No. 844,701. PATENTED FEB. 19, 1907.

J. B. WANTZ.

ELECTRIC MOTOR.

APPLICATION FILED FEB. 23, 1906.

2 SHEETS—SHEET 1.

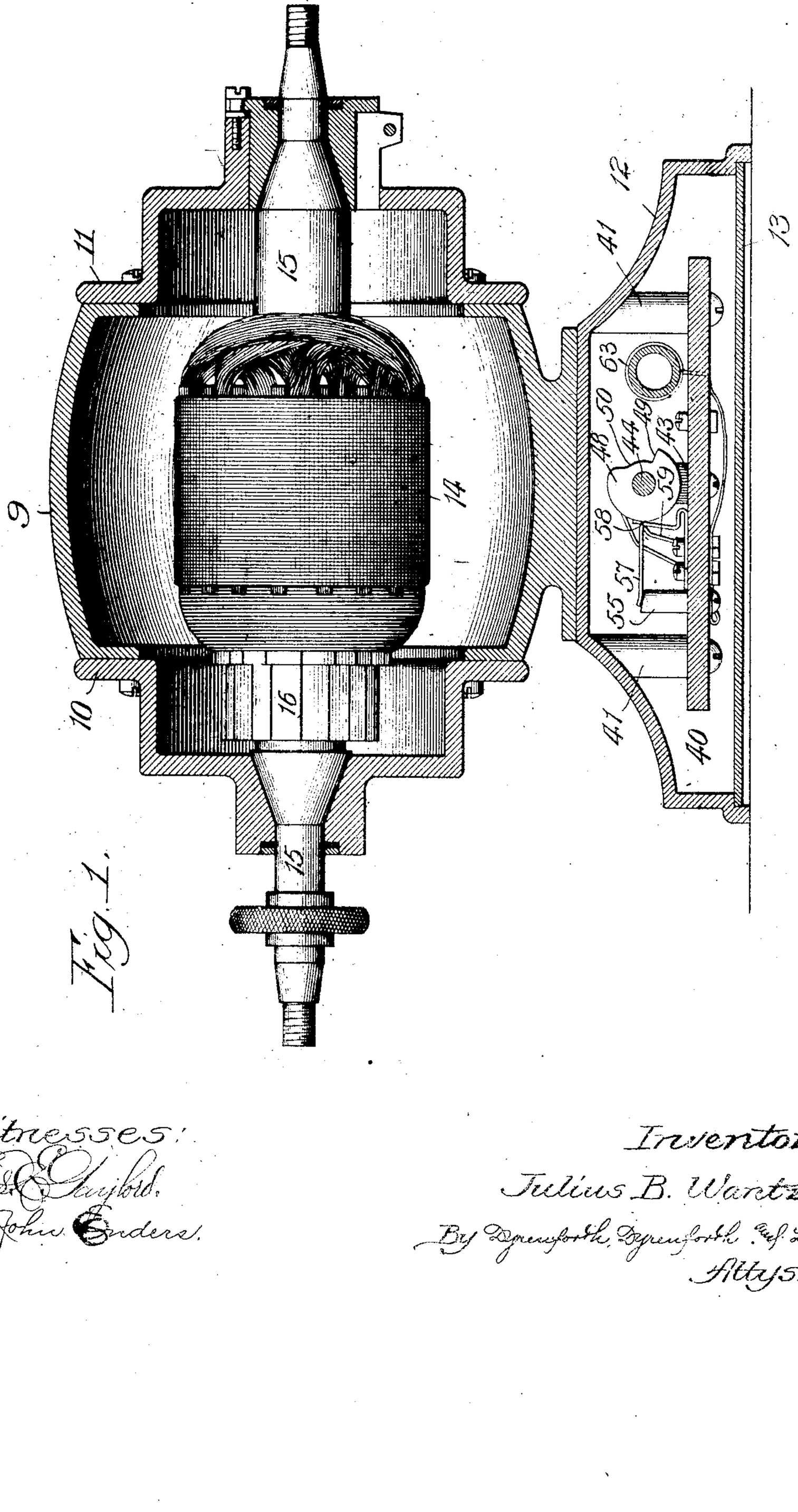


Fig. 1.

Witnesses:
Chas. C. Gaylord.
John Enders.

Inventor:
Julius B. Wantz.
By Dyrenforth, Dyrenforth & Lee,
Attys.

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2 SHEETS—SHEET 2.

