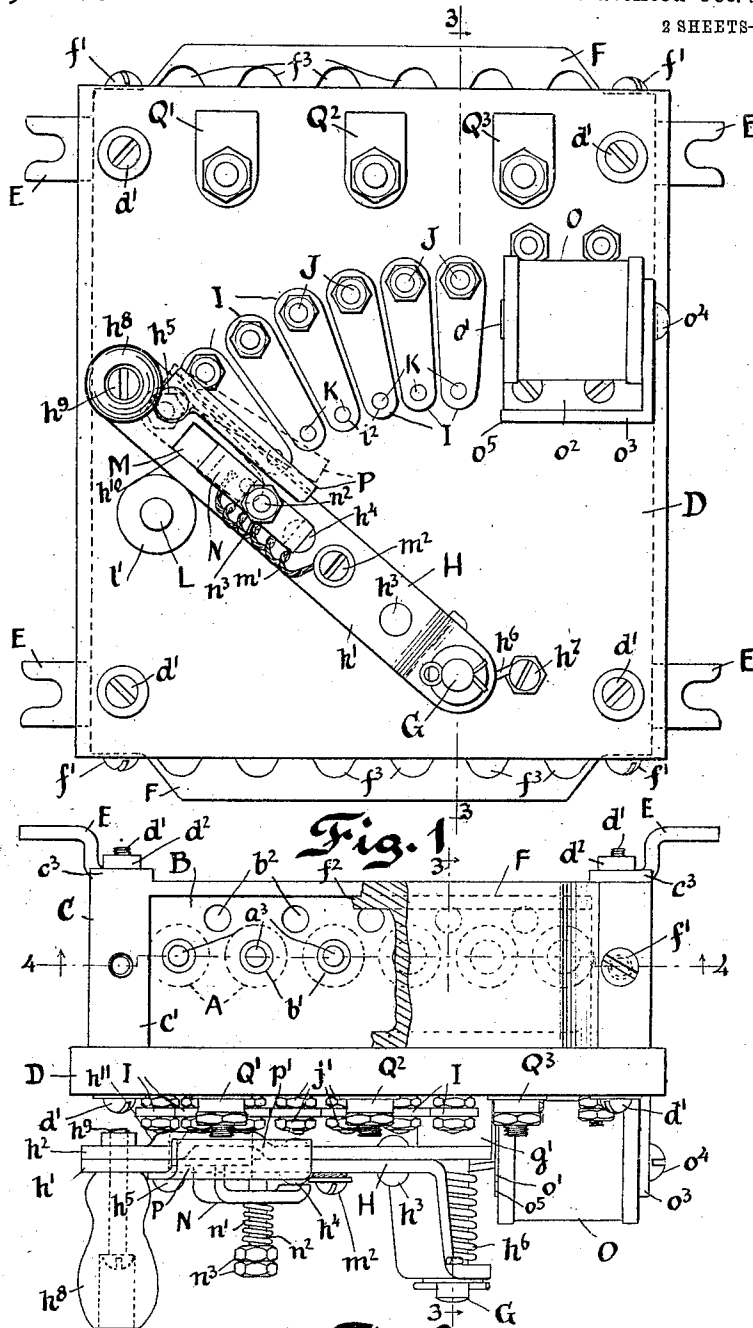


J. T. KALWEIT & W. H. GAULKE.
RHEOSTAT FOR ELECTRIC MOTORS.
APPLICATION FILED JULY 7, 1910.

1,006,560.

Patented Oct. 24, 1911.

