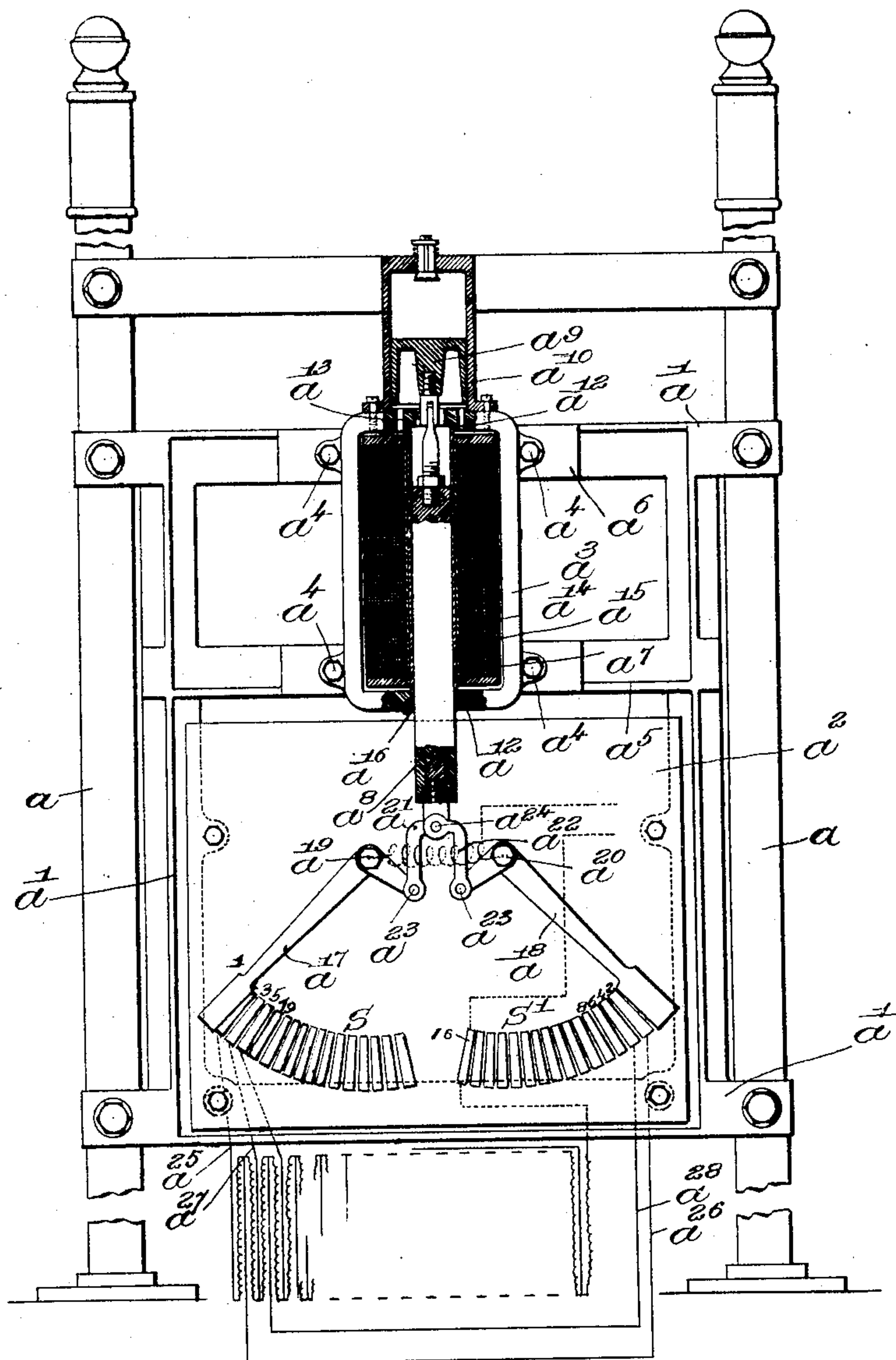


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J. W. MOORE.  
AUTOMATIC RHEOSTAT.  
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NO MODEL.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 741,814, dated October 20, 1903.

Application filed March 2, 1903. Serial No. 145,691. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH W. MOORE, a citizen of the United States, residing at Newton Highlands, county of Middlesex, State of Massachusetts, have invented an Improvement in Automatic Rheostats, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

My invention is a switch operated by a solenoid, and is for use in connection with such electrical apparatus as electric motors, &c.

