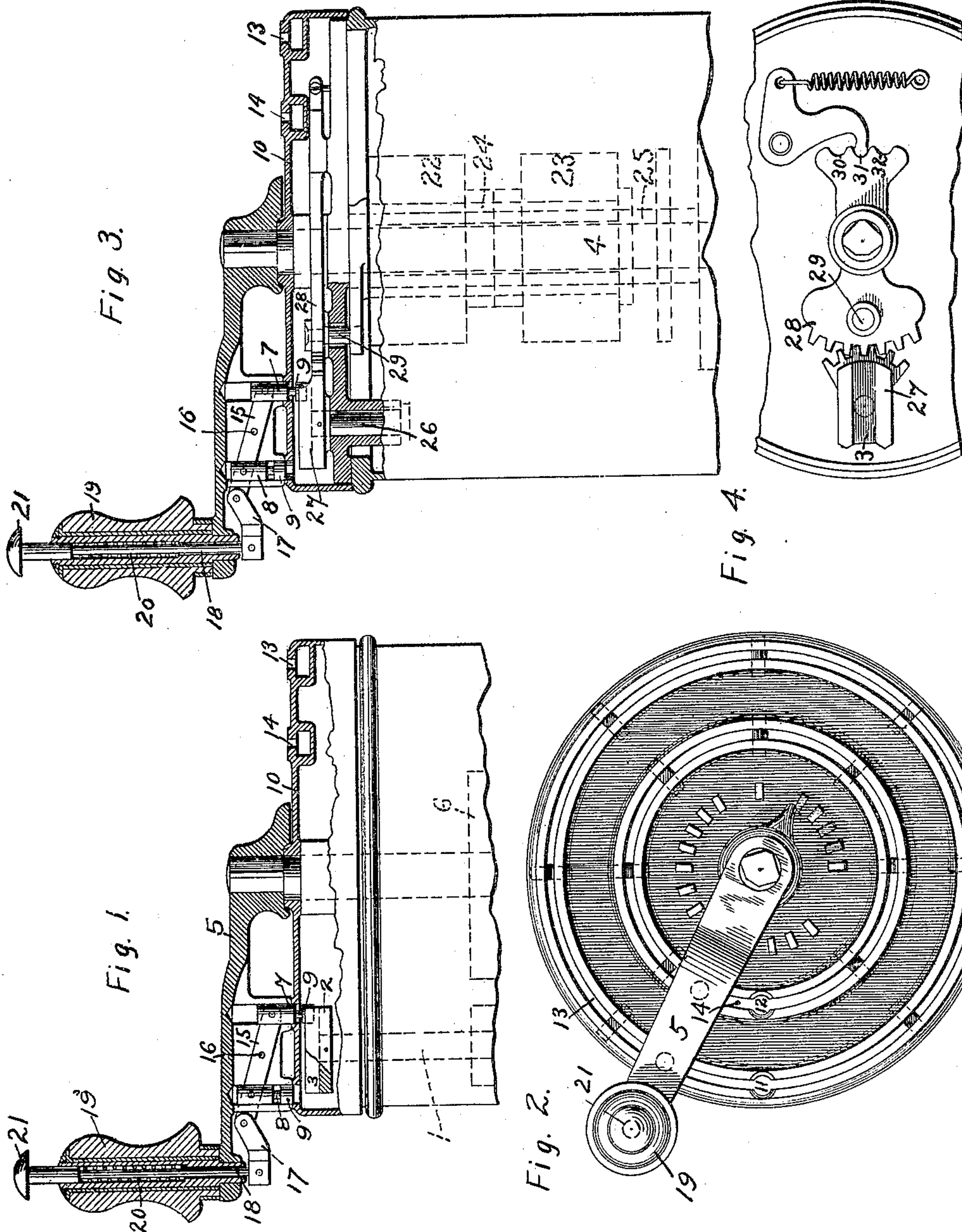


G. LAIRD & J. P. TODD.
CONTROLLER FOR ELECTRIC MOTORS.

APPLICATION FILED JULY 22, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

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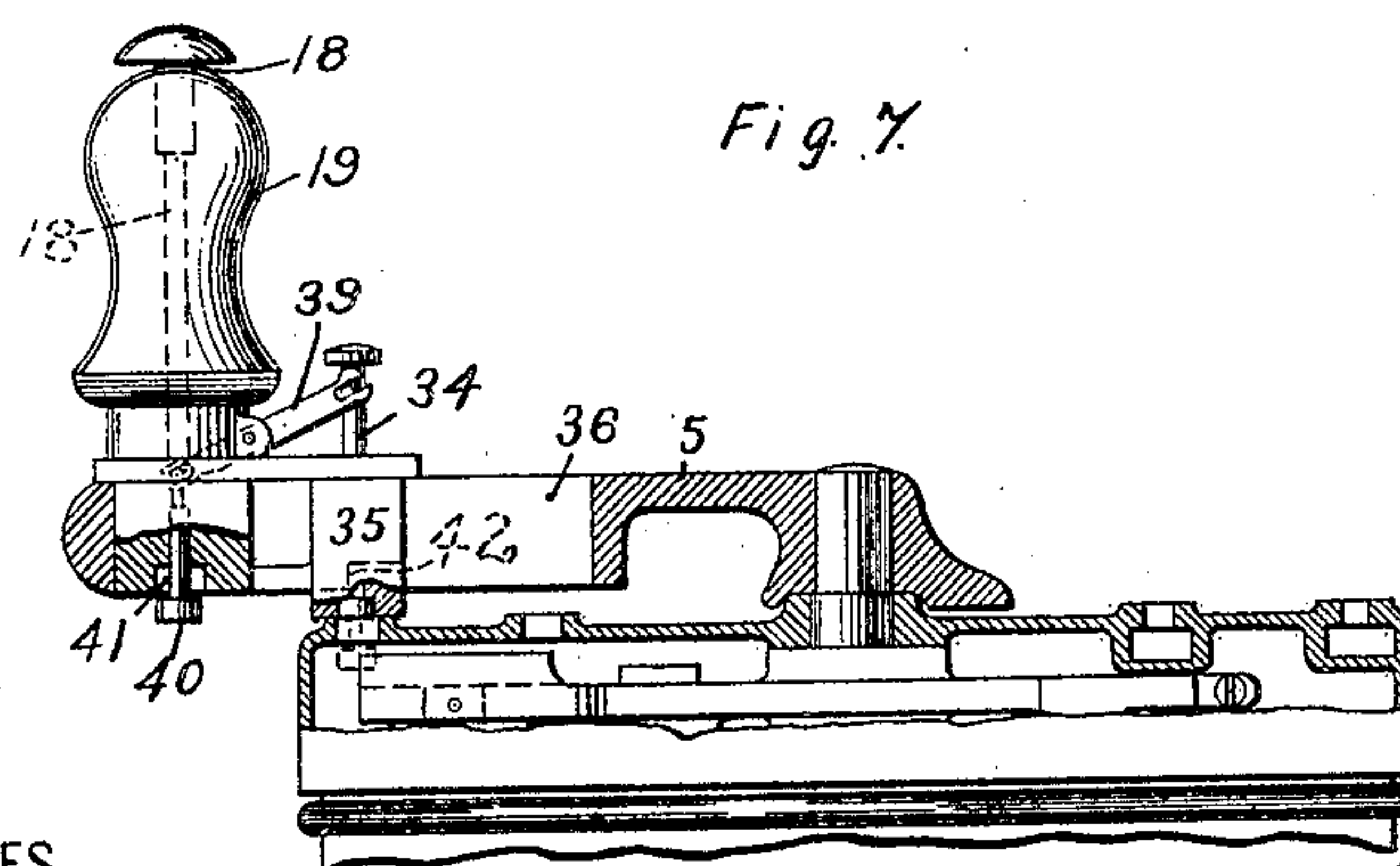
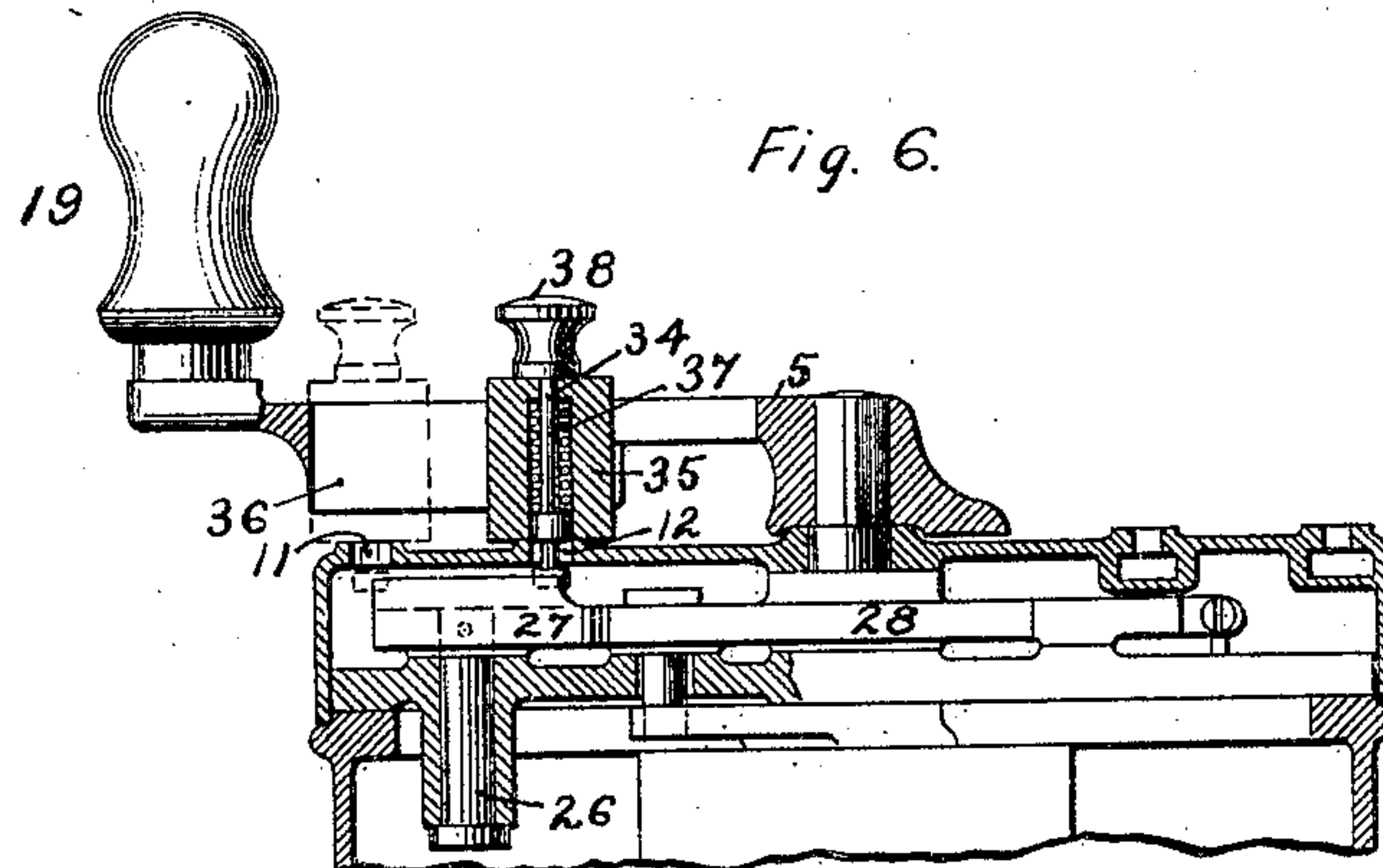
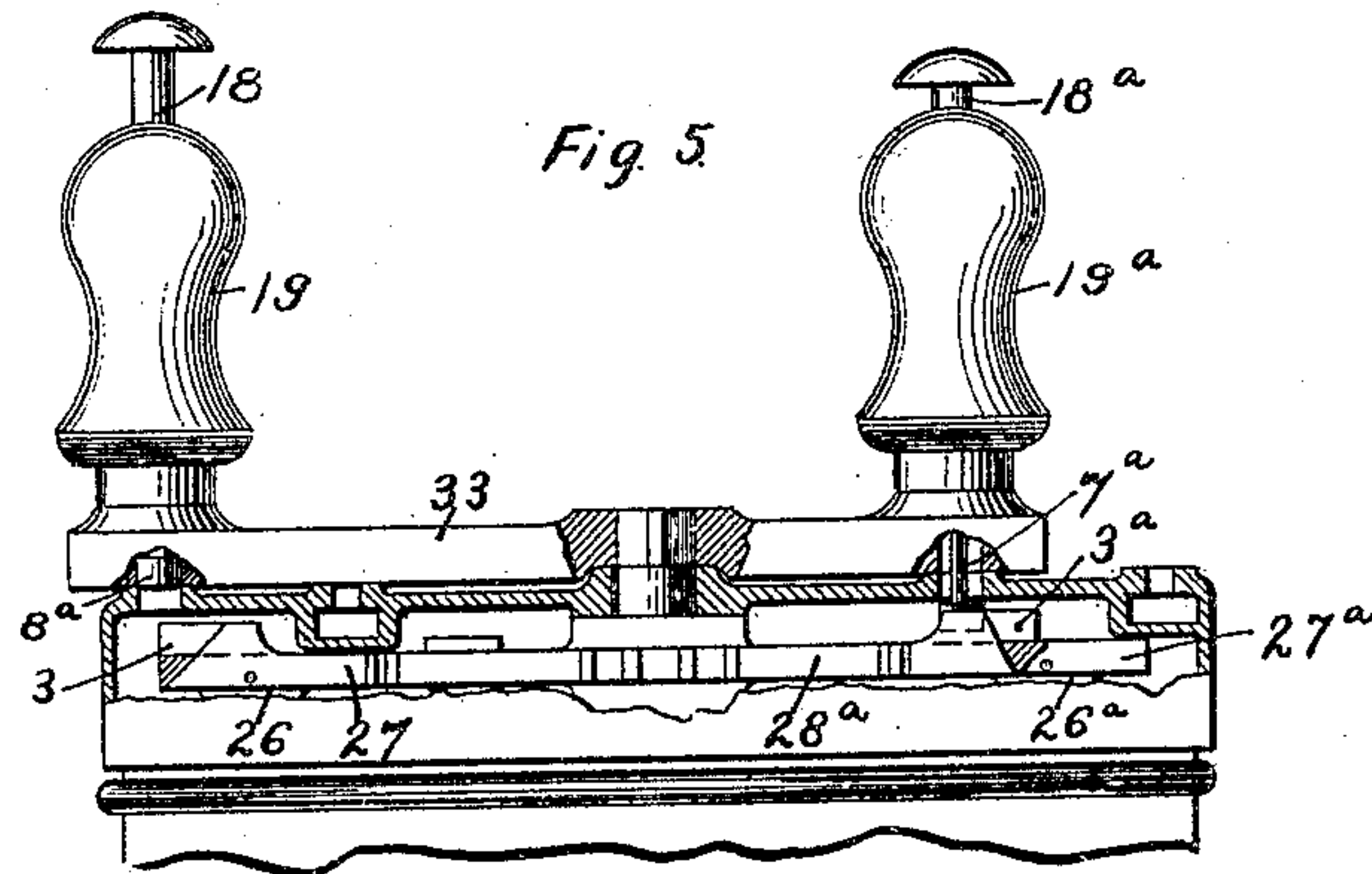
No. 798,190.

