for moving one pencil relatively to the other whereby the distance therebetween may be increased for producing resistance, a switch-lever, and means connected with said switch-lever for closing the gap between the carbons for cutting out resistance.

3. In an electric controller, a switch-lever, a pair of carbon pencils, a solenoid in series with said pencils, connections between the plunger of said solenoid and one of said pencils whereby the pencils may be separated when the solenoid is energized, and means connected with said lever for moving the pencil to shorten the arc, whereby the resistance in the circuit is diminished.

4. In an electric controller, a switch-lever, a pair of carbon pencils, a solenoid in series with said pencils, said solenoid having an armature, connections between the armature of said solenoid and one of said pencils whereby the pencils may be separated when the solenoid is energized, and means connected with said lever for moving the armature to shorten the arc, whereby the resistance in the circuit is diminished.

5. In an electric controller, a pair of carbon pencils forming a portion of an electric

circuit, a solenoid in the circuit with said pencils, means connecting one of said pencils with the core of the solenoid, whereby the pencils are separated when the current flows, a controller lever, and means connected with said lever for drawing the core out of said solenoid and for closing the space between the carbons, whereby the resistance in the circuit is diminished as the controller lever is moved.

6. In an electric controller, a pair of carbon pencils forming a portion of an electric circuit, a solenoid in the circuit with said pencils, means connecting one of said pencils with the core of the solenoid, whereby the pencils are separated and an arc is formed when the current flows and the core is drawn into the solenoid, a controller lever, and means connected with said lever for drawing the core out of said solenoid and for closing the space between the carbons, whereby the resistance in the circuit is diminished as the controller lever is moved, and means for adjusting the connections between the core and the pencil.

7. In an electric controller, a pair of carbon pencils, electro-magnetic devices in series with said pencils, connections between one of said pencils and said electro-magnetic devices, whereby the pencils are separated and tend to remain separated while the current flows therethrough, a controller lever, an arm connected with said lever and engaging the said electro-magnetic devices, whereby when said lever is swung, the movable carbon is moved to close the space between the pencils and thus cut out the resistance.

8. In an electric controller, a pair of carbon pencils, electro-magnetic devices in series with said pencils, connections between one of said pencils and said electro-magnetic devices, whereby the pencils are separated and tend to remain separated while the current flows therethrough, a controller lever, an arm connected with said lever and engaging the said electro-magnetic devices, whereby when said lever is swung, the movable carbon is moved to close the space between the pencils and thus cut out the resistance, and means for closing a shunt circuit around the pencils when the latter are brought substantially together.

9. In an electric controller, a pair of carbon pencils, a pair of solenoids in series with said pencils, an armature having cores projecting into said solenoids, connections between said armature and one of said pencils, whereby the pencil is moved with the armature, and an arc is formed between the pencils, a controller lever, and an arm on said lever in normal engagement with said armature substantially midway between the solenoids, said armature being so shaped that as the arm is moved in either direction by the controller lever, the armature will be moved to vary the length of the arc between the carbon pencils, whereby the resistance is correspondingly varied.

10. In an electric controller, a pair of carbon pencils, a pair of solenoids in series with said pencils, an armature having cores projecting into said solenoids, connections between said armature and one of said pencils, whereby the pencil is moved with the armature, and an arc is formed between the pencils, a controller lever, an arm on said lever in normal engagement with said armature substantially midway between the solenoids, said armature being so shaped that as the arm is moved in either direction by the controller lever, the armature will be moved to vary the arc between the carbon pencils, whereby the resistance is correspondingly varied, and means for closing a shunt circuit around the pencils when the latter are brought substantially together.

11. In an electric controller, a pair of carbon pencils, a pair of solenoids in series with said pencils, an armature having cores projecting into said solenoids, connections between said armature and one of said pencils, whereby the pencil is moved with the armature, and an arc is formed between the pencils, a controller lever, an arm on said lever in normal engagement with said armature substantially midway between the solenoids, said armature being so shaped that as the arm is moved in either direction by the controller lever, the armature will be moved to vary the arc between the carbon pencils, whereby the resistance is correspondingly varied, and means for closing a shunt circuit around the solenoids and pencils when the latter are brought substantially together.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

RALPH R. ROOT.

Witnesses:
S. E. FOUTS,
W. L. MCGARRELL.