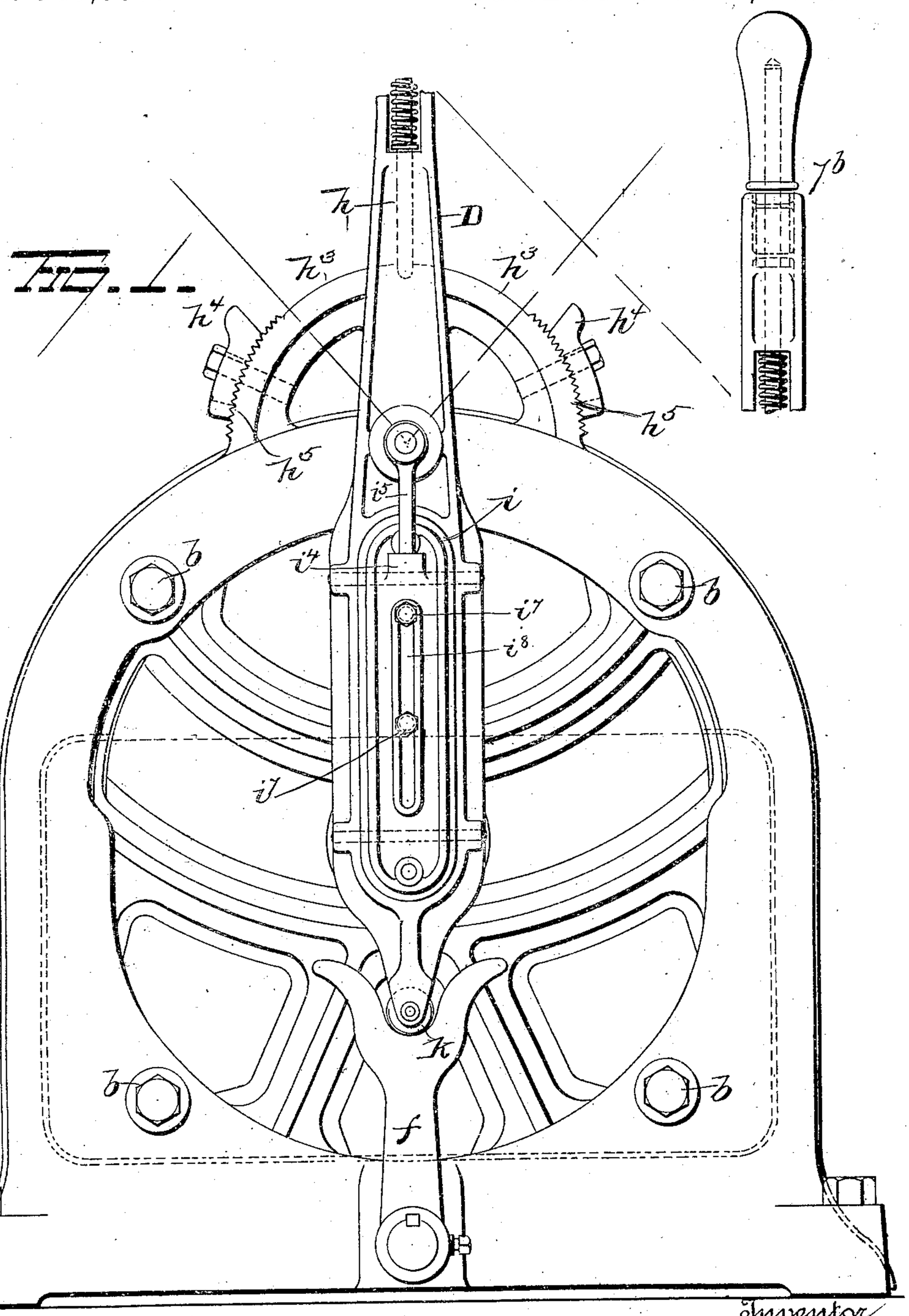
(No Model.) 4 Sheets—Sheet 1.

J. P. B. FISKE.

COMBINED RHEOSTAT AND REVERSING SWITCH FOR ELECTRIC MOTORS.

No. 549,597. Patented Nov. 12, 1895.

FIG. 1.



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(No Model.) 4 Sheets—Sheet 2.

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COMBINED RHEOSTAT AND REVERSING SWITCH FOR ELECTRIC MOTORS.

No. 549,597. Patented Nov. 12, 1895.

Fig. 2.

