

No. 850,443.

PATENTED APR. 16, 1907.

A. PEDERSEN.
MOTOR CONTROLLER.
APPLICATION FILED AUG. 16, 1905.

2 SHEETS—SHEET 1.

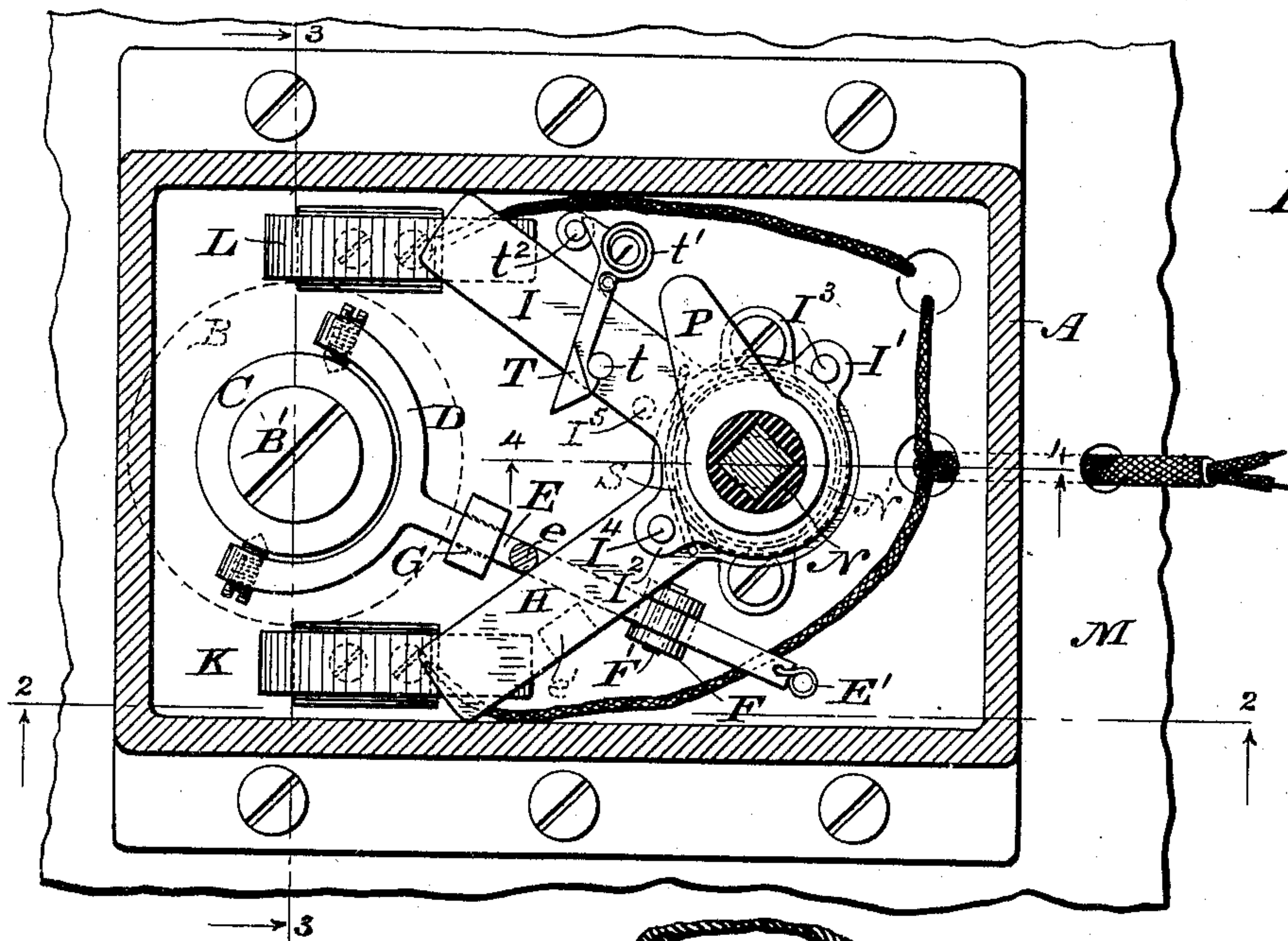


Fig. 1.

