No. 803,452. PATENTED OCT. 31, 1905.

G. E. STEVENS.

RHEOSTAT.

APPLICATION FILED OCT. 12, 1904.

Fig-1.

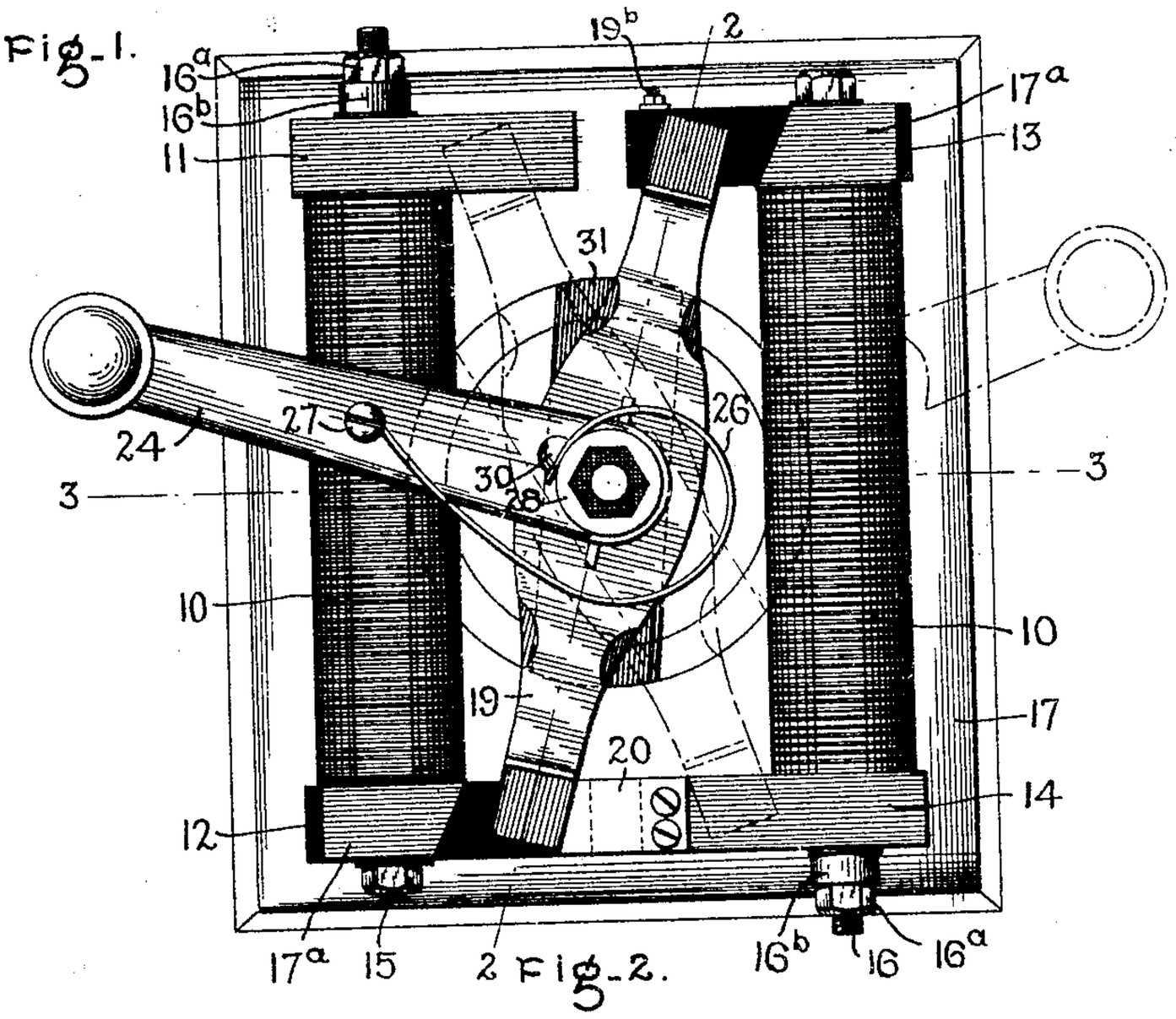


Fig-2.