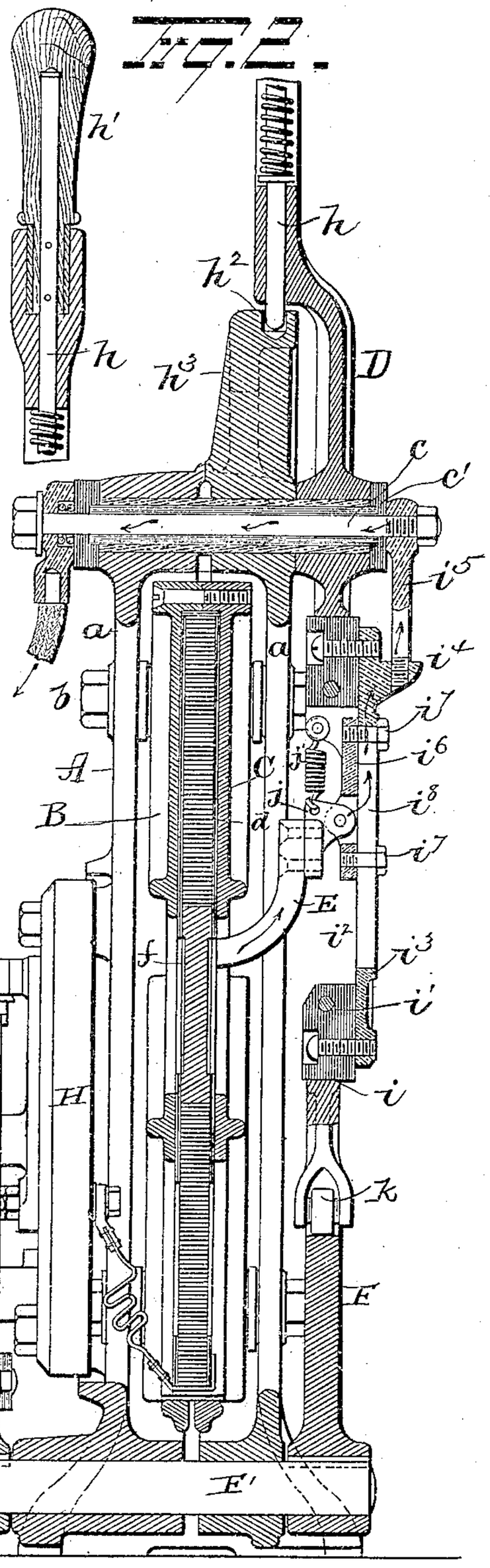
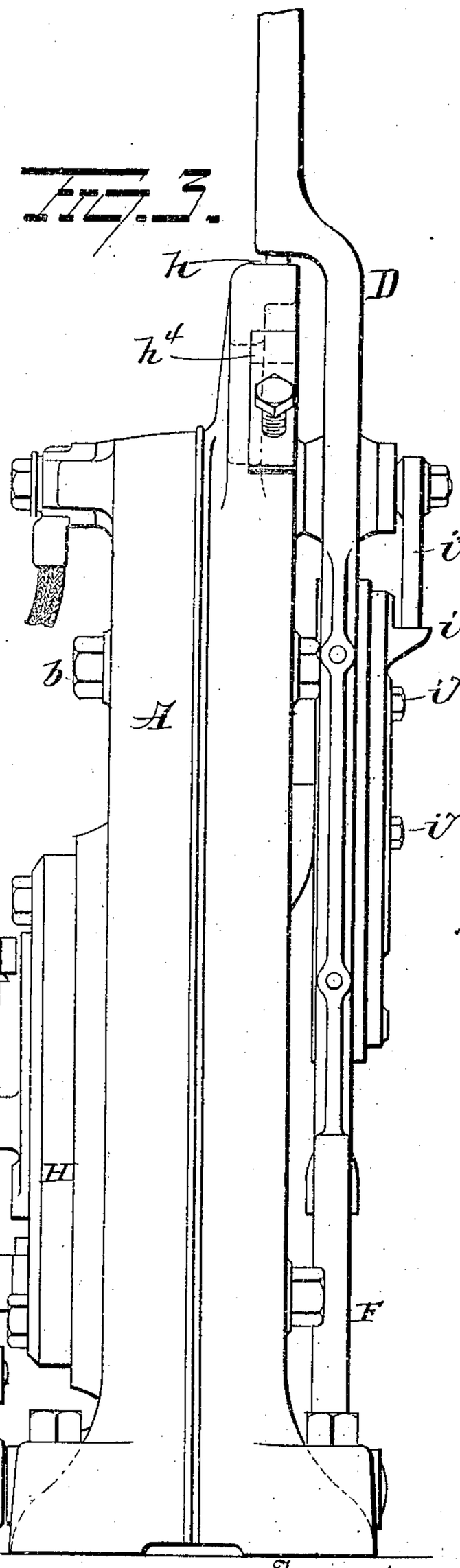


Fig. 3.



