Aug. 11, 1931. A. J. HOLMES 1,818,953

ELECTRIC HEATER

Filed Feb. 18, 1929 2 Sheets-Sheet 1

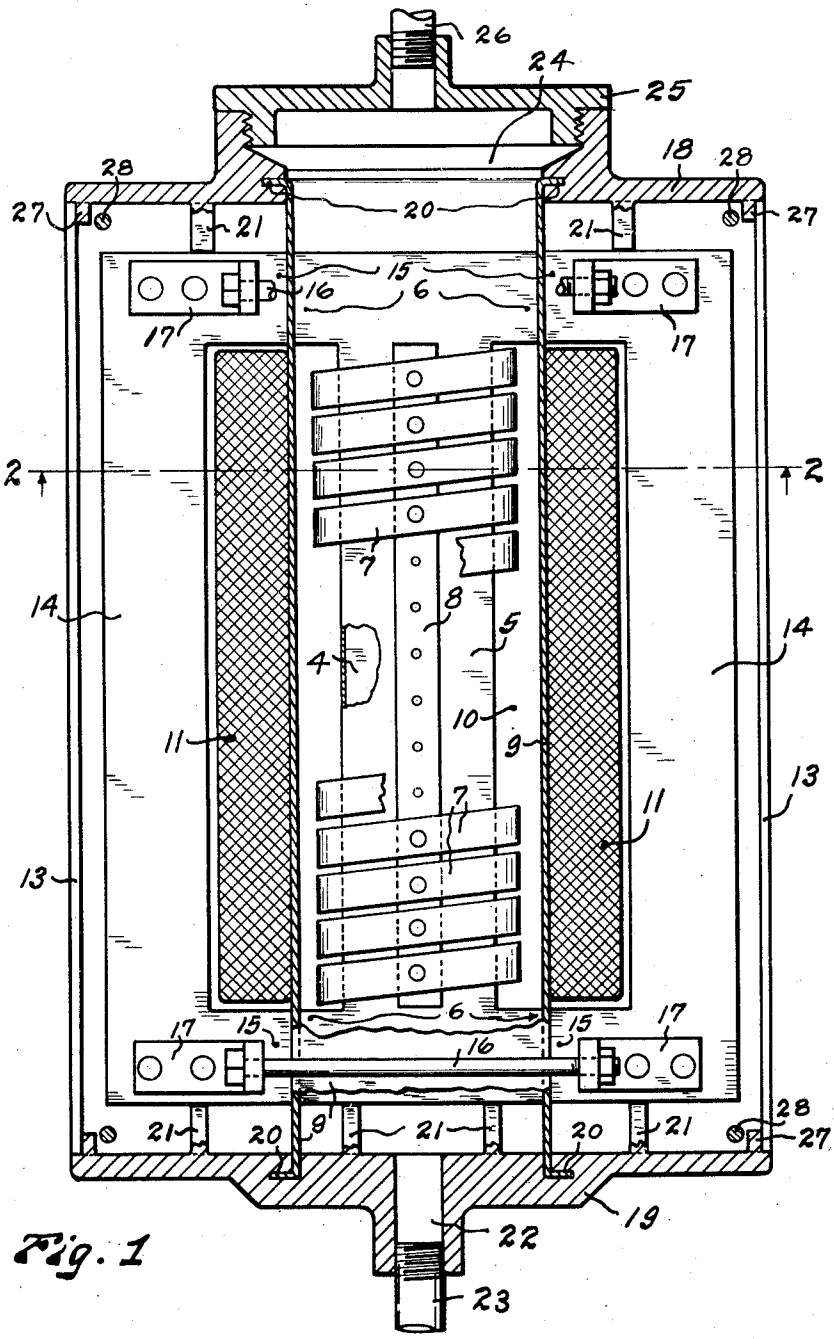


Fig. 1

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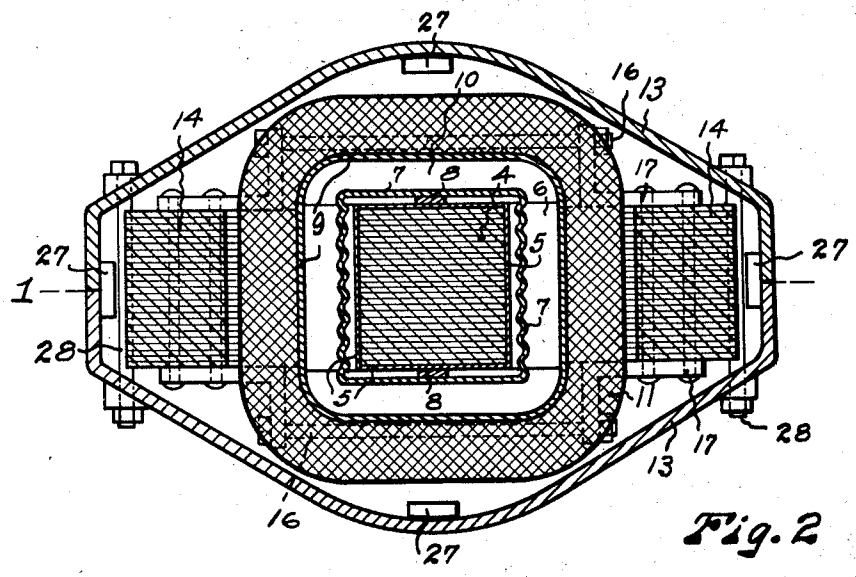


