(No Model.) 3 Sheets—Sheet 1.

C. E. WOODS.

CONTROLLER FOR DYNAMO-ELECTRIC MACHINES.

No. 579,028. Patented Mar. 16, 1897.

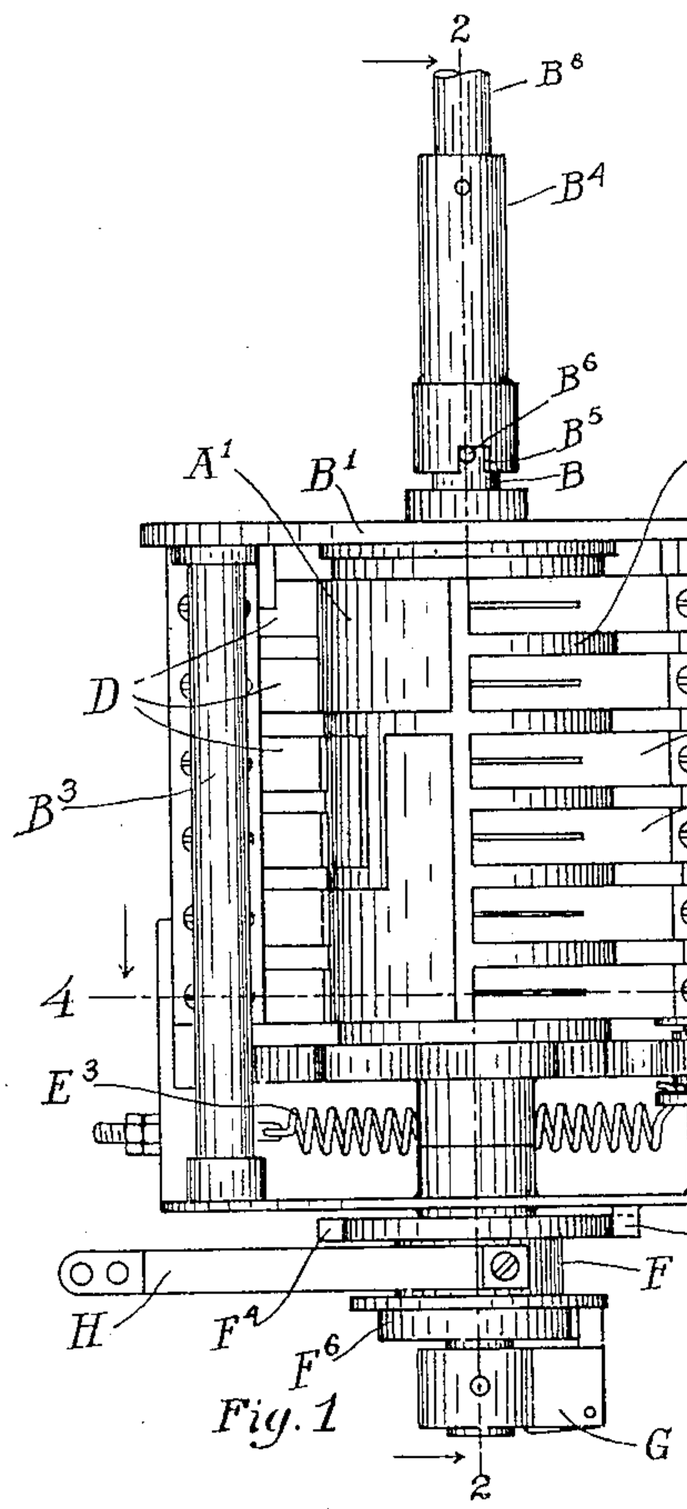

Fig. 1