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J. P. B. FISKE.

COMBINED RHEOSTAT AND REVERSING SWITCH FOR ELECTRIC MOTORS.

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Fig. 4.

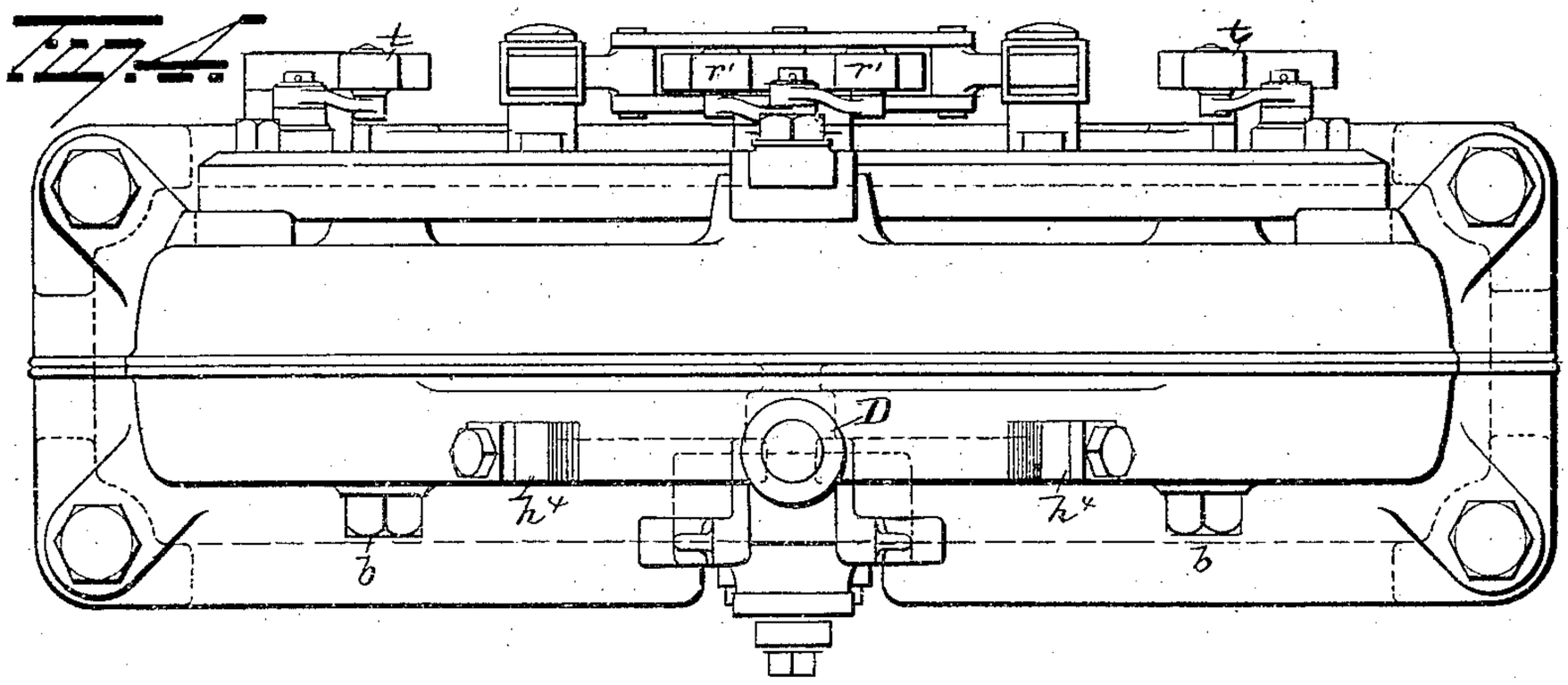


Fig. 1a.

