No. 845,024. PATENTED FEB. 19, 1907.

H. E. WHITE.

CONTROLLER.

APPLICATION FILED JUNE 6, 1906.

2 SHEETS—SHEET 1.

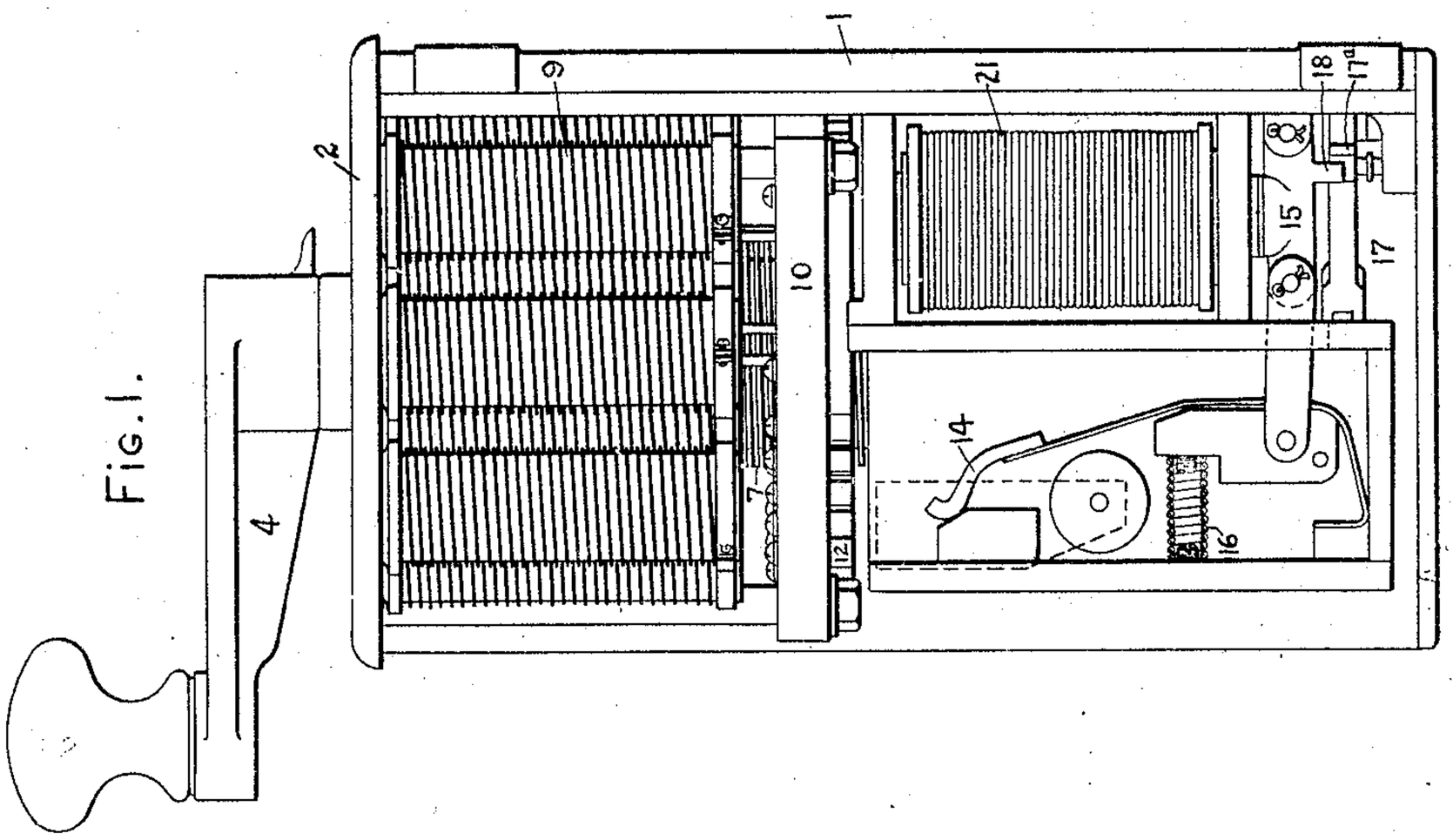

Fig. 1.

