E. J. OVINGTON.

ELECTRIC HEATING UNIT.

APPLICATION FILED JAN. 25, 1909.

994,188. Patented June 6, 1911.

Fig. 1.

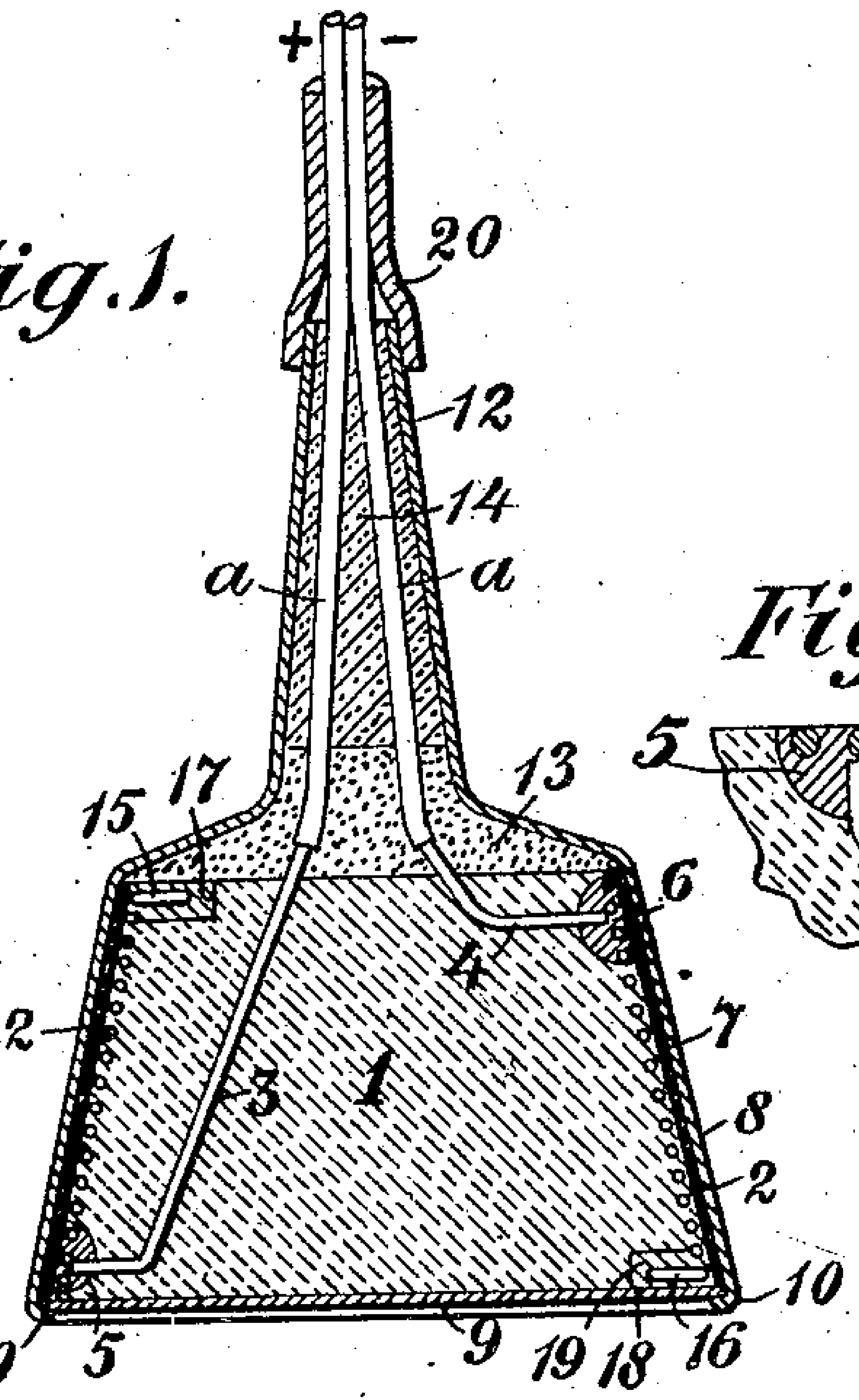


Fig. 2.

