

W. H. GAULKE.
 ALTERNATING CURRENT RHEOSTAT FOR POLYPHASE CIRCUITS.
 APPLICATION FILED JAN. 3, 1911.

1,051,098.

Patented Jan. 21, 1913.

2 SHEETS—SHEET 1.

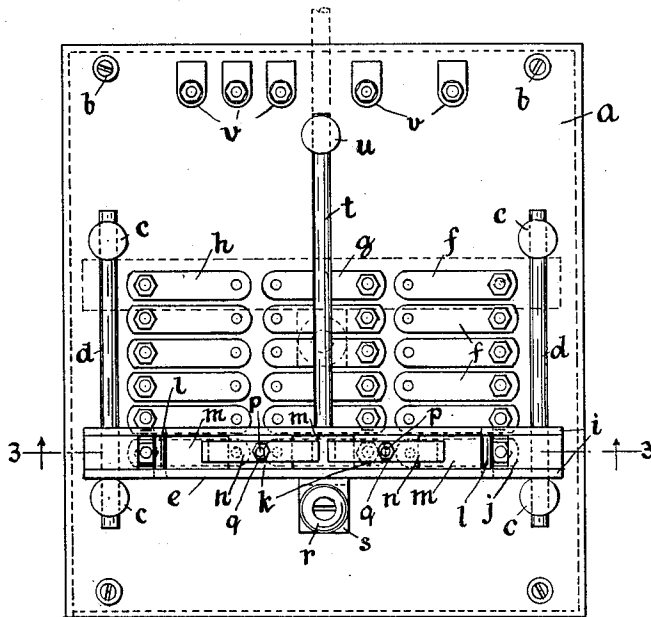


Fig. 1

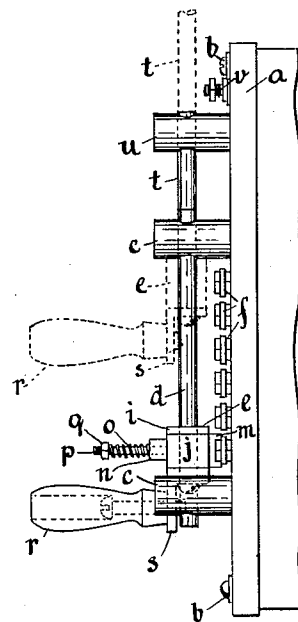


Fig. 2

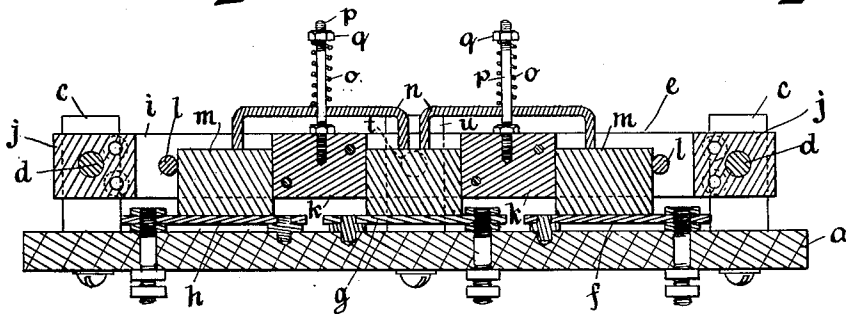


Fig. 3

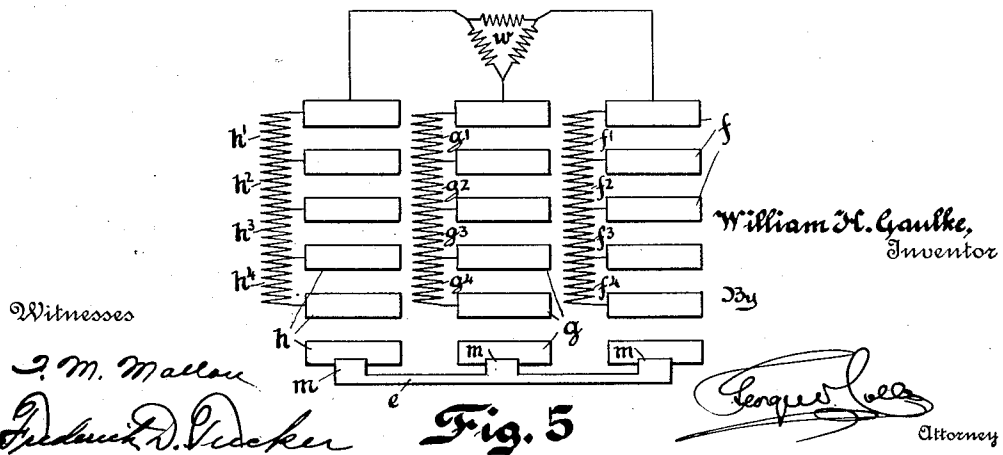


Fig. 5

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2 SHEETS-SHEET 2.

