H. E. HEATH.

RHEOSTAT.

APPLICATION FILED AUG. 4, 1905.

919,575.

Patented Apr. 27, 1909.

2 SHEETS—SHEET 1.

Fig. 2

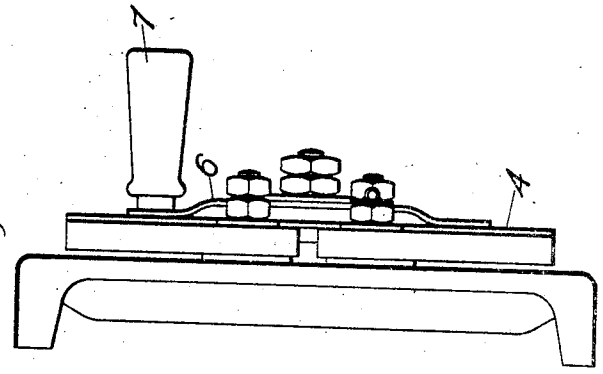
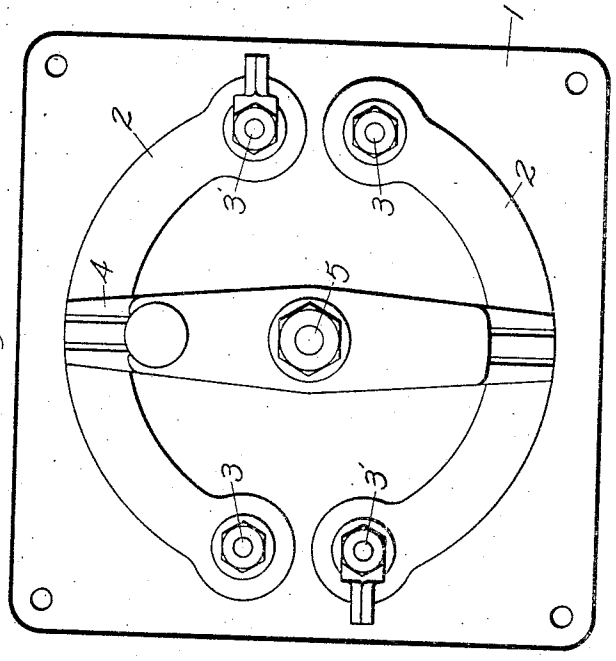


Fig. 1



Witnesses:

Benjamin B. Hall

Bertha Secor

Inventor;

Harry E Heath

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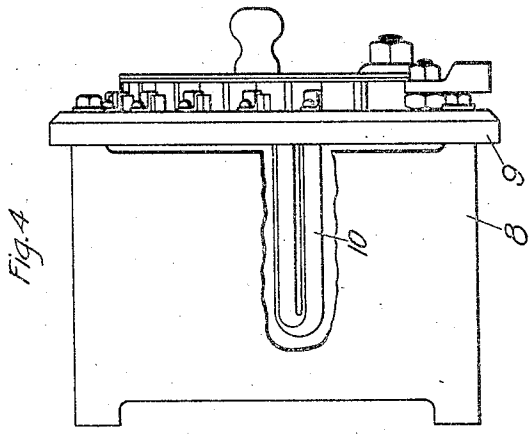


Fig. 4

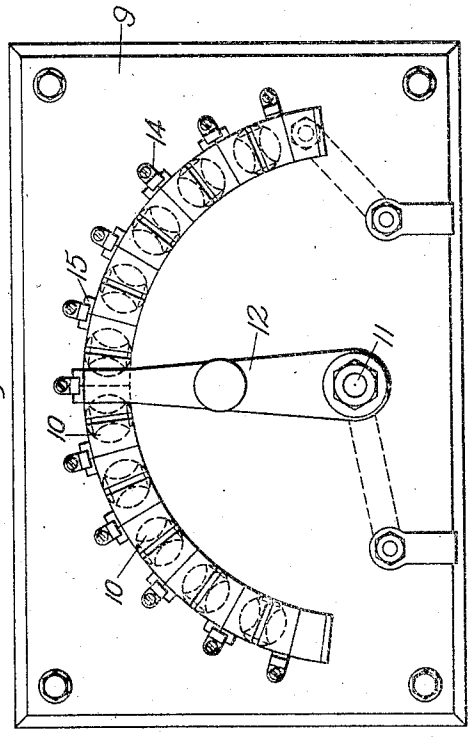


Fig. 3



Fig. 7



Fig. 6

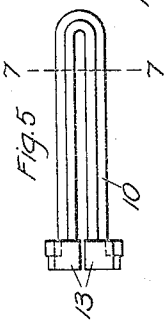


Fig. 5

Witnesses:
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UNITED STATES PATENT OFFICE.

HARRY E. HEATH, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

RHEOSTAT.

No. 919,575. Specification of Letters Patent. Patented April 27, 1909.

Application filed August 4, 1905. Serial No. 272,893.

To all whom it may concern:

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

This invention relates to resistance units for electric circuits and has for its object the provision of an improved unit of this character which will be practically indestructible while at the same time occupying a minimum of space and capable of being produced at a very low cost.

In the construction of resistance units heretofore, it has been the common practice to use a resistance conductor wound into a coil or any convenient form, providing the same with terminals for connection with the electric circuit. Units of this character have not been entirely satisfactory owing to the fact that they are easily destroyed, as for instance, by being burned out. They are likewise expensive to construct and occupy more space in proportion to the resistance offered than is oftentimes desirable.

