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L. C. HYATT

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INCLOSED ELECTRIC HEATER

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FIG. 1

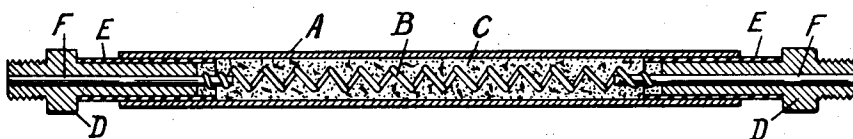


FIG. 2

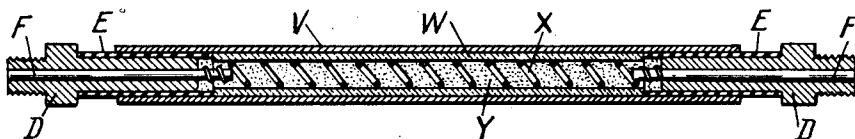


FIG. 3

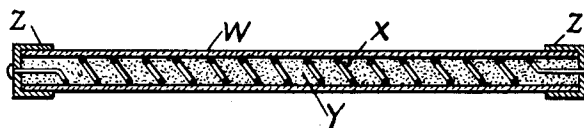
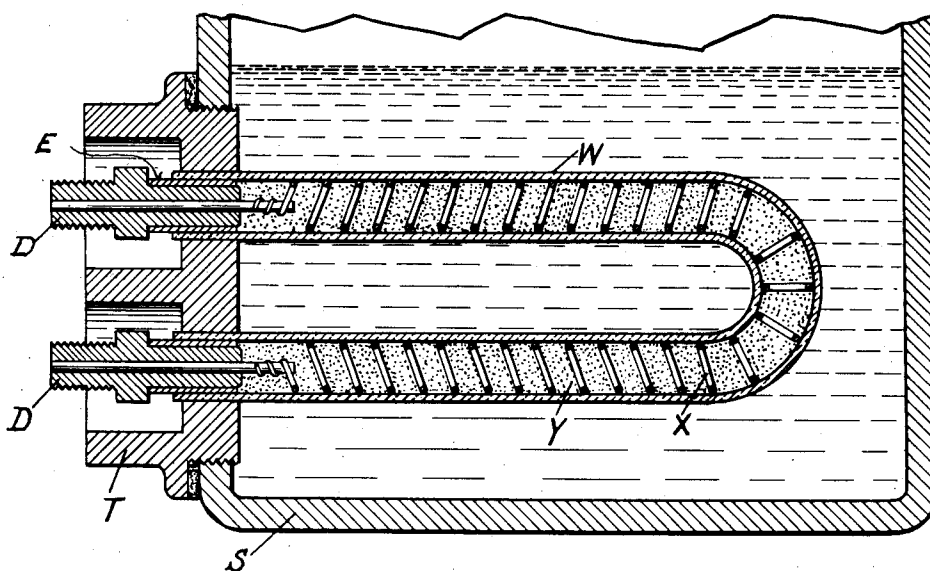


FIG. 4



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INCLOSED ELECTRIC HEATER

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Application May 9, 1929, Serial No. 361,743

2 Claims. (Cl. 219—38)

For a detailed description of the present form of my invention, reference may be had to the following specification and to the accompanying drawing, forming a part thereof, wherein

Fig. 1 illustrates an existing form of inclosed electric heater;

Figs. 2, 3 and 4 illustrate my improvement thereon.

My invention consists in a form of electric heater of the inclosed type capable of operating at a much higher temperature of the resistor and having a far greater capacity than has heretofore been possible in ordinary heaters of this type. This I accomplish by supporting and electrically insulating the resistor with a material which is at the same time permeable by radiant heat and which will also retain to an adequate extent its electrical insulating quality when it is itself at a luminous heat. It is well known that radiant heat travels in the order of about 181,000 miles per second, i. e. approximately the speed of light. On the other hand, heat travels by conduction a matter of inches per minute or minutes per inch, depending upon the material. It is also well known that radiant energy (radiant heat) travels through space, whereas conducted heat does not. Also, that radiant energy is stopped by opaque bodies, whereas conducted heat is not. Therefore, with a heater unit of this type, the generated heat of the resistor will be dispersed to the outside atmosphere or to the inclosing metal casing or other medium to be heated at a far more rapid rate than when the customary opaque and heat insulating materials are employed as electrical insulators. Thus the heater has a correspondingly greater capacity than heretofore, not only responding instantaneously to the electric current, but the resistor can be maintained with safety at an operating temperature which would be unsafe and even ruinous to pre-existing heaters. This permits a natural saving in cost of the heater as well as in the space required for it.

