

L. BOOTHMAN.
ELECTRIC REGULATING RHEOSTAT.
APPLICATION FILED MAR. 4, 1915.

1,351,019.

Patented Aug. 31, 1920.
2 SHEETS—SHEET 1.

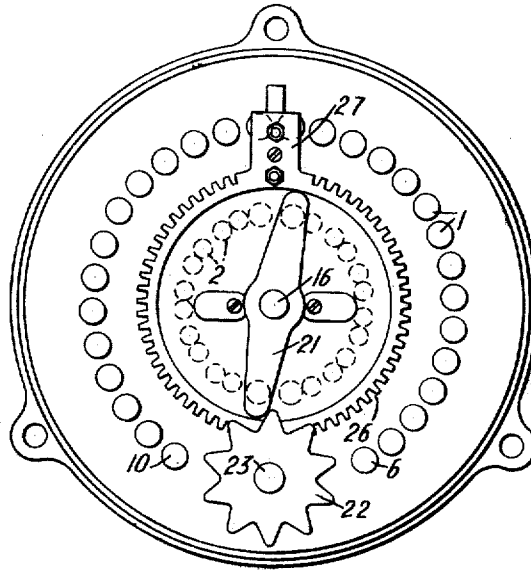


Fig. 1.

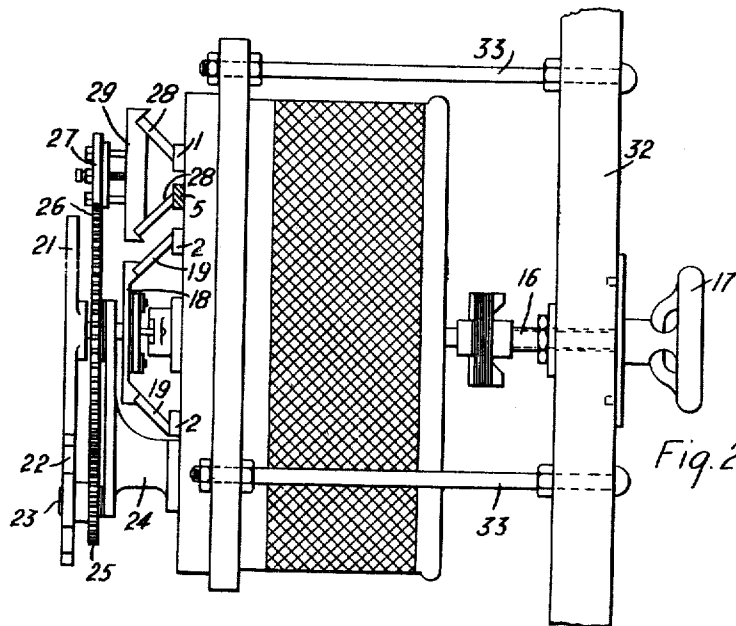


Fig. 2.

WITNESSES:

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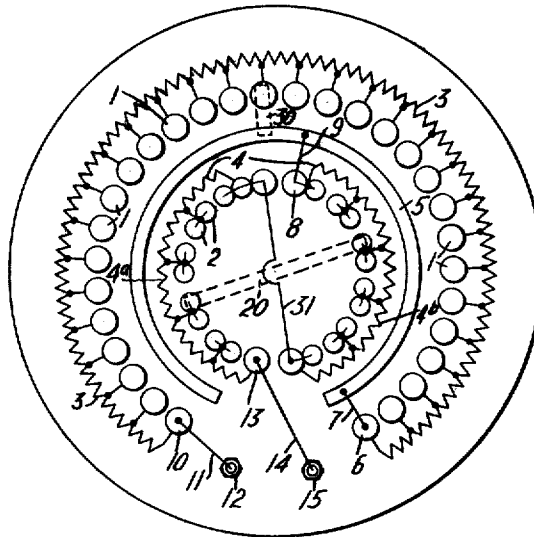
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Fig. 3.



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UNITED STATES PATENT OFFICE.

LAWRENCE BOOTHMAN, OF MANCHESTER, ENGLAND, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRIC REGULATING-RHEOSTAT.

1,351,019.

Specification of Letters Patent. Patented Aug. 31, 1920.

Application filed March 4, 1915. Serial No. 12,214.

To all whom it may concern:

Be it known that I, LAWRENCE BOOTHMAN, a subject of the King of Great Britain, and a resident of Manchester, in the county of Lancaster, England, have invented a new and useful Improvement in Electric Regulating-Rheostats, of which the following is a specification.