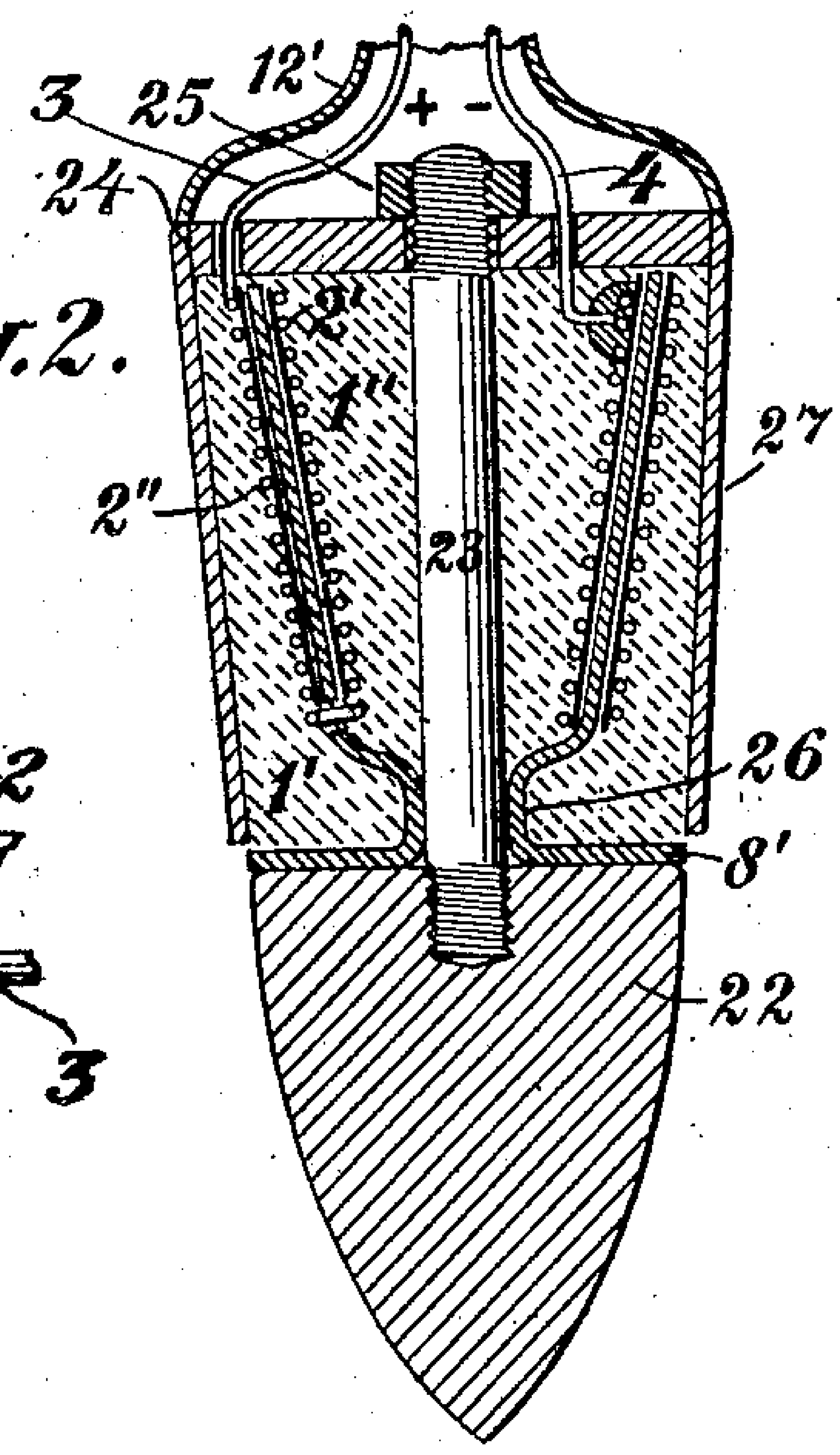


Fig. 10.

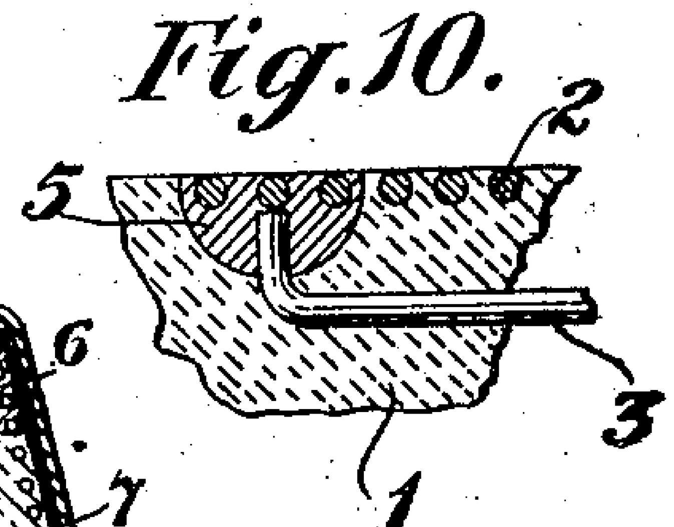


Fig. 3.