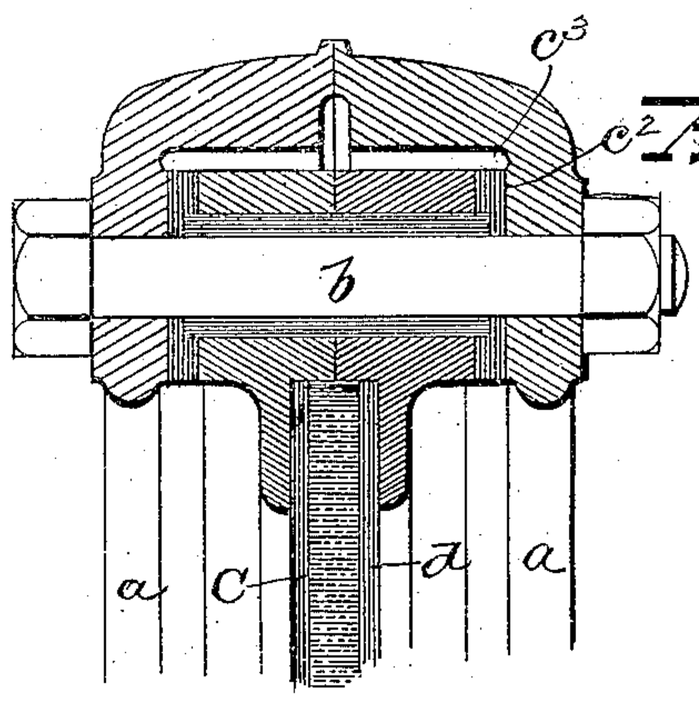


Fig. 1.

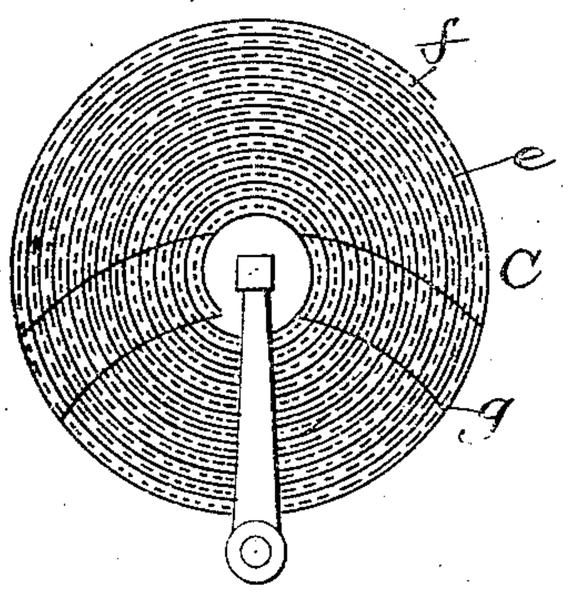


Fig. 2.

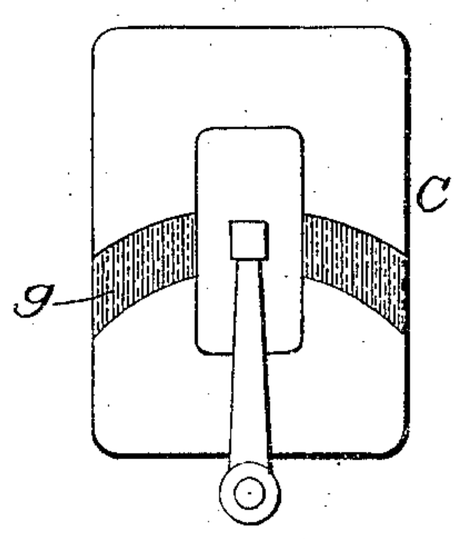
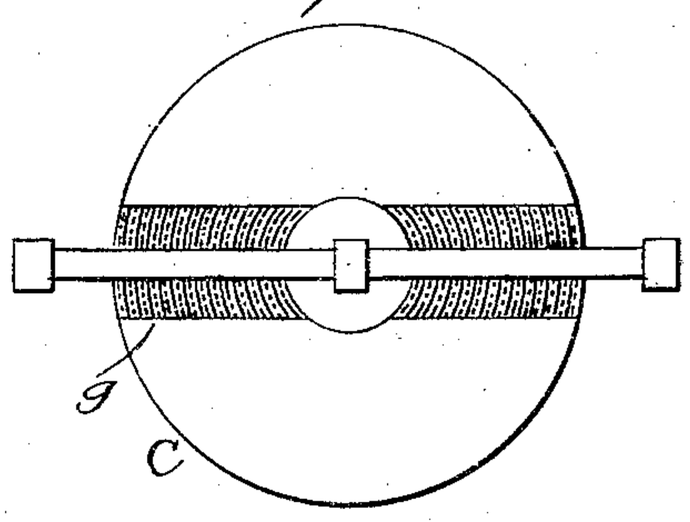


Fig. 3.