2 SHEETS—SHEET 1.



Witnesses

Florence M. Mallan
Joseph M. Embury

Julius C. Kalweit and Wm. H. Gaulke,
Inventors

By

George Deane Cole

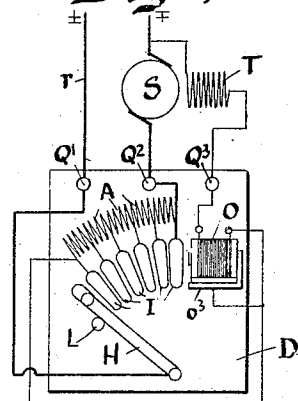
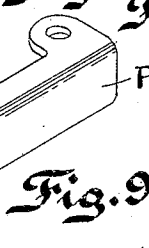
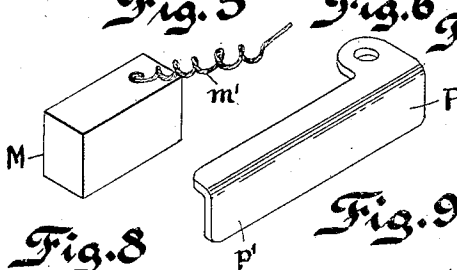
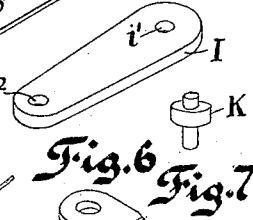
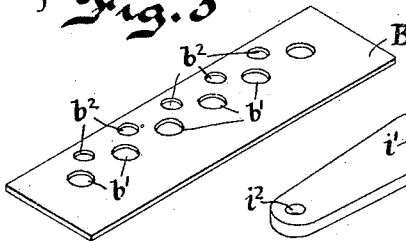
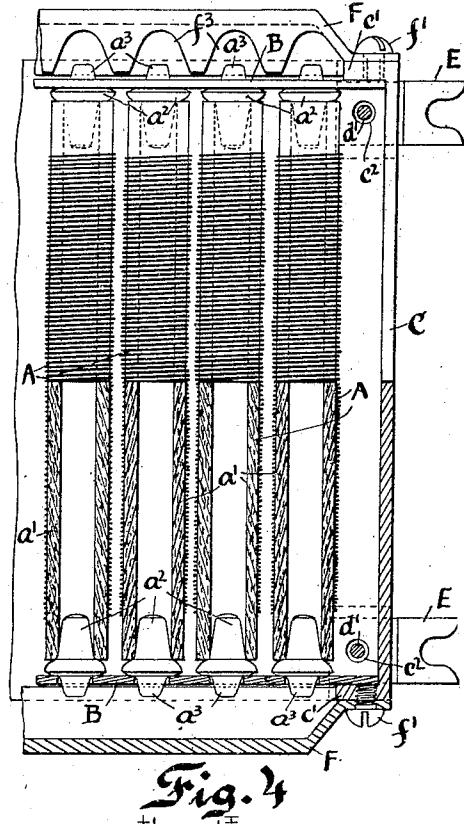
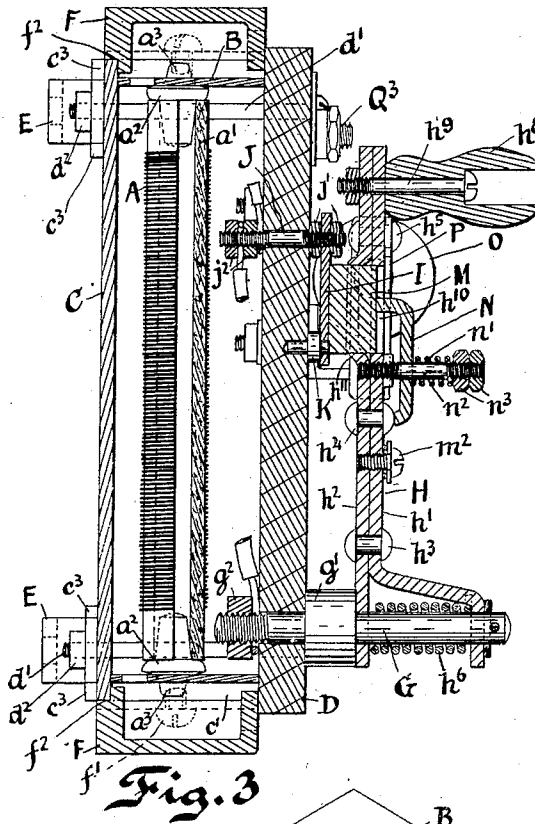
Attorney

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2 SHEETS—SHEET 2.



Witnesses

Florence M. Mallon
Joseph M. Embury

Julius T. Kalweit and William H. Gaulke,
Inventor

By *Amos C. Moore*
Attorney

UNITED STATES PATENT OFFICE.

JULIUS T. KALWEIT AND WILLIAM H. GAULKE, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO INDEPENDENT ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF WISCONSIN.

RHEOSTAT FOR ELECTRIC MOTORS.

1,006,560.

Specification of Letters Patent.