PATENTED AUG. 29, 1905.

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2 SHEETS—SHEET 2.



WITNESSES.

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UNITED STATES PATENT OFFICE.

GEORGE LAIRD AND JOHN PERCIVAL TODD, OF MANCHESTER, ENGLAND,
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CONTROLLER FOR ELECTRIC MOTORS.

No. 798,190.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed July 22, 1904. Serial No. 217,609.

To all whom it may concern:

Be it known that we, GEORGE LAIRD and JOHN PERCIVAL TODD, subjects of the King of Great Britain, and residents of Manchester, in the county of Lancaster, England, have invented a new and useful Improvement in Controllers for Electric Motors, of which the following is a specification.

This invention relates to controllers for electric motors of the kind in which switches are provided for varying the amount of resistance in the motor-circuits and where two or more motors are employed for connecting them either in series or in parallel, and separate switches are provided for changing the motor-circuits to effect reversals of motion. Controllers of this general character are now well known and are commonly provided with "braking" positions, as well as "power" or "running" positions. Heretofore separate levers have been used for controlling the positions of the "main" and "reversing" drums, suitable gearing being employed whereby the movement of the main controller-drum when passing from its power to its braking positions, or vice versa, will actuate the reverser-drum, according to the manner in which the latter has been set by means of its lever, so as to reverse the respective connections of the field-magnets and armatures of the motors. This is necessary in order that the motors when driven as generators by the momentum of the car may generate a braking-current in the braking positions of the controller.

The object of the present invention is to provide an improved arrangement for operating a controller of the kind described above, in which arrangement but a single lever is employed, suitable connections between said lever and the reverser drum or drums being provided, by means of which the latter will be rotated at will in the proper manner to secure the correct relation between the armature and field-magnets of the motor or motors for either "forward" or "backward" running or braking, the said lever being rotated in the same directions for power or braking whether the car or vehicle is moving forward or backward.

