No. 699,064. Patented Apr. 29, 1902.

H. P. BALL.

RHEOSTATS, ELECTRIC HEATERS, &c.

(Application filed June 27, 1898.)

(No Model.) 2 Sheets—Sheet I.

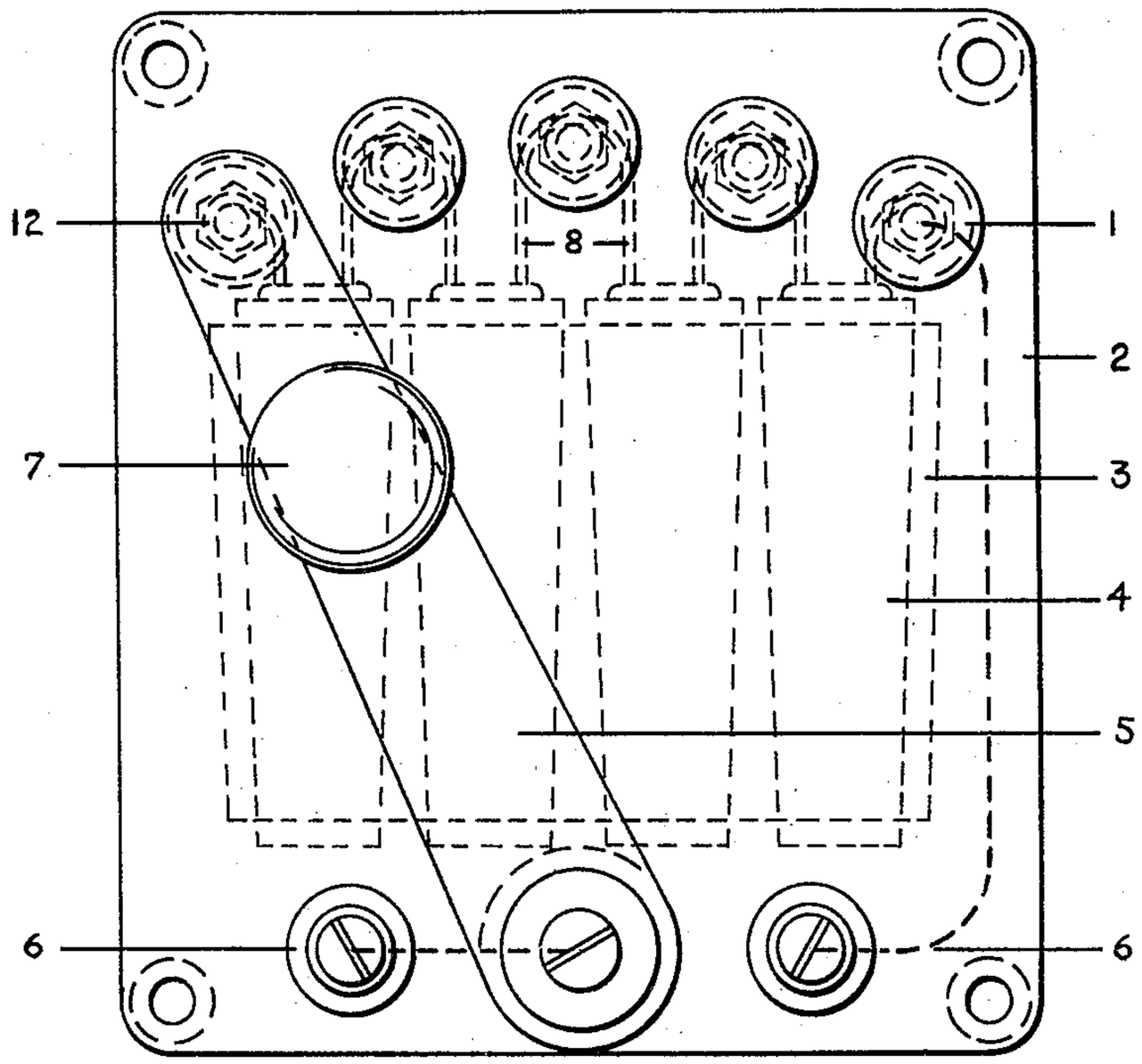

Fig. 1.