Patented Oct. 24, 1911.

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To all whom it may concern:

Be it known that we, JULIUS T. KALWEIT and WILLIAM H. GAULKE, both of Milwaukee, Wisconsin, have invented a Rheostat for Electric Motors, of which the following is a specification.

This invention relates to rheostats or resistance-boxes for electric circuits, and more particularly to that type called starting-boxes, which are used for starting and controlling electric motors. This type of rheostat is provided with a quantity of resistance which is divided into sections by taps leading to contact-pieces on the face of the box, over which moves a pivoted contact-arm which is connected with one pole of the circuit, and said arm is provided with a spring acting to bring it back when released to the starting-point, while an electromagnet is arranged in the motor-circuit and acts upon the armature carried by said pivoted arm to hold the latter in "on" position when it has been turned up to the last point, in which all the resistance is cut out of the circuit.

Our invention has for its object to improve the construction of such starting-boxes; first, by providing an improved construction of containing-case for the resistance which will completely inclose it so as to prevent danger from flashes in the case of the box or resistance burning out, and at the same time give ample ventilation; secondly, by providing an improved construction of the contact-pieces, which will make not only a cheaper construction but will enable them to be readily removed and replaced when worn or burned out, without removing the box from its place, thus eliminating time and expense for repairs; thirdly, by providing an improved means for making contact between the arm and the contact-pieces which will give perfect electrical connection and perfectly smooth action; and fourthly, by providing an improved mounting for the armature of the electromagnet.

Our invention comprises the constructions and combinations which will hereinafter be described in detail and specifically pointed out in our claims.

The nature of our invention will best be understood from a consideration of the accompanying detailed description, taken in connection with the accompanying drawings,

which show the most improved form of our invention as applied to one of the small sizes of rheostat. It will of course be understood that in larger sizes the form and number of parts will be varied as required by circumstances while retaining the same principle.

In the aforesaid drawings Figure 1 is a front elevation of a complete rheostat constructed according to our invention; Fig. 2 is a plan thereof, with a part of the upper guard-piece of the casing broken away; Fig. 3 is a vertical transverse section on plane 3-3 with the contact-arm in vertical position, one of the resistance coils being shown in partial section; Fig. 4 is, as to the upper half, a front view of the rheostat with the front plate removed, and as to the lower half, a section on the plane 4. Figs. 5, 6, 7, 8, and 9 are perspective views of separate elements; and Fig. 10 is a diagrammatic view of the electrical connections.

In these drawings every reference letter refers always to the same part.

The rheostat-resistance as shown comprises a series of coils of resistance-wire A mounted upon tubes a' of insulating material (such as asbestos), and said tubes are mounted on insulating spindles a^2 which have two tapering ends separated by a flange; the outer ends of the spindles of each coil being in turn supported by two holding-plates B which close the ends of the casing and have a series of holes b' in which the outer tapering ends a^3 of said spindles fit.

The body-member C of the casing or box comprises only the two lateral sides and the back thereof, the ends and front thereof being open; and at said ends there are provided overhanging flanges c' , which engage the ends of the plates B (see Fig. 4), thereby holding them and the coils A in position, and at the same time closing the ends of the box. The front of the box is closed by the insulating slab D, which, as customarily, may be made of any suitable insulating material such as slate, marble, etc., and said slab is secured in place by four screws d' passing through holes in the corners of the slab and through corresponding holes c^2 in the back of the casing C, said screws serving also to fasten four foot-pieces E which are set between snugs c^3 on the back of the casing and secured by the nuts d^2 on the ends of

said screws. These foot-pieces, however, are not of the essence of our invention, but form a convenient means of supporting the rheostat on and securing it to a wall or switch-board.

In order to secure ventilation for the interior of the box, each plate B is perforated with a series of holes b^2 , which provide for air-currents through the box; and to detain any particles of hot metal which may be blown through these holes, as in the case of a short-circuit or burn-out, each end of the box is covered with a guard-piece F, whose ends are flanged and secured to the flanges c' by screws f' ; each of said guard-pieces interlocking with the back edge of the member C by means of a rabbet f^2 , but at the front a series of apertures f^3 are provided through which the air-currents can pass. Any material which may possibly be blown through the apertures b^2 will strike the interior of the guard-pieces F and will not be able to pass through the holes f^3 .