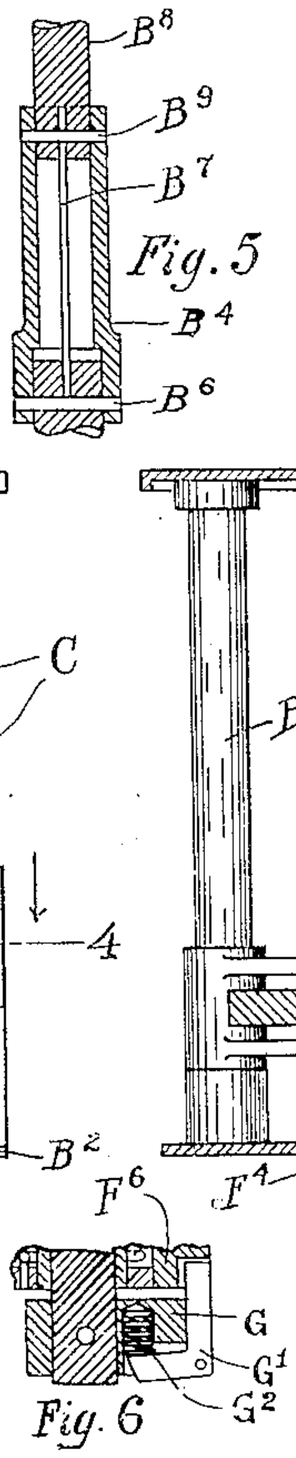

Fig. 5

Fig. 6

Fig. 2

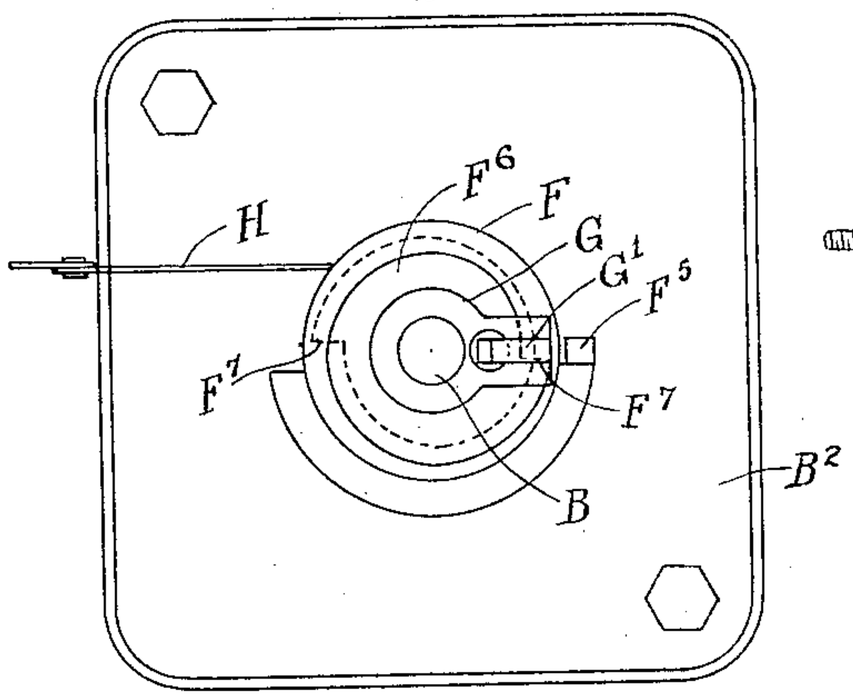

Fig. 3

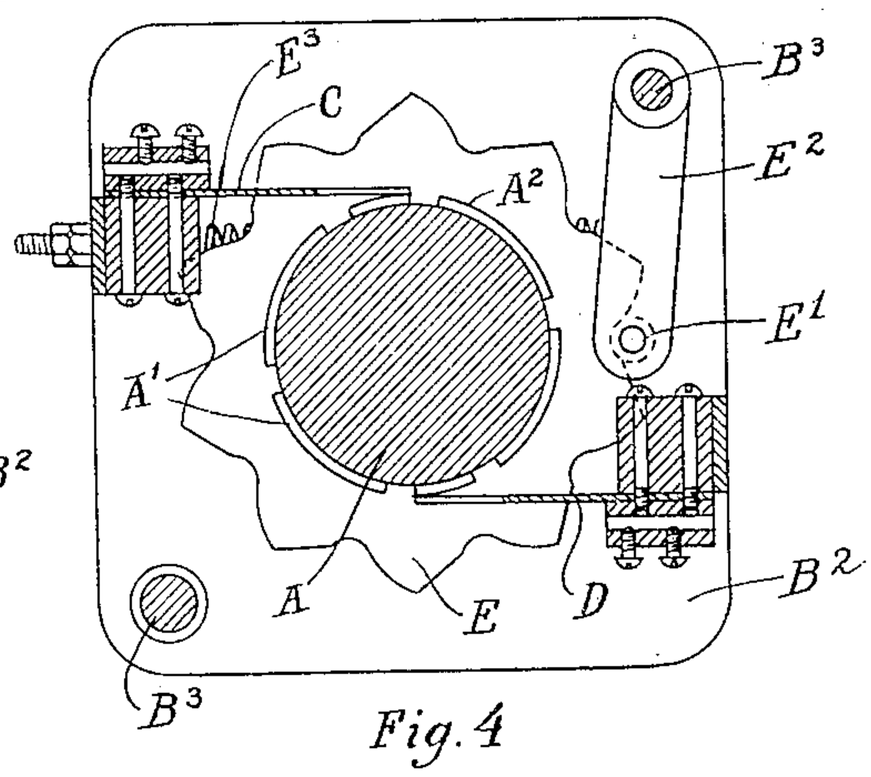

Fig. 4

WITNESSES:

Donald M. Carter

Francis M. Ireland

INVENTOR

Clinton E. Woods

(No Model.) 3 Sheets—Sheet 2.

C. E. WOODS.

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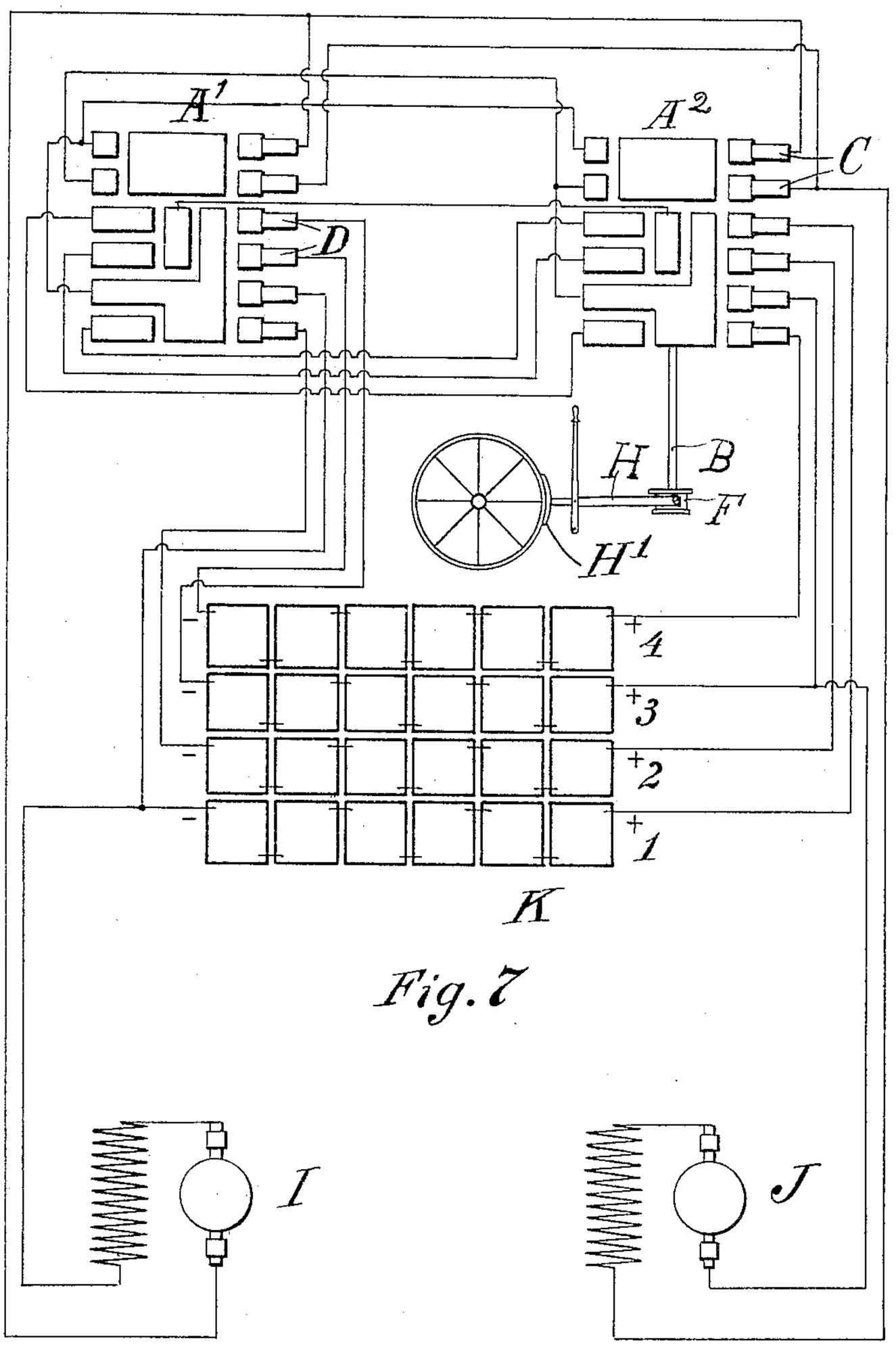

Fig. 7

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(No Model.) 3 Sheets—Sheet 3.

