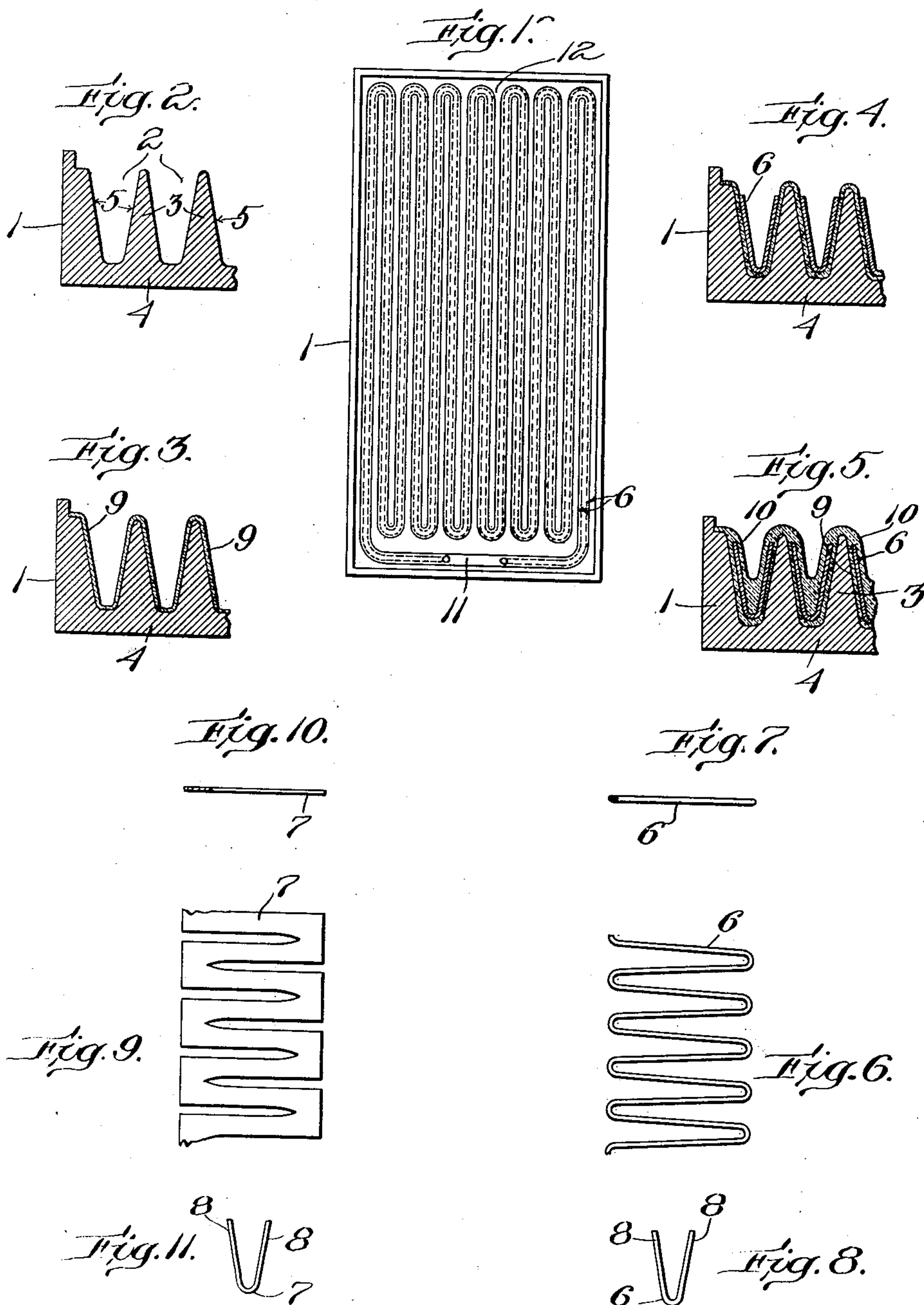


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ELECTRIC HEATING DEVICE.
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905,045.

Patented Nov. 24, 1908.



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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATING DEVICE.