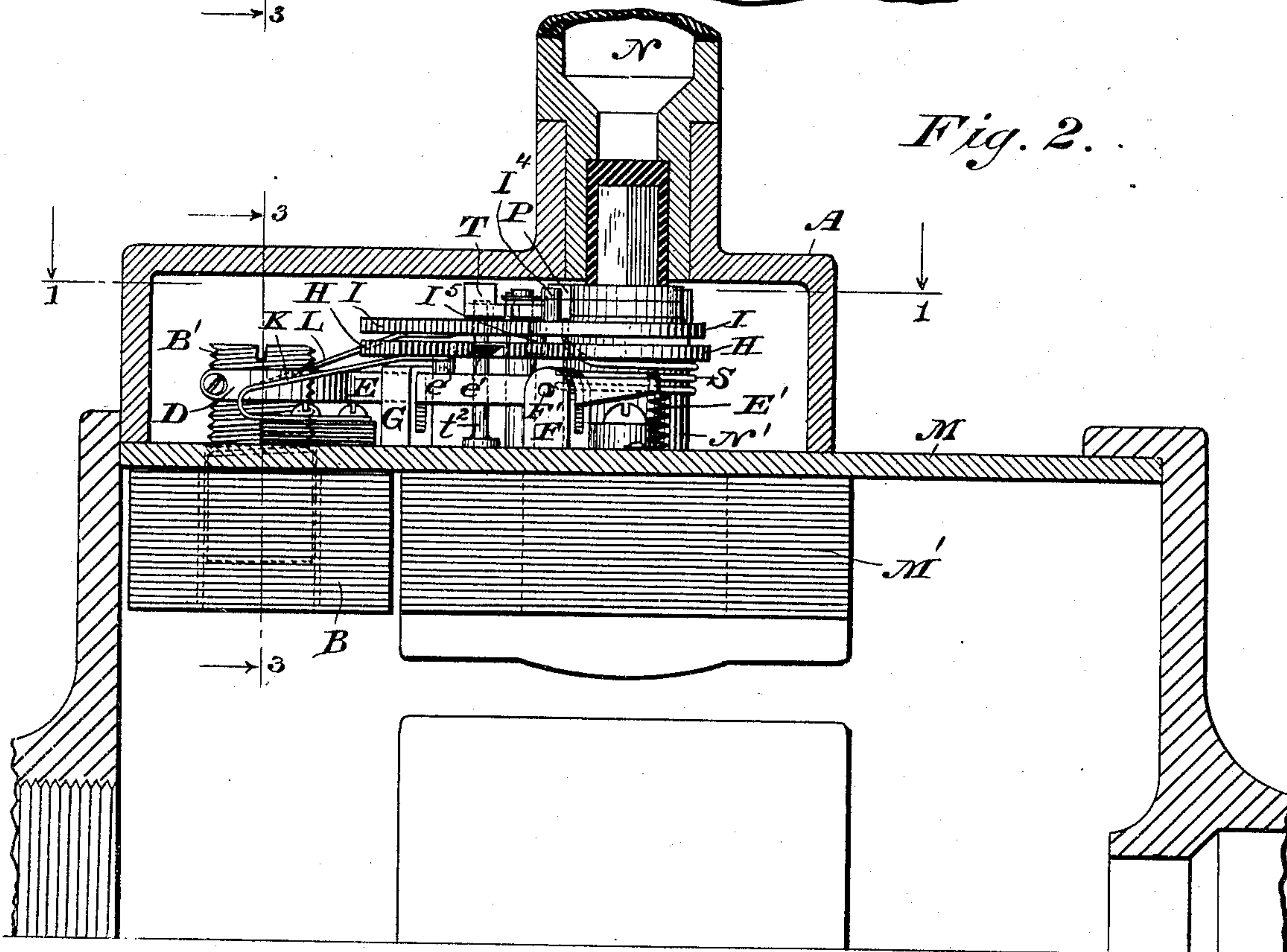


Fig. 2.