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CONTROLLER FOR DYNAMO-ELECTRIC MACHINES.

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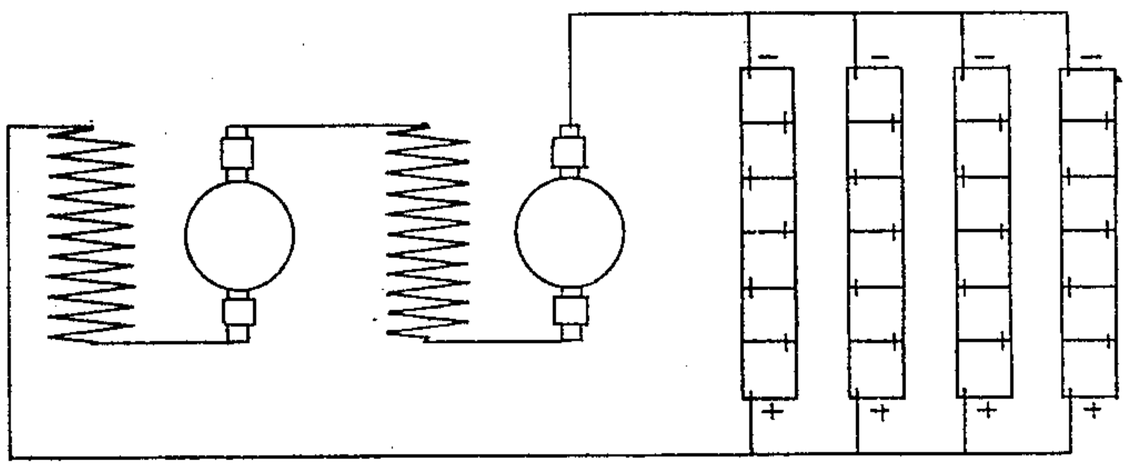