No. 905,045.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, JAMES I. AYER and HORACE B. GALE, citizens of the United States, and residents of Cambridge and Natick, respectively, both in the county of Middlesex and State of Massachusetts, have invented an Improvement in Electric Heating Devices, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Our invention is an improvement on the primary invention set forth in co-pending application Serial No. 438,103 filed June 12, 1908, in which the general purpose and nature of the invention are set forth, the present improvement having for its object the still further increase of heating capacity and uniform distribution of the heat, for a given weight or size of apparatus.

Stated in general terms, this type of invention consists of so disposing the resistance wire with relation to the heat receiving or absorbing surface, which is parallel to the plane of the resistance wire or ribbon, as greatly to increase the available surface area both of the resistance medium and of the heat-absorbing medium over that which is possible when the resistance medium is laid flat upon a single plane or horizontal heat-absorbing surface, in the manner common in electrically heated tools and apparatus.

The desired result is secured by standing a ribbon-like layer of resistance wire or the like on edge substantially perpendicularly to the general plane of the heater, the latter being provided with corresponding grooves in which the edgewise-standing resistance wire is immovably secured by vitreous enamel fused to the iron or metal constituting the heat-absorbing medium and also fused about the wire, thereby holding the latter in an extended flat layer or plane vertical to the main body of the iron and yet parallel to the heat-absorbing surfaces or walls of said grooves. By maintaining this extended flat layer of resistance medium thus parallel or at a uniform distance at all points from the heat-receiving surface, a uniform rate of absorption of heat is insured and yet a very much greater length of heating unit is made possible, so that less stress or strain results for a given length of wire, inasmuch as the desired temperature of the

tool is maintained through the agency of a much longer resistance wire than before. In other words, for a given mass of heat absorbing and conveying plate or tool, the same quantity of heat as before is derived from a greater length of the resistance wire than before, and hence the latter is subjected to less strain inasmuch as there is obviously a lower temperature per given length of wire, and yet notwithstanding this fact there is no irregular heating of the wire (such as would occur if the wire were wound in a coil or in any form which would place any part of the wire further from the plate than any other part) because all portions of the laterally extended or ribbon-like layer of said wire are at practically the same distance from the heat-receiving and absorbing surface of the plate.

Our present improvement consists in arranging the widely extended ribbon-like layer of resistance wire or current-conveying medium in a reflex form, *i. e.* in a V shape or U shape, viewed in cross section, the receiving grooves of the plate being correspondingly shaped, and the intervening ribs or projecting portions of the plate having their sides or heat receiving and absorbing surfaces arranged parallel respectively to the adjacent sides of the reflex winding of wire. By this means we secure the advantages of the main invention with increased efficiency of results.

Our invention also has advantages of manufacture, durability and use.

In the accompanying drawings, in which we have shown preferred embodiments of the invention, Figure 1 represents in top plan the general arrangement and construction of a heating base, tool or other utensil constructed according to our invention; Fig. 2 is an enlarged or exaggerated fragmentary sectional view showing the general shape of the metal block or plate; Fig. 3 is a similar view showing the plate provided with the first receiving layer of enamel; Fig. 4 a similar view showing the resistance wire or medium in place; Fig. 5 a similar view showing the covering layer of enamel applied, thereby immovably embedding the resistance in operative position; Figs. 6 and 7 are plan and end views respectively of a ribbon of resistance wire bent flatwise; Fig. 8 being an end view of the same reflexed or bent into V shape, according to our inven-

tion; Figs. 9, 10, and 11 are similar views of a ribbon-like winding stamped from sheet metal instead of being bent from wire, technically so called.

5 It will be understood that our invention is intended to apply to practically all forms of electric heaters such as are now in general use, being especially adaptable to such forms of electric heaters as demand flat surfaces.