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MOTOR-CONTROLLER.

No. 850,443.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed August 16, 1905. Serial No. 274,397.

To all whom it may concern:

Be it known that I, ADOLPH PEDERSEN, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Motor-Controllers, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

My invention relates to motor-controllers; and its object is to supply such a device that shall be especially adapted for use upon small motors, such as are employed in portable electrical drills and analogous machines.

Said invention consists of means hereinafter fully described, and specifically set forth in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure 1 represents a horizontal section of my improved motor-controller, taken upon the plane designated by the line 1 1, Figs. 2, 3, and 4. Fig. 2 represents a vertical section thereof, taken upon the plane indicated by the line 2 2, Figs. 1 and 3, in combination with a portion of the casing of a portable drill and the field structure of a multipolar series-wound constant-potential electric motor. Fig. 3 represents a vertical section taken upon the plane designated by the line 3 3, Figs. 1 and 2. Fig. 4 represents a vertical section taken upon the plane designated by the line 4 4, Fig. 1; and Fig. 5 is a diagram illustrating the circuit and connections.

My invention is designed to be an improvement upon the motor-controller set forth in my pending application for United States Letters Patent, Serial No. 262,368, filed May 26, 1905, the modifications and changes from the structure there disclosed being made with the purpose of producing an equally-efficient controller that shall be adapted for use on lighter machines. Thus the motor-controller described in the above application is found to be unduly cumbersome when applied to drills weighing less than thirty

pounds, whereas the device shown in this application is constructed so simply and of such light material as to be capable of being affixed to a machine weighing from five to thirty pounds without adding perceptibly either to its weight or compass, and at the same time its control is equally effective in its operation. Said invention is adapted for use in a great many situations; but it is especially serviceable as applied to electrical drills. Accordingly I have shown it in the drawings in combination with a portable electrically-driven drill and shall now describe its construction and operation in such connection.

Upon the motor-frame M is mounted a casing A, within which the controller is incased, so that it is entirely outside the reach of the operator and cannot be tampered with either through ignorance or malice. Projecting within such controller-casing A and journaled in a block N' is the inner end of an operating-handle N. Rotatably mounted upon this inner end of handle N, but insulated therefrom, as clearly shown in Fig. 4, are two independent contact members or switch-blades H and I. These blades, while movable independently of each other, are nevertheless in contact with each other so as to form a continuous conductor.

Suitably insulated from the motor-frame M, upon which they are supported, are two contact-springs K and L, adapted to contact with switch-blades H and I, respectively, when they are positioned as shown in Fig. 1. Normally these blades are held in their "off" position intermediate of the contact-springs K and L by means of a helical spring S, which encircles the block N' and is secured at one end to blade H and at the other to blade I. To retain switch-blade H in its "on" position—i. e., in contact with spring K—an electrically-controlled device is provided. This device comprises, primarily, a solenoid B in circuit with the motor to be controlled and which, as shown, is mounted within the drill-casing, but which in other connections would be conveniently located behind the switch-board to which the controller would be attached.

Moving inside the solenoid B is a suitable core or plunger B', supported by a ring C, which in turn is held on trunnions D, formed on the bifurcated end of lever E. This lever