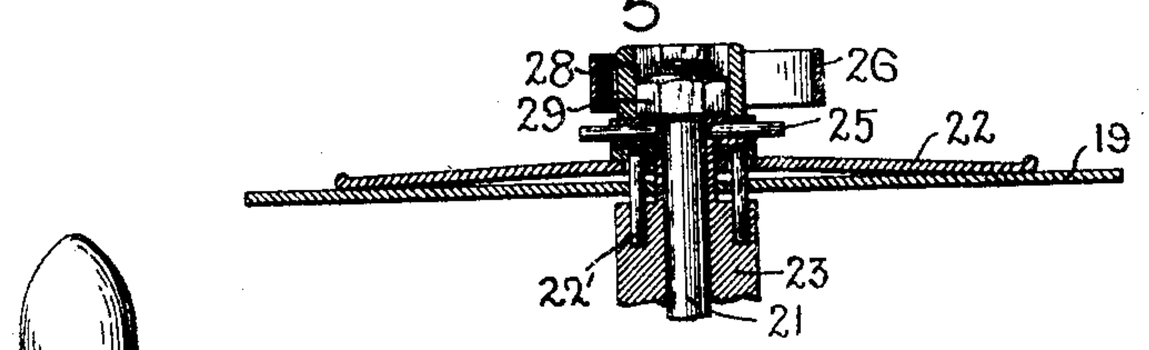


Fig-3.

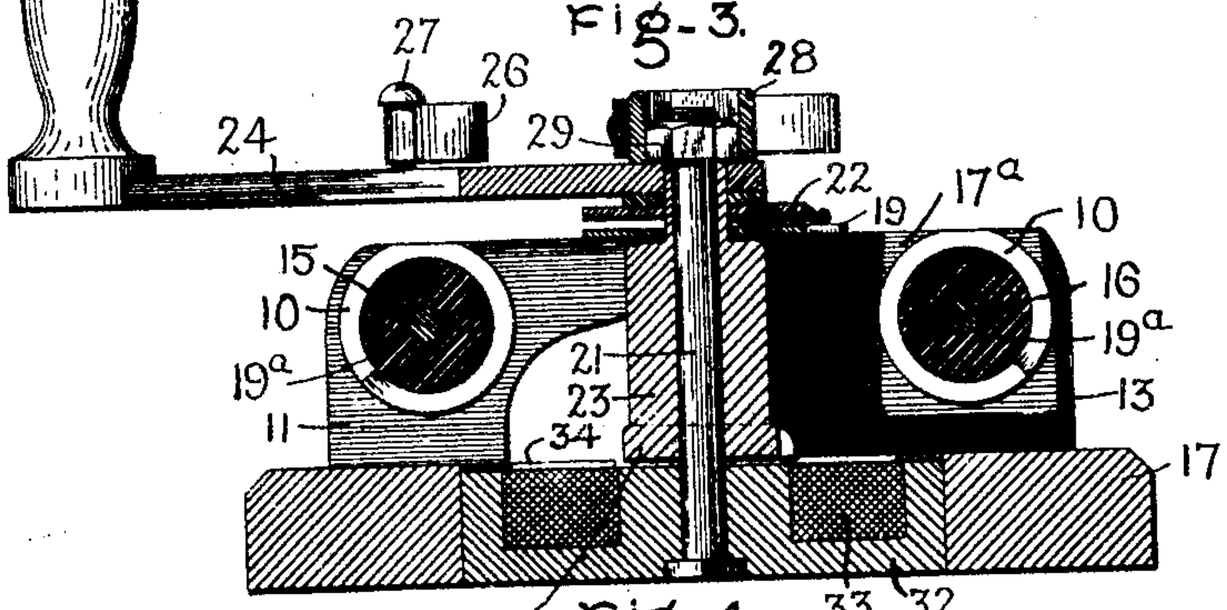
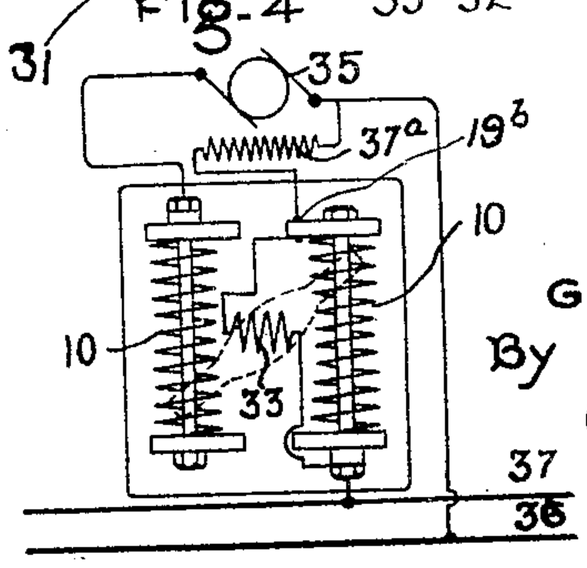