Fig. 2

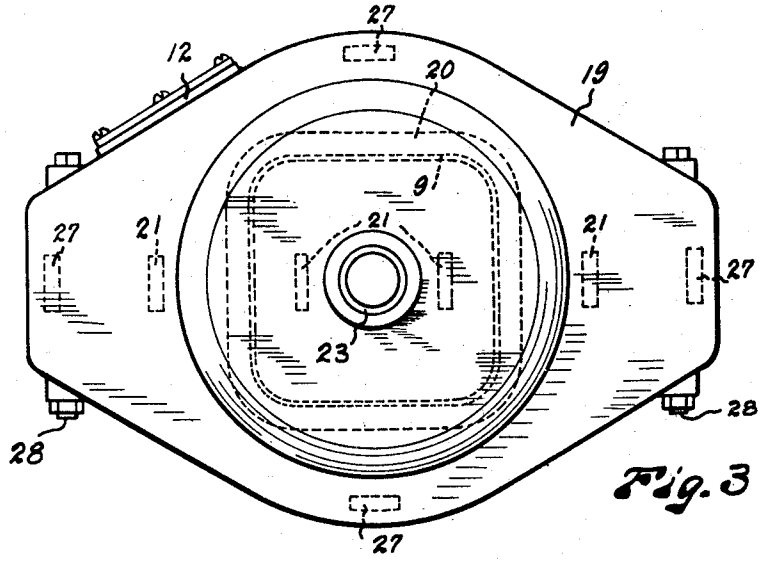


Fig. 3

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UNITED STATES PATENT OFFICE

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ELECTRIC HEATER

Application filed February 18, 1929. Serial No. 340,809.

My invention relates to improvements in electric heaters and the object of my invention is to provide an alternating current type electric heater which is simple in construction, highly efficient in operation and economical in its consumption of power.

Another object is to provide an electric heater that is substantially instantaneous in its delivery of heat to the liquid to be heated and one that is comparatively free from external heat losses.

Another object is to provide an electric heater wherein the water is disposed between the secondary element which is the heating element, and the primary element whereby said primary element is prevented from heating to a degree that would cause the same to deteriorate.

Another object is to provide a heater in which the liquid chamber is constructed of a rust proof metal which will resist the formation of any electric currents set up within its walls.

A further object is to provide an electric heater having efficient and simple means forming and completing its magnetic circuit thereby increasing the efficiency of the heater.

A still further object is to provide an induction water heater which is simple, durable and economical in construction, which is rapid and efficient in operation and which will not readily get out of order when in use.

Other objects will be apparent from the following description taken in connection with the accompanying drawings.

In the drawings Figure 1 is a view in longitudinal section of an electric heater constructed in accordance with my invention substantially on broken line 1—1 of Fig. 2, parts being shown in plan.

Fig. 2 is a cross section of the same substantially on broken line 2—2 of Fig. 1.

Fig. 3 is an end elevation of the bottom end of the heater.

Referring to the drawings, throughout which like reference numerals designate like parts, I show an electric heater embodying a central magnetic core 4 of laminated iron construction entirely encased within a protective covering 5 of high resistance material which serves to exclude the water or liquid from the core, thus preventing rust and corrosion, greatly lengthening the life of the core and greatly increasing the efficiency of the heater. The laminated core 4 has end portions 6 of greater width and the narrower central portion of said core between the ends 6 is surrounded by a secondary member 7 in the form of a strip of bar winding or a tube or fluted tube which is arranged to have an electric current induced therein. Bus bars 8 may be provided between the secondary 7 and the casing 5 of the core 4 wherever they are necessary.