My invention relates to electric rheostats, and it has for its object to provide an improved rheostat of the kind comprising two distinct rheostatic elements, one, which may conveniently be termed the main rheostat, for varying the resistance in circuit by a series of steps, and the other, which will be hereinafter referred to as the subdividing rheostat, to be alternately cut into and out of circuit between each two successive steps of the main rheostat.

My invention comprises a particular construction in which the contact members of the main and subdividing rheostats are arranged in two concentric circles and the movable contact members or bridge pieces of the rheostats are operatively connected together by means of spur gearing, as hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a rear elevational view, and Fig. 2 is a side elevational view of a regulating rheostat constructed in accordance with the present invention, and Fig. 3 is a diagrammatic view showing the electric circuits that form a part of the device shown in Fig. 1.

The fixed contact members of the main rheostat are indicated at 1 and those of the subdividing rheostat at 2, the latter being divided into two semi-circular sets, as shown. Between the contact members 1 of the main rheostats are connected resistance elements 3, the resistance of each of which is equal to the total resistance of a series of resistance elements 4 with which the subdividing rheostat is provided. The series of resistance elements 4 is divided into substantially equal parts 4^a and 4^b, which are connected between the contact members 2 in the ordinary manner. Concentric with the contact members 1 is a nearly circular contact member 5 which is connected to the last contact member 6 of the series of contact members 1 by a conductor 7 and which is also connected to the first contact member 8 of the series of contact members 2 by a conductor 9. The first contact member 10 of the

series of contact members 1 is connected by a conductor 11 to one terminal 12 of the rheostat, and the last contact member 13 of the series of contact members 2 is connected by a conductor 14 to the terminal 15 of the rheostat.

The rheostat is provided with an operating shaft 16 having an operating handle 17 of any suitable description. Near the rear end of the shaft opposite to the handle 17 is secured a cross arm 18 carrying movable contact members 19 that are adapted to successively engage the fixed contact members 2 as the shaft 16 is rotated, thus forming a bridge piece, as indicated diagrammatically at 20 in Fig. 3. Also secured to the shaft 16 is a two-armed lever 21 the ends of which are adapted to alternately engage the teeth of a spur gear wheel 22 that is mounted to rotate on a stud 23 projecting from a bracket 24 which forms part of the frame of the rheostat. Attached to the spur gear wheel 22, so as to rotate with it, is a spur gear wheel 25 adapted to mesh with a spur gear wheel 26 that is loosely mounted on the shaft 16 or on a projection of the bracket 24. The spur gear wheel 26 is provided with a projecting arm 27 carrying contact members 28 which are connected together by means of a bridge piece 29 and are adapted, respectively, to move over the fixed contact members 1 and the circular contact member 5 as the spur gear wheel 26 is rotated. The contact members 28 and the bridge piece 29 are indicated diagrammatically at 30 in Fig. 3 as forming a connection between one of the contact members 1 and the circular contact member 5.

As will be seen from Fig. 3, the series of contact members 2 and the resistance elements 4, which are connected to the contact members 2, are divided into two parts which are connected by the conductor 31, and the contact members 2 are so formed or arranged that, as the bridge piece 20 is moved, one of its ends will always be in contact with one of the contact members 2, while the other end is moving from one contact member 2 to the next.

The operation of the apparatus is as follows: When all the resistance is in circuit, the bridge piece 30 connects the last contact member 6 of the series of contact members 1 to the circular contact member 5, and the bridge piece 20 connects the two contact

members of the series 2 which are also connected by the conductor 31. In order to reduce the total resistance, the handle 17 is rotated to cause the bridge piece 20 to rotate in the counter-clockwise direction in Fig. 3 and thus to gradually cut out the resistance 4. When the bridge piece 20 has been rotated through very nearly a semi-circle, it will be in position to connect the contact members 8 and 13, and the lever 21 will engage one of the teeth of the spur gear wheel 22, as shown in Fig. 1 of the drawings. A further movement of the shaft in the same direction will cause the bridge piece 20 to again connect the contact members of the series 2 which are connected by the conductor 31, so that the whole of the resistance 4 will be cut into circuit again. At the same time, the spur gear wheel, together with the spur gear wheel 25, will be partially rotated by reason of the engagement between the lever 21 and the gear wheel 22, which will cause the spur gear wheel 26 to rotate in a counter-clockwise direction to move the bridge piece 30 from the contact member 6 to the next contact member, and thereby to cut out the first section of the resistance 3. A further rotative movement of the bridge piece 20 through a semi-circle will, as before, gradually cut out the whole of the resistance 4 and, at the end, another movement of the bridge piece 30 will be caused, which will cut out the next section of the resistance 3, while the resistance 4 is reinserted. It will be readily understood that rotative movement of the handle 17 in the other direction will result in increasing the amount of resistance in place of diminishing it.

