Feb. 27, 1923. 1,446,807

J. F. MERCER

ELECTRIC HEATER FOR LIQUIDS

Filed Nov. 29, 1921 2 sheets-sheet 1

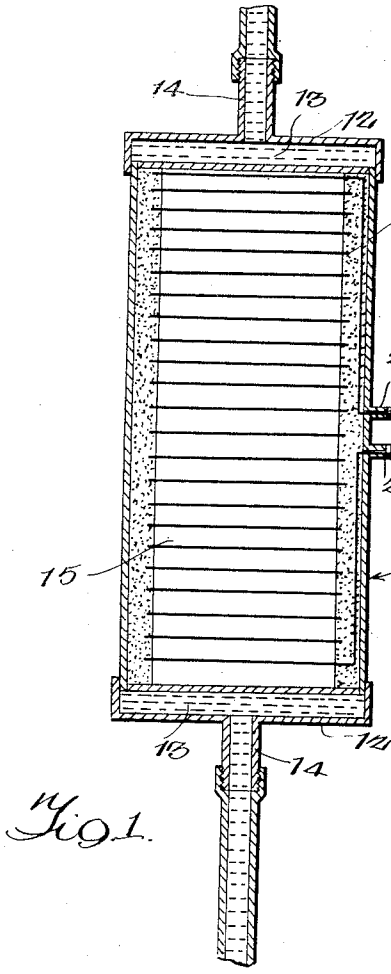

Fig. 1.

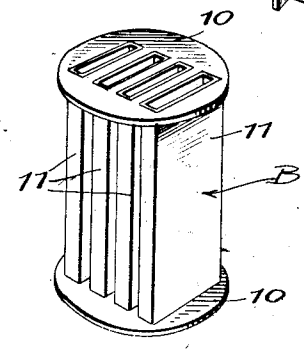

Fig. 2.

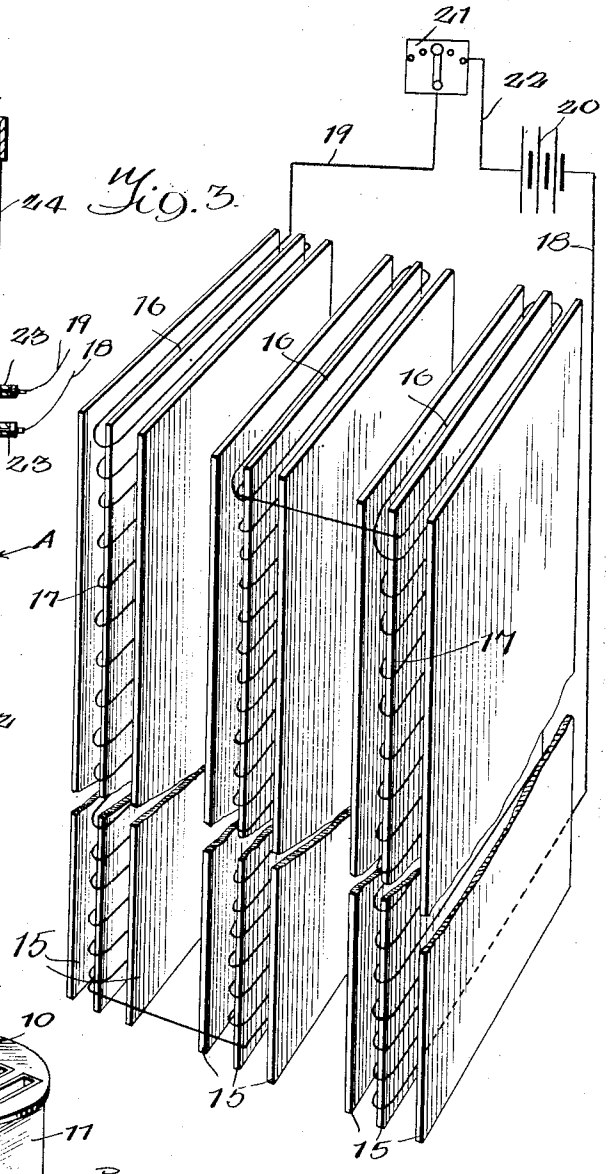

Fig. 3.

