A. SIMON.

ELECTRICAL RESISTANCE DEVICE.

APPLICATION FILED MAY 14, 1910.

1,158,572.

Patented Nov. 2, 1915.

Fig. 1.

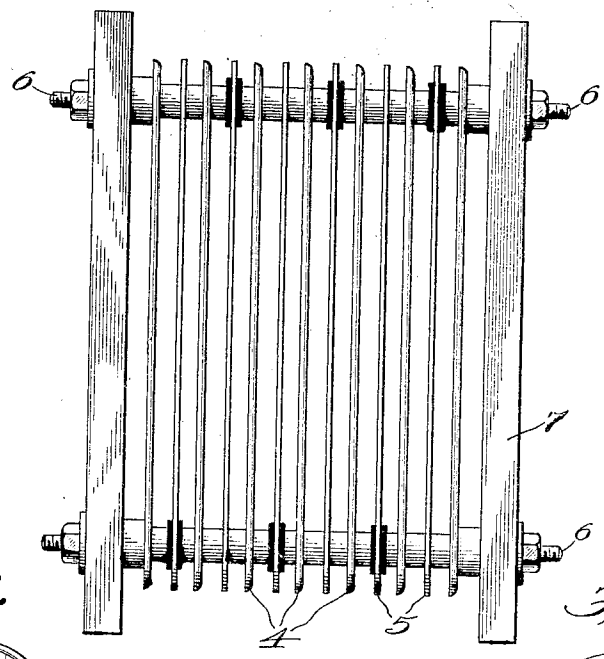


Fig. 2.

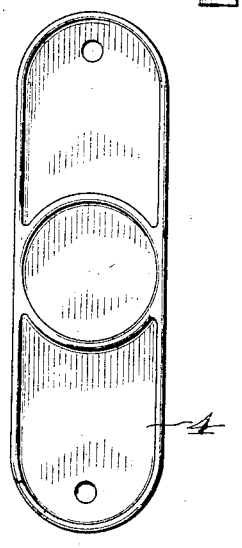
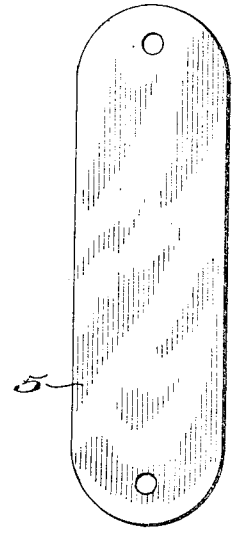


Fig. 3.



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UNITED STATES PATENT OFFICE.

ARTHUR SIMON, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO CUTLER-HAMMER MFG. CO., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

ELECTRICAL RESISTANCE DEVICE.

1,158,572. Specification of Letters Patent. Patented Nov. 2, 1915.

Application filed May 14, 1910. Serial No. 561,403.

To all whom it may concern:

Be it known that I, ARTHUR SIMON, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Electrical Resistance Devices, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in electrical resistance devices, and more particularly to a method and means for increasing the amount of electrical energy dissipated by an ordinary resistance body.

It is well understood that the efficiency of a resistance body depends upon the amount of electrical energy which it can dissipate at a given temperature rise thereof. In other words, the efficiency of a resistance body depends upon the rapidity with which the electrical energy transformed into heat can be dissipated. Thus, the efficiency of a resistance body or unit may be increased, by increasing the rapidity with which the heat generated therein is dissipated. Heretofore it has been customary to dissipate the heat by convection of the unit with the surrounding air. With such an arrangement, the dissipation of the heat is governed by the ventilation conditions, and the ventilation conditions are dependent upon the arrangement of the resistance unit or units. If a plurality of resistance units are placed in close proximity, it is apparent that the ventilation thereof will be relatively poor, and yet, in practice, it is a matter of great economy, and practically a requirement, to make a group or bank of resistance units, as compact as possible.

According to my invention, I propose to dissipate a part of the heat of the resistance body, or bodies, by radiation, as the percentage of heat which may be thus dissipated is much larger than can be accomplished by convection. The efficiency of the radiation method of dissipating heat, depends largely on the character of the surfaces of the resistance units. In practice, however, the surfaces of commercial resistances are usually very much the character of perfectly black bodies, as defined in physics, which condition is very favorable for heat radiation. I have found that a resistance unit, under favorable conditions, can dissipate by radiation, several times the amount of electrical energy that it is possible to dissipate with resistances as commonly arranged in practice where convection is relied upon.

I have further found that a group or bank of resistance units may be made to dissipate electrical energy by heat radiation, by merely inserting between adjacent units, a suitable body which is capable of absorbing the radiated heat and dissipating the same by convection with the air passing between the units. Of course, with such an arrangement, the heat developed in the resistance unit is dissipated by both radiation and convection.

Inasmuch as such arrangement provides for a much greater dissipation of the electrical energy converted into heat, it, obviously, requires fewer resistance units to accomplish the dissipation of a given amount of energy. In practice, I have found that with my arrangement of the units, the efficiency thereof is practically doubled, which means that only half of the units heretofore required for giving the desired resistance, need be employed where the same are arranged in accordance with my invention.