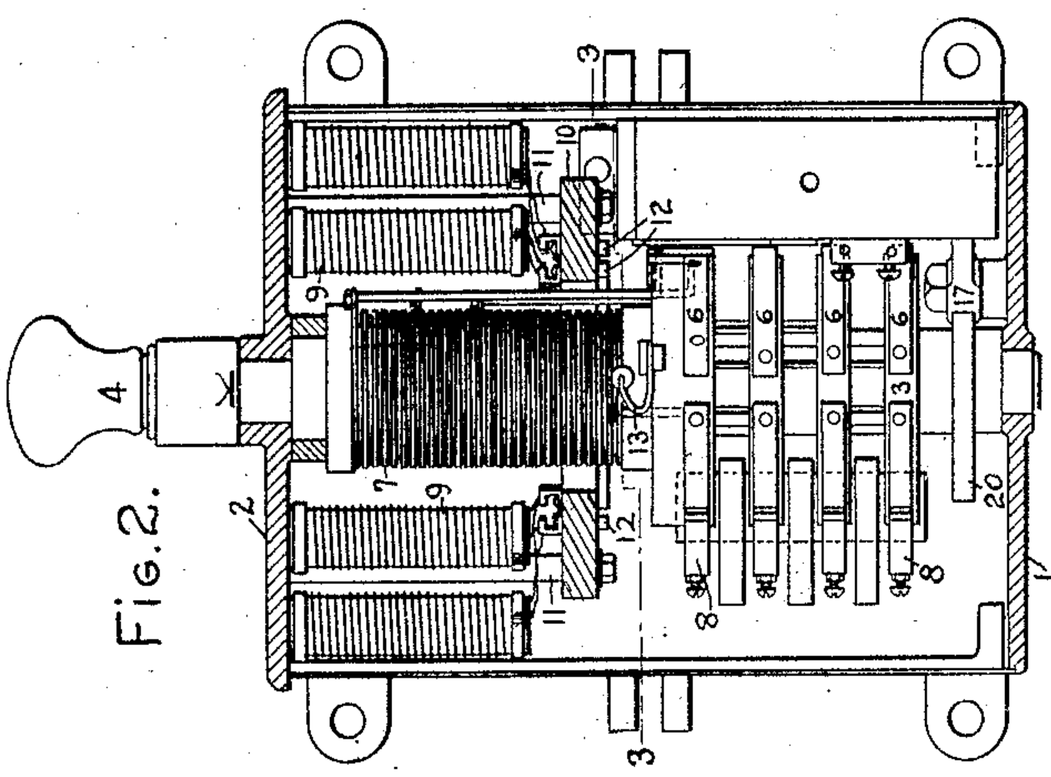

Fig. 2.

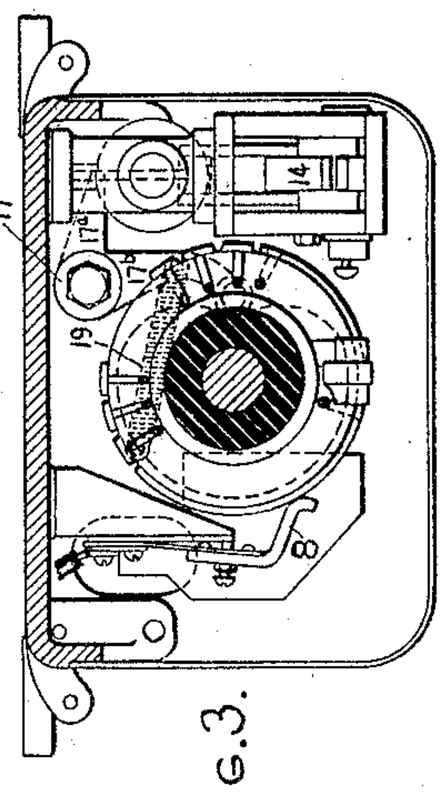

Fig. 3.

