

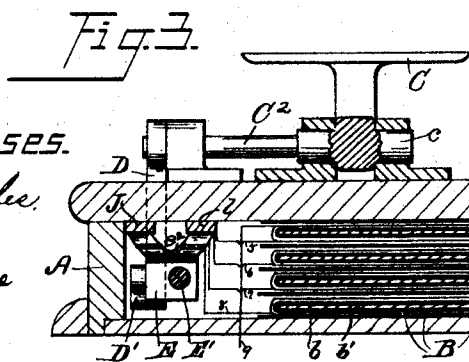
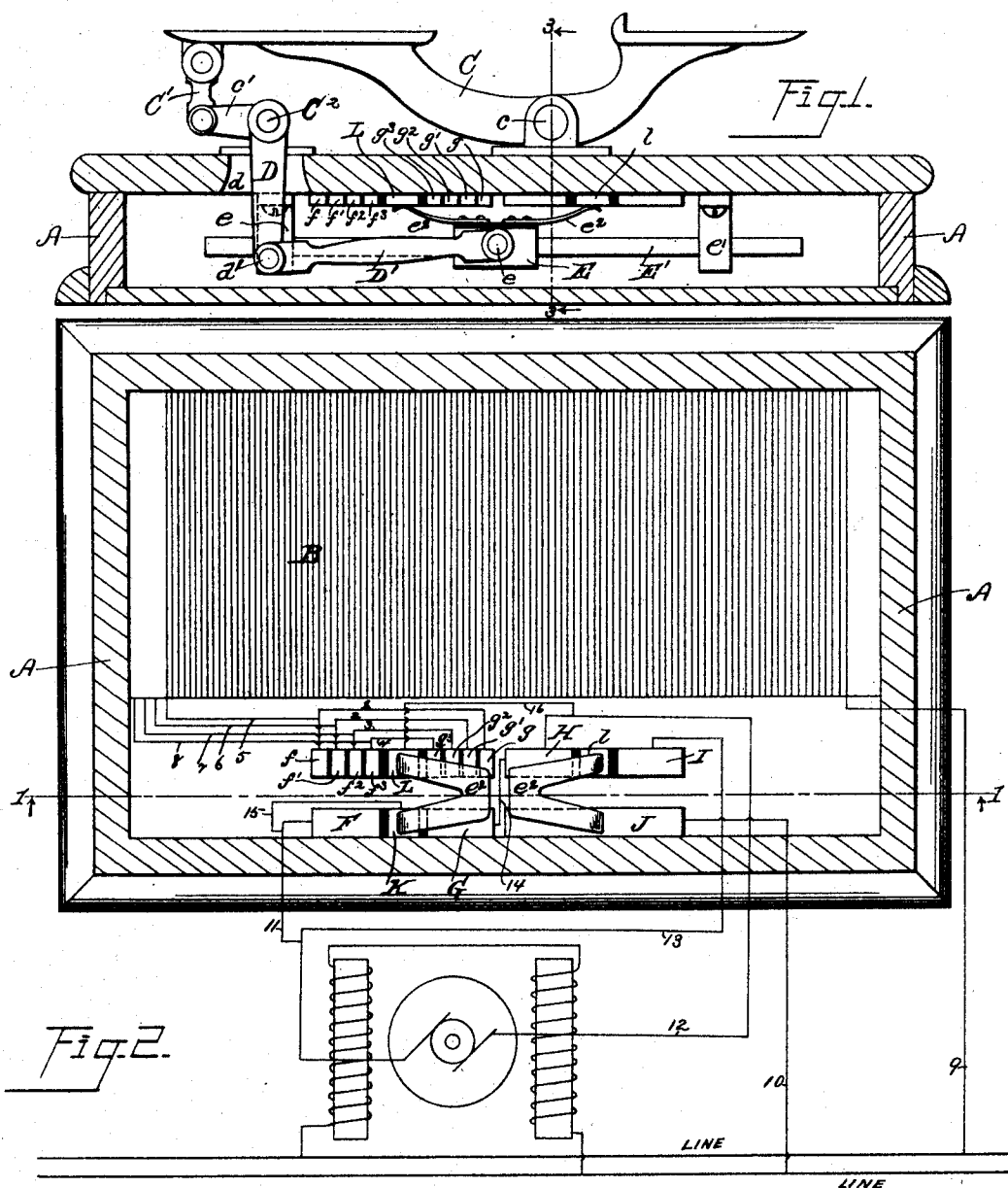
(No Model.)