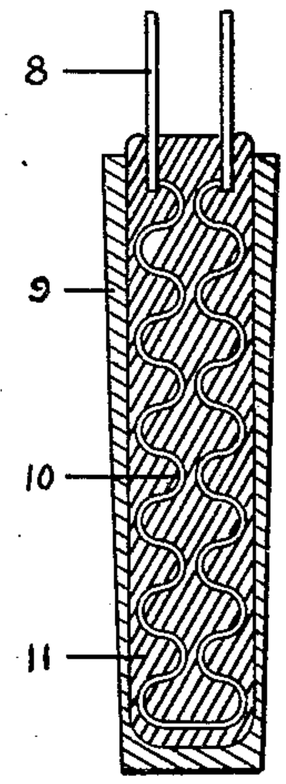

Fig. 2.

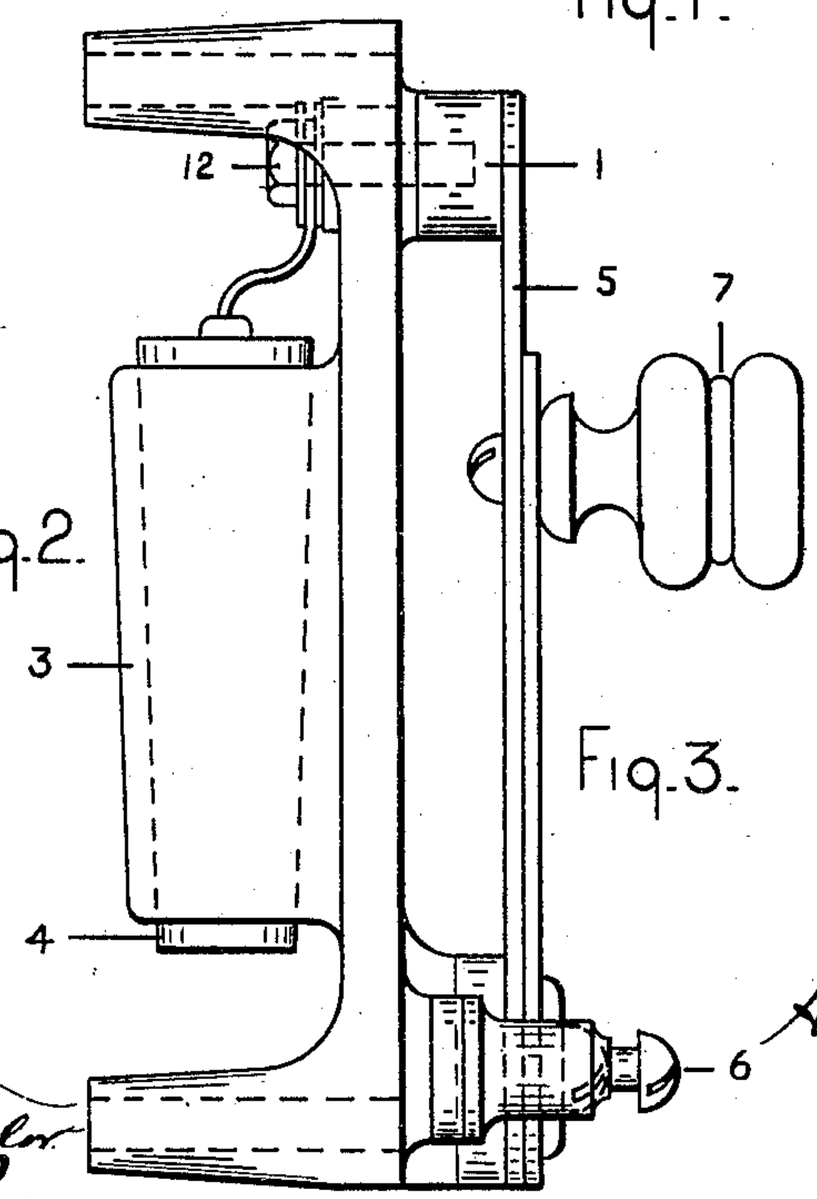

Fig. 3.

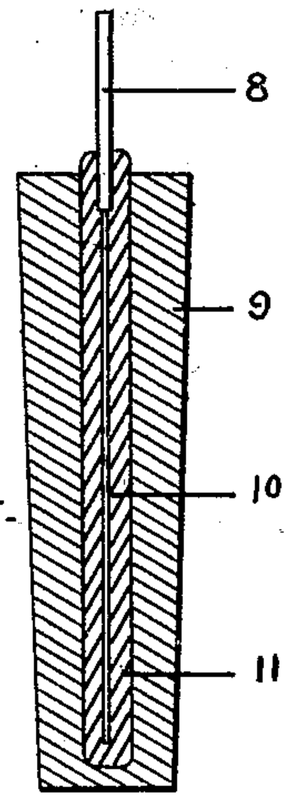

Fig. 4.