Referring to Fig. 1, which illustrates an electric heater of the inclosed type heretofore in use, A represents a metallic tube, B the coil of conductor, often called the "resistor", and C represents a powdered and packed insulating material such as magnesium oxide, lava, alundum, or zirconium oxide, all of which are electrical insulators more or less refractory to heat, but are also nonconductors of heat and opaque to heat radiation. The terminal rods F F of resistor B are inclosed in end bushings D D wrapped in mica E where they enter the tube A. The advantage of this

former type of heater is that the outside metal casing is electrically insulated, being therefore safe to handle, and capable of being clamped to, or immersed in, a material to be heated thereby. The disadvantage of it, which I have succeeded in overcoming, is that the resistor is insulated thermally as well as electrically. For that reason the generation of heat in the resistor must be kept strictly limited, for the safety of the resistor conductor, while the slowness of heat removal from said conductor to the casing or medium to be heated by the casing, makes necessary the employment of a comparatively large heater for any large heating transaction. In other words, the former heater has only a low capacity.

Turning next to Fig. 2, which illustrates my improvement, V represents the metallic outer tube. W represents a tube of quartz, preferably transparent, although translucent quartz will serve, and inside of the quartz tube is the resistor X, having its terminal rods F F in the bushing D wrapped with mica where it enters the metal case, just as in the old heaters. The quartz tube is permeable to heat radiation, instead of being a heat insulator, and instantly transmits the heat radiated from the resistor to the metal case V or other heat receiving medium outside of the quartz. For that reason, it becomes possible, and such is my practice, to operate the resistor at a luminous heat, either a red, or even a white heat. Thereby I gain a large capacity in a given heater, as compared with those previously used. Unless this heat is absorbed by the casing or other medium about as rapidly as it is generated in the resistor, the quartz will also become red hot, but this is immaterial because the quartz, unlike other insulators, will maintain its electrical insulating property at high heat. Moreover it will at high heat preserve its shape and mechanical strength and,—what is also of importance,—it has only a negligible coefficient of expansion. Thus I am able to operate my heater at a much higher temperature and with a much greater concentration of heat volume therein than has been heretofore possible. Moreover, the transparency of the quartz to heat radiation permits a rapid dispersion of the greater amount of heat generated in the resistor to the metal case and other external media to be heated thereby, so there is no accumulation of heat in the resistor, in spite of its high temperature. Since it is desirable that the resistor, in its superheated condition, should be kept from vibration in the quartz tube, I pack the tube, both in and around the resistor, with quartz sand, indicated at Y, or vibration may be prevent-

ed by winding the resistor with a thin layer of asbestos.

Turning next to Fig. 3, I illustrate therein another form of my invention wherein the outside metal case is eliminated, and on the quartz tube 5 W are mounted at each end a metal cap Z welded to one end of the resistor. This form of my invention is available in many situations and is made possible by the aforesaid properties of the 10 quartz tube, particularly its ability to maintain its mechanical strength and adequate electrical insulating duty at high temperatures, as well as its transparency to heat radiation.

In Fig. 4 I have illustrated one of the many applications of the form of my invention which appears in Fig. 3. In Fig. 4 S represents a cross section of a vessel containing liquid to be heated. At one point in the wall of this vessel is screwed a panel T, and in this panel are mounted the two 20 ends of a U-shaped quartz tube W. In each end of the quartz tube is a bushing D, such as I have heretofore described as placed in the end of a metal case outside of the quartz tube (see Fig. 2). In this apparatus, the quartz tube will have adequate mechanical strength, even at a luminous 25 temperature, to act as a support for the resistor X and will also insulate the resistor electrically, which has heretofore been non-insulated thermally, and deliver its heat directly to the liquid in 30 the tank.

In the following claims I intend to exclude such heater insulation as may be opaque to heat radiation, however effective it may be as electrical insulation.

What I claim as new and desire to secure by 5 Letters Patent is:

1. A heater of the character described comprising a non-luminous heat-receiving medium, a tubular support of dielectric material permeable to radiant heat, said support being fixedly 10 positioned with respect to said heat receiving medium, a resistor element of the luminous type located within said tube, and a mass of vibration-preventing dielectric material interposed between the resistor and its support, said interposed material possessing high insulating quality and said 15 resistor element, said resistor support and the interposed dielectric material being constructed and arranged to transmit radiant heat to said 20 heat receiving medium.

2. In a heater of the character described, a radiant heat-transmitting unit comprising a tubular body of dielectric material permeable to radiant heat, a resistor element within said tubular 25 body, and a mass of vibration preventing dielectric material filling said tubular body and inclosing said resistor element.

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