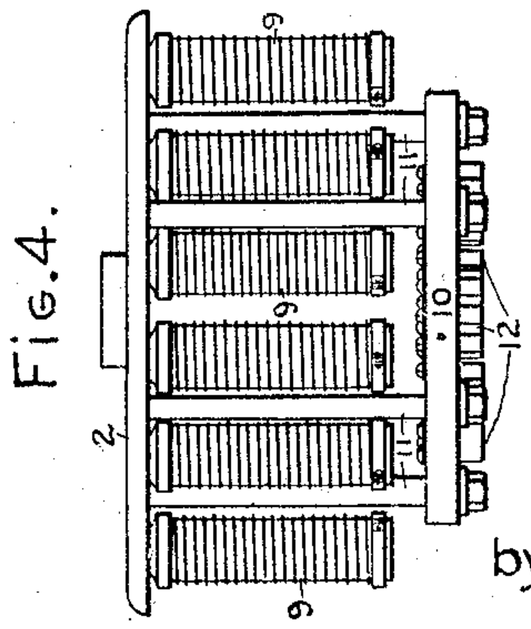

Fig. 4.

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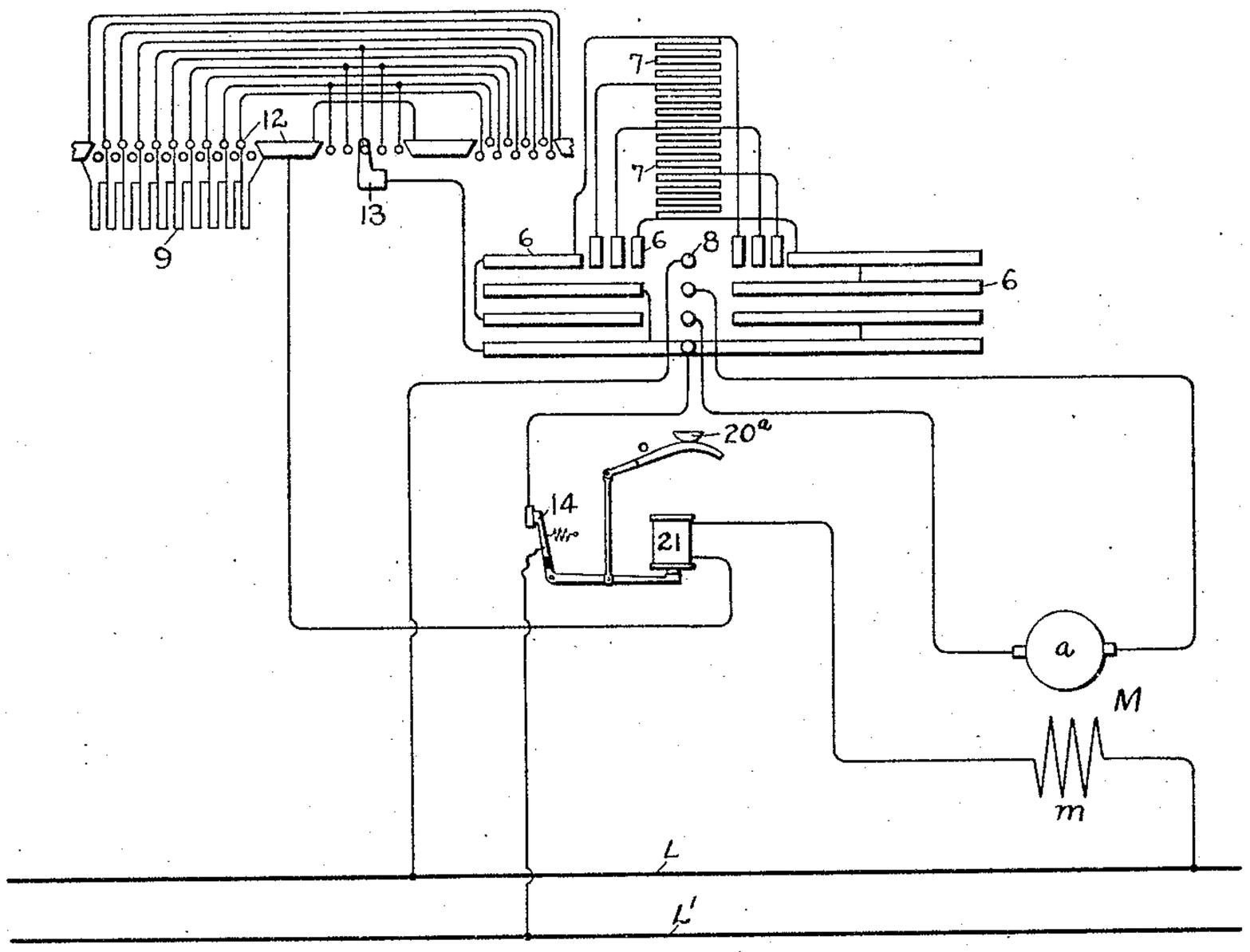
2 SHEETS—SHEET 2.