Fig. 2.

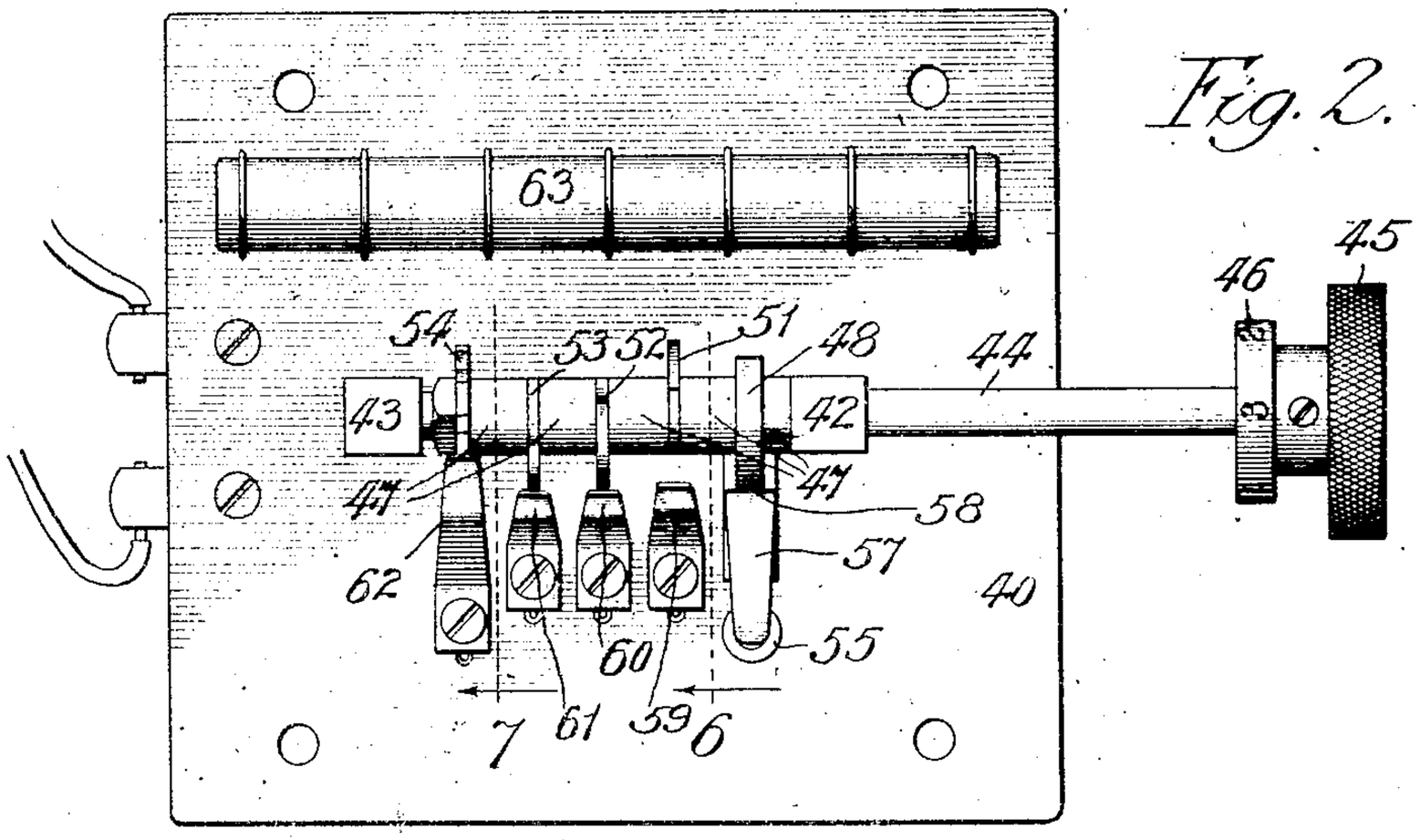



Fig. 3.