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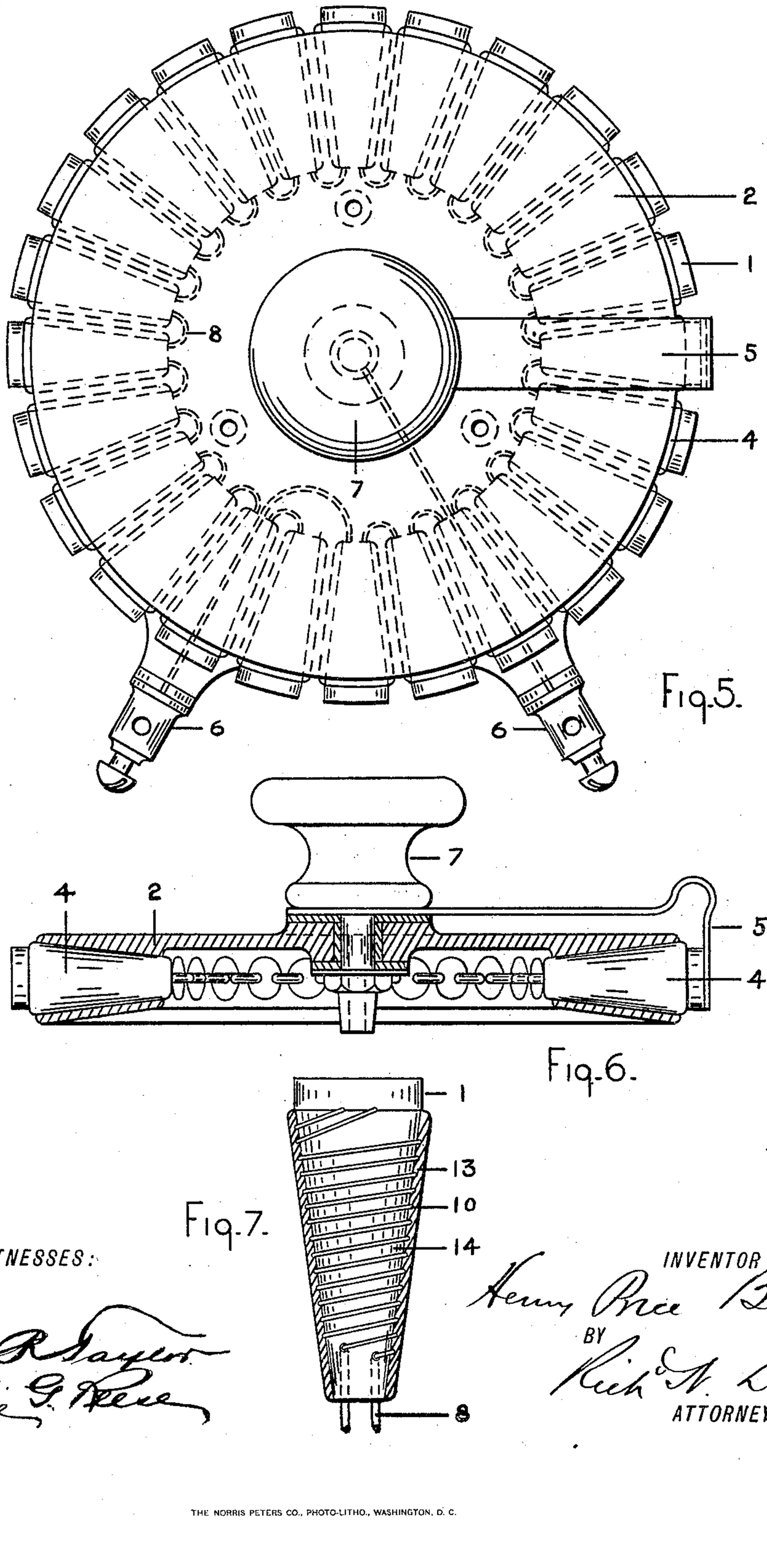

Fig. 5.

Fig. 6.

Fig. 7.

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RHEOSTAT, ELECTRIC HEATER, &c.

SPECIFICATION forming part of Letters Patent No. 699,064, dated April 29, 1902.

Application filed June 27, 1898. Serial No. 684,619. (No model.)

To all whom it may concern:

Be it known that I, HENRY PRICE BALL, a citizen of the United States, residing at Mount Vernon, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Rheostats, Electric Heaters, and Similar Apparatus, of which the following is a specification.