Fig 8

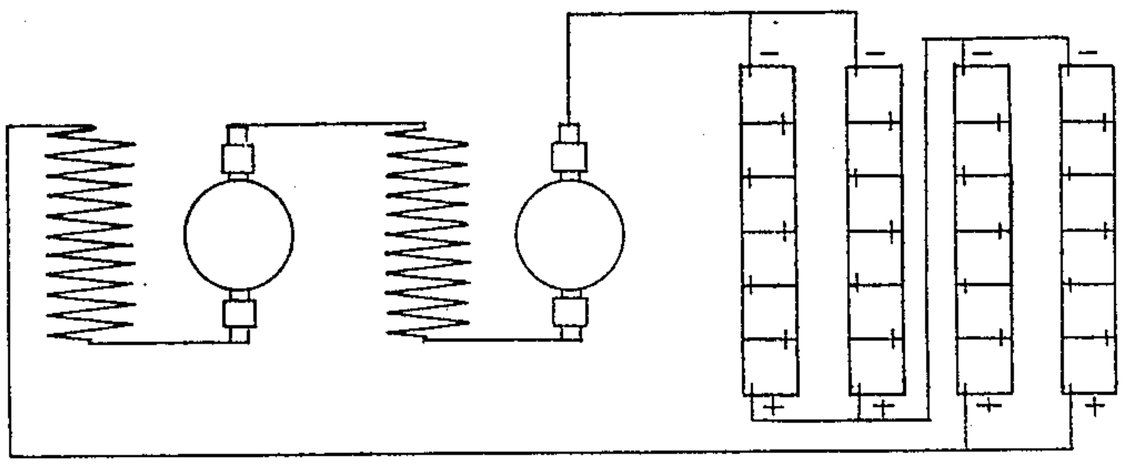

Fig 9

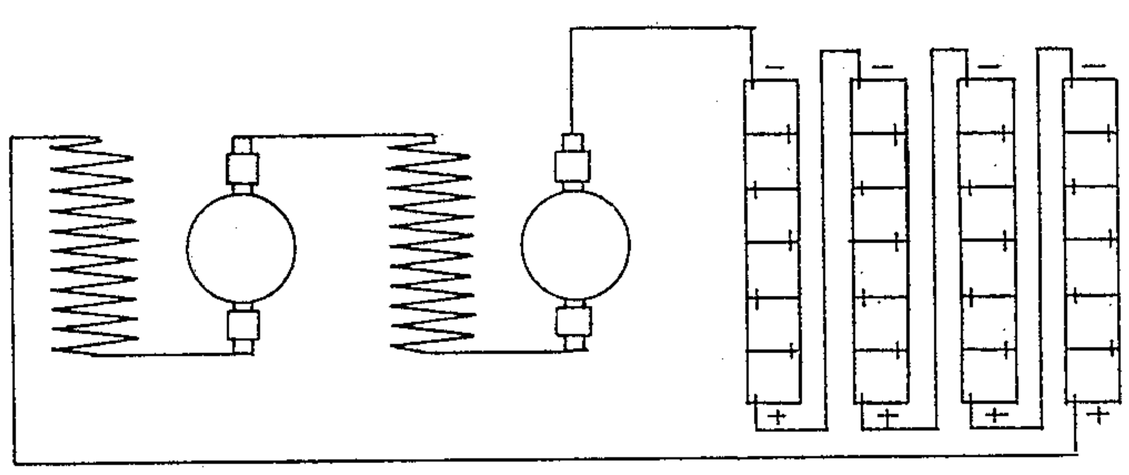

Fig 10

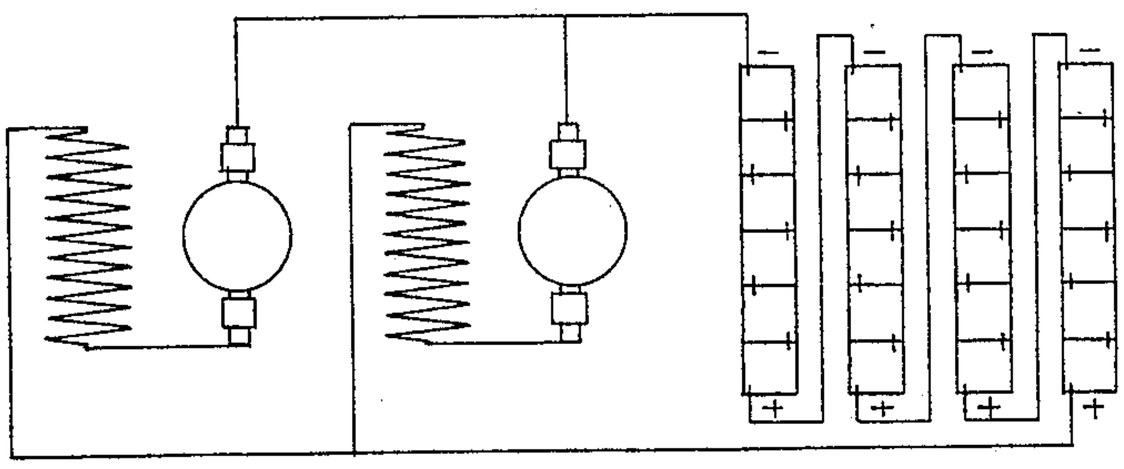

Fig 11

WITNESSES:

Donald M. Carter

Bertha C. Sims

INVENTOR

Clinton E. Woods,

BY

James W. Parker,

ATTORNEY.

UNITED STATES PATENT OFFICE.

CLINTON E. WOODS, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE AMERICAN ELECTRIC VEHICLE COMPANY, OF SAME PLACE.

CONTROLLER FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 579,028, dated March 16, 1897.

Application filed January 15, 1896. Serial No. 575,602. (No model.)

To all whom it may concern:

Be it known that I, CLINTON E. WOODS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Controllers for Dynamo-Electric Machines, of which the following is a specification.

My invention relates to controllers for dynamo-electric machines, particularly for such machines as are operated as motors.

The object of my invention is to provide a new and improved controlling device for controlling the circuits of such machines, and is illustrated in the accompanying drawings, wherein—

Figure 1 is a view of a controller embodying my invention. Fig. 2 is a section on line 2 2, Fig. 1, parts being omitted. Fig. 3 is an end view of the controller. Fig. 4 is a section on line 4 4, Fig. 1. Fig. 5 is a section through one end of the controller-shaft, and Fig. 6 is a section through the other end of said shaft at right angles to the section shown in Fig. 2. Fig. 7 is a diagrammatical view showing the circuit connections, motors, and other parts. Figs. 8, 9, 10, and 11 are diagrammatic views of the several methods of connecting or the successive relations of the several parts resulting from the use of the controller.