WITNESSES

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Fig. 4

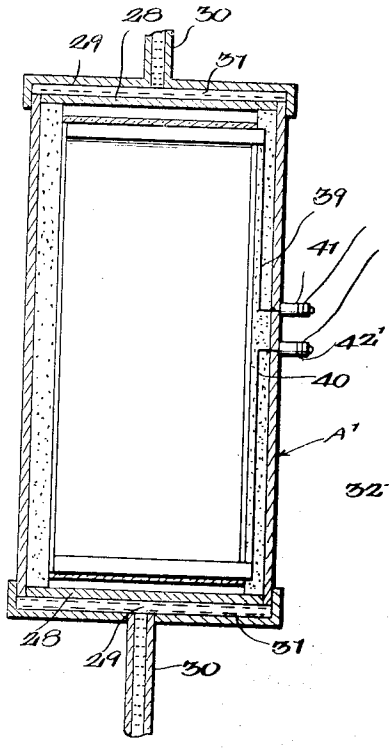


Fig. 5

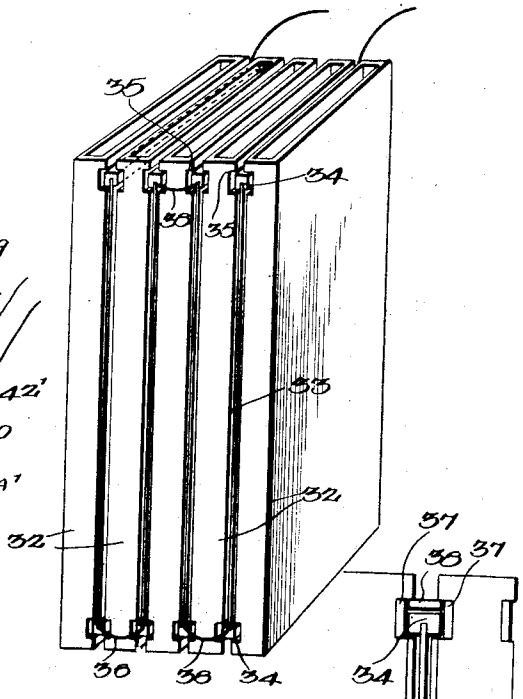


Fig. 6.

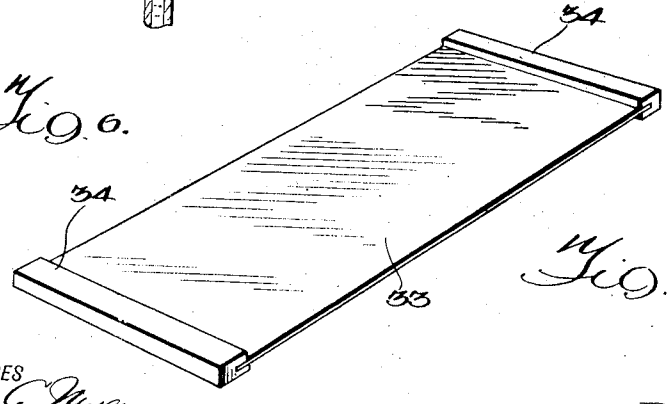
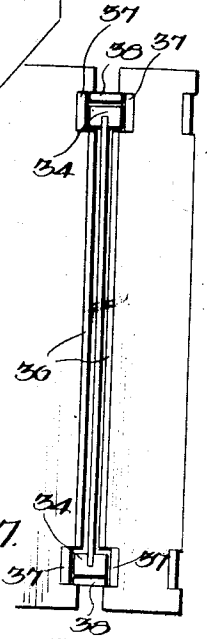


Fig. 7.



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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATER FOR LIQUIDS.

Application filed November 29, 1921. Serial No. 518,529.

To all whom it may concern:

Be it known that I, JOHN F. MERCER, a citizen of the United States, and a resident of Globe, in the county of Gila and State of Arizona, have invented certain new and useful Improvements in Electric Heaters for Liquids, of which the following is a specification.

This invention relates to an electric heater for liquids.