The core 4 with its protective housing 5 and secondary 7 are enclosed within an outer tubular housing 9 of a highly resistant metal which forms a conduit 10 through which liquid may flow to be heated. The tubular housing 9 is shown as rectangular in cross section with rounded corners but it may be of any convenient shape. A primary winding 11 is provided on the exterior of the housing 9 in insulated relation therefrom and is arranged to be connected with an external source of supply of electric current by means, not shown, which may be positioned within a suitable receptacle 12 on the exterior of a housing 13 which encloses the heater. The ends 6 of the core 4 are wide enough so that they abut against the tubular housing 9 on opposite sides leaving spaces above and below said core for the passage of liquid. Two U shaped armatures 14 of laminated magnetic material are disposed on opposite sides of the tubular housing member 9 with their ends 15 pressed firmly against the outer sides of said housing member directly opposite to the ends 6 of the core, said armatures 14 serving to complete the magnetic circuit of the heater.

The armatures 14 are held in place by bolts 16 which pass through angle brackets 17 on said armatures. The bolts 16 serve to clamp the ends 15 of the armatures tightly against the tube 9 and to force said tube tightly aginst the ends 6 of the core thus forming tight connections between the parts which carry the magnetic circuit.

Two end members 18 and 19 are rigidly

secured to the ends of the tube 9. This may be done by flanging the ends of the tube 9 as at 20 and embedding the flanged ends into the end plates in the process of casting the end plates or it may be done by brazing or welding the tube to the end plates. The two end plates 18 and 19 are spaced from the ends of the core 4 and armatures 14 and have lugs 21 that engage with said ends of said core 4 and armatures 14. This affords spaces at the ends of the heater, tends to prevent electrical hum in the heater when in operation and helps hold the core and armature in place. The lower end plate 19 is provided with a central water inlet opening 22 for the reception of a water circulation pipe 23. The upper end plate 18 has a centrally positioned hub 24 affording an opening large enough so that the core and secondary may be withdrawn therethrough and has a screw cap 25 forming a closure for said hub and adapted to be connected with a water outlet pipe 26.

The sides of the housing are preferably in the form of two half shells 13 which rest on studs 27 on the end plates 18 and 19 and are secured in place by bolts 28 which pass crosswise through said half shells thus forming a very quickly and easily demonstrated structure.

The entire heater is quickly and easily assembled or taken apart thus reducing cost of production and making the parts easily accessible for the purpose of cleaning or repairs should the same be necessary.

In operation of this heater, the same is installed, preferably in an upright position, so that liquid, as water, may be free to flow therethrough and current from an external source is supplied to the primary coil 11. This current flowing in the primary 11 induces a current in the secondary 7 causing the lines of magnetic flux to be cut thereby producing a great volume of electric energy within said secondary 7 which produces a large quantity of heat units therein resulting in a substantially instantaneous heating of the parts within the chamber 10 and a correspondingly quick heating of the liquid within said chamber. As soon as the liquid is heated it will tend to rise, setting up a circulation through the heater in the usual manner.

This heater is substantially instantaneous in its heating up operation and is capable of developing a high efficiency in proportion to the power used. The high resistance covering protects the laminated metal parts from direct contact with the liquid thus preventing corrosion and rapid deterioration.

The metal of the tubing 9 is of such a character as to resist the loss of power through the formation of currents therein and is preferably quite thin in order to keep the break in the magnetic circuit between the parts 6 and 15 as small as possible. The metal casing 5, enclosing the metal core 4, has as its principal object the protection of said core from corrosion and is itself, of course, non-corrodible. In certain cases this casing 5 may be utilized as the secondary circuit or as an auxiliary thereto, by permitting currents to be formed therein to heat it and the water in which it is submerged.

The foregoing description and accompanying drawings clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that changes in form, shape and arrangement of parts may be made within the scope and spirit of the following claims.

What I claim is:—

1. In an electric heater, a tubular liquid chamber formed of high resistance metal, a core of magnetic material disposed within said chamber, a protective covering of metal entirely enclosing said core, and secondary coil means disposed within said chamber and surrounding said core.

2. In an electric heater, a tubular liquid chamber, a core of magnetic material within said chamber, a liquid tight metal covering for said core, said covering and the walls of said chamber being of non-corrosive metal, a primary coil surrounding said chamber, and a secondary disposed within said chamber and surrounding said core.

3. In an induction electric water heater, a tubular liquid chamber, a core of magnetic material within said chamber, a primary coil surrounding said chamber, a secondary disposed within said chamber and extending around said core, and armatures magnetically connected with the ends of said core and extending around the primary coil to complete the magnetic circuit.

4. In an induction electric water heater, a tubular liquid chamber, a core of magnetic material within said chamber, a liquid tight metal covering for said core, said covering and the walls of said chamber both being formed of non-corrosive material, a primary coil surrounding said chamber, a secondary disposed within said chamber and extending around said core, and armatures magnetically connected with the ends of said core and forming magnetic paths around said primary coil.

5. The apparatus as described in claim 4, in which the ends of the tubular liquid chamber have liquid tight connection with end plates which are adapted for connection with liquid circulating means.

In testimony whereof I affix my signature.

ANDREW J. HOLMES.