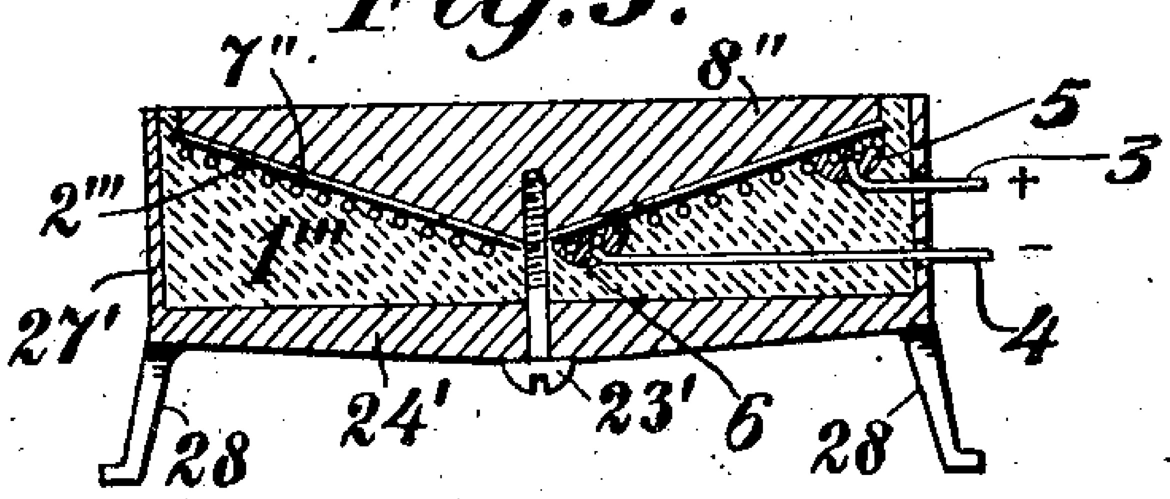


Fig. 4.

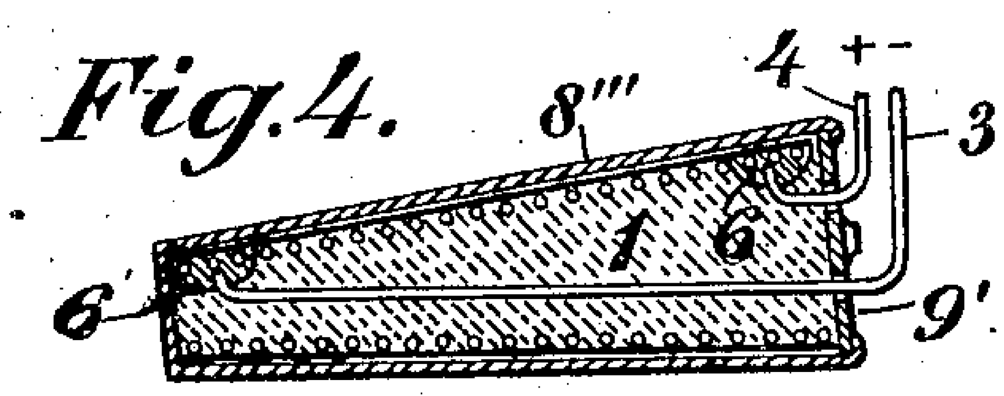


Fig. 5.