Resistance units have also been proposed which are made of cast material such as cast iron in the form of grids, and also of molded material as graphite and carbon, which constitute what are known as stick resistances. These cast and molded units have been found to be objectionable for many reasons and their use has therefore been greatly limited. In the case of the cast grids, the specific resistance is so low that the apparatus requires considerable space and moreover, since the material is oxidizable, the life is short in case the temperature is raised above the normal. These objections also apply to the molded graphite and carbon resistances which have a further objection in that the coefficients of expansion are such as to cause the unit to disintegrate by repeated heating and cooling. It has been found that the element silicon has a specific resistance nearly twice that of ordinary carbon but that unlike carbon, it is able to withstand a red heat without oxidation. Moreover, its expansion coefficient is low, and it will not disintegrate under changes of temperature. In order to place this element into a desirable form for resistance units it occurred to me that the element might possibly be cast into regular forms so as to be conveniently handled. Upon trial it was found that this could be done and that not only large castings could be made but that crystalline silicon could be cast into small pencils not exceeding one-quarter of an inch in diameter. It was found moreover, that the resistance of these cast units is nearly constant and that upon increase in temperature up to a red heat, the resistance increased very slightly. The specific resistance of these units being twice that of carbon, the units may be small and compact. I have also found that a cast unit can be heated to a red heat and suddenly cooled by plunging in water without cracking or disintegrating it. These properties render the unit a very desirable one as a substitute for the wire, graphite and carbon resistance, it being possible to construct a very compact, cheap, efficient and durable rheostat of these cast units. For purposes of illustration, therefore, I have shown my improved resistance unit in connection with a rheostat, but it should be understood that I do not limit my invention to this particular use since it is capable of wide application. My invention, therefore, is only limited by the scope of the claims annexed to and forming a part of this application.

In the drawings, Figure 1 is a plan view of a rheostat embodying my improvements; Fig. 2 is an elevation of the same; Fig. 3 is a plan view of a modified form of my invention; Fig. 4 is an elevation of the same; Fig. 5 shows one of the resistance units used in the modified form of my invention; Fig. 6 is an end elevation of the same; and Fig. 7 is a sectional view taken on the line 7—7 of Fig. 5.

Referring to the drawings (Figs. 1 and 2), 1 is an insulating base of any desired material commonly used in devices of this character. I prefer, however, to employ a base of cast iron which is insulated by means of the coating of enamel. Mounted upon this insulating base is a pair of resistance units 2 secured to the base by means of the bolts 3. These units are cast from the element silicon into the form of an arc and mounted as shown so as to practically form a circle. A brush arm 4 is pivoted at 5 so that its free ends engage the units 2. The arm 4 is held in yielding contact with the units by means of the spring 6 secured to the pivot bolt 5. The bolts 3' serve as terminals for the units which may be electroplated or otherwise treated at the ends to make good electrical contact. A

starting handle 7 is secured to the controlling arm by means of which the latter may be moved so as to vary the amount of resistance in circuit in a well-known manner. By moving the arm to the right from the position shown in Fig. 1, resistance is gradually cut out of circuit while by moving it to the left the resistance is cut in. In this form of my device, the variation of resistance is gradual and a very fine regulation may therefore be obtained.

In Figs. 3 to 7, I have shown a modified form in which a step-by-step variation is produced. Referring to these figures, 8 is a box of suitable material provided with an insulating cover 9 which serves as a base for the rheostat. A series of resistance units 10 are mounted upon the base and arranged in the form of a circle with 11 as a center. A brush arm 12 is pivoted at 11 so that its free end moves over and successively engages the units 10 to cut them in or out of circuit in a well-known manner. These units 10, I prefer to cast from silicon in the form shown in Figs. 5 to 7. I cast them into a U-shaped form, the cross-section of which is oval as shown in Fig. 7. The enlarged ears 13 are provided for making contact with the arm 12. The units are connected in series by means of the clips 14 which connect the units through the shoulders 15. The resistance may be therefore, increased or decreased by moving the arm 12 to the left or right as desired, to successively cut in or out the resistance units. It will, therefore, be seen that I have shown two forms of rheostats which embody my improved resistance unit, one of which provides for successively cutting out the units and the other provides for gradually varying the extent of a single unit. It should, however, be understood that I do not limit myself to these forms of rheostats, nor do I limit the use of my resistance unit to its application to a rheostat, as many other uses will suggest themselves to those skilled in the art.

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

1. A resistance unit of cast silicon provided with a contacting terminal.

2. A resistance unit consisting of a body of cast silicon having an affixed terminal thereon.

3. A resistance unit consisting of a body of cast silicon of uniform cross-section.

4. A resistance unit consisting of a body of uncombined silicon in crystalline form cast in regular shape.

5. A rheostat comprising a cast silicon unit, and a controlling arm mounted for engagement therewith.

6. A rheostat comprising a cast silicon unit, and a controlling arm mounted for sliding engagement therewith.

In witness whereof, I have hereunto set my hand this first day of August, 1905.

HARRY E. HEATH.

Witnesses:

JOHN A. McMANUS, Jr.,

HENRY O. WESTENDARP.