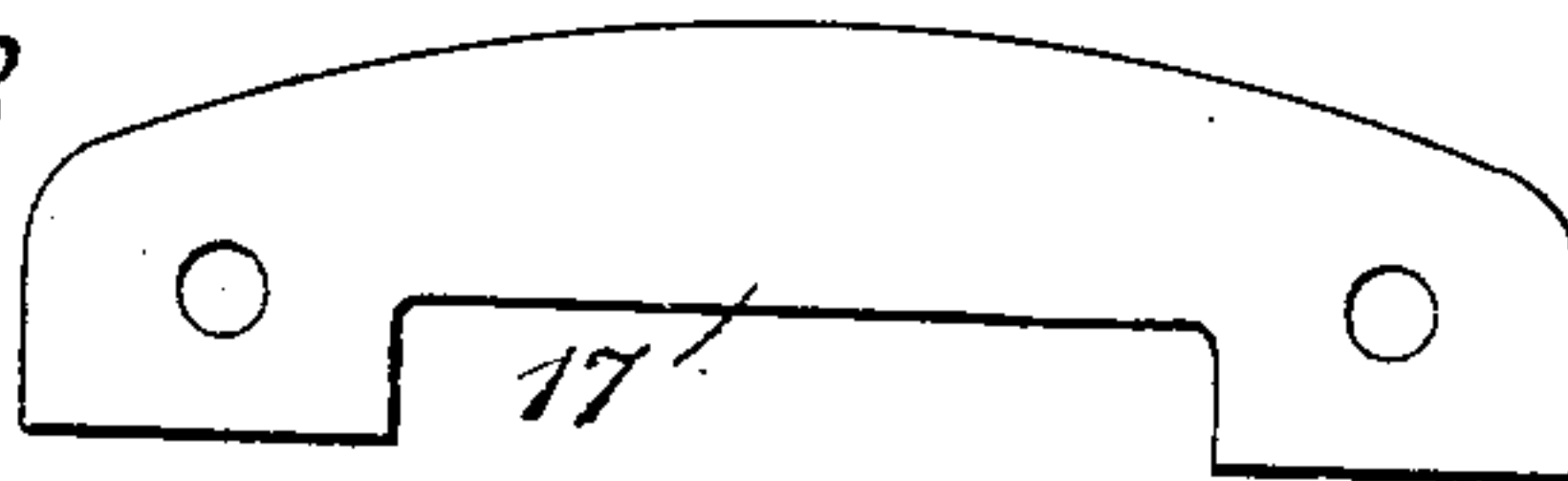


WITNESSES:  
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*Fig. 3*



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# UNITED STATES PATENT OFFICE.

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## RHEOSTAT.

946,544.

Specification of Letters Patent.

Patented Jan. 18, 1910.

Application filed January 16, 1906. Serial No. 296,338.

*To all whom it may concern:*

Be it known that I, FORD W. HARRIS, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rheostats, of which the following is a specification.

My invention relates to rheostats or resistances which are adapted to effect current regulation in electric circuits and it has for its object to provide a rheostat of this class which shall be inexpensive in construction and which shall comprise a plurality of interchangeable units, the ohmic resistance of which may be predetermined and varied without changing the principal dimensions or general construction of the unit.

In the design of rheostats for certain kinds of service it is desirable to provide a resistance group comprising a strong frame structure and a plurality of interchangeable resistance units mounted thereon which have a relatively large radiating surface in order to prevent an excessive rise in temperature. These conditions have been met in the prior art for circuits of relatively large capacity, where the required ohmic resistance was comparatively low, by providing resistance units of the well known cast metal grid type but for use with motor equipments which are adapted for propelling relatively light loads, such as are found on mining locomotives or in crane service, particularly if the current delivered thereto is at an electromotive force of 500 volts or more, the minimum number of cast iron grids which will afford the desired ohmic resistance are capable of carrying currents that are larger than may safely be applied to the motors.

My improved resistance comprises a plurality of interchangeable units which may, in many cases, take the place of the cast iron grids of the prior art and their resistances may be made many times greater than the resistance which could be provided by a cast iron grid of a given size by reason of the mechanical limitations inherent in the cast grids while their current-carrying capacity is sufficient for the service to which they are adapted.

In the accompanying drawing, Figure 1 is a plan view of a portion of a rheostat constructed in accordance with my invention, Fig. 2 is an end elevation of the rheostat shown in Fig. 1 and Fig. 3 is an en-

larged detail view of a connector shown in Figs. 1 and 2.