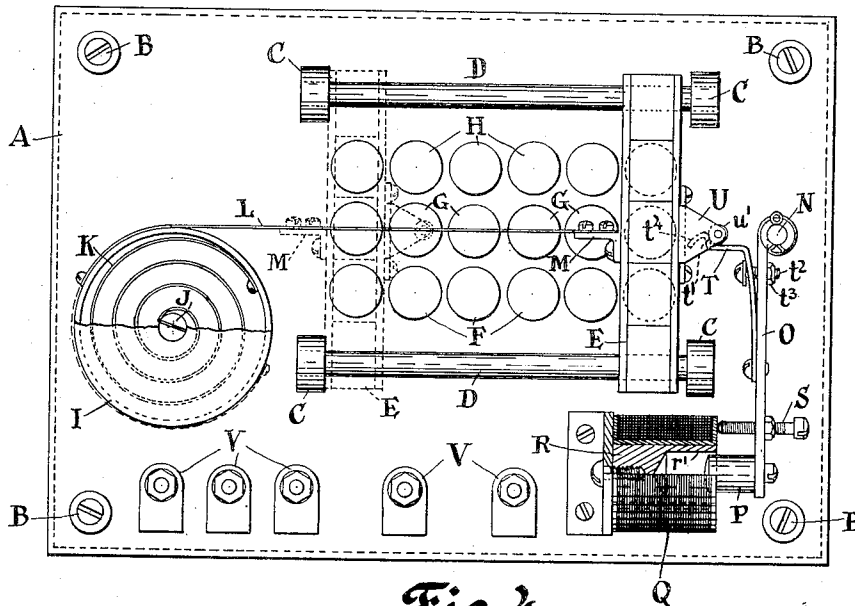


Fig. 4

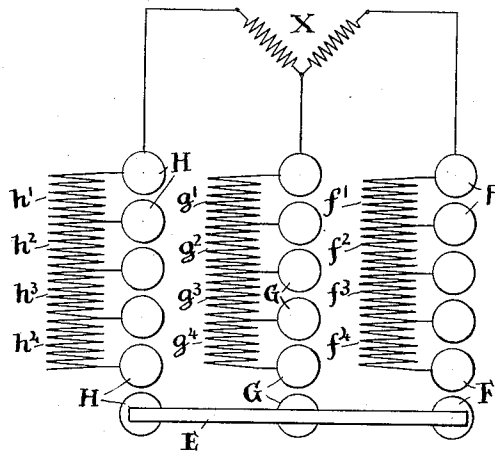


Fig. 6

William H. Gaulke, Inventor

Witnesses

J. M. Mallon
 Frederick D. Tucker

By *George S. M. Hall*

Attorney

UNITED STATES PATENT OFFICE.

WILLIAM H. GAULKE, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO INDEPENDENT
ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF WISCONSIN.

ALTERNATING-CURRENT RHEOSTAT FOR POLYPHASE CIRCUITS.

1,051,098.

Specification of Letters Patent.

Patented Jan. 21, 1913.

Application filed January 3, 1911. Serial No. 600,510.

To all whom it may concern:

Be it known that I, WILLIAM H. GAULKE, of Milwaukee, Wisconsin, have invented an Alternating-Current Rheostat for Polyphase Circuits, of which the following is a specification.

This invention relates to rheostats for controlling polyphase-motors and is adapted for use with currents of two, three or any number of phases.

The object of my invention is to provide a simple form of rheostat particularly adapted to control synchronous induction-motors, though it is also adapted for use in other situations for controlling polyphase-circuits. Further, I aim to provide such a rheostat with an automatic no-voltage release, to wit, a device adapted, in the case of failure of the power, to return the rheostat immediately to the starting position.

More particularly the nature of my invention is set forth in the following detailed description thereof and defined in my claim, reference being had to the accompanying drawings, wherein:

Figure 1 is a front-elevation of a simple form of rheostat constructed according to my invention; Fig. 2 is a side-view of the front-portion thereof; Fig. 3 is a longitudinal section therethrough, on the plane 3 of Fig. 1 and on a larger scale; Fig. 4 is a front-view of another form of my improved rheostat with automatic no-voltage release; and Figs. 5 and 6 are distribution diagrams showing the connections of the rheostat for three- and two-phase circuits respectively.

The reference letters refer each to the same part in each figure of the drawings.

Referring to the first form, the front-plate of the rheostat, which is of slate or other insulating material, is designated *a*, being secured by screws *b* to the rheostat-case, as usual. On this plate are mounted four posts *c* which carry two parallel bars *d*. The parallel bars *d* serve as guides for the shiftable contact-bar *e* which operates to make contact between three series of contact-plates *f*, *g* and *h*, and whose construction is best shown in Fig. 3 and is as follows: A pair of longitudinal bars *i* are secured together with a pair of end spacing-blocks *j* at the ends, and a pair of intermediate spacing-blocks *k* and a pair of transverse-pins or rivets *l*. Between the pins *l* and blocks

k are disposed three independent contact-blocks *m* which press upon the respective contact-blocks *f*, *g* and *h* and are confined laterally by the longitudinal bars *i* and the blocks *k* and pins *l*, but are adapted to shift vertically, to take up wear and provide a uniform and constant pressure upon the contact-plates. This pressure is provided by means of a pair of yokes *n*, each pressing upon two adjacent contact-blocks and held resiliently thereagainst by springs *o*, which are mounted on central-posts *p* on the blocks *k*, said springs abutting against nuts *q* on the ends of said posts. By means of the springs and yokes, the pressure is uniformly distributed upon the three contact-blocks *m*.