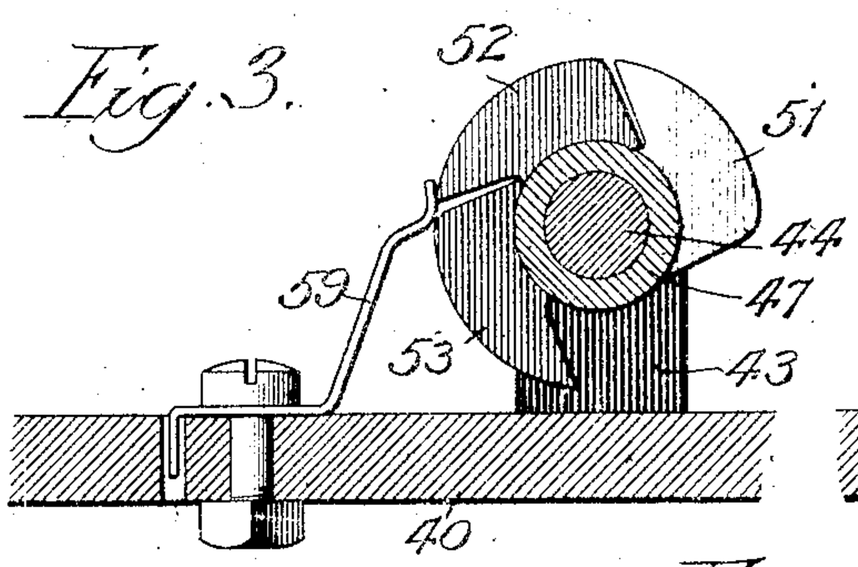



Fig. 4.

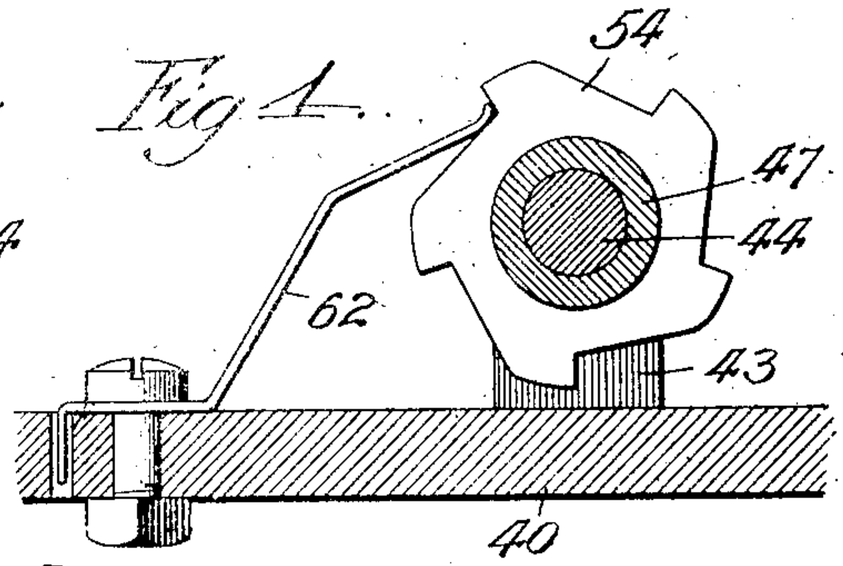
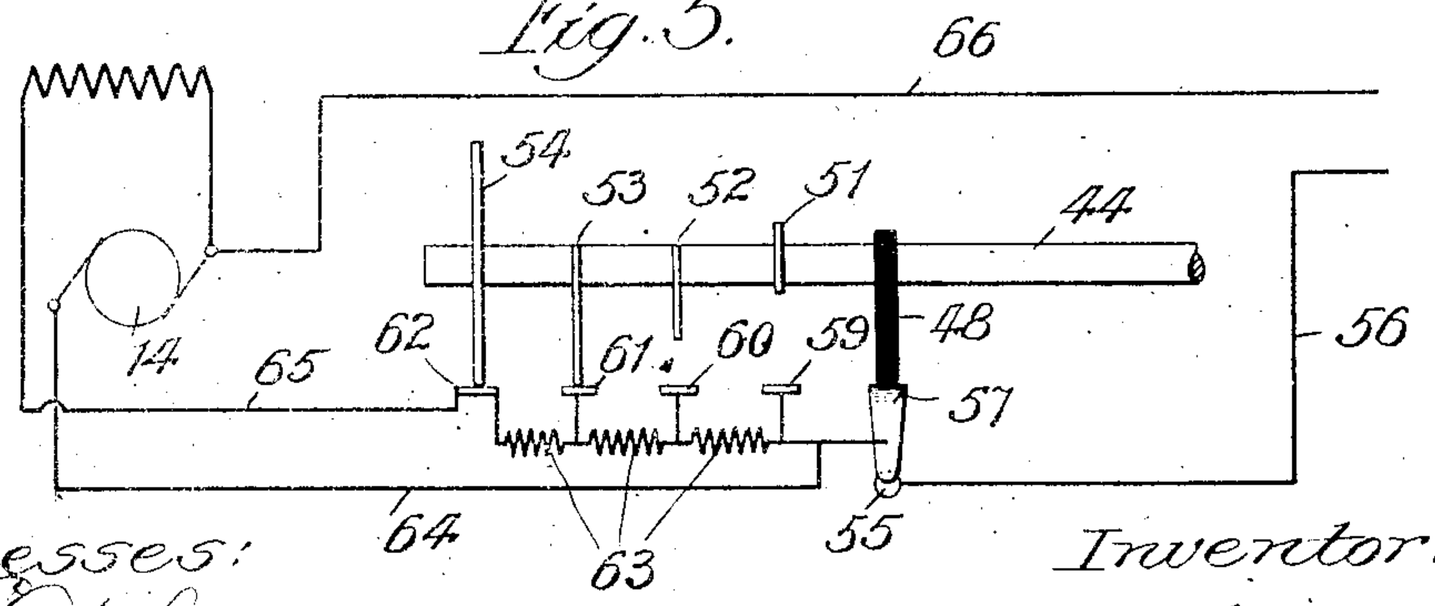