Referring to the drawings, the rheostat comprises a supporting frame 1 and a plurality of similar resistance units 2, 3, 4, etc., mounted thereon. The frame 1 comprises two similar end brackets or castings 5 having recesses 6 to receive straps for rigidly mounting the frame upon the bottom of a car or elsewhere and side connecting rods 7 which are covered with films or wrappings of insulating material such as mica, upon which the several units are mounted.

The units 2, 3, 4, etc., are of similar construction and severally comprise side plates 8 and 9 which are shown as rectangular in shape but which may obviously be of any convenient size or shape and are connected by insulating spacing bushings 10 and 11 which fit over the insulated rods 7. A plurality of spools 12 of non-conducting material, such as porcelain or soapstone, which is capable of withstanding a considerable rise in temperature, are mounted in two substantially parallel rows between the plates 8 and 9 and near their upper and lower edges, the bushings 11 and 12 being located between the plates substantially at the middle points of their sides. Close to and below the end spools of the upper row are located spools 13 and a strip 14 of relatively high-resistance conducting material, such as German silver or iron, passés from the upper end spools, to which it is attached, under the corresponding end spool of the lower row, then over the second spool of the upper row, then under the second spool of the lower row and so on, in zigzag formation, until the last spools of the upper row are reached, the end of the strip being attached to the said two spools at the end of the row.

Straps 15 of conducting material are riveted to the extremities of the resistance strip, pass around the end spools of the upper row, and project above the plates 8 and 9 in the form of ears to which terminal members 16 or connectors 17 may be attached by bolts 18.

Since the resistance units have the same dimensions, the length of the resistance strip will be substantially the same for each unit but their ohmic resistances may be of any convenient value by varying the thickness, or the width, of the strip or the material of which it is constructed, within limits which



are dependent upon the mechanical strength of the strip and its adaptability to conform to the shape to which it must be bent.

The similarity of the frames, bushings and spools of which the units are constructed makes it possible to manufacture these parts in large quantities and to design units of various standard ohmic resistances, as will be readily understood.

10 In assembling the units upon the frame 1, insulating washers 19 should be placed upon the rods 7 between the several units and between the end units and the castings 5, and if the several units are to be connected in series relation, one end of the resistance strip on an end unit will be provided with a terminal 16 while the opposite end of this strip will be connected by a connector 17 with the extremity of the resistance strip on the next adjacent unit, the circuit connections being completed in a similar manner between the several units.

The size and arrangement of parts may, of course, be varied within the scope of my invention and the several units comprising a group may be connected in any convenient manner.

I claim as my invention:

1. A resistance structure comprising a pair of end castings, a pair of rods on which said castings are mounted, a plurality of pairs of substantially rectangular plates mounted on said rods between the end castings, spacing bushings between said pairs of plates, a plurality of spools of non-conducting material independently supported side-by-side in rows between the plates and adjacent to opposite edges thereof, strips of relatively high-resistance conducting material supported by the spools between the plates in zigzag formation, and terminal pieces removably attached to the ends of the conductor.

2. In a rheostat, the combination with a

supporting frame comprising a pair of end castings connected by a pair of insulated rods, of a plurality of resistance units mounted upon said rods and each comprising a pair of end plates, a plurality of spools of non-conducting material independently supported side-by-side between said plates, and a strip of relatively high-resistance conducting material disposed upon said spools in zigzag formation.

3. In a rheostat, the combination with a supporting frame comprising a pair of end castings connected by a pair of insulated rods, of a plurality of resistance units mounted upon said rods and each comprising a pair of plates between which a plurality of spools or cylinders of non-conducting material are independently mounted side-by-side in rows near opposite edges and a strip of relatively high-resistance conducting material disposed upon said spools in zigzag formation.

4. In a rheostat, the combination with a supporting frame comprising a pair of end castings connected by a pair of insulated rods, of a plurality of resistance units mounted upon said rods and each comprising a pair of substantially rectangular plates separated by spacing bushings, a plurality of spools of non-conducting material independently supported side-by-side in rows between the plates and adjacent to opposite edges thereof, a strip of relatively high-resistance conducting material disposed upon said spools in zigzag formation, and terminal pieces removably attached to the ends of the conductor.

In testimony whereof, I have hereunto subscribed my name this 10th day of January 1906.

FORD W. HARRIS.

Witnesses:

THOS. S. HOWELL,  
BIRNEY HINES.