Feb. 19, 1929. 1,702,326

L. H. VERONNEAU

ELECTRIC HEATER

Filed June 21, 1926

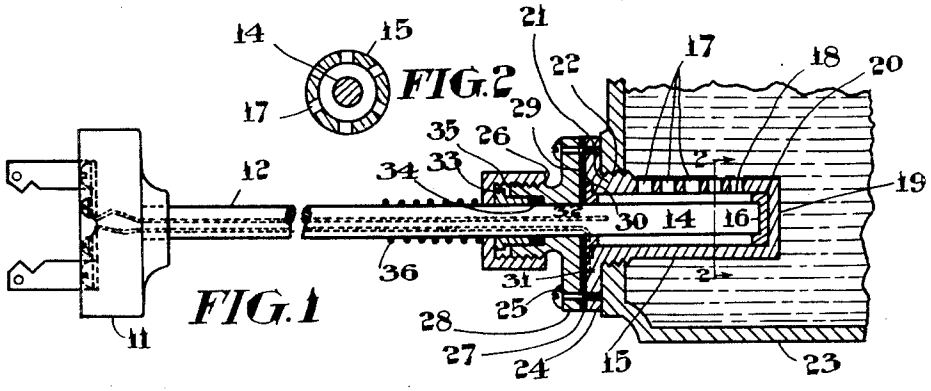


FIG. 2

FIG. 1

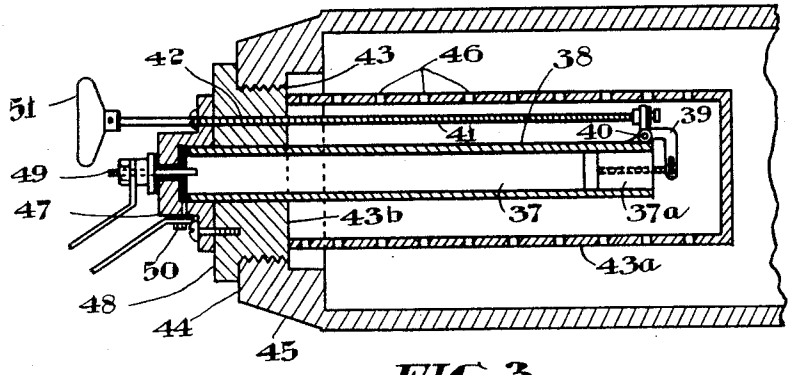


FIG. 3

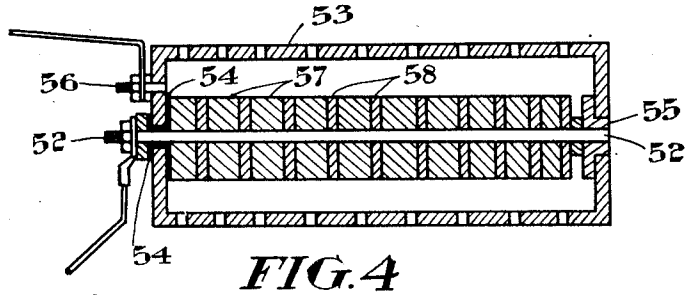


FIG. 4

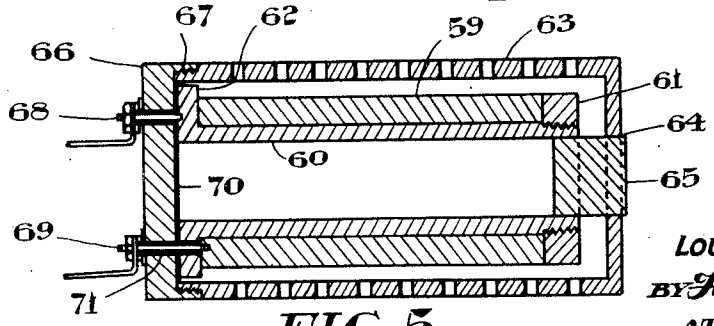


FIG. 5

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC HEATER.

Application filed June 21, 1926, Serial No. 117,585, and in Great Britain June 29, 1925.

This invention relates to new and useful improvements in electrically operated heating devices, and the object of the invention is to provide a heating device which will be inexpensive to manufacture, simple to operate and efficient in the results obtained.

Another object is to provide a heating device of the class stated which will operate on alternating or direct current and under any voltage.

Another object is to provide a heating device in which the current consumption will be reduced as the temperature of the fluid or gas under treatment is raised.

In my invention I provide a heating element of carbon or a combination of carbon and copper or like non-magnetic material of high conductivity. The heating element is surrounded by a perforated casing or covering which allows the liquid or gases which are to be heated to come in direct contact with the copper and carbon core within the casing. The perforations also regulate the flow of fluid or gas due to their rise in temperature.

In the drawings:—

Figure 1 is a sectional elevation of my preferred form of heating element attached to a tank.

Figure 2 is a cross sectional elevation taken on the line 2—2, of Figure 1.

Figure 3 is a sectional elevation of a modified type of heating element with a core adjusting attachment.

Figures 4 and 5 are sectional elevations of typical modifications which may be made in the construction of the heating device.