is pivoted upon a support F by means of a pin F', such support being mounted upon the motor-frame M. The pivotal movement of lever E is restricted by a fair-leader G, likewise mounted upon frame M. Normally plunger B' is held withdrawn from solenoid B as far as fair-leader G will permit by means of a helical spring E', attached to the other end. When lever E is in this position, a pin e on its upper surface engages switch-blade H in the manner shown in Fig. 5, and so holds it in its on position. It is evident from the description of this retaining device that upon the character of the current becoming such as to cause solenoid B to attract plunger B' with sufficient force to overcome spring E' switch-blade H will be released and under the influence of spring S will assume its normal off position. To similarly retain switch-blade I in its on position, a catch T, Figs. 1 and 5, is provided, being held in proper position to engage a lug t on the upper surface of blade I by means of a pin t' and coil-spring t'. To release switch-blade I, and thus allow it to assume its off position, a pointer P is rotatively attached to the inner end of handle N, being so shaped as in the course of its rotation to disengage catch T from pin t. This pointer is further utilized to return such switch-blades H and I to their on positions. To this end switch-blade I is provided with two laterally-extending ears I' and I'', from which project upwardly lugs I³ and I⁴, respectively. When blade I is in its off position, it may accordingly be returned to its on position by swinging pointer P around until it engages lug I³, whereupon by further rotation in the same direction the blade I will be brought into engagement with catch T. Similarly when blades H and I are both in their off positions if pointer P be swung in the opposite direction it will engage lug I⁴, and upon further rotation a lug I⁵, projecting downwardly from blade I, which lies over blade H, will engage blade H and carry it into engagement with lug e on lever E. To facilitate such engagement, the portion of blade H which is thus brought in contact with lug e is beveled on its under surface, as shown at e', Figs. 1 and 5. The sides of the controller-casing and the lug I⁵ prevent the switch-blades H and I from being pulled by the spring S beyond their central off position.

From the diagram shown in Fig. 5 the circuit can be traced very readily, as follows: from the connecting-cable through the positive terminal to the contact-spring K, switch-blade H, switch-blade I, contact-spring L, solenoid B, field-coils M', the commutator and negative terminal and thence out.

The operation of my controller is as follows: During the ordinary operation the

switch-blade I is utilized, said blade being thrown to its off position by means of the turning pointer P, which is manually operated to the left to engage the catch T and release the pin t therefrom, whereupon the switch-blade I is actuated to its off position by means of the spring S, this movement of the switch-blade I ahead of and independent of the pointer P resulting in the securing of a very quick-acting brake. The turning of the pointer P to the right will cause the same to engage with the pin I³, thus turning the switch-blade I so as to contact with the spring-contact L and at the same time permit the pin t to be engaged by catch T, the switch-blade H in the meanwhile remaining in its on position. Under excessive load the circuit is broken by means of the switch-blade H, said blade being thrown to its off position by means of the spring S when the flux of the solenoid reaches a quantity great enough to draw the plunger B' into the solenoid B, and thus release the switch-blade II from the pin e upon the lever E. The solenoid is previously adjusted so the amount of flux required to produce the above-described effect is less than the quantity that has been found dangerous to the operation and safety of the machine. The manner in which the switch-blade H is returned to its on position by means of the operating-pointer P has already been indicated, as has also the manner in which blade I is returned to its on position.

It will be noted from the above description and the accompanying drawings that the safety feature of my device is wholly automatic; that the starting and stopping are wholly controlled through the switch-blade I except when the magnetic flux of the motor becomes excessive, when the break is occasioned by the throwing of the switch-blade H to its off position, and, farther, that the reestablishment of the contact between the switch-blade H and spring-contact K cannot be effected without first throwing the contact-blade I out of contact with the spring-contact L.

In addition to differences from the device shown in the aforementioned application that are readily apparent upon a perusal of the foregoing description I desire to call attention to the fact that in this device the action of the solenoid is not assisted by the magnetic flux of the field, but is energized entirely by the strength which it derives from the current, whereas in my former application the solenoid has been shown as secured to the back of one of the field-magnets, and hence has been assisted in its attraction of the plunger B' by the magnetic flux of such field-magnet.

This invention comprises a motor-controller of a very small type, and it would be

inconvenient, if not absolutely impossible, to locate the solenoid within the sphere of the field created by the motor.

The form of construction herein shown renders my device very exact and effective, inasmuch as any desired size and strength of solenoid may be used, and the quantity of flux that will be generated in the same can be accurately calculated for any given current. It will be further noted that I have provided a very convenient arrangement whereby one of the handles utilized for moving and guiding the drill or other machine is also utilized for operating the controller, although obviously separate handles might be used for these two purposes; that the operative can in no way hold or force the machine to the work over and above its adjusted capacity; that my improved motor-controller is, in effect, a simple safety-switch, and that it is very reliable, cheaply constructed, and readily applicable in any circuit as a substitute for a fuse.