Fig. 5.



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UNITED STATES PATENT OFFICE.

HAROLD E. WHITE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CONTROLLER.

No. 845,024. Specification of Letters Patent. Patented Feb. 19, 1907.

Application filed June 6, 1906. Serial No. 320,412.

To all whom it may concern:

Be it known that I, HAROLD E. WHITE, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Controllers, of which the following is a specification.

This invention relates to controllers for electric motors, and comprises certain novel features of construction and organization of parts to be hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 shows in side elevation a controller arranged in accordance with the present invention, a portion of the protecting-casing being removed. Fig. 2 is a view on a somewhat smaller scale, showing the controller partly in section and partly in front elevation. Fig. 3 is a view taken on line 3 3 of Fig. 2. Fig. 4 is a front elevation of the cap-plate of the controller with the parts carried thereby; and Fig. 5 is a diagram showing the controller in developed form and the various connections between the controller, a motor, and a source of current-supply.

Reference being had to the drawings, 1 indicates a controller-casing having a removable cap-plate 2.

3 is a controller-cylinder having its shaft journaled at its opposite ends in the bottom of the casing and in the cap-plate.

4 is a handle secured to the shaft of the controller-cylinder above the cap-plate.

The contact-segments 6 do not extend throughout the entire length of the cylinder; but between the upper of these contact-segments and the cap-plate are arranged a series of resistance-sections 7, to which the segments 6 are electrically connected. Fingers 8 coöperate with segments 6 in the usual way. The resistances 7, it will be noticed, serve as a blow-out device. The space within the casing surrounding the resistance-sections 7 is filled with a plurality of resistance-coils 9, arranged in parallel with the controller-shaft and secured at their upper ends to the cap-plate. A disk 10, preferably made of insulating material, is supported from the cap-plate upon rods 11 directly beneath the lower ends of the group of coils 9, and on this disk, preferably on the lower side thereof, are mounted a plurality of contact-buttons 12, electrically connected to the resistance-coils 9. Attached to the controller-cylinder is a spring-finger 13, which when the controller-cylinder is rotated engages successively with the contacts of the series 12. The arrangement of parts shown is particularly adapted for controlling the resistance in series with the armature of the motor and in series with a shunt-field, the main controller-contacts being arranged to connect the motor for forward or reverse operation in series with the resistance-sections 7 and thereafter to cut out these resistance-sections and introduce into the field-circuit the resistance 9.

In order to make it possible to return the controller to its initial or "off" position upon failure of motor-current at any time, I have provided a circuit-breaker, consisting of a switch 14, adapted to be closed by a toggle 15 and to be opened by means of a spring 16. The bell-crank lever 17 is pivoted on the controller casing in such position that the arm 17^a is adapted to engage a lug 18 on one member of the toggle 15 and through the action of spring 19 close the switch. A cam 20 on the controller-cylinder engages with the other arm 17^b of the bell-crank lever and forces the arm 17^a out of engagement with lug 18 in all positions of the controller except the off position.

21 is an electromagnet so proportioned and arranged that when current is flowing through it is sufficiently powerful to hold the switch closed, but not powerful enough to close it. This electromagnet is energized upon turning the controller from the off position before the switch is released from the bell-crank lever. Therefore the circuit-breaker is maintained closed during the running positions of the controller. If at any time, however, the motor-current fails, the circuit-breaker opens and cannot be closed unless and until the controller is brought to the off position, whereupon the switch is mechanically closed in the manner described.