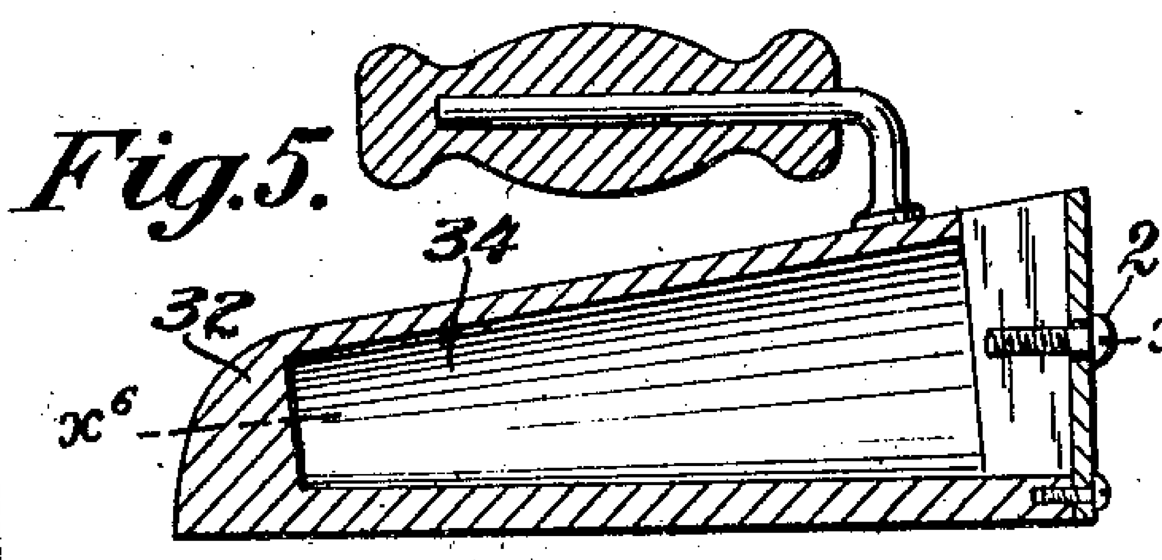


Fig. 7.

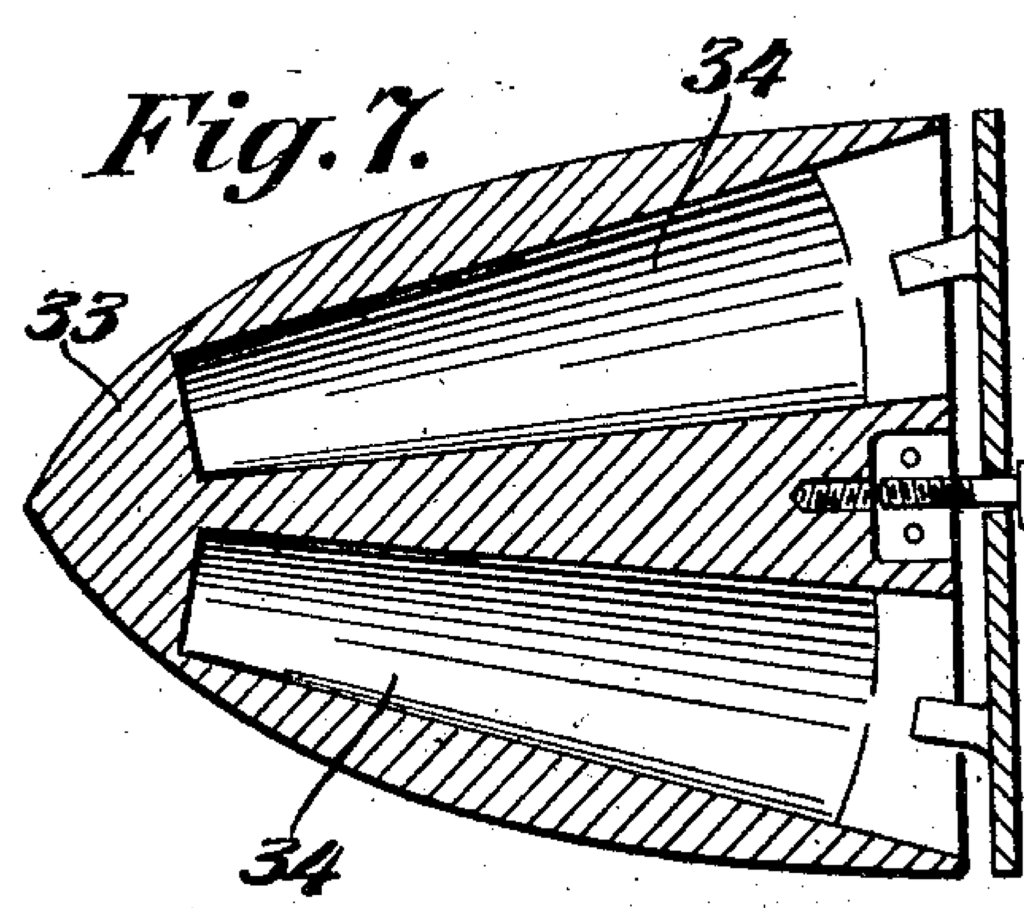


Fig. 6.