My invention relates to rheostats, electric heaters, and similar apparatus in which electric energy is converted into heat; and my object is to simplify and cheapen the construction and so construct and arrange the parts whereby the steps or sections of the resistance will be separable. These separable steps or sections are independently mounted or carried by supports adapted to be attached to or mounted upon or within a common support consisting, preferably, of a heat absorbing or radiating body—such, for instance, as cast-iron. With such construction the steps or sections of the resistance may be made up in uniform or standard sizes and employed for rheostats or heaters of various sizes or capacities by employing a greater or less number, the common support, of course, being preferably arranged in various sizes.

In the accompanying drawings to avoid unnecessary repetition I have illustrated my invention only as applied to rheostats.

In the accompanying drawings, Figures 1 and 3 are plan and end views, respectively, of a rheostat having the resistance arranged in four independent or separable steps or sections. Figs. 2 and 4 are sectional views of one of the steps or sections, showing the insulation surrounding the resistance and a metallic or other suitable coating surrounding the insulation. Fig. 5 is a plan view of a different form of rheostat, one suitable for use as a field-rheostat, and in which the steps or sections are mounted radially within the common support. Fig. 6 is a central cross-section of the rheostat shown in Fig. 5, and Fig. 7 is an elevation and partial section of the steps or sections employed with the rheostat of Fig. 5.

In Figs. 1 to 4, inclusive, the common support 2 is shown as rectangular in shape and provided on the under side with a rib 3, which is provided with four tapering holes, forming sockets for receiving the independent supports 4, which carry the steps or sections 10 of the resistance. The outer surfaces of these supports are tapered to closely fit the tapering holes in the rib 3, and thus be held in position solely by friction, although, if desired, set-screws or other means may be provided to hold the supports in place and in intimate contact with the surrounding walls of the sockets. The sections or steps 10 of the resistance may be arranged in various forms or shapes and are provided with terminal wires 8. In the form shown in Fig. 2 the conductor is reflexed, while in Fig. 4 it is arranged in a straight or plain loop. The resistance 10 is surrounded by a suitable insulating material 11, which may be glass, fire-clay, terra-cotta, or any similar or other suitable material applied in any suitable or well-known manner.

In practice I prefer to surround the coating of insulation with a metallic jacket 9. This jacket is preferably made of metal and may be made in suitable form to receive the insulated resistance; but as a matter of cheapness and to facilitate construction I prefer to cast about the insulating material a low-fusing metal, such as lead, white-metal, or similar material. The advantage of the latter arrangement is that the common support 2 may be made of any desired material or metal, such as cast-iron or brass or other high-fusing metal in commercial use, while the jackets 9 can be made of any suitable low-fusing metal which will not disintegrate the insulating-coating 11. Furthermore, the jacket so formed can be readily worked or shaped into form to accurately fit the sockets in the rib 3. The terminals 8 of the independent sections are adapted to be connected to binding-posts 12 on the under side of the common support 2, and which binding-posts are suitably insulated from said support and connected to contact-buttons 1 on the upper side of the support, as is well understood. The first or right-hand contact-button 1 is connected underneath the support to the binding-post 6, and the other binding-post 6 is connected to the pivoted contact-blade 5, which is arranged to make contact with the button 1, a handle 7 being provided to operate the contact-blade. As shown, the terminals 8 have a larger cur-

rent-carrying capacity than the heating-conductor 10. By forming the joint between the two within the insulating material the heat developed outside of the insulating material is kept sufficiently low to prevent deterioration. If, however, this joint were exterior of the insulating material, the heat developed in the conductor would rapidly destroy it, owing to the relatively low heat-radiating capacity of the air.

In Figs. 5 and 6 the common support 2 is circular in form, having a heavy rim in which is formed a series of tapering holes to receive the steps or sections 4, as in the arrangement of Fig. 1. In this arrangement the terminal wires 8 of adjacent sections are shown as connected together; but it will be understood that, if desired, binding-posts 12 may be provided, as in the arrangement of Fig. 1. Also in this arrangement the contact-blade 5 is connected with one of the binding-posts 6, the other binding-post 6 being connected to one of the terminal wires 8 of the last section.

The section of resistance illustrated in Fig. 7 comprises a support 14, which may be of insulating material or of metal coated with an insulating material. A conductor 10 is wound on this support and covered with a layer of insulation 13. As shown, the resistance is wound on the core or support in a double spiral, one end being connected to the contact-button 1, which is secured to the core 14, and insulated therefrom if the core is made of metal, and the free ends or terminals 8 of the resistance 10 pass out through suitable holes at the inner end of the core for connection to adjacent sections, as shown in Figs. 5 and 6. The support shown in Fig. 7 may be inserted in the sockets of the common support in the form shown, or, if desired, a coating of metal may be applied thereto either before or after insertion in the sockets.