E. F. RAMIEN.

# SWITCH FOR GOVERNING ELECTRIC MOTORS.

No. 505,063.

Patented Sept. 12, 1893.



*Witnesses.*

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# UNITED STATES PATENT OFFICE.

EDGAR F. RAMIEN, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO HORACE HOBBS, AUGUSTUS W. FRIESE, AND HENRY W. RAMIEN, OF SAME PLACE.

## SWITCH FOR GOVERNING ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 505,063, dated September 12, 1893.

Application filed April 8, 1893. Serial No. 469,543. (No model.)

*To all whom it may concern:*

Be it known that I, EDGAR F. RAMIEN, a citizen of the United States, residing at Milwaukee, county of Milwaukee, State of Wisconsin, have invented a certain new and useful Improvement in Switches for Governing Electric Motors; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to new and useful improvements in switches for governing electric motors, and consists in the matters hereinafter described and pointed out in the appended claims.

In the accompanying drawings illustrating my invention Figure 1. is a vertical longitudinal sectional view of a device embodying my invention, said section being taken on line 1—1 of Fig. 2. Fig. 2. is a view illustrating in diagram, the arrangement of the variable resistance, together with its connections with the switch and with the motor. Fig. 3 is a vertical transverse sectional view taken on line 3—3 of Fig. 1, and illustrating the arrangement of the resistance coils within the casing.

Referring by letter to said drawings, A represents a suitable casing, which may be of any desired shape, but is conveniently made in the form shown, and within which the coils of the variable resistance, together with the switch mechanism, are located. The resistance coils B B, are conveniently made in the form shown in Figs. 2 and 3, said coils being each composed of resistance wire wound upon a flat support, formed from a suitable sheet *b*, of insulating material, such, for instance, as asbestos paper or the like, which is arranged upon or around a sheet *b'*, of stiffening material, such, for instance, as sheet iron or the like. These resistance coils are arranged within the casing A, so as to extend lengthwise thereof, but so as to leave a longitudinal space adjacent to one side of the casing, for the reception of the contact pieces and the switch mechanism. Any desired number of resistance coils may be employed, and said coils

are conveniently arranged one upon another, in the manner shown in Fig. 3.

A foot treadle C is pivotally supported as at *c*, upon a suitable block secured to the top of the casing A, and a link C' connects one end of said treadle C with a crank arm *c'* fast on a horizontally disposed shaft C<sup>2</sup> which is journaled in suitable supports upon the top of said casing. A depending arm D, is likewise secured at its upper end to said shaft C<sup>2</sup> and extends downwardly through a slot *d* in the top of the casing, and is engaged at *d'* with a connecting rod D', and a block E is pivotally connected at *e*, with the other end of said connecting rod and arranged to slide upon a longitudinal rod E' which is mounted upon suitable hangers *e' e'*, and a pair of contact springs *e<sup>2</sup> e<sup>2</sup>* are carried by, but insulated from the sliding block E and also insulated from each other.

Suitable elongated contact pieces F and G are arranged in any convenient manner within the longitudinal space at the side of the casing A, being preferably secured to the top piece of the said casing, and parallel with but at some little distance from said contact pieces F and G, are arranged respectively two series of smaller contact pieces *f f' f<sup>2</sup> f<sup>3</sup>* and *g g' g<sup>2</sup> g<sup>3</sup>*, in the manner shown in the drawings. The series of contact pieces *f f' f<sup>2</sup> f<sup>3</sup>* is arranged to take up exactly the same space lengthwise of the casing as the larger contact piece F, and is also arranged exactly opposite said contact piece F, while the series of small contact pieces *g g' g<sup>2</sup> g<sup>3</sup>* is similarly arranged with respect to the larger contact piece G.