Like letters and numerals refer to like parts throughout the several figures.

The circuit-controller proper consists of a cylinder A, of insulating material, having upon its surface a series of contacts A′ A². This cylinder is provided with a shaft B, which is mounted in bearings in a frame by which the device is supported. This shaft may extend through the cylinder, or may consist of two parts connected with the ends thereof, as shown in the drawings.

The frame supporting the cylinder may be of any desirable construction. As herein shown it consists of the end plates B′ B², connected together by the rods B³. A series of brushes C C are connected with this frame in any convenient manner and are adapted to bear upon the contacts on the cylinder. A second series of brushes D D are adapted to bear upon the contacts on the opposite side of the cylinder. These brushes are insulated from each other and are provided with binding-posts, by which they may be connected in circuit.

Fastened to the cylinder A is a notched or toothed wheel E. A roller E′ engages the notches on the wheel and is connected with the movable arm E², rotatably mounted upon one of the rods B³. Connected with the arm E² is a spring E³, the other end of which is connected to some part of the frame in which the contact-cylinder is mounted. One end of the shaft B has connected therewith a hollow sleeve B⁴, provided with a slot B⁵, adapted to engage a pin B⁶, rigidly connected with the shaft. A spring B⁷ is connected with the shaft B and with the rod B⁸, leading to the handle of the controller. This part of the device may be constructed in any desirable manner. As herein shown, the pin B⁶ passes through slots in the sleeve B⁴, so as to connect it with the shaft B. The spring B⁷ is connected to the rod B⁸ and sleeve B⁴ by means of the pin B⁹, said spring engaging a slot in the end of the shaft B, but not permanently connected therewith. This construction of the handle and of the shaft, together with the toothed or notched wheel E and roller E′, allow the contact-cylinder to be moved suddenly as the brushes leave one set of contacts and thus prevent arcing and short-circuiting of the contacts.

Loosely mounted upon the other end of the shaft B is a movable part or sleeve F, provided with a spring F′, having one end connected therewith, the other end of said spring being connected with a collar F², rigidly connected to the projecting sleeve F³ on the plate B². This movable part or sleeve is provided with a projecting semicircular piece F⁴, which limits its motion by coming in contact with the stop F⁵, connected with the plate B². The movable part or sleeve F is provided at its outer end with a cam-wheel F⁶, provided with the contact-surface F⁷. An arm G is rigidly connected with the shaft B and is provided with a pawl G′, adapted to engage the cam-

wheel F^6. This pawl consists of a bell-crank lever pivoted to the arm G, one end of said lever being in contact with the spring G^2, associated with said arm. By this construction the pawl may pass entirely around the cam-wheel and will be in contact with the surface at all times. A flexible strap or the like H is connected with the movable part or sleeve F and is also connected with the brake H'. (See Fig. 7.) It will be seen that by this construction the brake is normally held away from its opposed surface by means of the spring F' and that the sleeve F will be rotated when the brake is operated.

I have shown the brake mechanism in a diagrammatic form in Fig. 7, so as to illustrate fully the operation of my device; but it is evident that any suitable or desirable brake mechanism may be used. I have shown in Fig. 7 a diagram of circuits used in one form of my controller. This diagram shows two motors I J, connected with a series of storage batteries K, the batteries and motors being connected with the brushes C C and D D and the contacts A' A^2 in such a manner that the batteries and motors may be connected together in a number of different ways by rotating the contact-cylinder and bringing the brushes into contact with the different contact-plates thereon. The contacts and circuits, as shown in this diagram, are arranged for four different combinations. The first movement of the brushes connects the two motors in series and the four rows of batteries in multiple. When the cylinder is rotated to its second position, the motors are still in series and the batteries are in multiple series, the rows 1 and 2 of the batteries being in multiple and the rows 3 and 4 being in multiple, the two sections being in series with each other. When the contact-cylinder is moved to its third position, the four rows of batteries and the two motors are all in series. When the contact-cylinder is moved to its fourth and last position, the batteries are all in series and the motors in multiple.