Fig-4



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UNITED STATES PATENT OFFICE.

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RHEOSTAT.

No. 803,452. Specification of Letters Patent. Patented Oct. 31, 1905.

Application filed October 12, 1904. Serial No. 228,132.

To all whom it may concern:

Be it known that I, GEORGE E. STEVENS, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Rheostats, of which the following is a specification.

The present invention relates to rheostats; and the principal object of the invention is to provide a rheostat which is of large capacity relative to its bulk, substantial and simple in construction, efficient in operation, and cheap to manufacture; and to this end it comprises a novel organization, together with certain features of construction which will be best understood upon reference to the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a plan view of a rheostat constructed in accordance with the invention. Fig. 2 is a longitudinal section of the movable contact, taken on a plane indicated by the line 2 2 of Fig. 1. Fig. 3 is a sectional view, the plane of section being indicated by the line 3 3 of Fig. 1; and Fig. 4 is a diagram of electrical connections.

In carrying out my invention I employ a resistance unit of the type disclosed in my prior application, Serial No. 193,713, filed February 15, 1904. This unit consists of one or more helical edgewise-wound resistance-ribbons having their turns insulated from each other and forced together, so as to form a rigid structure. Preferably the insulation employed consists of an insulating cement, which not only serves to insulate the turns but to bind them together. The fixed element of the rheostat in the present instance consists of two such units 10 10, arranged parallel to each other and firmly secured between end blocks 11, 12, 13, and 14 by means of bolts 15 and 16, which extend through the interior of the units and through suitable apertures in said blocks. These bolts are provided with nuts 16^a, which may be screwed down against the interposed sleeves 16^b to force the turns of the winding together and hold them in place. The threaded ends of the bolts constitute two of the rheostat-terminals, and when connected up the ends of the connecting-leads are held in place between the sleeves 16^b and the nuts 16^a. The blocks 11, 12, 13, and 14 are firmly secured to a base 17, of wood or other suitable insulating material. Two of these blocks—viz., 11 and 14—are composed of copper or other good conducting material and are in electrical contact with the ends of the adjacent ribbon-winding and with the threaded ends of the bolts. The remaining blocks 12 and 13 are composed of some suitable insulating material, such as soapstone, and each has set into its upper face a strip 17^a, of conducting material, such as copper, which is bent down between the adjacent end of the winding and the block, thus providing a contact for the outer end of the bridging contact 19. The strips 17^a do not completely cover the upper faces of the blocks 12 13, but insulating-faces are left, upon which the outer ends of the contact 19 are adapted to rest when the rheostat is in "off" position. The upper surfaces of the blocks 11 and 14 are also located so as to be engaged by the contact 19.

As clearly shown in Fig. 3, the central rods 15 and 16 are completely insulated from the winding by the insulating compound 19^a with which the interior of the coil is filled, so that the circuit between either the block 11 or 14 and the opposing contact-strip 17^a is completed only through the winding. The insulating-block 13 is further provided with a binding-post 19^b. The adjacent blocks 12 and 14 are connected by a strip 20, which constitutes a stop for the rotary contact 19 of the rheostat. This rotary contact is mounted so as to rotate about a central post 21, located midway between the resistance units 10 and extending transversely thereto. The outer ends of the contact 19, in addition to engaging the contact-blocks 11 and 14 and the contact-strips 17^a, also ride over the upper portion of the edgewise winding of the units 10. The contact 19 is forced downward into engagement therewith by means of a leaf-spring 22, and the spring and the contact are firmly secured by pins 22′ to a supporting-block 23, which is rotatably mounted on the pivot-post 21 and is given its movement of rotation by an operating lever or handle 24, firmly secured to its upper end by transverse pins 25. From this it will be apparent that as the operating-lever 24 is rotated the block 23 and the contact 19 will also be rotated, the contact progressively engaging the turns of the resistance-winding. For the purpose of returning the parts to off position a spiral return-spring 26 is provided. This spring is secured