Many different arrangements may be devised by means of which the invention may be carried into effect.

In the accompanying drawings, Figure 1 is a view, partially in section and partially in elevation, of a portion of a controller, showing one arrangement for operating the reverser-drum in accordance with this invention. Fig. 2 is a plan view of the controller shown in Fig. 1. Fig. 3 is a view similar to Fig. 1, but illustrating a construction in which the reversing drums are concentric with the main-drum shaft. Fig. 4 is a plan view of a portion of the mechanism shown in Fig. 3. Figs. 5, 6, and 7 are views similar to Fig. 3, but showing modifications in the construction of the controlling-lever.

Referring to Figs. 1 and 2, the reversing-drum shaft 1 is provided with a head 2, in which is formed a groove 3, which groove when the several parts are in the "off" position is in alinement with the center of the main-drum shaft 4 and the reverser-drum shaft 1. A controlling-lever 5 for operating the main-drum 6 is provided with two pins or plungers 7 and 8, which when the lever 5 is in the off position can be alternately reciprocated, so as to enter the groove 3 in the head 2 of the reverser-drum shaft 1 on one or the other side of the center of said shaft, so that when the lever is moved in the one direction the shaft 1 is caused to rotate in either the one direction or the other, according to which of the two pins 7 and 8 has entered the groove 3. Each of the pins 7 and 8 is preferably provided with an enlarged head 9, which can be inserted through the top cover 10 of the controller and into engagement with the groove 3 when the lever 5 is in the off position by way of corresponding admission-holes 11 and 12, provided for that purpose in the cover 10, while the annular slots 13 and 14, with which the holes 11 and 12, respectively, communicate, are of only sufficient width to allow of the passage of the pins 7 and 8, and therefore prevent the heads 9 from passing out of the plane of the aforesaid groove 3 until the controlling-lever 5 is returned to the off position. When the lever 5 has been rotated a sufficient distance in either direction from the off position to rotate the reverser-drum shaft 1 to the necessary extent, the pin 7 or the pin 8, as the case may be, clears the groove 3 in the head 2 of the reverser-drum shaft 1, whereby the lever 5 may be moved to the several power and braking positions

without further movement of the reverser-drum. The pins 7 and 8 of the controlling-lever 5 may either each be operated independently against the action of a spring by means of separate handles provided on the controlling-lever 5 when it is desired to project the one or the other of the two pins into the groove 3, or, as shown, they may be coupled together by a lever 15, pivoted at 16. The lever 15 may be conveniently operated, for example, by a projecting arm 17, attached to the lower end of a rod 18, that is located in the handle 19 and is normally held in its outermost position by a spring 20, so that the pin 7 for forward running, for example, is normally in the groove 3 when the lever 5 is in the proper position for such engagement. When it is desired to run in the opposite direction, the pin 7 is withdrawn from the groove and the other pin 8 is projected into it by depressing a head 21, with which the rod 18 is provided. By this means the correct actuation of the controller for backward running or braking is obtained by merely operating the lever 5 with the head 21 of the rod 18 depressed.

Referring to Figs. 3 and 4, when the reverser-drums 22 23 are mounted concentrically with the main-drum shaft 4, they are detachably secured to a sleeve 24, capable of rotating freely either upon the shaft 4 or upon a boss 25, forming the top bearing for the shaft 4. The reverser-drum shaft is in this case replaced by a reversing or counter shaft 26, upon which is keyed a gear-segment 27, provided with a groove 3, and the reverser-drum sleeve 24 is caused to rotate by a gear-segment 28, either forming part of the sleeve 24 or, as shown, revolving freely upon the main-drum shaft 4 and connected to the sleeve 24 by means of a pin 29, for example. When a single reverser-drum only is used, the sleeve 24 may be dispensed with and the drum mounted freely on the main-drum shaft 4, the gearing in connection with the reverser-drum shaft being secured to the reverser-drum. The segment 28 affords a convenient structure upon which the usual reverser-drum detents 30 31 32 may be placed.

Referring now to Fig. 5, when it is desired to reverse by separate handles on the controlling-lever they may be arranged diametrically opposite to each other on a double-ended controlling-lever 33, so that the respective directions of rotation for power and braking are the same irrespective of the direction of travel of the vehicle. This result is obtained by providing a second reversing-shaft 26^a with a gear-segment 27^a, having a groove 3^a, each of the segments 27 and 27^a being geared to a double-gear segment 28^a on the main-drum shaft and the pins 7^a and 8^a being caused to enter their respective grooves 3^a and 3 by depressing corresponding rods 18 and 18^a in the respective handles 19 and 19^a.