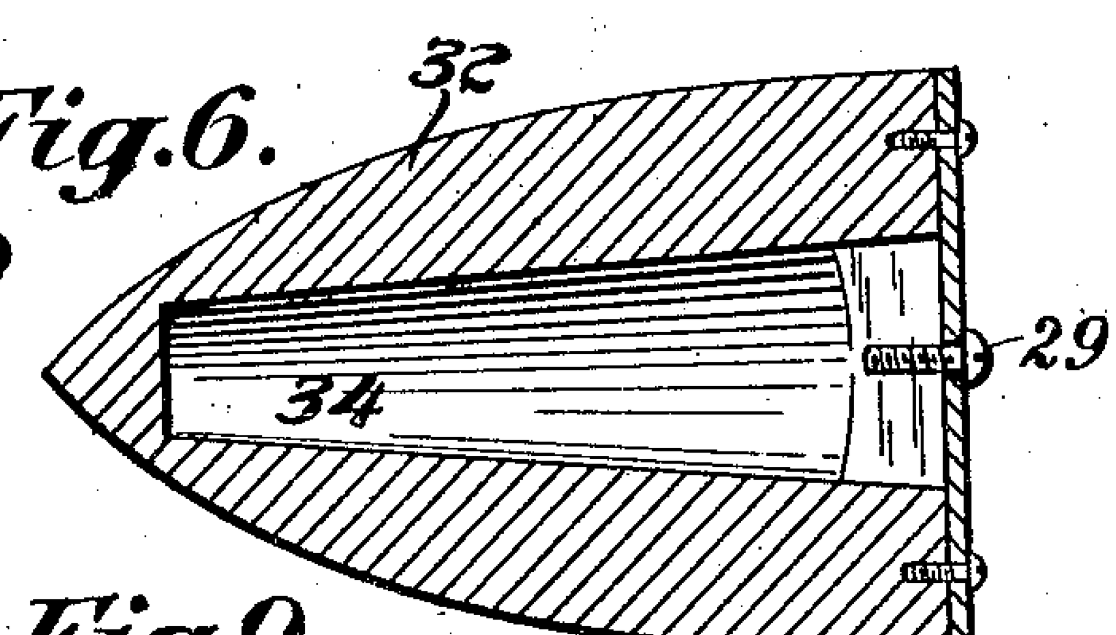


Fig. 8.

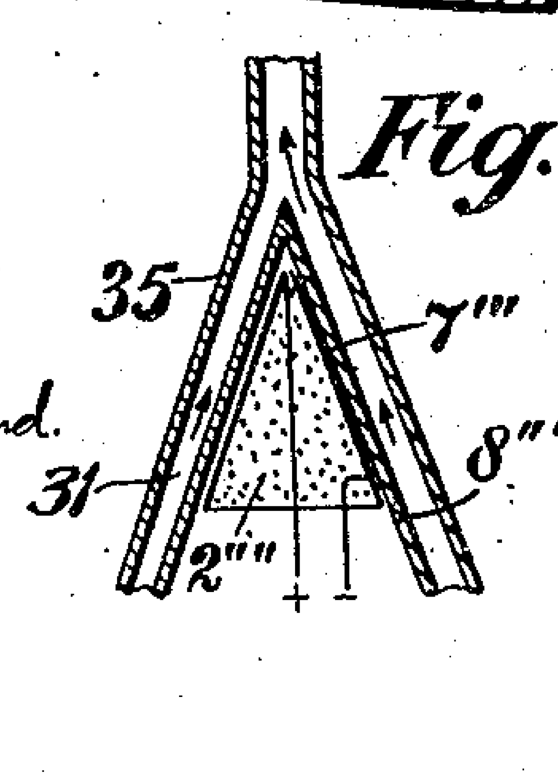
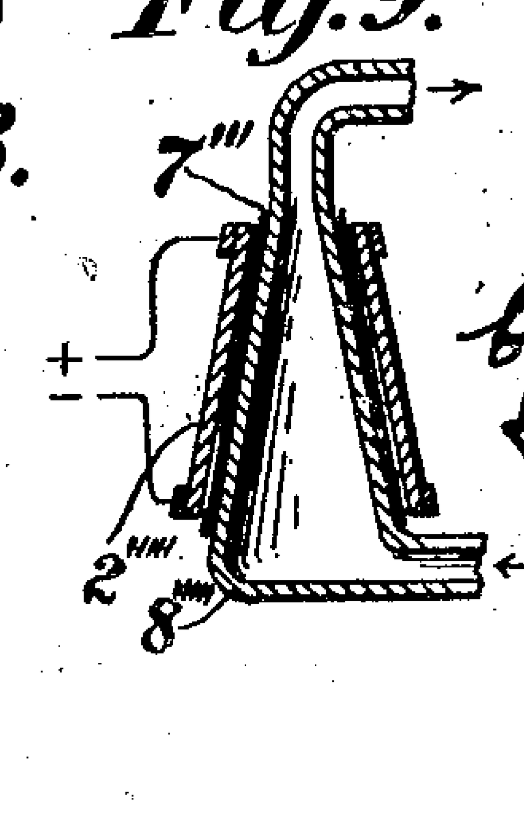


Fig. 9.