Among the objects of the invention is to provide a heater of the character mentioned which is compact in construction and which has an exceedingly high heating capacity at a low consumption of current.

Other objects and objects relating to details of construction, combination and arrangement of parts will hereinafter appear in the detailed description to follow.

The invention is illustrated by way of example in the accompanying drawings, in which:—

Figure 1 is a central vertical sectional view of the heater when fully assembled and connected with a liquid supply.

Figure 2 is a perspective view of the heat exchange unit.

Figure 3 is an enlarged detail view showing the manner in which the heating coils are supported and insulated and also showing the connection thereof with a suitable source of current supply.

Figure 4 is a view similar to Figure 1 but showing a different form of heating element.

Figure 5 is an enlarged perspective view illustrating the positioning of the heating element as used in Figure 4 between the different heat transferring casings.

Figure 6 is a perspective view of one of the heating elements.

Figure 7 is a fragmentary elevation illustrating the manner of insulating the heating elements from the casings of the heat exchanging casings.

Referring to the drawings more particularly, A indicates generally a cylindrical casing in which there is enclosed the heat exchange unit generally indicated by the reference character B. The heat exchange unit B more particularly consists in a pair of circular plate or head members 10 between which there extends a plurality of elongated casings 11, each of which is rectangular in cross section and serves as a passage for conducting a liquid through the heater. The ends of the casing 11 are open, as shown, and sealed to prevent any liquid passing through the heater other than through the passages thereof. The head 10, in each instance, is adapted to form a tight closure for the associated end of the casing A. Upon each end of the casing A there is fitted an auxiliary head or cap 12 which is adapted to form a chamber 13 at each end of the heat exchange unit B. Also each cap or auxiliary head 12 is formed with a nipple 14 by which the same may be connected with a liquid supply as shown.

The casings 11 in the present instance are four in number and between adjacent pairs there is interposed three sheets of mica, these sheets of mica are grouped as in Figure 3 and each generally indicated by the reference numeral 15. As shown each of the sheets of mica 15 corresponds in width and length to one side of a casing 11. The sheets of mica of course may be replaced by other suitable insulating material, if desired, and preferably the outside sheets of each group are secured in some suitable manner to the adjacent wall of the associated casing 11. The middle sheet 16 of each group is for the purpose of supporting the heating coil. In this instance a resistance wire 17 is wound about each middle sheet 16, and the wires are connected through the wires 18 and 19 to one side of the battery 20 and one terminal of the resistance box 21. The circuit is then completed between the resistance box 21 and the battery 20 by a wire 22.

Also as shown in Figure 1 the cylindrical casing A is formed with a pair of nipples 23 through which the supply wires 18 and 19 may be extended.

Between the heat exchange unit B and the inner walls of the cylindrical casing A there is packed granulated asbestos as at 24, or other suitable heat insulating material.

It is believed from the foregoing description that the operation of the present invention is clearly apparent without a detailed description thereof. Also it is believed that the advantages of the invention may be obvious. An important feature is the manner in which the resistance wires are disposed with relation to the heat exchange unit B. By this arrangement a high heating capacity of a small unit may be obtained with a very low consumption of current.

Referring to Figures 4 to 7 inclusive, A′ indicates the housing or casing for the heat-

ing unit which is cylindrical in form similar to that shown at A in Figure 1 and which has fitted in each end a head 28 and a cap 29 each cap being provided with a pipe 30 which is adapted to communicate with the chamber 31 formed between each head 28 and associated cap 29.

In this instance as shown in Figure 5 the heat exchanging unit consists in a plurality of casings 32 which are similar in shape to the casings 11 constituting the heat exchanging unit B shown specifically in Figure 2. The casings 32 are positioned between the heads 28 and each casing extending through the heads 28 so that the ends thereof communicate with the chambers 31. Also it may be mentioned that the heads 28 may be formed with the casings 32 if so desired. In either instance the heads 28 are properly slotted about the ends of the casings 32 so that a liquid may not enter within the casing A'.

In the present instance each heating element, one of which is shown in Figure 6, consists in a sheeting 33 which may be made of material adapted to offer a higher resistance to the flow of electric current such as nichrome or the like and each end has fitted thereon a bar 34 which is preferably made of copper or other metal having good conductivity to the flow of electric current.