Having thus described my invention in detail, that which I particularly point out and distinctly claim is—

1. In motor-controllers, the combination of a movable contact member; means for actuating the same; a second contact member mechanically retained in its "on" position; and manually-operable means adapted to release said second member from such mechanical retention whereupon the circuit is automatically opened, said latter means being also adapted to actuate said second member to its "on" position.

2. In motor-controllers, the combination of a movable contact member; means for actuating the same; a second contact member mechanically retained in its "on" position; and manually-operable means adapted to release said second member from such mechanical retention whereupon the circuit is automatically opened, said latter means being also adapted to actuate both of said contact members to their "on" position, respectively.

3. In motor-controllers, the combination of a movable contact member; means adapted to hold the same normally in a predetermined position; a second contact member mechanically retained in its "on" position; and manually-operable means adapted to release said second member from such mechanical retention whereupon the circuit is automatically opened, said latter means being also adapted to actuate said second member to its "on" position and said first member to positions other than said predetermined position.

4. In motor-controllers, the combination of a movable contact member; means adapted to hold the same normally in its "off" position; a second contact member mechan-

ically retained in its "on" position; and manually-operable means adapted to release said second member from such mechanical retention whereupon the circuit is automatically opened, said latter means being also adapted to actuate both of said members to their "on" positions, respectively.

5. In motor-controllers, the combination of a movable contact member; means adapted to hold the latter normally in its "off" position; a second movable contact member mechanically retained in its "on" position and adapted to move said first member to its "on" position; and a handle adapted to control the movements of said second member and to release the same from said mechanical retention.

6. In motor-controllers, the combination of a movable contact member; a second movable contact member mechanically retained in its "on" position and adapted to move said first member to its "on" position; means adapted to hold both of said contact members normally in their "off" positions; and a handle adapted to control the movements of said second contact member and to release the same from said mechanical retention.

7. In motor-controllers, the combination of two movable contact members, one of said members being electrically operated to break the circuit when a certain electrical condition therein is attained, and the other of said members being only manually operable to control the stopping and starting in normal operations; means tending to throw both of said members into their "off" position; means adapted to effect such manual operation, such latter means adapted to move said first member to its "on" position; and means adapted to effect such electrical operation.

8. In motor-controllers, the combination of two independently-movable contact members in series, one of said members being electrically operated to break the circuit when a certain electrical condition therein is attained, and the other of said members being only manually operable to control the stopping and starting in normal operations; means adapted to effect such electrical operation; and means adapted to effect such manual operation, the movement of said first member to its "on" position, after said electrical operation, being effected by said last-named means and resulting in the movement of said second member to its "off" position.

9. In motor-controllers, the combination of a movable handle; a pointer fixed thereon; two switches rotatable thereon; a solenoid in the motor-circuit, means connected with the core of the latter and adapted to retain one switch in its "on" position when said core is in its outermost position and to release the same upon the inward stroke of said core; a

catch adapted to retain the other switch in its "on" position, said pointer adapted to disengage said catch, means tending to throw both switches into their "off" positions, and
 5 lugs upon one switch, some of said lugs adapted to engage said pointer and others adapted to engage the other switch.

10. In motor-controllers, the combination of a movable handle; a pointer fixed thereon;
 10 two switches independently rotatable thereon; a solenoid in the motor-circuit; a lever connected with the core of the latter and provided with means adapted to retain one switch in its "on" position when said core is
 15 in its outermost position, a predetermined flux in the solenoid-field adapted to effect the inward stroke of its core whereby said switch is released; a catch adapted to retain the other switch in its "on" position, said
 20 pointer adapted to disengage said switch from said catch; a retractile spring tending to throw both switches to their "off" positions; a lug upon said second switch adapted to engage and move said first switch; and lugs
 25 upon said second switch adapted to be engaged by said pointer.

11. In motor-controllers, the combination of two switches; manually-operable means for actuating one of said switches, said switch
 30 having a movement independent of said actuating means, the other of said switches adapted to be moved to its "on" position when said first switch is moved to its "off" position.