Witnesses:

L. N. Leonard

M. Beulah Townsend.

Inventor

Edward J. Ovington

by James R. Townsend

his Atty.

UNITED STATES PATENT OFFICE.

EDWARD J. OVINGTON, OF LOS ANGELES, CALIFORNIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO ELECTRIC DEVICE COMPANY, A CORPORATION OF CALIFORNIA.

ELECTRIC HEATING UNIT.

994,188. Specification of Letters Patent. Patented June 6, 1911.

Application filed January 25, 1909. Serial No. 474,165.

To all whom it may concern:

Be it known that I, EDWARD J. OVINGTON, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Electric Heating Unit, of which the following is a specification.

An object of the invention is to provide means whereby matter desired to be heated may be heated by electricity with a minimum waste of time and energy.

Further objects are to provide a form of heater especially adapted to rapidly and economically heat liquids in an open vessel; and to provide a simple and cheap construction whereby a practical immersion heater can be produced.

The invention is applicable to various forms of electrical heating apparatus.

The accompanying drawings illustrate the invention as embodied in some of the various forms of apparatus to which it is applicable.

Figure 1 is an axial section of an immersion heater embodying this invention in one of its forms. Fig. 2 is an axial section of a soldering-iron constructed in accordance with this invention. Fig. 3 is an axial section of a hot-plate or electric-stove embodying features of the invention. Fig. 4 is a vertical mid-section of a heating unit adapted to be inserted in a laundry-iron shell. Fig. 5 is a vertical section of a laundry-iron shell to receive the heating unit shown in Fig. 4. Fig. 6 is a sectional plan of one form in which a laundry-iron shell may be constructed to receive a heating unit corresponding to that shown in Fig. 4. Fig. 7 is a plan section of another form of laundry-iron shell adapted to receive the heating unit constructed in accordance with the principles of Fig. 4. Fig. 8 is a view partially diagrammatic, to illustrate the application of the principles of this invention to an instantaneous water-heater. In this view the heating element is surrounded by a conduit for the fluid to be heated. Fig. 9 is a view showing the application of the principles of this invention in a manner reverse to that shown in Fig. 8. Fig. 10 is a detail of the connection of the lead with the resistance.

In the several views parts corresponding in function but different in construction are indicated by the same reference characters with distinguishing indices.

In some of the forms, the electrical heating unit comprises a non-heat-absorbing element of general conical form, extending in some instances to a semi-oval, semi-spherical, paraboloid, or pyramidal form, truncated, or non-truncated as may best suit the service to which the article is to be applied. The conical surface of said element may be either convex or concave, and against said conical surface is disposed an electrical resistance corresponding in form to said surface. On the opposite side of said resistance is a cover of heat-conducting material through which the heat is to be applied to the substance to be heated.

The heat-conducting material must be an electrical insulator, and may be supplemented by additional covering of heat-conducting material that is or is not an electrical insulator. The non-heat-absorbing element may or may not be an electrical insulator. In case it is not an electrical insulator, there will be interposed between the resistance and such element an electrical insulator which may or may not be a non-heat-absorber.

Referring to Fig. 1, 1 is a non-heat absorbing element of a general conical form which may be of circular or other cross-section. Preferably, it is the frustum of a slightly-tapering cone. This element may be made of porcelain, Portland cement, plaster of Paris, magnesium-oxychlorid cement, zinc-oxychlorid cement, or cement formed by the use of an oxid of any one of a group of metals as zinc-oxid, calcium-oxid, magnesium-oxid, and the like; also silicates of metals such as magnesium-silicate, otherwise known as asbestos; care being taken that the same when finished is dry so as to be practically non-heat-absorbent. The electrical resistance 2 may preferably be formed of a fine, highly-refractory metallic material, well-known in the art for this purpose, the same being tightly wound on the non-heat-absorbing element from top to bottom of the cone. The electrical leads or conductors 3 and 4 are preferably of copper connected respectively with the terminals of the resistance 2 by means of large metallic pieces 5, 6, that are actually connected with a comparatively large space of the resistance at the terminals, as by including in actual contact a plurality of turns of the coils of wire 2 shown in this view. Actual contact is secured and maintained by means of a metallic bond, as by solder of a somewhat lower melting-point than the enlarged metal pieces or the resistance. The electrical resistance in circuit is wholly disposed at the exterior surface of the core and the low resistant conductor pieces 5, 6, attached to the ends of the electrical resistance are in thermal contact with the shell, thus eliminating the possibility of burn-out which would occur if any part of the resistance were inclosed in such a way that the head would be confined. The purpose of such a method of connection is to eliminate practically all electrical resistance where the resistance-material joins or makes contact with the conductors of copper. This construction does away with all twisting and otherwise straining of the resistance material where it is connected with the leads, and at the same time maintains a comparatively smooth surface on the resistance which facilitates the conduction of heat away from the same. This construction also reduces the liability of oxidation at that point.