I have described these several parts in detail; but it is evident that they may be greatly varied in form, construction, and arrangement without departing from the spirit of my invention, and I therefore do not wish to be limited to the construction shown.

Fig. 7 also shows a diagrammatic brake mechanism, the brake-shoe H' being connected with the strap H and being opposed to a wheel or other surface connected with the dynamo-electric machine or the vehicle or mechanism operated thereby. It is of course evident that this brake mechanism may be of any suitable description, and I have not endeavored to represent it in any other than a diagrammatic way.

The electric system herein shown, of which the controller is a part, is particularly adapted to be used in connection with electric vehicles. It will be seen that with this system I use a series of storage batteries connected together in groups, or, in other words, that instead of using a single generator I use a divided generator. The controller is so constructed that the groups of cells or parts of the divided generator may be connected in circuit in various ways, the whole being so arranged that the current, instead of being controlled by means of a resistance, is controlled by varying the manner in which the parts of the divided generator are connected in the circuit.

The use and operation of my invention are as follows:

When the parts are in the position shown in Fig. 1, the controller is in its normal open-circuit position and the brake is on—that is, in contact with its opposed surface. If now the brake is released, the spring F' rotates the sleeve F so as to bring the contact-surface F^7 of the cam-wheel F^6 to the position shown in dotted lines in Fig. 3, or, in other words, moves it to a position one hundred and eighty degrees removed from the position shown in Fig. 1. The projection F^4 thereon then comes in contact with the stop F^5 and prevents further movement. If now the contact-cylinder is rotated by means of the handle, the sleeve B^4 will be moved until the side of the slot B^5 comes in contact with the pin B^6. A further movement of the handle of the controller will then move the cylinder and the notched wheel E. The roller E' is then moved along the surface of one of the teeth of said wheel until it gets to the outer end of the tooth. At this point the cylinder is free to rotate, and it will be given a sudden movement by means of the spring B^7, so as to rapidly move the brushes from one of said contacts to another, thus preventing arcing and short-circuiting. This movement is made possible by means of the slot B^5 in the sleeve B^4. If the motion of the handle of the controller is continued, the movement of the contact-cylinder will be slow until the roller again comes to the outer edge of one of the teeth, when the operation above described will be repeated. When the contact-cylinder is moved to a position where the motors are connected in circuit in the manner desired, the pawl G', which has been moving around the surface of the cam-wheel F, is moved past the contact-surface F^7 thereon and drops down, so as to engage the same, the motion of said pawl being brought about by the spring G^2. If now the brake H' is moved so as to bring it into contact with its opposed surface, the sleeve F will be moved by means of the strap H, and since the contact-surface F^7 on the cam-wheel F^6 is in contact with the pawl G' on the shaft of the contact-cylinder said cylinder will be moved around to its normal open-circuit position. The motion is stopped by the projection F^4 coming in contact with the stop F^5, as shown in Fig. 3.

It will be seen that I have here a simple controlling device which is automatically operated by the brake mechanism, so as to cut the motors out of circuit, the controller being

so constructed that it is moved rapidly at the points where the brushes change from one set of contacts to another.

I claim—

1. A controller for dynamo-electric machines comprising a rotatable shaft having a cylinder rigidly connected therewith, said cylinder provided with a series of separated contacts, a series of brushes opposed to said contacts, an operating-handle connected with said shaft, a movable part associated with said cylinder and connected with a brake associated with the dynamo-electric machine, and a connection between said contact-cylinder and the movable part associated therewith, whereby said cylinder is automatically moved to its normal open-circuit position when the brake is applied.

2. A controller for dynamo-electric machines comprising a rotatable cylinder provided with a series of separated contacts, said cylinder mounted in a frame carrying a series of brushes opposed to said contacts, a movable part rotatably mounted upon the shaft of said cylinder and connected with a brake, associated with the dynamo-electric machine, the connection between the movable part and said brake being such that said movable part is operated by the movement of said brake.

3. A controller for dynamo-electric machines comprising a rotatable cylinder provided with a series of separated contacts, a series of brushes opposed to said contacts, a movable part rotatably mounted upon the shaft of said cylinder, and connected with a brake associated with the dynamo-electric machine, a cam on said movable part, a pawl connected with the contact-cylinder and adapted to engage said cam, the whole being so constructed that the pawl engages the contact-surface of the cam when the contact-cylinder is moved so as to connect the dynamo-electric machine in circuit, whereby when the brake is applied said cylinder is moved to its normal open-circuit position.