12. In motor-controllers, the combination of two switches; manually-operable means for actuating one of said switches, said switch
 35 having a movement independent of said actuating means; electrically-controlled means for operating the other switch to its "off" position; and means for actuating said latter switch to its "on" position.
 40

13. In motor-controllers, the combination of two switches; manually-operable means
 45 for actuating one of said switches, said switch having a movement independent of said actuating means; and electrically-controlled means for operating the other switch to its "off" position, the actuation of said first
 50 switch to its "off" position effecting the actuation of the second switch to its "on" position.

14. In motor-controllers, the combination of two switches; manually-operable means
 55 for actuating one of said switches, said switch having a movement independent of said actuating means; electrically-controlled means tending to operate the other switch to its "off" position; and means for actuating
 60 said latter switch to its "on" position.

15. In motor-controllers, the combination of two switches; manually-operable means for actuating one of said switches, said switch having a movement independent of

said actuating means; and electrically-controlled means tending to operate the other switch to its "off" position, the actuation of said first switch to its "off" position effecting the actuation of the second switch to its "on" position.
 70

16. In motor-controllers, the combination of two switches; manually-operable means for actuating one of said switches, said switch having a movement independent of said actuating means, the other switch being
 75 actuated to its "off" position only by means of a predetermined current; means controlled by said current for so actuating said second switch to its "off" position; and means for actuating said latter switch to its
 80 "on" position.

17. In motor-controllers, the combination of two switches; manually-operable means for actuating one of said switches, said switch having a movement independent of
 85 said actuating means, the other switch being actuated to its "off" position only by means of a predetermined current; means controlled by said current for so actuating said second switch to its "off" position, the actua-
 90 tion of said first switch to its "off" position effecting the actuation of the second switch to its "on" position.

18. In devices of the general character described, the combination of the motor and a
 95 suitable casing therefor; a controller supported upon said casing and comprising two movable switches; manually-operable means adapted to control the movements of one of said switches; and a solenoid mounted in
 100 said casing and adapted to control the movements of the other switch.

19. In devices of the general character described, the combination of the motor and a
 105 suitable casing therefor; a controller supported upon said casing and comprising two movable switches; manually-operable means adapted to control the movements of one of said switches for normal operations of the tool; and a solenoid mounted in said casing
 110 and adapted to control the movements of the other switch so as to enable the same to open the circuit when a predetermined electrical condition is reached therein.

20. In devices of the general character de-
 115 scribed, the combination of the motor and a suitable casing therefor; a controller-casing mounted upon said motor-casing; a handle for moving and guiding the tool; a pointer fixed to said handle; circuit-breaking means
 120 within said controller-casing, said pointer adapted to control the movements of said circuit-breaking means for normal operations; and a solenoid adapted to control the movements of said means so as to enable the same
 125 to open the circuit when a predetermined electrical condition is reached therein.

21. In devices of the general character de-

scribed, the combination of a motor and a
suitable casing therefor; a controller-casing
mounted upon said motor-casing; a handle
for moving and guiding the tool extending
5 exteriorly from within said controller-casing;
a pointer fixed to said handle within said con-
troller-casing; circuit-breaking means tend-
ing to hold the circuit open, said pointer
adapted to control the movements of said
10 circuit-breaking means for normal operations
of the tool; and a solenoid mounted in the
motor-casing and adapted to control the
movements of said circuit-breaking means so
as to enable the same to open the circuit
15 when a predetermined electrical condition is
reached therein.

22. In devices of the general character de-
scribed, the combination of the motor and a

suitable casing therefor; a controller-casing
mounted upon said motor-casing, a handle 20
for moving and guiding the tool and extend-
ing exteriorly from within said controller-cas-
ing; a pointer fixed to said handle within
said controller-casing; two movable switches,
said pointer adapted to control the move- 25
ments of one of said switches for normal oper-
ations of the tool; and a solenoid adapted to
control the movements of the other switch so
as to enable the same to open the circuit
when a predetermined electrical condition is 30
reached therein.

Signed by me this 7th day of August, 1905.

ADOLPH PEDERSEN.

Attest:

JNO. F. OBERLIN,
G. W. SAYWELL.