Among the principal objects of my invention are the provision of mechanism for securing a short movement of the core, reducing to a minimum the tendency to arc between the contacts by providing a large number of steps or contacts, and hence avoiding a wide difference of voltage between successive contacts, and providing a free movement of parts without liability of binding or frictional resistance due to improper alinement of the moving parts.

In the preferred embodiment of my invention herein shown I secure the foregoing objects by a special construction of core-guide, winding-tube, dash-pot, and bearings, which insures exact alinement in manufacture and assemblage of parts, and I provide in connection therewith a balanced gravity movement, one form thereof being secured by having opposite pivoted contact-makers similarly mounted at the opposite sides of the vertical center of the core and moving parts, said contact-makers being connected thereto by links, so that they maintain a perfect balance or counterpoise on each other throughout all their movements, and the contacts and wiring therefrom are arranged in double sets arranged to be made alternately effective by said respective contact-makers, all as will be more apparent from the following description, taken in connection with the accompanying drawing, in which I have shown one form of my invention applied to a motor-starting rheostat.

In the drawing I have shown a view in front elevation, parts being broken away and sectioned, the wiring thereof being indicated largely diagrammatically, showing one embodiment of my invention.

It will be understood that the field of usefulness of my invention is not restricted to the precise relations herein shown; but for convenience I have shown opposite posts  $a$ , carrying a bracket or supporting-grill  $a'$ , to which is secured a slab  $a^2$  beneath a frame  $a^3$ , secured by bolts  $a^4$  to cross-bars  $a^5$   $a^6$  of the grill or support  $a'$ . The frame  $a^3$  supports the solenoid  $a^7$ , provided with a core  $a^8$ , operating vertically and regulated in its movement by a dash-pot whose piston-head or plunger  $a^9$  is secured thereto at its upper end, operating in a cylinder  $a^{10}$ , fast on the upper end of the frame  $a^3$ .

I have omitted most of the usual details found in connection with devices of this character and have endeavored to confine the drawing and description as far as practicable to the essential features of novelty which I prefer to use.

As usually constructed the dash-pot and general arrangement of the core and magnet have been quite different from my construction and location, so that it has been difficult to maintain proper movement. As this feature of my invention is of considerable importance, I will describe it first.

To get true alinement and facilitate the mounting and exact positioning of the parts in proper relation, I suspend or mount the solenoid-spool in the frame  $a^3$  independently thereof by mounting it on a separate support or standard, (instead of securing it therein by adjustment-screws or other clumsy and adjustable mechanism,) and I compel everything to come to perfect alinement by mounting all the parts with relation to a standard surface or standard points of engagement. This standard surface may be provided in other ways; but I prefer to secure it by turning or otherwise forming the frame  $a^3$  with a longitudinal bore  $a^{12}$ , whose upper end constitutes a shoulder and whose lower portion a bearing, said shoulder and bearing thereby affording a base or standard with reference to which everything is compelled to agree. I simply place the frame  $a^3$  in a lathe and turn out the bore  $a^{12}$  and also at the same time turn a surface  $a^{13}$  on the upper end of the frame to receive the dash-pot, thereby insuring that said bore and dash-pot will be in correct vertical relation to each other.



The solenoid is wound on a foundation  $a^{14}$ , of thin material, having an inner surface fitting snugly over a tube  $a^{15}$ , and the latter is formed of the proper internal size to receive the core  $a^8$  and constitute a guide therefor. Having provided the parts, as described, I place the solenoid-spool in the frame, holding the winding-tube  $a^{14}$  thereof in approximate alinement with the bore  $a^{12}$  of the frame, and then insert the tubular core-guide  $a^{15}$  in said bore and through said tube  $a^{14}$ , said tube  $a^{15}$  fitting snugly into the shouldered upper end of the bore  $a^{12}$  and coming flush with the lower end of said bore, whereupon I simply insert a set-screw  $a^{16}$  in the frame to bear against the lower end of said tube  $a^{15}$ , and thus secure the solenoid in exactly correct vertical alinement. The core is then inserted and secured properly to the dash-pot plunger  $a^9$ , and the other parts are assembled in obvious manner. This brings me to perhaps the most important feature of my invention, which although for best results coöperating with the alining features thus far described is not limited thereto in all respects, but has an extended field of usefulness.