In Fig. 6 we have shown a single pin 34 so arranged in the controlling-lever 5 that it may be transferred at will when the said lever is in the off position from the admission-hole 11 to the hole 12, and vice versa. The pin 34 is located in a block 35, that is adjustably mounted in a slot 36 in the controlling-lever 5 and is normally caused to protrude by a spring 37, so as to engage with the groove 3 in the head of the reversing-drum shaft or, as shown, in the segment 27 of the reversing-shaft 26. When it is desired to reverse the motors, the pin 34 may be raised by a knob 38 or other suitable device against the action of the spring 37, whereupon the block 35 may be transferred from the position shown in full lines to that indicated by dotted lines, so that when the knob 38 is released the pin 34 will pass through the hole 11 and enter the opposite end of the groove 3.

As shown in Fig. 7, the handle 19 of the controlling-lever 5 may slide in a slot 36 in the said lever and be locked in either the forward or the backward position. In this case the block 35 may be attached to or form a portion of the handle 19, and the pin 34 may be raised against the action of spring 37 by a lever 39, operated by a rod 18, passing through the center of the handle 19. To the lower end of the rod 18 is attached a locking-bar 40, which engages with notches 41 and notches 42 for the backward and forward positions, respectively, so that when the pin 34 is raised by depressing the rod 18 the locking-bar 40 will be removed from the corresponding notch in the lever 5, and both handle 19 and pin 34 may be transferred from the one position to the other.

Obviously the same or a similar result may be achieved by constructions other than those described and shown, these being merely illustrative of several ways in which the invention may be carried into effect, and all such modifications are within the scope of the invention.

The various contact-making devices of the controller and the circuit connections thereof may be arranged in any well-known and convenient manner.

We claim as our invention—

1. In a controller for electric motors, the combination with a main drum and a reversing switch-drum, of a single operating-lever having means for so adjusting its connection with the reversing switch-drum that a one-way movement of the lever may effect rotation of said drum in either direction.

2. In a controller for electric motors, the combination with a main drum and a reversing switch-drum, of a single operating-lever, actuating connections supported by said lever and means supported by the lever for adjusting said connections to effect reverse movements of said drum by a one-way movement of the lever.

3. In a controller for electric motors, the combination with a main drum and a reversing switch-drum having a shaft provided with a grooved head, of a single operating-lever 5 having two actuating-pins and means for moving either of said pins into the groove in said head and for simultaneously withdrawing the other pin.

4. In a controller for electric motors, the 10 combination with a main drum and a reversing switch-drum, of a grooved head connected to the reversing switch-drum, a single operating-lever and an actuating device supported thereby and movable to engage either end of 15 the groove in the head according to the direction of movement desired for the reversing switch-drum.

5. In a controller for electric motors, the combination with a main drum and its oper- 20 ating-handle, of a reversing drum, a grooved head connected thereto and means for connecting said operating-handle with said grooved head at either side of its axis of rotation.

25 6. In a controller for electric motors, the combination with a main drum and its operating-handle, of a reversing drum, a rotatable, grooved head operatively connected to said reversing drum and means for making 30 and breaking connection between the operat-

ing-handle and said grooved head at either side of its axis of rotation.

7. In a controller for electric motors, the combination with a main drum and an operating-handle therefor, of a reversing drum, a 35 grooved, rotatable head operatively connected to said reversing drum, one or more plungers supported by said operating-handle and means for moving the same into and out of the groove in said head at either side of its 40 axis of rotation.

8. In a controller for electric motors, the combination with a main drum and an operating-handle therefor, of a reversing drum, a grooved head connected thereto, a casing 45 having a cap provided with two concentric annular slots each of which is enlarged at one point, two plungers mounted in the operating-handle and means for moving said plungers alternately through the respective en- 50 larged portions of said annular slots into the groove in said head at opposite sides of its axis of rotation.

In testimony whereof we have hereunto subscribed our names this 23d day of June, 1904. 55

GEORGE LAIRD.

JOHN PERCIVAL TODD.

Witnesses:

JNO. R. THORNHILL,

JAS. STEWART BROADFOOT.