Referring more particularly to the drawings, 11 designates a typical wall plug which may be connected to a source of electrical current supply. A double cored flexible cable 12 is attached at one end to the plug in the usual manner and at the other end to portions of the heating device in the manner hereinafter described. In Figure 1, which shows my preferred form of heating device, one of the strands or conductors of the cable is connected to a round rod 14 of carbon or carbon composition, which is held in position within a casing 15 by means of the recessed washer 16, which may be made of wood or other insulating material. The casing is provided with a plurality of holes or slots 17, which may be cut or formed in the wall 18 surrounding the carbon rod. The inner surface of the wall 18 is spaced equidistant from the outer face of the rod. The end 19 of the casing positions the carbon in the longitudinal direction by engaging with the outer surface 20 of the washer 16. A portion 21 of the casing is provided with a screw thread, which is adapted to engage with a threaded aperture 22 of a tank 23, which may be a radiator, boiler, automobile radiator or like heating appliance or container. A flange 24 is also provided at one end of the casing. Attached to the flange 24 by means of the screws 25 is the gland neck 26, through which the double-cored cable is placed. An insulating washer 27 is placed between the flange 24 and the flange 28 of the gland neck 26. A rubber or like washer 29 may be placed in a recess 30 formed in the end of the casing to position the rod. The remaining end of the wire of the double cored cable is placed between the flanges and held in position by means of a stud or dowel pin 31 secured to the flange 24. To prevent water from leaking through the gland neck aperture 32, a gland 33 is provided, which is pressed against a rubber or like gasket 34 by means of an internally threaded cap 35, which engages with a screw thread formed in the flange neck. A standard cable protection spring 36 may be provided to protect the cable while in use.

In Figure 3, the carbon rod is made in two portions 37 and 37$^a$, both portions being encased in a metal sheath 38. The portion 37$^a$ is adjustably mounted in any suitable manner to a fulcrum lever 39 oscillatably mounted in lugs 40 formed in the side of the casing. A threaded rod 41 is mounted in a threaded aperture 42 formed in the casing 43, which surrounds the sheath and the carbon adjusting means. One end of said rod is secured to the fulcrum lever in any suitable manner to allow free movement of said lever. The casing may also be provided with an externally threaded portion 44 for attaching the device to a tank 45. Perforations 46 are provided in the casing 43 to allow the liquid or gases to come in direct contact with the sheath. The casing may be made in two portions, as shown in Figure 3, the portion 43$^a$ being attached to the threaded portion 43$^b$ by any suitable means, or the portions forming said casing may be cast in one piece. A gland or cap 47 may be fitted to the flange 48 of the casing and an insulating bush may be placed between the terminal stud 49 and the gland or cap. One wire is attached to the

stud 49 which is connected to the carbon rod 37 and the other wire may be connected to the gland 47 by means of the screw 50. A handle 51 is provided to allow easy manipulation of the adjusting screw or rod. In Figure 4 a terminal rod 52 is placed within the perforated casing 53 and insulated therefrom by means of the vulcanite or like washer 54 at one end and the wooden washer 55 at the other end. The other terminal 56 is secured to the casing. Mounted on the terminal rod are the carbon washers 57 and the brass or copper washers 58, a copper washer being placed between each pair of carbon washers. In Figure 5, which shows another modification, a carbon sleeve 59 is mounted on a flanged copper sleeve 60, one end of which is provided with an internally threaded collar 61 adapted to hold the carbon against the flange 62. The carbon and copper sleeves are surrounded by a perforated casing 63, one end of which is provided with an aperture 64 into which a wooden or like plug 65 may be placed to hold the sleeves in position. The other end of the casing is provided with an internally threaded cap 66 adapted to engage with the external thread 67 formed in the wall of the casing. One terminal 68 is connected directly to the casing, while the other terminal 69 is connected to the copper sleeve, which is insulated from the cap by means of the insulating washer 70. The terminal 69 is insulated from the cap by means of the vulcanite or like bushing 71. Many modifications may be made in the construction of the device without departing from the spirit of the invention.

In operation, the casing is attached or mounted to a tank or the like which contains the liquid or gas to be heated. The device shown in Figures 4 and 5 may be used as immersion heaters. The core and casing are connected to a source of current supply, which may be alternating or direct and of any voltage. When the current is switched on, the circuit is completed through the core to the casing by the fluid or gas which is heated by means of the carbon which is a conductor of high resistance. It appears from experiments that cold water offers a greater resistance to the passage of the current than water of a higher temperature and, as the temperature increases, the current consumption decreases until the water reaches boiling point, at which point the current consumption is practically negligible, thereby providing an economic means for heating liquids or gases.

The device is very simple and inexpensive to manufacture and may be used for a variety of purposes, such as household heating, automobile radiator heating, sterilizing tanks and numerous other devices. The heater may also be used for heating large quantities of water by installing a number of them within a tank and connecting them in series or in parallel to any of the standard switches, which may be so arranged to cut out one or more of the heating elements according to requirements. This is the usual practice in electrical work and is cited as a possible use to which this invention may be adapted.

Having now particularly described my invention, what I claim is:—

1. An electrical heating device having an inner electrode spaced from and surrounded by a perforated outer electrode, said inner electrode comprising a carbon portion made in two parts and surrounded by and contacting with a metallic sheath exposed to the liquid to be heated, means pivotally attached to the sheath and secured to one of the carbon parts to allow easy adjustment of said part, and manually operated means attached to pivoted means for adjusting the carbon parts.

2. An electrical heating device including an electrode comprising a carbon portion made in two parts enclosed in a closely fitting metallic sheath, a bell crank lever pivoted to said sheath and having one arm secured to one of said carbon parts and an operating member connected to the other arm of the bell crank lever.

In witness whereof, I have hereunto set my hand.

LOUIS HENRY VERONNEAU.