The core  $a^8$  operates in a true vertical plane and is connected at its lower end with opposite arms  $a^{17}$  or contact-makers  $a^{17} a^{18}$ , constituting a portion of the rheostat, said arms being pivoted, respectively, at  $a^{19} a^{20}$  and connected by links  $a^{21} a^{22}$ , freely pivoted at one end to said arms at  $a^{23}$  and at their other ends to the core at  $a^{24}$ . Said contact-makers swing in arcs over a series of contacts  $s s'$ , whose resistance connections are shown diagrammatically, where it will be seen that a resistance-wire  $a^{25}$  connects from contact 1 through all the resistance to contact 16, while the resistance-wire  $a^{26}$  connects from contact 2 through the resistance to 16, and wire  $a^{27}$  connects from contact 3 through the resistance likewise to 16, and wire  $a^{28}$  connects from contact 4 in a similar manner, and so on in such manner that as the two contact-makers are swung simultaneously over the contacts they alternately complete the circuit throughout the successive contacts  $s s'$  with which they come in contact, the contact-maker  $a^{18}$  being herein shown as having a lead with relation to the contacts  $s'$  over the contact-maker  $a^{17}$  with relation to the contacts  $s$  for facilitating this result. By this means not only am I enabled to provide a very large number of contacts and to provide the same in such position that the entire amplitude thereof is covered by a relatively short movement of the core, but the core is maintained in absolute equipoise throughout all its movements, inasmuch as the weight of one arm counterbalances the shifting tendency of the other, and hence the movement thereof does not tend in any way to bind the core or shift it in the slightest degree out of vertical alinement. The core not only has no tendency to bind or shift laterally, but it is positively held by the

combined weight of the contact-makers in true alinement. Moreover, by having the parts in exact vertical position, as shown, the apparatus automatically returns to proper position by gravity after it has been disturbed. By having the dash-pot at the top in vertical alinement with the parts and all the latter in perfect balance the apparatus is rendered sensitive and operates with minimum wear and maximum certainty.

I have aimed to gain great precision with extreme simplicity of construction and number of parts.

I am aware that various details of construction may be changed and other forms and arrangement of parts resorted to without departing from the spirit and scope of my invention, and accordingly I do not limit the latter otherwise than as expressed in the claims taken in connection herewith.

As already stated, my invention is applicable to various relations, and also certain features or subcombinations thereof may be used without other features thereof, as will be more apparent in the claims.

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

1. A device of the kind described, comprising a solenoid, a core actuated thereby, and a rheostat having means for providing a maximum number of contacts for a minimum movement of said core, said means comprising two independent contact-makers connected to said core and operated simultaneously thereby, and two similar series of contacts, one of said contact-makers having a lead on its series of contacts ahead of the position of the other contact-maker on its series.

2. A device of the kind described, comprising a vertical solenoid, a core actuated thereby, a rheostat composed of two series of co-operating contacts, and two independent contact-makers, each contact-maker being independently connected to said core for successively making contact with the contacts of its series, and when taken alone tending to throw said core out of vertical alinement, said tendency being at all times counterbalanced by the other contact-maker.

3. A device of the kind described, comprising a solenoid, a core actuated thereby, a rheostat having two series of contacts whose resistance-wires are tapped alternately from the two series of contacts, a separate contact-maker for each of said series of contacts, and separate connections from the two contact-makers to said core for operating the same simultaneously.

4. A device of the kind described, comprising a vertical solenoid, a core movable vertically therein, a rheostat comprising two sets of contacts and two contact-makers pivotally mounted in similar position, respectively, on the opposite sides of said core, independent connections jointed to said contact-makers



and said core for simultaneously operating the same, said parts being free to return by gravity to normal position.

5 A device of the kind described, comprising a solenoid, a single-piece frame therefor, standard points of engagement being provided on the opposite ends of said frame, a support secured at said standard points of engagement, said solenoid being mounted on  
10 said support out of supported contact with said frame, said support and said standard points having a definite and unchangeable relation to each other and to the axis of said solenoid, a core movable in said solenoid, contacts, and a contact-maker connected to said  
15 core and actuated thereby.

6. A device of the kind described, comprising a solenoid, a single-piece frame therefor,

standard points of engagement being provided on the opposite ends of said frame, a 20 tubular support secured unchangeably at its opposite ends at said standard points of engagement, said solenoid having an axial opening fitting snugly said tubular support and being supported directly thereby, a core fitting within said tubular support and movable  
25 freely lengthwise thereof, contacts, and a contact-maker operated by said core.

In testimony whereof I have signed my name to this specification in the presence of 30 two subscribing witnesses.

JOSEPH W. MOORE.

Witnesses:

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