In Fig. 5 the controller is shown connected so as to supply the motor M with current from the source of current-supply by conductors L and L'. The controller is shown in its off position, wherein the cam indicated by the reference character 20^a maintains the switch 14 closed. Upon turning the con-

troller in either direction from the off position a circuit is completed through the field-winding *m* of the motor and the maintaining-coil 21 of the circuit-breaker, while a second circuit is completed through the motor-armature *a* in series with the resistance-sections 7. As the controller is turned into the successive running positions the resistance-sections 7 are progressively cut out of the armature-circuit and the sections 9 are introduced into the field-circuit. These circuits are not traced in detail, since they are readily apparent from an inspection of the drawings.

It will be seen that the controller is extremely simple and compact in construction notwithstanding that all of the resistances which may advantageously be used are included within the controller-casing. Upon taking off the cap-plate the entire field resistance, together with the contacts connected thereto, is removed without disturbing the wiring of the controller or altering the adjustments, the controller being again ready for immediate operation when the cap-plate is replaced. Changes in the adjustment of the field resistance or repairs thereto may conveniently be made without dismantling the whole controller or making it necessary to move about the whole controller.

While the arrangement shown is that preferred by me, it is not necessary that the field resistances and armature resistances be placed above the contacts on the cylinder, since the field resistances and contact-disk may obviously be attached to either end or head of the casing.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a controller, a casing having a head, a movable controller member supported in said casing and journaled at one end in said head, stationary contacts coöperating with said member, a nest of resistance-coils supported by said head, a member provided with a series of contacts in electrical connection with said resistance-coils also supported on said head, and a contact-finger carried by the movable controller member and arranged to engage the contacts of said series.

2. In a controller, a casing having a head, a controller-cylinder having its shaft journaled at one end in said head, contact-fingers coöperating with said cylinder, a series of resistance-coils grouped about said controller-shaft and supported at one end upon said head, a disk supported from said head and arranged adjacent the free ends of said resistance-coils, a series of contacts on said disk in electrical connection with said resistance-coils, and a contact-finger carried by said controller-cylinder and arranged to engage successively the contacts of said series of contacts.

3. In a controller, a casing having a cap-plate, a controller-cylinder supported in said casing and journaled at one end in said cap-plate, contact-segments on the lower portion of the controller-cylinder, stationary contacts coöperating with said segments, resistance-coils supported on the upper portion of said cylinder and connected to said segments, a series of resistances grouped about the upper end of the controller-cylinder and supported upon the cap-plate, a disk supported from said cap-plate below said series of resistances, a series of contacts on said disk electrically connected to said series of resistances, and a contact-finger carried by the controller-cylinder and arranged to engage with said series of contacts.

4. In a controller, a casing having a removable cap-plate, a movable controller member supported in said casing and journaled at one end in the cap-plate, stationary contacts coöperating with said controller member, a series of resistances grouped about said controller member above the stationary contacts and secured to said cap-plate, a member provided with a series of contacts in electrical connection with said resistances also supported from the cap-plate, and a contact-finger upon said movable controller member arranged to engage with the contacts of said series of contacts.

5. In a controller, a casing having a removable head, a controller-cylinder supported in said casing and journaled at one end in said head, a series of resistances grouped about said cylinder and supported on said head, a member supported on said head and having a series of contacts in electrical connection with said series of resistances, and complementary contacts coöperating with the contacts on said member and with the controller-cylinder.

6. In a controller, a casing having a removable head, a controller-cylinder supported in said casing and journaled in said head, an armature resistance supported upon said cylinder adjacent said head, a disk having a series of contacts supported by said head, a series of field resistances grouped about said armature resistances between said disk and the said head and in electrical connection with the contacts on the disk, segments on the controller-cylinder connected to said armature resistance, and contacts coöperating with the contacts on the said disk and with the controller-segments.

7. In a controller, a casing having a removable cap-plate, a controller-cylinder within said casing and journaled at one end in said cap-plate, an armature resistance mounted on the end of the cylinder adjacent the cap-plate, contact-segments on the remaining portions of the cylinder some of which are connected to said armature resistance, a series of field resistances grouped

about said armature resistance and permanently supported on said cap-plate, a disk permanently supported upon said cap-plate adjacent the lower ends of the field resistances, contacts on said disk in electrical connection with said field resistances, fixed fingers coöperating with the controller-segments, and a finger carried by the controller-cylinder and arranged to be moved over the contacts on said disk.

In witness whereof I have hereunto set my hand this 4th day of June, 1906.

HAROLD E. WHITE.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.