A shifting-handle *r* is conveniently secured to the contact-bar *e* by means of an angle *s*, and to prevent the bar from binding against the guides *d* and hold it parallel, a third bar *t* is secured, in parallel relation with the guides *d*, to the contact-bar *e*, and slides in a guide-post *u*, which is preferably somewhat beyond the line of the posts *c*. The travel of the contact-bar is indicated by the full- and dotted-line positions in Figs. 1 and 2. Terminal-posts *v* are provided upon the plate *a* for convenience in making the connections herein below described.

In the second form of my rheostat, I have illustrated a face-plate *A* secured to the rheostat-case by screws *B* and having mounted thereon four posts *C* carrying the parallel guide-bars *D*, upon which slides the contact-bar *E*, which electrically connects the contact-pieces *F*, *G* and *H*, all substantially as described in the case of the first form. In connection with this form, I provide means for automatically returning the bar *E*, when released, to the starting-point, which is its left-hand position in the drawing, said means comprising preferably a barrel *I*, turning upon a central-post *J* and connected therewith by a spiral-spring *K*, which is adapted to turn the barrel in a counter-clockwise direction; and a tape or cord *L* attached to said barrel connects it operatively with the bar *E* by means of an angle or bracket *M*, as shown.

At the right-hand side is mounted a pivot-post *N*, on which swings through a small angle a bar *O*, this latter having secured to its end an armature *P* adapted to be

attracted by an electro-magnet Q, shown partly in section. The magnet-core R and armature P are constructed according to the principles enumerated in my United States patent application No. 587,823, filed Oct. 19, 1910, the former being hollowed out as shown at r' and the latter of a slightly smaller diameter and in concentric position, so as to enter the bore r' without touching the wall thereof; and its limiting position is fixed by an adjusting-screw S abutting upon the face of the magnet. The bar O carries a bent latch-piece T, which is somewhat flexible and is adapted to engage with a catch U mounted on the contact-bar E; said catch having preferably a roller u' and said latch-piece a surface t' which catches over the roller and is nearly at right angles to the direction of movement of the contact-bar. The angle which the surface t' makes with the line of movement of the contact-bar is regulated by means of an adjusting-screw t^2 , which is screwed into the bar O and locked by a nut t^3 . It will be seen that by increasing or diminishing the effective length of the screw t^2 the surface t' is changed through a slight angle and thereby the resultant force created by the reaction of the spring K and acting upon the surface t' to turn the bar O away from the magnet is increased or diminished. Owing to the presence of the roller u' , the sensitivity of this arrangement is especially great, because the friction of release is almost entirely eliminated, thereby making the apparatus respond to the exact diminution of the magnet-strength to which it is set. When the magnet-strength has been fixed, the predetermined voltage permitting the release of the contact-bar can be exactly adjusted by means of the screw t^2 as well as by the abutment-screw S. A lip t^4 formed on the end of the latch-piece T is adapted to be struck by the roller u' in the advance movement of the contact-bar, so as to turn the bar O sufficiently to enable the roller to engage with the surface t' . As in the first form of the rheostat, terminal-posts V are conveniently provided for making the electrical connections.

The rheostat-coils may be of any convenient construction and are connected as

shown diagrammatically in Figs. 5 and 6, the contact-pieces and contact-bar being shown in outline and connected by the resistance-coils $f', f^2, f^3, f^4, g', g^2, g^3, g^4, h', h^2, h^3$, and h^4 . The extreme contact-pieces f, g and h or F, G and H are connected through three of the terminals v or V to the three terminals of a synchronous three-phase armature, w , as in Fig. 5, or a two-phase armature X, as shown in Fig. 6. As the contact-bar is moved from the starting-end of its travel along the contact-pieces, it short-circuits successive sections of resistance by connecting any set of three of said contact-pieces, as will be clear without further explanation.

I wish it understood that my invention is not limited to the use of all the above described features and constructions, for some may be omitted and others may be varied or modified in various ways, as will readily occur to those skilled in the art.

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

In a rheostat, the combination of a plurality of parallel rows of contact-pieces, a contact-bar disposed across said rows so as to cover a piece in each row simultaneously, means for guiding said bar in a movement parallel to itself and to said rows, the contact-pieces in each row being united together by interposed resistances, a plurality of independent contact-blocks, one for each row and resting on one of the contact-pieces thereof, each of said blocks being free to move in said contact-bar toward and from the contact-pieces, a number of yokes each of which has ends which press on two adjacent contact-blocks, an upright post mounted on said bar in the center of each yoke and passing through a hole therein, a coiled-spring on each post pressing on said yoke, and an abutment for said spring on the outer end of the post.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

WM. H. GAULKE.

Witnesses:

FRANK KRAEMER,
GEORGE W. COLLES.