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COMBINED RHEOSTAT AND REVERSING SWITCH FOR ELECTRIC MOTORS.

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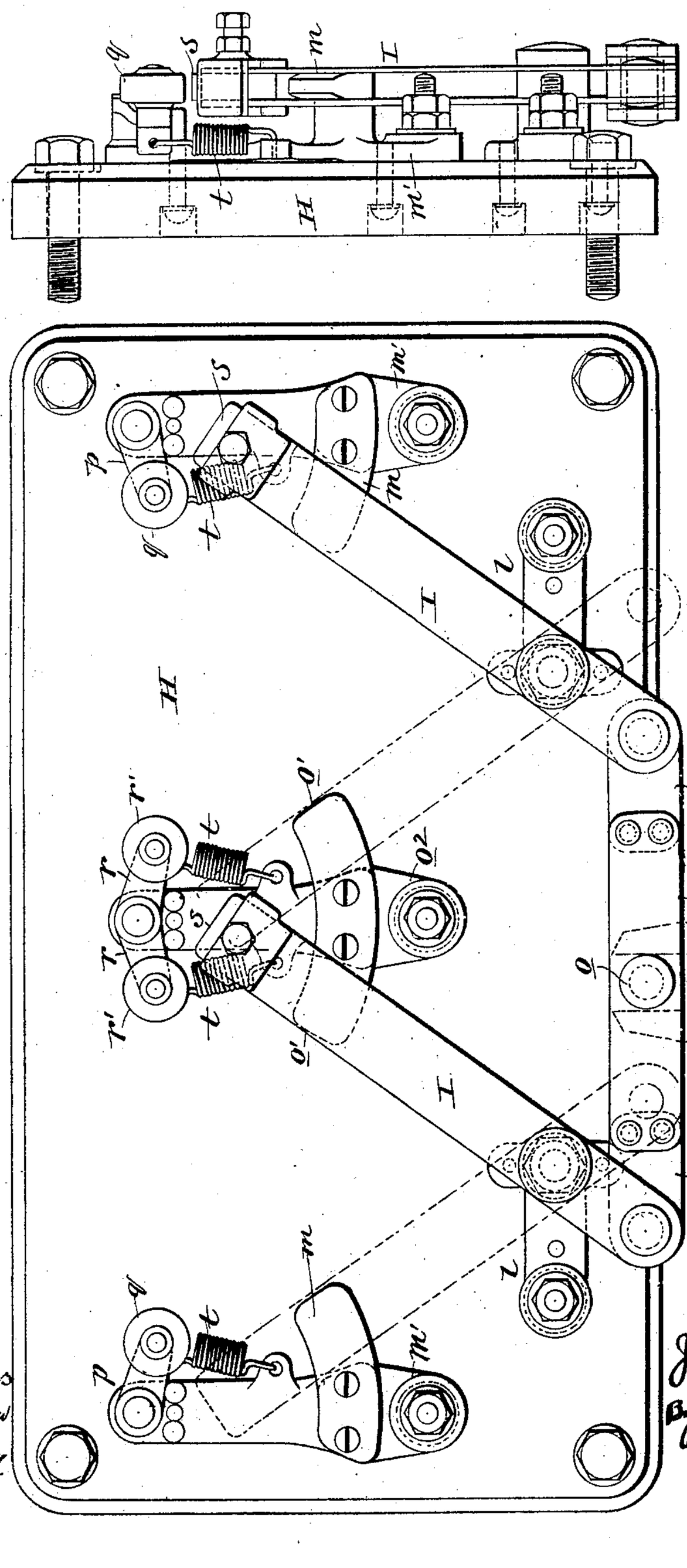
Fig. 1.



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UNITED STATES PATENT OFFICE.

JONATHAN P. B. FISKE, OF ALLIANCE, OHIO.

COMBINED RHEOSTAT AND REVERSING-SWITCH FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 549,597, dated November 12, 1895.

Application filed November 6, 1894. Serial No. 528,053. (No model.)

To all whom it may concern:

Be it known that I, JONATHAN P. B. FISKE, a resident of Alliance, in the county of Stark and State of Ohio have invented certain new and useful Improvements in a Combined Rheostat and Reversing-Switch for Electric Motors; and I do hereby 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 appertains to make and use the same.