at one end to the pin 27, extending upward from the handle, and at its opposite end to a collar 28, which fits over a nut 29, screwed on the upper end of the pivot-post 21. The collar and nut are held in fixed relation by a set-screw 30. The pivoted block 23 terminates at its lower end in a laterally-extending armature 31, which is adapted to rotate above the poles of a locking or retaining magnet 32, having its coil 33 resting in an annular groove in the face of the magnet-core. Two segmental plates 34, of brass or other suitable material, are secured to the upper face of the magnet-core, so as to hold the armature 31 out of engagement with the polar face of the magnet except in certain positions. The uncovered portion of the core-face, being between the ends of the plates 34, is located so that it will register with the armature 31 when the movable element of the rheostat is moved to a position in which all the resistance is cut out of circuit.

The rheostat, as above described, may be connected up with an electric motor in the manner illustrated in Fig. 4, in which the motor-armature 35 is connected directly between the lead 36 of the supply-circuit and one of the terminals of the rheostat, and the other terminal is connected directly to the lead 37 of the supply-circuit. The coil 33, in series with the motor field-winding 37^a, is connected directly across the line, the coil 33 being connected between the terminal at the lower end of the bolt 16 and the binding-post 19^b and the field-winding being connected between said post and the line side of the armature.

In the operation of the above-described mechanism the parts are normally held in the position illustrated in Fig. 1—that is, in the off position with the contact 19 against the stop 20 and its ends upon the insulated portions of the contact-blocks 12 and 13. When it is desired to start the motor, the operating-lever 24 is moved upward toward the right from the position shown in Fig. 1 and the contact 19 is moved over the winding of the resistance units 10. Assuming that the contact 19 has been moved far enough to have passed over a few of the turns of each of the units, the circuit through the rheostat will then be completed as follows: from the terminal at the lower end of the right-hand unit 10, through the block 14, the adjacent turns of the right-hand unit 10 to the right-hand end of the contact 19, through said contact to the left-hand unit 10, thence upward through the turns of said unit to the contact 11, and out at the adjacent terminal. During the movement of the contact 19 the armature 31 will be drawn downward by the magnet 32 against the tension of the contact 19 and the leaf-spring 22 into engagement with the spacing-plates 34. When the parts have been moved to the position illustrated in dotted lines in Fig. 1, the armature 31 will have passed beyond the plates 34 and will be drawn down into the depression between them by the magnet 32. In this position the edges of the armature 31 on opposite sides of the pivot-post will engage the ends of the strips 34 and will be held thereby in the dotted-line position even though the operator's hand be removed from the operating-lever 34. In this position of the posts a relatively small current in the magnet-coil will be sufficient to hold the armature down in locked position. In case of failure of current in the line or the occurrence of other conditions which will sufficiently de-energize the magnet 32 the armature 31 will be drawn up through the spring action of the leaf-spring 22 and contact 19 upon the engaging shoulders of the strips 34. Then the parts will be returned to the off position by the spiral spring 26. When all the resistance of the rheostat is cut out—that is, when the parts are in the dotted-line position of Fig. 1—the circuit will be completed between the terminals directly from block 14 to the block 11 through the movable contact 19.

It is obvious that other resistance units might be employed than those constructed in the manner described and that many alterations and modifications might be made in the specific structure herein disclosed without departing from the spirit and scope of my invention. I therefore do not wish to be limited to the specific matter illustrated, but aim to cover by the terms of the appended claims all such alterations and modifications.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A rheostat comprising a resistance unit consisting of a helical insulated conductor having its turns continuously forced together to form a rigid structure, and a coöperating contact rotatable on an axis transverse to the unit to progressively engage its turns.