The apparatus, as will be seen in Fig. 2, is intended to be mounted on a switch-board panel 32 by means of the supporting bolts 33, its simple and compact shape being very well adapted for this purpose. The apparatus may, however, be used as an ordinary rheostat, in which case the operating handle is preferably provided on what has been referred to as the rear end instead of being placed in front of the switchboard, as shown.

I claim as my invention:

1. A rheostat for electric circuit control comprising a main series of rheostat elements, a subdividing rheostat associated therewith, contact members adapted to progressively engage the said main and subdividing rheostats, and gearing for operating the said contact members in timed relation to each other, said gearing comprising a gear wheel carrying the contact member belonging to the main rheostat, a second gear wheel meshing with the said contact-carrying gear wheel, a third gear wheel adapted to rotate in unison with the said second gear wheel, and a lever secured to move in unison with the contact member belonging to

the subdividing rheostat and adapted to periodically engage the said third gear wheel and to partially rotate the said gear wheel at each such engagement.

2. A rheostat for electric circuit control comprising a main series of rheostat elements, a subdividing rheostat associated therewith, contact members adapted to progressively engage the said main and subdividing rheostats, and gearing for operating the said contact members in timed relation to each other, said gearing comprising a gear wheel carrying the contact member belonging to the main rheostat, a second gear wheel meshing with the said contact-carrying gear wheel, a third gear wheel having a relatively small number of teeth and adapted to rotate in unison with the said second gear wheel, and a lever adapted to rotate coaxially with the said contact-carrying gear wheel and in unison with the contact member belonging to the subdividing rheostat and also adapted to periodically engage the said third gear wheel and to partially rotate the said gear wheel at each such engagement, whereby the contact member belonging to the main rheostat is advanced one step after each complete movement of the contact member belonging to the subdividing rheostat.

3. A rheostat for electric circuit control comprising a series of rheostat elements, a subdividing rheostat divided into two parts associated therewith, contact members adapted to progressively engage the said main and subdividing rheostats, the contact member for said subdividing rheostat engaging both of said parts, and means for operating said contact members in timed relation to each other.

4. A rheostat for electric circuit control comprising a substantially circular series of main rheostat elements, a subdividing rheostat concentrically disposed within the said series of elements, said subdividing rheostat being divided into two semi-circular parts connected in circuit with each other, contact members adapted to progressively engage said main and subdividing rheostats, the contact member for said subdividing rheostat engaging both of said semi-circular parts, and means for operating said contact members in timed relation to each other.

5. A rheostat provided with two series of stationary contact members, resistance elements connecting the members of each series, the contact members of one of said series being divided into two semi-circular sets, movable contact members adapted to progressively engage said stationary contact members, the movable contact member for said divided series engaging both of said sets and engaging a contact member of one of said sets while moving between contact members of said other set, and means for

for operating said movable contact members in timed relation to each other.

6. A rheostat comprising a main resistor and a plurality of subdividing resistors, means for short-circuiting said main resistor, means for simultaneously short-circuiting corresponding portions of each of said subdividing resistors and means for effecting the operation of said first-named means after every complete operation of said second-named means.

7. A rheostat comprising a main resistor and a pair of auxiliary resistors, a series of nearly circular stationary contact members connecting the terminal points and intermediate points of said main resistor, a plurality of sets of stationary contact members concentrically disposed with respect to said series of contact members connecting the terminal points and intermediate points of said auxiliary resistors, a nearly circular stationary contact member concentrically disposed with respect to said other contact members, means connecting one of the terminal contact members of said series to said nearly circular contact member, means connecting said nearly circular contact member

to one of the terminal contact members of one of said sets, means connecting the other terminal contact member of said one set to one of the terminal contact members of said other set, a movable contact member having two portions for respectively engaging the contact members of each of said sets so as to simultaneously short-circuit corresponding portions of each of said auxiliary resistors, a movable contact member having two portions for respectively engaging the contact members of said main resistor and said nearly circular contact member, and means for moving said second-named movable contact member from engagement with one of the contact members of said main resistor into engagement with a succeeding contact member of said main resistor after every half revolution of said other movable contact member.

In testimony whereof I have hereunto subscribed my name this eleventh day of February, 1915.

LAWRENCE BOOTHMAN.

Witnesses:

J. S. PECK,

GEORGE COWLEY.