My invention relates to an improved combined rheostat and reversing-switch for electric motors, the object of the invention being to so construct an apparatus of the nature above specified as to reduce the cost of manufacturing the same to a minimum.

A further object is to construct and arrange the apparatus in such manner that it shall be very easy to operate.

A further object is to produce an apparatus of the class above mentioned which shall be simple in construction and effectual in all respects in the performance of its functions.

With these objects in view the invention consists in the combination, with a rheostat and operating devices, of a reversing-switch connected with and operated by said operating devices.

The invention also consists in the combination, with a reversing-switch for a motor and operating devices, of a rheostat controlled by the operation of said operating devices, said rheostat being so constructed and arranged that the resistance material will be switched out of circuit when the operating devices are turned in either direction from their normal position.

The invention further consists in the combination, with a reversing-switch and operating devices, of a rheostat bearing such relation to said operating devices that when the operating devices are operated at either side of their normal position the switch will be operated and more or less resistance material gradually switched into or out of circuit.

The invention also consists in a rheostat composed of a coiled conductor having insulating material between its convolutions and having a transverse path over said convolutions for a contact device.

The invention also consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a face view. Fig. 2 is a vertical cross-section. Fig. 3 is a side view. Fig. 4 is a plan view. Figs. 5 and 6 are views illustrating the switch devices. Fig. 7 is a detail view of the resistance-coil. Figs. 7^a and 7^b are detail views. Figs. 8 and 9 are views illustrating modifications.

A represents the main frame of the apparatus, and comprises counterpart plates *a a*, secured together by means of bolts *b b b b* and *c*, the latter being insulated from the plates *a* by means of an insulating-sleeve *c'*. Within the frame A a tray B is located, said tray being made in two parts and provided with perforations for the passage of the bolts *b*, insulating-sleeves c^2 being inserted within said perforations, so as to insulate the tray from said bolts *b*, and at the ends of said sleeves washers c^3 are disposed between the tray and frame, so as to insulate these parts from each other. The tray B is constructed to receive a resistance-coil C between its members, said coil and tray being insulated from each other by means of suitable insulating material *d*. The coil C is preferably composed of ribbon of German silver or other suitable resistance material, and between its convolutions insulating material *e* (such as mica) is placed.

The resistance-coil C is preferably provided with a hub or center *f*, of non-conducting material, and said coil is milled across the face to produce a contact-path *g*, with which a brush, (similar to a commutator-brush,) hereinafter described, makes contact. The contact-path *g* is preferably made in the arc of a circle, extending outwardly from opposite sides of the non-conducting center or hub *f*, so as to accommodate the contact-brush, which I prefer to attach to a pivoted lever D. The lever D is pivotally connected between its ends with the bolt *c* and insulated therefrom by the sleeve *c'*. The upper end of the lever D is provided with a locking-pin having a handle h', said pin being adapted to normally enter a socket h^2 in a quadrant h^3, secured to the top of the frame A, so as to retain said lever normally in a vertical position and the con-

tact-brush in engagement with the hub or disk f in the center of the resistance-coil. Stops h^4 are adjustably secured to the quadrant h^3, whereby to limit the throw of said lever, said stops being serrated or toothed on their under faces to engage similar serrations or teeth h^5 on the quadrant. Below the pivotal connection of the lever D with the bolt c said lever is made with an opening i, in which a plate i', of fiber or other insulating material, is inserted, said insulating-plate being made with an elongated slot i^2. To the insulating-plate i' a metal plate i^3 is secured and provided at its upper end with a lug i^4, having a screw-threaded perforation for the reception of the lower end of a rod i^5, the upper end of which is electrically connected with the bolt c. To the inner face of the metal plate i^3 a metal bracket i^6 is secured by means of bolts i^7, said bolts passing through an elongated slot i^8 in said metal plate i^3, whereby to enable said bracket to be adjusted vertically. To the bracket i^6 a small lever j is pivoted, to which the contact-brush E is secured, said brush being maintained in contact with the resistance device by means of a spring j', one end of which is connected with the lever j, and the other end is secured to a lug projecting from the metal plate i^3. In placing the device in the circuit one wire is connected with the bolt c, and the other wire is connected with the outer extremity of the coiled resistance material.

A rheostat constructed as above described is very cheap, since the cost of winding the ribbons of the spiral conductor and interposed insulation, and finishing the contact-path is very small.