Upon the face of the slab D are mounted, among other things, a shoulder-pin G, which forms a pivot for the contact-arm H, and a series of contact-plates I, arranged about the pin G as a center and electrically connected to the several sections of resistance and to other points, as will be hereinbelow described. The nature and construction of said contact-arm and plates form important features of our invention. We provide each contact-plate in the form of a metallic strip, ordinarily of brass, made in the form shown in Fig. 6, with holes i' and i^2 at its opposite ends. A series of screw-stems J, carrying nuts j' , j^2 , are set in corresponding holes in the slab D and secured in place by said nuts; the outer end of each screw-stem passing through the hole i' in one of the contact-plates, which is secured thereto by the outer nut j' , while the inner nut j^2 is used for securing one or more wire-leads from the resistance-sections A. At the inner end of each contact-plate I is set a shouldered dowel K, one end of which fits in the hole i^2 and the other in a recess d^3 in the face of the slab D, said recess being such as to form a driving fit for the dowel, or else the dowel may be fixed therein by use of cement or other adhesive. As thus constructed it will be seen that when one of the plates I is injured or worn out, it can be removed and replaced by a new one in a very few minutes, and at a very trifling expense, by simply releasing the outer nut j' .

The contact-arm H is pivotally mounted on the pin G as aforesaid, which latter is provided with a spacing-shoulder g' and a nut g^2 , by which it is secured in a hole in the slab D and electrically connected with one of the terminals of the box as herein-after described. Said contact-arm is conveniently made from two metal bars h' , h^2

secured together by rivets h^3 , h^4 , h^5 . The pivoted end of the bar h' is separated from that of the bar h^2 in order to give a proper lateral bearing to provide for the pressure of the arm against the contact-plates, and in order to move the arm when released to the left-hand or "off" position and hold it there, a helical torsion-spring h^6 is mounted upon the pin G between the ends of the two bars, one end of said spring being engaged with the arm and the other with an abutment-pin or screw h^7 mounted on the slab D. A suitable abutment-pin L, provided with a rubber sleeve l' for a cushion, is placed in position to limit the left-hand swing of the contact-arm. On the outer end of the arm, or at any convenient point thereof, is mounted the handle h^8 upon a screw h^9 .

At a point opposite the contact-plates I a slot h^{10} is formed in the contact-arm to receive the contact-block M, which can move forward and back in said slot and thus adjust itself to any unevenness of the plates and press with a continuous and even pressure thereupon. The lower bar h^2 of the arm is bent in as shown at h^{11} (Fig. 3) away from the bar h^9 at this point, so as to give a wide lateral bearing to the contact-block. Upon the latter presses one end of a member N, whose other end rests on the head of the rivet h^4 and upon which resiliently presses a helical spring n' mounted on a threaded pin n^2 which projects at right angles to the arm H and carries on its end nuts n^3 whereby the pressure of the spring may be adjusted and fixed. The arm H itself being connected in a circuit, a positive and unvarying electrical connection with the contact-block M is provided by a flexible connecting-wire m' soldered to the block and engaged under the head of a binding-screw m^2 .

The electromagnetic means by which the contact-arm is held at the right-hand or "on" position comprises an electromagnet having a cylindrical core o' projecting slightly from the end facing the contact-arm, said magnet being mounted upon a base o^2 which is in turn mounted on the slab D, and which has an angular flange o^3 , to which the core o' is secured by a screw o^4 and which forms a complementary core, as its end o^5 is flush with the end of the core o' and coacts therewith, to attract and hold the armature P on the contact-arm. This armature magnetically connects the core o' and the end of the flange o^3 when the contact-arm is in its right-hand or "on" position and is pivoted at its end farthest from the pin G upon the rivet h^5 , this giving it a slight swinging movement, whose extent is indicated by the full- and dotted-line positions shown in Fig. 1. As clearly illustrated in Figs. 2 and 3, said member P has a flange or apron p' parallel to the lateral edge of the contact-arm and adapted to form a suitable surface for

engagement with the magnetic elements o' and o^5 .