The electrical resistance 2 when disposed on the element 1, which in this instance is a core, is of a general conical form and is nested with heat-conducting elements 7 and 8 of the same general form as the element 1. The element 7 is electrical insulation as mica, or enamel somewhat similar to that used on kitchen-utensils, and the element 8 is a spun-metal shell of copper or other suitable material, the greater portion of the interior of which may be covered with heat-conducting electrically non-conductive enamel to form a part or all of the insulation 7. The rim of said shell is preferably left free of such enamel and is spun over a cap 9 that is inserted into the shell after the element 1 and the resistance thereon have been forcibly pressed into the shell. The spun joint 10 thus formed between the cap 9 and the shell is made water-tight by means known in the art. This may be accomplished by tinning the adjoining surfaces before spinning, and then after spinning, heating the joint so as to flow the two surfaces together by means of the tin. The conductors 3, 4 are suitably insulated as at *a*, to prevent short-circuiting or grounding. A handle-member 12 is joined to the shell 8. This may be done by spinning the handle and shell of one piece or by any other suitable process. Inside the continuation of the shell thus formed dry material as sand 13, or wax 14, or both, may be filled in to close the space and protect the interior from admission of water. These materials also act to prevent the conducting wires from twisting or otherwise being damaged. The conductors are thus brought out in a water-tight connection.

To make the immersion heater shown in Fig. 1, the two conducting wires 3, 4 are bent into the proper shape and the metallic pieces 5 and 6 attached thereto and electrically connected therewith, are placed in a mold, not shown, whose form is similar to the form of the core 1. A cement is then poured into the mold and is allowed to set. When the resulting core is removed, the two metallic pieces 5 and 6 being flush with the sides of the mold at the time of pouring, are exposed on the surface of the core. Metallic resistance is then wound onto the core and three or four of the turns on each end are soldered to the metallic pieces 5 and 6. The ends 15 and 16 of the metallic resistance are then anchored to the core by cutting slots 17, 18 in the core in which the before-mentioned ends are placed, and the slots then filled with cement 19 of the same general character as used in the core. This construction obviates the possibility of the unwinding or otherwise loosening of the metallic resistance if the temperature rises to the melting point of the solder or other metal employed between the metal pieces 5 and 6, and the resistance. A rubber tube 20 may be employed to form an elastic closure for the open end of the handle-member 12.

In the form shown in Fig. 2 where the invention is applied in a soldering iron a portion of the heated element 8′ is in thermal contact on both sides with heating resistances 2′ and 2″. These resistances are held in place by the non-heat absorbent elements 1′, 1″, and one end of the heated element 8′ is spun to a flat surface to facilitate the conduction of heat to the removable soldering-iron tip 22 that is screwed onto a bolt or stud 23 of a non-magnetic metal as copper or brass that extends through the core 1′ and a compression cap 24 which is held in place by a nut 25 on the bolt 23. The whole is attached to a handle-member 12′ only a portion of which is shown. This may be done by brazing the handle-member to the plate 24. The shell 8′ is bent inwardly at 26 and is there brazed or otherwise firmly fixed to the bolt 23. A case to afford mechanical protection for the cement may be provided as shown at 27. The same is not in direct thermal contact with the heated shell 8′.

In the hot-plate or electric-stove shown in Fig. 3 the heated element 8″ is in the form of a flat inverted cone. It is well known that the ordinary construction of an electric hot-plate is such that in operation the edges are of a lower temperature than the center owing to the loss of heat due largely to air currents. In the construction as shown in Fig. 3 the heat-producing element is so arranged that there is a perfectly even heat conduction from the resistance material to the heated element, and as the heated element is thinner near its periphery than in the center, the heat reaches the upper surface of the plate at the periphery before it reaches the center. The heat-producing material 2‴ is held in tight thermal contact between the non-heat-absorbent material 1‴ and the heat-conducting electrical insulating material 7″ and the hot-plate 8″ by means of the circular cap 24′ and the bolt or screw 23′. A casing 27′ may be disposed about the non-heat absorbent element 1‴ to protect the same from mechanical injury. This, however, is not essential. The cap 24′ may be provided with legs 28 as shown in the drawing.