From the construction and arrangement of parts above described it will be seen that when the lever D is turned on its fulcrum in one direction or the other more or less resistance will be included in the circuit, the current passing through the apparatus as indicated by the arrows in Fig. 2.

By the use of my improved construction of rheostat the employment of separate contact-plates mounted on an insulated base and connected by wires to the resistance is entirely done away with, and therefore one great source of expense, trouble, and annoyance is eliminated.

A further advantage of my improved construction is that there are from twenty-five to forty contacts per inch, depending upon the thickness of the conductor used, and therefore the number of contacts is so great as to reduce the voltage between the contacts to so small an amount as to entirely eliminate the sparking which takes place in rheostats as they have heretofore been constructed.

It will be noticed that there are two distinct paths on the resistance-coil for the contact shoe or brush E—that is to say, one path when the brush is moved to the right and a similar path when the brush is moved to the left. Thus the cutting out of resistance is exactly the same regardless of the direction in which the brush E is moved from the center of the coil. In other words, a double set of contacts will be provided "cross-connected" to each other and connected with the resistance in such a way that the action is the same whichever way the arm is turned. The necessity for thus having a double set of contacts will be seen when the relation of the resistance to the reversing-switch is considered, the construction and operation of which latter will be presently explained.

The lower end of the lever D is provided with a roller k, adapted to enter the forked or bifurcated end of an arm or lever F, secured to a rock-shaft F', which latter is mounted in the lower portion of the framework of the apparatus and at its opposite end is provided with an arm G, having a bifurcated upper end, for a purpose hereinafter explained.

A plate or base H, of insulating material, is secured to the rear face of the frame A for the reception and support of my improved reversing-switch, a description of which will now follow.

Brackets l are secured to the base H, and to these brackets switch-levers I I are pivotally connected at points near their lower ends, and adapted near their upper ends to engage contact-plates m' m, projecting from contact-blocks m' m^2. To the lower end of each switch-lever a link n is connected, and said links are connected together by means of a bar or bars n', of non-conducting material, said bar or bars being provided with a pin or pins o, which enter the bifurcated end of the lever or arm G. The switch-levers I are also adapted to engage the respective ends of a contact-plate o', secured to a contact-block o^2, secured to the center of the base H, one of said switch-levers being normally in contact with said contact-plate o' and the other switch-lever being normally in contact with one of the contact-plates m, and by connecting the short arms of the switch-levers by the bar n' when the latter is moved longitudinally both switch-levers will be shifted simultaneously to reverse the current through the motor with which the apparatus is connected. To the upper ends of the contact-blocks m' arms p are pivotally connected, in the free ends of which arc-rupturing rollers q are mounted, and to the upper end of the central contact-block o^2 arms r are pivotally connected and provided at their free ends with arcing-rollers r'. Each switch-lever is provided at its free end with an arcing-tip s, of carbon or similar material, adapted to engage the arcing-rollers, the latter being normally retained in their normal positions by means of springs t, secured at one end to the arms in which the rollers are mounted and at their other ends to the contact-blocks.

The reversing-switch constructed as above explained is quite similar to reversing-switches as heretofore constructed, except

that it is provided with an additional feature—viz., arc-rupturing contacts so placed that the circuit will always be made and broken between these contacts in preference to making and breaking at the main contacts, the arc-rupturing rollers being so held as to come in contact with the respective switch-bars and take up the arc.

From the construction and arrangement of the entire apparatus as above described it will be seen that by operating the lever D the contact-brush E will be moved over the contact-path on the edges of the ribbon of which the resistance-coil is composed, and simultaneously motion will be imparted to the switch-levers through the medium of the lever F, rock-shaft F', lever or arm G, and connecting-bar *n'* to shift the said switch-levers and reverse the current through the motor. The moment the operating-handle is turned to the right the reversing-switch is set in one direction, thus causing the current to pass through the armature from that direction, and as the lever D is gradually thrown over the resistance will be cut out gradually by the contact-brush E working over the ribbon. As the lever D is again thrown to the central position the breaking of the circuit is done on the arcing-rollers, thus preventing sparking at the switch-contacts. When the lever D is thrown in the reverse direction, the reversing-switch is also thrown over, causing the current to pass through the motor in the opposite direction, the contact-brush E cutting out the resistance, as before.

My improvements are exceedingly simple in construction, sparking at the various points of electrical contact is reduced to a minimum, the circuit through the motor can be easily and quickly reversed without injury thereto, and the apparatus is effectual in every respect in the performance of its functions.