As illustrated in diagram in Fig. 2, the contact pieces *f* and *g* are connected together by a wire 1, contact pieces *f'* and *g'* by a wire 2, contact pieces *f<sup>2</sup>* and *g<sup>2</sup>* by a wire 3, and contact pieces *f<sup>3</sup>* and *g<sup>3</sup>* by a wire 4. A wire 5 connects one end of one of the resistance coils B, with wire 1, a wire 6 similarly connecting the next coil B with wire 2, a wire 7 connecting the third coil B with wire 3, and a wire 8 connecting the fourth or last coil B with wire 4. The several coils are connected together in series in a familiar manner, and a wire 9 leads from one of the line wires of

an electric circuit to the end of the first coil B opposite to the end with which the wire 5 is connected. The contact springs carried by the sliding block E' are arranged to extend across the space between the contact pieces F and G and the smaller contact pieces opposite thereto, and as shown in Fig. 2 of the drawings, more particularly, said springs are bifurcated so as to afford greater elasticity, and insure a perfect contact of the ends of said springs with the respective contact pieces at all times. A contact piece H and another piece I, similar in size and arrangement to the pieces F and G are arranged in the path of the other contact spring  $e^2$ , and a contact piece J is arranged parallel thereto and so as to extend the entire length of the pieces H and I, and is connected by a wire 10 with the other line wire of the electric circuit.

In connecting the device with an electric motor, the field magnets are connected with the line wires in the usual manner, and a wire 11 connects the contact F with one pole of the armature, while a wire 12 connects the contact H with the other pole of the armature. A wire 13 connects the contact I with wire 11, and a wire 14 connects contact G with contact H.

From the construction of the foot treadle and connected parts, it follows that by rocking said treadle upon its pivotal support, a longitudinal movement will be imparted to the block E' with its connected contact springs  $e^2$  in either direction according to the direction of movement of the treadle. Now, supposing that the operator depresses the heel end of the treadle, so as to bring the springs  $e^2$  respectively into engagement with the contacts F  $f^3$ , and H J: current from the line will enter through wire 9, traverse the entire series of coils B B, from thence passing by wires 8 and 4 to contact  $f^3$ , thence by spring  $e^2$  to contact F, and from thence by wire 11 to one pole of the armature, through the armature, back by wire 12 to contact H and thence by spring  $e^2$  to contact J, and out by wire 10 to the other line wire. In this condition, all of the resistance of the series of coils B B is in circuit, and hence the slowest speed of the motor is obtained. By operating the treadle to move the spring  $e^2$  into engagement with contact  $f^2$ , one coil of the resistance will obviously be cut out, the current however traversing precisely the same path as before, but the motor being given a correspondingly greater speed. In this way one after another of the resistance coils may be cut out, until by the time the spring rests on contact  $f^1$ , but one of the coils B will be in circuit, and the motor will have proportionately increased its speed, until the highest speed at which it is desired to run the motor is reached. Now, to reverse the motor, it is only necessary to operate the treadle so as to shift the springs into engagement with contact G and the series  $g$   $g'$   $g^2$   $g^3$  opposite, and contacts I J, respectively, when current trav-

erses the series of coils B B, or so many of them as are in circuit, and by the appropriate connecting wire to the small contact of said series upon which the spring rests, and thence by the spring, to contact G, thence by wire 14 to contact H, and by wire 12 to the other pole of the armature, through the armature and by wire 13 to contact I and thence by the other spring  $e^2$  to contact J, and finally out by wire 10 to the other line wire. By this change the motor will be reversed, and from the described connections of the two series of small contacts, it follows that when the springs approach the limit of movement in either direction the speed of the motor will increase, while a movement toward the center will obviously cause a corresponding decrease in speed.

As illustrated in Fig. 2, more particularly, I prefer to provide between the contacts F and G, a contact piece K and opposite to said contact piece K, a similar contact piece L interposed in like manner between the two series of smaller contact pieces, and similarly, between the contact pieces H and I, is interposed a blank  $l$ . The contact K is connected by a wire 15 with wire 11, and the opposite contact L is connected by a wire 16 with wire 12, so that when the spring rests on the two contacts K L, a circuit is established from the armature by wires 11 and 15 to contact K, thence by the spring to contact L and thence by wires 16 and 12 back to the armature.

Much trouble has been heretofore experienced in the operation of motors in which it is necessary to suddenly shut off or reverse the current, from the fact that when the current is cut off from the armature, the momentum of the armature causes it to revolve for a time, and it then runs as a dynamo and generates a counter current which is liable to heat or burn out the armature connections, but by establishing a circuit for this counter current generated by the armature in the manner described, at the instant when the main current is broken, the armature is brought to an instant stand-still by the opposition offered by said counter current to a further rotation of the armature, and this instantaneous stopping of the machine is effected without any heating of the armature or its connections.