Fig. 5.

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# UNITED STATES PATENT OFFICE.

JULIUS B. WANTZ, OF CHICAGO, ILLINOIS, ASSIGNOR TO VICTOR ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## ELECTRIC MOTOR.

No. 844,701. Specification of Letters Patent. Patented Feb. 19, 1907.

Application filed February 23, 1906. Serial No. 302,462.

*To all whom it may concern:*

Be it known that I, JULIUS B. WANTZ, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Electric Motor, of which the following is a specification.

My object is to provide an electric motor of improved construction adapting it for the convenient use of dentists and others to operate flexible shafts or to hold grinding or buffing wheels or other attachments which it is desired to rotate at different speeds, according to the character of the work to be performed.

In carrying out my invention I provide the motor with improved speed changing and controlling switch mechanism.

In the drawings, Figure 1 is a vertical section through the device; Fig. 2, a plan view of the improved speed-controlling switch mechanism; Figs. 3 and 4, enlarged broken sections taken, respectively, on lines 6 and 7 in Fig. 2 and viewed as indicated by the arrows; and Fig. 5, a broken diagrammatic view of the switch mechanism, circuit, and resistance.

The motor has a close dust-proof shell consisting of the main or body portion 9 and ends or caps 10 and 11, fastened thereto with screws, as indicated. The body portion 9 would contain the field-magnets (not shown) and is mounted upon a hollow base 12, provided with a removable bottom plate 13. The armature 14 is upon an armature-shaft 15, carrying the commutator 16.

In the hollow base 12 is a platform 40, of slate or other insulating material, fastened by screws against depending lugs 41. Mounted on the platform are bearings 42 and 43 for a rotary shaft 44, which passes outward through the casing and is provided at its outer end with a thumb-wheel 45 and indicator-collar 46. Surrounding and secured to the shaft 44 between the bearings 42 and 43 are spacing sleeves or nuts 47, which clamp between them in the positions shown a cam 48, of insulating material, having an abrupt shoulder 49 and depressed portion 50, short cams or segments 51, 52, and 53, of conducting material, and a ratchet-wheel 54 of conducting material. The cams 51, 52, and 53 are fastened, as indicated, to extend at progressive angles, the cam 48 and ratchet-wheel 54 being mounted upon the shaft according to an arbitrary arrangement relative to the intermediate cams. On the platform is a contact-post 55, forming the terminal of a line-wire 56. 57 is a spring fastened by screws to the platform, as shown in Fig. 1, and having a shoulder 58 in the path of the cam 48. In the paths of the cams 51, 52, and 53, respectively, are contact-springs 59, 60, and 61, all mounted upon the platform, as shown, and also mounted upon the platform is a spring-contact dog 62, bearing against the ratchet-wheel 54. 63 is a resistance coil or tube. It is illustrated as a tube in Figs. 1 and 5 and by resistance-coils in the diagram Fig. 5 for purposes of illustration.