Instead of making the contact-path across the face of the coiled resistance-conductor in the arc of a circle for the accommodation of the movement of the contact-brush when carried by a pivoted lever said contact-path may be made straight across the face of the coil or exactly in line with the diameter thereof, as shown in Fig. 9.

The resistance-coil instead of being made round may be wound in rectangular form, as shown in Fig. 8.

Various other slight changes might be made in the details of construction of my invention without departing from the spirit thereof or limiting its scope, and hence I do not wish to limit myself to the precise details of construction herein set forth; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a frame and a tray secured thereto, of a resistance coil retained in position by said tray and having its convolutions insulated from each other, and a contact device adapted to be passed transversely over said convolutions, whereby to include more or less of said resistance coil in an electric circuit, substantially as set forth.

2. The combination with a frame, of a resistance coil supported therein, said resistance coil being composed of a ribbon of resistance material, interposed insulating material between the convolutions of the coil and a center or hub of non-conducting material, and a contact device adapted to be passed transversely over the convolutions of said coil in either direction from said non-conducting center or hub, substantially as set forth.

3. The combination with a frame, of a two-part tray secured thereto, a resistance coil having insulating material between its convolutions, held in position by said tray, insulating material between the coil and tray, and a contact device adapted to be passed transversely over the convolutions of said resistance coil, substantially as set forth.

4. The combination with a frame and a resistance coil carried thereby, said resistance coil having insulating material between its convolutions, of a pivoted lever having an elongated opening, an insulating plate having an elongated slot secured in the slot of the lever, a metallic plate secured to said insulated plate, and a contact device carried by said metallic plate and adapted to pass over said resistance coil, substantially as set forth.

5. The combination with a frame and a resistance coil having insulating material interposed between its convolutions, of a pivoted lever, a metallic plate carried by said pivoted lever and insulated therefrom, a lever pivotally connected with said plate, and a brush carried by said pivoted lever and adapted to pass over the convolutions of the resistance coil, and a spring adapted to maintain said brush normally in contact with the resistance device or coil, substantially as set forth.

6. The combination with a frame and a resistance coil secured therein, said resistance coil having insulating material between its convolutions, of a pivoted lever, a metallic plate carried by and insulated from said lever, a lever pivoted to said adjustable plate, a brush secured to the said last-mentioned lever and adapted to engage the resistance coil, and a spring adapted to maintain the brush in proper relation to the resistance coil, substantially as set forth.

7. The combination with a frame and a resistance coil held therein, said resistance coil having insulating material interposed between its convolutions, of a bolt or shaft mounted in the frame and insulated therefrom, an operating lever pivotally connected with said bolt or shaft and insulated therefrom, a non-conducting plate secured to said operating lever, a metallic plate secured to the non-conducting plate, a bar or rod connecting said metallic plate electrically with

said bolt or shaft, an adjustable metallic plate secured to the first-mentioned metallic plate, a lever pivoted to the adjustable plate, a contact brush secured to said last-mentioned lever and adapted to engage the resistance coil and pass over the convolutions thereof, and a spring adapted to maintain said brush in proper relation to said resistance coil, substantially as set forth.

8. The combination with a frame, a resistance coil carried thereby, and a quadrant on said frame provided with a socket, of a pivoted lever, a contact brush carried by and insulated from said pivoted lever, said brush being adapted to engage and pass over the convolutions of the resistance coil, a pin carried by said lever and adapted to enter the socket in said quadrant, and stops adjustably secured to said quadrant to limit the movement of said pivoted lever, substantially as set forth.

9. The combination with a switch lever and its contact plate, of an arm pivotally connected in electrical relation to said contact plate, a conducting roller carried by said arm, and a spring adapted to maintain said roller normally in the path of the switch lever whereby to produce an arc rupturing contact, substantially as set forth.

10. The combination with a switch lever and a contact plate, said switch lever having its end provided with material of low conductivity, of a pivoted arm having electrical connection with the contact plate, a conducting roller in the free end of said arm, and a spring constructed and adapted to maintain the roller in the path of the poor conducting material at the end of the switch lever, substantially as set forth.

11. The combination with a frame made in two parts secured together, of a tray made in two parts and inclosed by said frame, a resistance held in said tray, a contact device for the resistance, a reversing switch mounted on the frame and an operating device connected with said contact device and reversing switch, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JONATHAN P. B. FISKE.

Witnesses:

WILLIS H. RAMSEY

E. WOOLGAR.