4. A controller for dynamo-electric machines comprising a rotatable cylinder provided with a series of separated contacts, a series of brushes opposed to said contacts, a movable part rotatably mounted upon the shaft of said cylinder and connected with a brake associated with the dynamo-electric machine, a spring associated with said movable part and adapted to normally hold said brake out of contact with its opposed surface, a cam on said movable part, a pawl connected with the contact-cylinder and adapted to engage said cam, the whole so constructed that the pawl engages the contact-surfaces of the cam when the contact-cylinder is moved so as to connect the dynamo-electric machine in circuit, whereby when the brake is applied said cylinder is moved to its normal open-circuit position.

5. A controller for dynamo-electric machines comprising a rotatable cylinder provided with a series of separated contacts, a series of brushes opposed to said contacts, a movable part rotatably mounted upon the shaft of said cylinder and connected with a brake associated with the dynamo-electric machine, a spring associated with said movable part and adapted to normally hold said brake out of contact with its opposed surface, a cam on said movable part, a pawl connected with the contact-cylinder and adapted to engage said cam, the whole so constructed that the pawl engages the contact-surfaces of the cam when the contact-cylinder is moved so as to connect the dynamo-electric machine in circuit, whereby when the brake is applied said cylinder is moved to its normal open-circuit position, and means associated with said contact-cylinder whereby the cylinder is rapidly moved at the point where the brushes leave one set of contacts to engage another, so as to prevent short-circuiting.

6. A controller for dynamo-electric machines comprising a rotatable cylinder provided with a series of separated contacts, a series of brushes opposed to said contacts, a movable part rotatably mounted upon the shaft of said cylinder and connected with a brake associated with the dynamo-electric machine, a spring associated with said movable part and adapted to normally hold said brake out of contact with its opposed surface, a cam on said movable part, a pawl connected with the contact-cylinder and adapted to engage said cam, the whole so constructed that the pawl engages the contact-surfaces of the cam when the contact-cylinder is moved so as to connect the dynamo-electric machine in circuit, whereby when the brake is applied said cylinder is moved to its normal open-circuit position, a notched or toothed wheel connected with said contact-cylinder and provided with a spring-pressed roller adapted to work in the notches thereon, and a flexible connection between said contact-cylinder and the handle of the controller, the parts so constructed that the change from one set of contacts to another is made instantaneously.

7. A controller for dynamo-electric machines comprising a rotatable cylinder provided with a series of separated contacts, a series of brushes opposed to said contacts, a sleeve connected with said cylinder, so as to have a limited motion with relation thereto, said cylinder connected with a controlling-handle, a spring connecting said controlling-handle and said cylinder, and a toothed or notched wheel also connected with said cylinder and provided with a spring-pressed roller adapted to engage the teeth or notches thereon, substantially as described.

8. A controller for dynamo-electric machines comprising a rotatable cylinder provided with a series of separated contacts, a series of brushes opposed to said contacts, means associated with said contact-cylinder whereby the cylinder is rapidly moved at the point where the brushes leave one set of contacts to engage another, so as to prevent short-

circuiting, a movable part associated with said cylinder and connected with a brake associated with the dynamo-electric machine, the connection being such that said movable part is moved by the movement of the brake, a connection between said contact-cylinder and the movable part associated therewith, whereby said cylinder is automatically moved to its normal open-circuit position when the brake is applied.

9. The combination with a vehicle of an operating mechanism comprising a brake, a series of storage batteries divided into groups, one or more electric motors, a circuit-controlling device, and electric connections from said circuit-controlling device to said storage batteries and said motor or motors, said circuit-controlling device comprising a movable part, a series of contacts associated therewith, and so formed and positioned that the connection between said groups of storage batteries is varied so as to vary the current by varying the relative position of said contacts and a connection between said movable part and said brake whereby the circuit-controlling device is moved so as to break the circuit when the brake is applied.

10. In an electric system for vehicles, the combination of a brake, with a divided generator, one or more electric motors, a circuit-controlling device, and connections from said circuit-controlling device to said generator, and said motor or motors, said circuit-controlling device so constructed that when operated it varies the manner in which the parts of said divided generator are connected in circuit so as to vary the current, whereby the current is controlled without the aid of resistances, and a connection between said controller and said brake whereby the controller is moved so as to break the circuit when the brake is applied.

CLINTON E. WOODS.

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DONALD M. CARTER.