As shown most plainly in the diagram Fig. 8, the spring-contacts 57 and 59 are connected directly with a wire 64, leading to one brush of the motor, and the spring-contact 62 is connected with a wire 65, leading to the field of the motor. The contacts 57 and 59 are also connected to one end of the resistance 63, while the contact 62 is connected with the opposite end of the resistance. The contacts 60 and 61 are connected with the resistance at different points between its ends. When the shaft-rotating handle or thumb-piece 45 is turned to carry the abrupt shoulder 49 of the cam 48 (which cam is of vulcanized fiber or other insulating material) beyond the shoulder 58 of the spring 57, the said shoulder 58 springs into the recessed or depressed portion 50, thus breaking the contact between the said spring and the post 55. This breaks the current from the line-wire 56 to the motor. Turning of the shaft 44 to cause the contact or dog 62 to engage the next tooth of the ratchet 54 causes the first cam 51 to engage the contact 59 and the cam 48 to press the spring 57 upon the post 55. This causes the current from the wire 56 to pass through the post 55, spring 57, and wire 64 through the armature 14 and out to the line-wire 66. Current is at the same time shunted through the cam 51, shaft 44, ratchet 54, dog 62, and wire 65 through the motor-field to the line-wire 66. The effect of this first partial turning of the shaft is to close the direct and shunt circuits, but to cut no resistance into the shunt-circuit, and the motor will be caused to run at slow or first speed. Further turning of the shaft to cause the dog to engage the next notch of the ratchet 54

causes the cam 51 to release the contact-spring 59 and the next cam 52 to be brought into engagement with the contact-spring 60. This causes the shunt-circuit to pass over the contact-spring 57 through the first division of the resistance 63 to the contact-spring 60, thence through the cam 52, shaft 44, ratchet 54, and dog 62 to the field. The current thus weakened to the extent of the first division of the resistance 63 weakens the field-magnets accordingly and to that extent effects an increase in speed of rotation of the armature. Further turning of the shaft to cause the dog 62 to engage the next tooth of the ratchet 54 causes the cam 52 to release the contact-spring 60 and the cam 53 to engage the contact-spring 61. This cuts in two divisions of the resistance 63, and consequently increases the speed of rotation of the armature accordingly. Still further turning of the shaft 44 until the dog 62 engages the next tooth of the ratchet 54 causes the cam 53 to disengage the contact 61, whereby the entire resistance is cut in, the shunt-current passing from the spring 57 through the resistance to the motor-field, thereby weakening the latter to an extent which causes the armature to rotate at the highest speed, according to the well-known laws governing changes of speed brought about in the manner stated. In the final partial turning of the shaft to cause the dog 62 to engage the next tooth of the ratchet 54 the abrupt shoulder 49 of the cam 48 passes the shoulder 58 of the contact-spring 57, permitting said contact to spring suddenly out of engagement with the terminal 55, and thus break the circuit and stop the motor.

It will be understood from the foregoing description that the shaft 44 can be turned in but one direction, and each tooth of the ratchet marks a change in operation. In breaking the circuit the contact-spring jumps with such speed from the terminal while the dog is leaving one tooth of the ratchet for another that no spark will be drawn by the contact-spring. In fact, in the operation of my improved switch device the danger of spark-drawing is entirely eliminated.

What I claim as new, and desire to secure by Letters Patent, is—

1. The starting and stopping switch device for an electric motor comprising in combination a rotary shaft, a line-wire terminal, a normally open contact-spring movable into and out of engagement with said terminal and from which extends a direct armature-circuit, and a motor-field shunt-circuit, a ratchet on the shaft, and a dog coöperating therewith both included in the shunt-circuit, and a cam on the shaft shaped and movable to close said spring against said terminal and to permit sudden circuit-breaking resilience of the contact-spring.

2. The starting, stopping and speed-changing switch device for an electric motor, comprising in combination a rotary shaft, a line-wire terminal, a normally open contact-spring movable into and out of engagement with said terminal and from which extends a direct armature-circuit and a motor-field shunt-circuit, a ratchet on the shaft and a dog coöperating therewith both included in the shunt-circuit, a cam on the shaft having an abrupt shoulder and engaging said contact-spring with the terminal until said shoulder clears said contact, a resistance coöperating with said shunt-circuit, and contact-spring engaging and releasing cams on the shaft operating in series in the rotation of the shaft to cut in divisions of said resistance, substantially as and for the purpose set forth.

JULIUS B. WANTZ.

In presence of—
J. H. LANDES,
G. A. CHRITTON.