The construction in Fig. 4 is very similar to that in Fig. 1 with the exception that the end of the heated element 8‴ is entirely closed at the small end of the cone and at the large end of the cone the cap 9′ is suitably perforated for receiving the leads 3 and 4, the outside ends of which are arranged to receive a plug connected with the mains, not shown. The shell 8‴ is spun over the cap 9′ as shown. This unit may fit tightly into a metallic laundry-iron shell 32, 33, shown in Figs. 5, 6 and 7. This unit may be held in place by the friction of itself against the side walls of the tapering hole 34 in said laundry-iron shell, or it may be clamped tightly by means of a clamping-screw 29.

In Fig. 8 the heating element 2⁗ may be of an electrical resistance material which is non-heat absorbing, such as carbon, graphite, carborundum, or combinations of these with fine metallic particles or similar substances. This cone is electrically insulated by the heat-conducting element 7‴. The metallic heated element 8⁗, the electrical insulation 7‴, and the resistance material 2⁗ may be held in tight thermal contact by devices not shown. The substance to be heated, which may be liquid, passes through the funnel-shaped tube 35.

In Fig. 9 a reversal of the form just described is shown. In this view the heating element or resistance 2′′′′′ is a hollow truncated cone in which it fitted a hollow heated element 8′′′′′ through which a fluid to be heated may pass.

The forms shown in Figs. 8 and 1 are analogous in that the resistance in Fig. 8 is non-heat-absorbing by reason of the material of which the whole core is made, and the resistance shown in Fig. 1 is made non-heat-absorbing by constructing it of thin wire backed by a non-heat-absorbing core, so that the amount of heat absorbed by the heating unit is negligible in each instance.

In practical use the immersion heater shown in Fig. 1 may be inserted into a vessel of glass or other material containing water or other liquid, and the electricity being turned on, heat is developed in the resistance, and as this resistance is held in tight thermal contact with the copper shell the heat is delivered to the liquid through the shell with great rapidity which causes the liquid to quickly boil. Furthermore, the resistance being practically non-heat-absorbing on account of its thinness and the non-heat-absorbing character of the core around which it is disposed, the amount of heat that is not delivered quickly to the liquid is negligible. The shell of the immersion heater as shown in Fig. 1 is of smaller vertical than horizontal extension so as to facilitate heating the liquid when the shell is immersed therein, and also to avoid uncovering any portion of the shell in case of evaporation of the liquid being heated.

In the form shown in Fig. 1 I have approximated the extreme vertical extension as compared with the horizontal extension, and the conical form of the flattened shell shown in Fig. 1 causes some of the liquid to be vertically above a heated surface of the shell. This facilitates the circulation.

In Figs. 3 and 4 the flattened form of the heater is greater than in Fig. 1 so that when the forms shown in Figs. 3 and 4 are waterproofed to enable them to be operative when immersed, the heating surface will be spread out more at the bottom of the vessel, not shown, which contains the immersing liquid.

By constructing the heater of a conical form, as shown in Fig. 1, having a centrally arranged stem or handle, the circulation of the liquid in a vessel in which the heater is submerged will be maintained, and the cooler liquid in the vessel will flow down around the handle to displace the liquid which is heated by the conical surface.

I claim:

1. An electrical immersion heater comprising a water-proof heat-conducting shell of smaller vertical than horizontal extension, a non-heat-absorbing core, electrical resistance around the core, heat-conducting electrical insulation between the resistance and the shell, a cap in the end of the shell, said shell being spun over the cap and the joint being water-proof, a handle fastened to the shell, and electrical leads extending through the handle and connected with the terminals of the resistance.

2. An immersion water heater comprising a water-proof heat-conducting shell containing a heat insulating core of substan-

tially conical form, an electrical resistance-coil wound around said core, the ends of said coil being sunk into the body of the core, electrical conducting pieces sunk in the sides of said core flush with its surface and connected to two or more turns on each end, and electric terminals also embedded in the core and connected with said pieces.

3. An electrical immersion heater comprising a conical metal shell, interior insulation for said shell, a conical resistance core tightly pressed into said shell and a cap tightly pressed against said core, the end of said shell being spun over said cap to hold said core in place.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 19th day of January, 1909.

EDWARD J. OVINGTON.

In presence of—

JAMES R. TOWNSEND,

M. BEULAH TOWNSEND.