Heretofore it has been customary to mount the armature pivotally, but the pivotal point was placed midway between the magnetic poles. But one of said poles, namely the pole o' , is very much stronger than the other, because the whole magnetic flux passes through the pole o' , but only a part through the pole o^5 . Having this in view we have placed the pivotal point of the armature P closer to the former than to the latter. Furthermore, it will be observed that by placing the pivot h^5 farther out toward the end of the arm, the pull necessary to hold the latter against the torsion of the spring h^6 is diminished in corresponding proportion. By reason of this additional consideration we have placed the pivotal point h^5 beyond both magnetic poles, and we have found by experiment that when thus mounted the magnet-strength which is required to hold the arm is only about half that which is required when the pivotal point is placed midway between the points o' and o^5 .

The manner in which the several electrical elements of our rheostat are intended to be connected up to each other and to a shunt-motor and line-circuit is illustrated in Fig. 10. Three terminals Q' , Q^2 , and Q^3 are mounted on the slab D; the first Q' , being permanently connected to the arm H and intended to be connected to one line-wire r ; the second, Q^2 , being connected with the right-hand or "on" contact-plate I, and intended for connecting one pole of the motor-armature S thereto; and the third, Q^3 , being connected through the electro-magnet O to the last active contact-plate I on the left, and being intended for connection with one pole of the motor-field T. It will be observed that the terminal of the magnet coil is grounded upon the armature-base o^2 whereby as soon as the arm has reached its "on" position the armature coils are cut out of the circuit.

While we have hereinabove described the preferred form of our invention, we wish it understood that we do not limit ourselves to anyone of the particular features thereof; we fully realize that it is capable of numerous modifications, and we consider such modifications and omissions may be made without departing from the principle of our invention.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a device of the character described, the construction for a contact-piece which comprises, in combination with the insulating slab, a screw-stem passing through a hole therein, nuts on said screw-stem on the opposite sides of said slab securing it in position,

an oblong contact-plate having a hole in one end through which the projecting end of said screw-stem passes, a nut on the end of said screw-stem over said contact-plate, said contact-plate having also a hole at its opposite end, and a shouldered spacing-pin fixed to said slab and fitting in said last-named hole; whereby said plate may be detached by removing said last-named nut.

2. In a device of the character described, the combination with the insulating slab and the pivoted contact-arm of a row of contact-pieces arranged upon said slab about the pivot of said arm as a center, each of said contact-pieces being an elongated metal plate having a hole at one end thereof, a row of screw-stems mounted on and projecting from the front face of said slab, spacing-pieces on the respective stems adjacent to the slab, the several stems passing through said holes in the respective plates beyond said spacing-pieces, nuts on the respective stems over said plates and holding them in position, and means for supporting and holding against lateral movement the opposite ends of said plates.

3. In a device of the character described, the combination with the insulating slab and the pivoted contact-arm of a row of contact-pieces arranged upon said slab about the pivot of said arm as a center, each of said contact-pieces being an elongated metal plate having a hole at each end thereof, a row of screw-stems mounted on and projecting from the front face of said slab, spacing-pieces on the respective stems adjacent to the slab, the several stems passing through the holes in one end of the respective plates beyond said spacing-pieces, nuts on the respective stems over said plates and holding them in position, and a row of shouldered dowels permanently fixed in recesses in the face of said slab the ends of which fit in the holes in the opposite ends of said plates.

4. In a device of the character described, the combination with a pivoted contact-arm formed with a slot therein, of a contact-block fitting in said slot and having a back-and-forth movement, contact-pieces opposite said arm on which said block presses, a bar resting at one end on said block and at the other end on said arm, a screw-stem mounted on said arm and passing through a hole in said bar, a coiled compression-spring mounted on said stem, and a nut mounted on the end of said stem and forming an abutment for said spring.

5. In a device of the character described, a construction for a contact-piece which comprises, in combination with the insulating slab, a flat contact-plate having a hole in each end, a pair of corresponding holes in said slab, a dowel-pin fitting in one of said holes in the slab and in one hole in the contact-piece, and carrying a spacing-ele-

ment separating the contact-piece from the slab, and a screw passing through the other hole in the contact-piece and that in the slab and securing the contact-piece to the slab,
5 said screw carrying another spacing-element similar to the first, whereby said contact-piece is held parallel to and spaced apart from said slab.

In witness whereof we have hereunto
our hands in presence of two witnesses.

JULIUS T. KALWERT.
WILLIAM H. GAULKE.

Witnesses:

GEORGE W. COLLE,
FLORENCE M. MALLON.