By the described arrangement of the blank  $l$  opposite to the center of the contact piece J, so that at the instant that one of the contact springs moves into engagement with the contact pieces K and L, the other spring will engage with said blank  $l$ , a double pole break is afforded in the main circuit which traverses the armature. It will be seen furthermore, that the full current is traversing the field magnets at all times, the several resistance coils being placed in circuit from time to time with the armature only.

By my improved form of construction of the resistance coils and the switch mechan-

ism, I am enabled to locate the said coils and said switch mechanism entirely within the casing A, and to arrange said casing within an exceedingly small compass.

5 A further advantage gained by my improved construction is that all of the operating parts except the treadle and the horizontal shaft are entirely concealed and protected within the casing so as to be free from any liability to accident. By my improved construction, furthermore, I am enabled to make all of the connections except the two with the line wires and the two with the armature, entirely within the casing, and the entire device  
10 may be properly connected up at the shop and then put in operative connection with the motor, by simply attaching said wires to the line wires and the poles of the armature.

By my improvement, the necessity of employing any outside resistance medium, such as a lamp board with a number of lamps, together with the complicated and expensive cables and connections necessary in such case, is entirely obviated.

25 While I have described and shown my improved switch as applied to a shunt wound motor, yet I would have it understood that my said improvement is equally well adapted for use in connection with a series wound motor, if desired.

30 My improved device is at once simple in construction, efficient in its operation, and durable and not liable to accidental derangement.

35 Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The hereindescribed switch for regulating electric motors, comprising a suitable casing, a series of resistance coils within said casing, a series of contact pieces respectively in electrical connection with said resistance coils, other contact pieces electrically connected with opposite poles of the armature, a foot treadle and a connected traversing block carrying suitable contact devices and arranged to engage with said contact pieces to successively bring said resistance coils into or out of the circuit with the armature, substantially  
40 as described.

2. A switch for regulating electric motors, comprising a suitable casing, a series of resistance coils located within said casing, a series of contact pieces respectively in electrical connection with the said resistance coils, other contact pieces electrically connected with opposite poles of the armature, a treadle pivoted upon the casing, suitable hangers within the casing a longitudinal rod engaged with said  
50 hangers, a traversing block mounted upon said rod and operatively connected with said treadle, and suitable contact devices carried by said block and adapted to engage with said contact pieces to successively cut said resistance coils into or out of circuit, substantially  
65 as described.

3. The combination with a suitable casing

and a series of resistance coils therein, of a series of contact pieces double the number of the resistance coils and inversely connected in pairs with said coils, other contact pieces connected with armature of a motor, a traversing contact device adapted to successively engage with the contact pieces of said series and simultaneously with a pair of the last mentioned contact pieces, said latter contact pieces being so positioned within the casing as to cause the current to traverse the armature of the motor in one direction when the contact pieces of one end of the series are in circuit and in an opposite direction when the contact pieces at the opposite end of said series are in circuit, and a foot treadle movably supported upon the casing and operatively engaged with said traversing contact, substantially as described.

4. The combination with a suitable casing and a series of resistance coils therein, said coils being of a thin flat form and arranged one upon another and connected together in series, a series of contact pieces double the number of the resistance coils and inversely connected in pairs with the respective coils, those connected with the first coil of the series being located farthest apart, and those connected with the last coil of the series nearest together, a contact piece located between said latter pair of contacts and free from connection with any of said coils, other contact pieces arranged parallel with said first mentioned series of contact pieces and adapted for electrical connection with opposite poles of the armature of a motor, an intermediate contact arranged opposite to the first mentioned central contact and also free from connection with any of the coils of the resistance, electrical connections between these two intermediate contacts and opposite poles of the armature, and a traversing contact device within the casing, arranged to bring any desired one of the contact pieces of said series into electrical connection with the opposite one of the other contact pieces, substantially as described.

5. The combination with a suitable casing, of switch mechanism located within said casing, suitable means upon the outside of the casing for actuating said switch mechanism, and a plurality of resistance coils having electrical connections with the contact sections of said switch mechanism, and each of said coils being formed from wire wound upon a thin, flat body of insulating material, said coils being arranged one upon another within the casing, and insulated from each other, and connected in series with each other, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

EDGAR F. RAMIEN.

Witnesses:

JOHN E. WILES,  
HORACE HOBBS.