2. A rheostat comprising two oppositely-disposed units, each consisting of a helical insulated conductor having its turns continuously forced together to form a rigid structure, and a coöperating contact rotatable about an axis between and transverse to said units and movable over the surfaces of the same to progressively engage their turns.

3. A rheostat comprising a resistance unit consisting of a helical insulated conductor having its turns continuously forced together to form a rigid structure, a coöperating contact rotatable about an axis transverse to that of the unit and movable over the same to progressively engage its turns, an operating-handle, a spring for returning the movable contact to off position, and electromagnetic means for holding said movable contact against said movement.

4. A rheostat comprising two oppositely-disposed resistance units each having an exposed contact-surface extending throughout

its length, a coöperating contact rotatable about an axis transverse to said units and movable over the surface of the same to progressively engage their turns, an operating-handle, a spring for returning said movable contact to off position, and electromagnetic means for holding said movable contact against said movement.

5. A rheostat comprising a fixed resistance element, a coöperating contact movable over one side of said element, a locking-magnet located at the opposite side thereof, a coöperating armature movable with said contact, and a spring for returning the contact to off position when released by said magnet.

6. In a rheostat, the combination of a base, a pivot-post secured thereto, a magnet secured to said base adjacent to said post, a movable contact rotatably mounted at the upper end of said post, suitable resistances in operative relation thereto, an operating-handle, a spring for returning the movable contact to off position, an armature pivotally mounted on said pivot-post in operative relation to said magnet and adapted to be drawn thereagainst to hold said movable contact against the tension of the spring.

7. A rheostat comprising a fixed resistance element, a coöperating movable contact, a fixed locking-magnet, a coöperating armature carried by said contact and movable transversely thereto, and means for keeping the armature out of engagement with the magnet until it has reached a definite position.

8. A rheostat comprising a fixed resistance element, a coöperating movable contact, a fixed locking-magnet, a coöperating yieldingly-mounted armature carried by said contact and movable transversely thereto, and means for keeping the armature out of engagement with the magnet until it has reached a definite position.

9. A rheostat comprising a base, a movable element and a fixed element mounted thereon, a spring for returning the parts to off position, electromagnetic means for holding the movable element against the tension of the spring comprising a magnet secured to said base, a yieldingly-mounted armature on the movable element, and strips on the magnet arranged to keep the armature out of engagement with the magnet except in the locking position.

10. A rheostat comprising a fixed resistance element, a coöperating movable contact, a spring for returning said contact to off position, a locking-shoulder adapted to hold said contact against the tension of said spring, a coöperating locking member carried by said contact, and electromagnetic means for throwing said parts into locking engagement.

11. A rheostat comprising a fixed resistance element, a coöperating movable contact, a spring for returning said contact to off position, a locking-armature carried by said contact, an electromagnet, a guide-strip over which said armature moves as the contact is moved, and a depression therein into which the armature is drawn by the magnet to lock the contact against the tension of the spring.

12. In a rheostat, the combination with a fixed resistance element and a base therefor, of a pivot-post secured to said base, a magnet located at the foot of said post, a rotary armature supported on said post and movable longitudinally thereof, and a yielding laterally-extending contact secured to said armature and adapted to engage the fixed element of the rheostat and to be put under strain by the downward movement of said armature.

13. In a rheostat, the combination with a fixed resistance element and a base therefor, of a pivot-post secured to said base, a magnet located at the foot of said post, a rotary armature supported on said post and movable longitudinally thereof, an operating-lever secured thereto, a yielding laterally-extending contact secured to said armature and adapted to engage the fixed element of the rheostat and to be put under strain by the downward movement of said armature, and a return-spring connected between the upper end of said post and said lever.

14. A rheostat comprising two oppositely-disposed resistance units each having an exposed contact-surface extending throughout its length, a coöperating contact rotatable about an axis transverse to said units and movable over the surface of the same to progressively engage their turns, and end members extending laterally from said units and lying in the path of said rotatable contact, two of said members being electrically connected to the adjacent ends of said units and two being insulated so as to break the circuit with said rotatable contact when engaged thereby.

In witness whereof I have hereunto set my hand this 10th day of October, 1904.

GEORGE E. STEVENS.

Witnesses:
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