The reduction in the number of the units, is a matter of great commercial value, inasmuch as the resistance units required in numerous instances are very expensive, and the heat absorbing bodies or blanks may be produced at a very low cost.

In practice, the heat absorbing bodies, interposed between the resistance units, may be of various different materials and of various different forms. I have found, however, that a plate of ordinary iron will prove very efficient as a heat absorbing body.

The shape of the body interposed between the units, is not of great importance, but in practice, I prefer to use thin plates of such dimensions as will give a maximum surface area.

For the purpose of more clearly disclosing the manner in which I carry out my invention, I have illustrated in the accompanying drawing, a rheostat constructed in accordance therewith.

In the accompanying drawing, Figure 1 is a schematic view of the rheostat, Fig. 2 illustrates one form of resistance units which may be used therein, and Fig. 3 illustrates

one form of blank which may be inserted between the resistance units.

The device schematically illustrated in Fig. 1, comprises a plurality of resistance units 4 and heat absorbing bodies, or blanks 5, assembled on suitable rods 6, which in turn are supported by a suitable frame 7. The resistance units and heat absorbing bodies, or blanks, are arranged alternately on the supporting rod 6, whereby one of the heat absorbing bodies, or blanks, is interposed between each adjacent pair of resistance units. As illustrated insulation shown in heavy black is provided for causing a tortuous passage of current through the resistance units and between the blanks, said blanks being excluded from circuit. The resistance units and heat absorbing bodies, or blanks, should be sufficiently spaced to permit a free circulation of air between the same.

In practice, the spacing between the resistance units and heat absorbing blanks, need not be any greater than the usual spacing between resistance units where the heat is dissipated by convection. The resistance units may be of the form illustrated in Fig. 2, which comprises a plate of German silver, or may be of various other forms. The heat absorbing bodies, or blanks 5, may also assume various different forms. In practice, however, I have secured very favorable results by the use of such a blank as is illustrated in Fig. 3. This blank merely comprises a sheet of iron, provided with suitable apertures for the reception of the supporting rod 6. Where economy of space is required, I make the heat absorbing blanks 5 of substantially the same shape and size of the units. Otherwise I prefer to make the blanks as large as practicable, in order to give the same a maximum surface area to facilitate dissipation of the heat thereof by convection.

With such an arrangement, as is illustrated in Fig. 1, when the current is passed through the resistance units, the heat of the resistance units will be radiated to the blanks 5, until said blanks have absorbed sufficient heat to reach practically the same temperature as the current carrying units. Under this condition they will transmit heat to the passing air in the same amount as the current carrying units. This means that a rheostat, composed of 50% of resistance units and 50% of blanks, will dissipate the same amount of electrical energy as a rheostat comprising double the number of resistance units without having blanks interposed between the same.

Of course, where resistance units are assembled, as in Fig. 1, but without the use of blanks, the heat of the units is radiated from one unit to another, but inasmuch as the units are maintained at practically the same temperature by the current, traversing the same, there is very little, if any, dissipation of heat by such radiation.

The economy, resulting from the application of my invention, is obvious, for the blanks are very inexpensive in comparison with the resistance units. Of course, German silver units are among the most expensive in use, but probably every resistance unit which is capable of use is more expensive than the blanks required by my invention. Further, the application of my invention would in numerous instances result in much economy of space, especially where the resistance units employed are formed on thick porcelain bases.

While I have disclosed one means for carrying out my invention, I desire to have it understood that it may be carried out in various other ways and by various different means. Furthermore, I wish it understood that my invention is not limited in its application to any particular class of rheostats, but that on the contrary, it is applicable to resistance devices used for various different purposes.

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

1. The herein described method of increasing the amount of electrical energy dissipated by rheostats of given resistance consisting in radiating the heat of the resistance to heat-absorbing bodies and cooling the latter.

2. The herein described method of increasing the rate of dissipation of electrical energy with a rheostat of given resistance consisting in directly radiating the heat of the rheostat resistance to a heat-absorbing body or bodies and dissipating the heat of the latter by convection.

3. A rheostat provided with a resistance and a non-current carrying heat-absorbing body arranged in proximity therewith but spaced therefrom to absorb by radiation the heat of said resistance and thereby effect an increased dissipation of electrical energy by said resistance.

4. A rheostat provided with a resistance body and a non-current carrying heat-absorbing body arranged in proximity therewith but spaced therefrom to absorb by radiation the heat of said resistance body, said bodies having radiating surfaces of substantially equal area.

5. A rheostat provided with a plurality of resistance elements arranged in a group and a plurality of non-current carrying heat-absorbing members interposed between adjacent elements to absorb the heat thereof by radiation and dissipate such heat by convection.

6. A rheostat provided with a plurality of resistance units and a plurality of heat-absorbing members arranged alternately in

a series and spaced from one another to permit circulation of air therebetween, said members being excluded from circuit and absorbing the heat of said units by radiation.

7. In a rheostat, the combination with supporting members of a plurality of resistance units and a plurality of iron heat-absorbing plates supported on said members in a spaced relation, said units and said plates alternating and said plates being excluded from circuit.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

ARTHUR SIMON.

Witnesses:
FRANK H. HUBBARD,
GEORGE HAYNES.