10 In the drawings, we have shown a rectangular block or plate 1 of metal as a convenient type of this general class of electrically heated tools and devices, and accordingly it will be understood that this is presented merely as a type and that it does not limit the invention in any way. This block or plate is provided with a series of grooves 2 and intervening ribs or lateral projections 3 standing approximately perpendicular to the main plane or body 4 of the block or plate. Preferably the heat-receiving surfaces 5 of these grooves and ribs are flared slightly from each other into V shape as shown. The resistance conductor is first bent or otherwise shaped in ribbon-like form as shown at 6, Fig. 6, and at 7, Fig. 9, the particular arrangement of the successive bends or turns of the winding being immaterial so long as the general object is secured of having as great a length as possible of wire all lying in one and the same plane, *i. e.* arranged in ribbon-like form. This ribbon or winding is then creased or re-
35 flexed down its middle as shown in Figs. 8 and 9 so as to present opposite approximately parallel upwardly extending legs or flat portions 8. If the grooves have their sides flaring, these portions 8 of the reflexed winding will correspondingly flare, or in other words the ribbon-like winding is bent or reflexed to correspond to the shape of the grooves so as to maintain the leg portions in planes parallel to the heat receiving and
45 absorbing surfaces of the ribs or walls of the grooves. Having thus formed the winding, a layer 9 of enamel or other suitable insulating medium is fused or otherwise applied as a preliminary coating to the iron or metal constituting the object to be heated, *i. e.* to the plate 1 in the illustration of the drawings, the reflexed ribbon is then put in place as shown in Fig. 4, and thereupon a fused enamel covering 10 or other suitable
55 insulating coating is applied so as to embed and retain thus in proper operative position the conductor which is to convey the electric current for heating the iron or plate 1.

60 It will be understood that any usual or preferred means of retaining and embedding the resistance wire may be availed of. It will also be understood that we are not limited in any way to the particular shapes of ribbon-like arrangements of the winding or
65 form of the grooves, or general shape of the

plate or tool, inasmuch as these are all capable of a wide variety of embodiments within the skill of those versed in the art, without departing from the spirit and scope of our invention. It will also be understood that the plate has transverse end grooves 11, 12 for receiving the wire at the ends, and in general the arrangement of the grooves may be varied according to the requirements of the particular tool or device or the preference of the particular constructor. The form shown in Fig. 1 is preferred because of its simplicity and the facility with which the wires may be placed and embedded.

From the above description it will readily be understood that when the current is turned on, the resistance wire throughout its greatly increased extent conveys from all points thereof uniformly to the adjacent receiving surfaces of the ribs 3 the same amount of heat, and inasmuch as the wire is in ribbon-like formation and stands substantially perpendicular to the general extent or plane of the plate 1 there is a greatly increased length of wire over that which would be possible if the wire were laid in the usual horizontal winding on the usual horizontal surface or top of the plate or metal constituting the object to be heated. In other words, our invention provides a large surface parallel to the face of the conductor, insuring the uniform and rapid absorption of heat at all points, said large surface being much greater in area than the plane or horizontal area of the plate or object to be heated. By this means the exposure of the generating surfaces of the ribbon-like winding is radically increased and the uniform absorption of heat therefrom is much greater than could occur by equivalent resistance applied to the flat surface of the heater in the ordinary manner.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In an electric heater, a heat-absorbing body provided with a series of grooves, and ribbon-like current conductor secured in said grooves, said ribbon-like conductor being creased longitudinally and having its reflexed sides held substantially parallel to the walls of said grooves.

2. In an electric heater, a heat-absorbing body provided with a series of grooves, and ribbon-like current conductor secured in said grooves, said ribbon-like conductor being creased longitudinally and having its reflexed sides held substantially parallel to the walls of said grooves, said ribbon-like conductor containing in its length a series of widthwise turns, providing a correspondingly longer path for the current than the length of the ribbon-like conductor.

3. In an electric heater, a heat-absorbing body provided with a series of grooves, and

ribbon-like current conductor secured in said grooves, said ribbon-like conductor being creased longitudinally and having its reflexed sides held substantially parallel to the walls of said grooves, said ribbon-like conductor consisting of wire bent back and forth continuously widthwise of the conductor.

4. In an electric heater, a heat-absorbing body provided in one side with a series of approximately V-shaped grooves extending approximately perpendicular to the general plane of the plate, and reflexed ribbon-like

conductor, V-shaped in cross section, permanently secured in said grooves with vitreous enamel, the sides of the conductor being embedded in the enamel approximately parallel to the adjacent walls of the grooves.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

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