In both forms of rheostat shown the individual supports 4 may be held in place by pouring molten metal into the sockets while the supports are held therein, so that upon cooling the metal will rigidly attach the individual supports to the common support; but I prefer, however, to arrange the individual supports so that they may be readily removed from the common support when necessary.

In the constructions shown it will be seen that practically the entire length of each section of the resistance lies in close proximity to the metal or other material of the common support, whereby the heat energy developed in the sections of the resistance will be rapidly transmitted to the surrounding material of the common support.

What I claim is—

1. As a new manufacture, a unit resistance for a device wherein electric energy is intentionally converted into heat, comprising a supporting-body of mineral insulating material, a conductor embedded therein, and a metal protector for the insulating material adhesively engaging the same, substantially as and for the purposes set forth.

2. As a new manufacture, a unit resistance for a device wherein electric energy is intentionally converted into heat, comprising a supporting-body of vitreous insulating material, a conductor embedded therein, and a metal protector for the insulating material adhesively engaging the same, substantially as and for the purposes set forth.

3. As a new article of manufacture, a unit resistance for a device wherein electric energy is intentionally converted into heat, comprising a layer of mineral insulating material, a conductor embedded therein, a terminal having a larger current-carrying capacity than the conductor, connected to the conductor and having the joint located within the insulating material, a protective and heat-conducting metallic case, and a metallic support adapted to receive a series of said unit resistances with their metallic cases in close mechanical contact therewith.

4. As a new article of manufacture, a unit resistance for a device wherein electric energy is intentionally converted into heat, comprising a layer of vitreous insulating material, a conductor embedded therein, a terminal having a larger current-carrying capacity than the conductor, connected to the conductor and having the joint located within the insulating material, a protective and heat-conducting metallic case, and a metallic support adapted to receive a series of said unit resistances with their metallic cases in close mechanical contact therewith.

5. As a new article of manufacture, a unit resistance for a device wherein electric energy is intentionally converted into heat, comprising a layer of glass, a conductor embedded therein, a terminal having a larger current-carrying capacity than the conductor, connected to the conductor and having the joint located within the layer of glass, a protective and heat-conducting metallic case, and a metallic support adapted to receive a series of said unit resistances with their metallic cases in close mechanical contact therewith.

6. In an apparatus wherein electric energy is intentionally converted into heat, the combination of a heat-absorbing support having a series of tapered openings therein, and a unit resistance engaging each of said openings by friction and comprising an insulating-core, a conductor embedded in said core, and a metal jacket surrounding the core, substantially as set forth.

7. In an apparatus wherein electric energy is intentionally converted into heat, the combination of a heat-absorbing support having a series of tapered openings therein, and a unit resistance engaging each of said openings by friction and comprising an insulating-core, a conductor embedded in said core, and a soft-metal jacket surrounding the core, substantially as set forth.

8. In an apparatus wherein electric energy is intentionally converted into heat, the combination of a heat-absorbing support having a series of tapered openings therein, and a unit resistance engaging each of said openings by friction, and comprising a core of mineral insulating material, a conductor embedded in said core, and a protective and heat-conducting metallic case.

9. In an apparatus wherein electric energy is intentionally converted into heat, the combination of a heat-absorbing support having a series of tapered openings therein, and a unit resistance engaging each of said openings by friction, and comprising a core of vitreous insulating material, a conductor embedded in said core, and a protective and heat-conducting metallic case.

10. In an apparatus wherein electric energy is intentionally converted into heat, the combination of a heat-absorbing support having a series of tapered openings therein, and a unit resistance engaging each of said openings by friction, and comprising a core of glass, a conductor embedded in said core, and a protective and heat-conducting metallic case.

11. In an apparatus wherein electric energy is intentionally converted into heat, the combination of a heat-absorbing support having a series of tapered openings therein, and a unit resistance engaging each of said openings by friction, and comprising a core of mineral insulating material, a conductor embedded in said core, a terminal having a larger current-carrying capacity than the conductor connected to the conductor and having the joint located within the core, and a protective and heat-conducting insulating-case.

This specification signed and witnessed this 25th day of June, 1898.

HENRY PRICE BALL.

Witnesses:
ARCHIE G. REESE,
JNO. R. TAYLOR.