As shown in Figure 5 one of the resistance elements is positioned between each adjacent pair of casings 32 and adjacent the ends of the casing 32 there are provided suitable transverse slots or grooves 35 which are adapted for receiving the conductor bars 34 on the ends of the resistance sheets 33 also the resistance sheets 33 are properly insulated from the sides of the casings 32 by a sheet of mica as at 36 (Figure 7) and likewise the bars 34 are insulated by mica strips or the like, 37. An additional strip of mica or other insulating material 38 may be used to further insulate the bars 34 from the casings 32.

The resisting elements between the casings heretofore described are preferably connected in series with each other which is accomplished by the wires 38 in a manner which is obvious. The two outermost sheetings 33 have their upper bars connected to the wires 39 and 40, said wires in turn being connected to the binding post 41 and 42, respectively, and from the binding posts 41 and 42 suitable wires may be shown to connect the heating unit with a suitable source of electric supply. Also if desired suitable resistance may be inserted in the circuit supplying the electric heating unit as illustrated in Figure 3 of the drawings.

It is thought that the operation of the unit shown in Figures 4 to 7 of the drawings and described is entirely clear and it may be here remarked that the purpose of the singular construction of heating elements is to provide a large heat radiating surface and thereby afford a highly efficient heating unit. It also may be remarked that this particular unit has the same advantages as set out in the Figures 1, 2, and 3 inclusive, that is it offers a large service for transmitting the heat from the heating elements to the liquid to be heated through the use of a number of casings 32.

I claim:

1. An electric heater of the character described, comprising a plurality of elongated casings disposed in parallel relation to each other and each adapted to permit the passage of a liquid therethrough, a resistance element interposed between adjacent pairs of the casings, and means for connecting the resistance elements to a supply of electric current.

2. An electric heater of the character described, comprising a plurality of elongated casings which are square in cross section and disposed in parallel relation to each other and having their adjacent sides in close proximity, a resistance element consisting in a sheeting of metal having a high resistance to the flow of an electric current interposed between each of the adjacent pairs of said casings, and means whereby said resistance elements may be connected with a source of electric current supply.

3. An electric heater of the character described comprising a plurality of elongated casings which are rectangular in cross section, a circular head connecting the similar ends of said casings, a cylindrical casing within which said first named casings are disposed, said circular heads being adapted to form a closure for the ends of said cylindrical casing, means whereby a liquid may be introduced into each of said casings, a resistance element interposed between each of the adjacent pairs of said casings, insulating means for resistance elements, and means whereby said resistance elements may be connected with a source of electric current.

4. An electric heater of the character described comprising a heat exchange unit consisting in a plurality of elongated casings disposed parallel to each other and having their adjacent sides in close proximity, a head for holding the similar ends of said casings in proper spaced relation, means for circulating a liquid therethrough in each of said casings, a resistance coil interposed between each of the adjacent pairs of said casings, and means for connecting said resistance coils to a source of electric current supply.

5. An electric heater of the character described, comprising a heat exchange unit consisting in a plurality of elongated casings disposed parallel to each other and having their adjacent sides in close proximity, a head for holding the similar ends of said

casings in proper spaced relation, means for circulating a liquid through each of said casings, a sheet of insulating material interposed between adjacent pairs of said casings, a coil wound upon said insulating sheet, and means whereby said coils may be connected with a source of electric current supply.

6. An electric heater of the character described, comprising a heat exchange unit consisting in a plurality of elongated casings disposed parallel to each other and having their adjacent sides in close proximity, a head for holding the similar ends of said casings in proper spaced relation, means for circulating a liquid through each of said casings, a sheet of insulating material interposed between each of adjacent pairs of said casings, said sheet corresponding in dimensions to one side of the casing, a resistance wire wound about said insulating sheet longitudinally thereof, and means for connecting said resistance wires to a source of electric current supply.

7. An electric heater of the character described, comprising a heat exchange unit consisting in a plurality of elongated casings disposed parallel to each other and having their adjacent sides in close proximity, a head for holding the similar ends of said casings in proper-spaced relation, means for circulating a liquid through each of said casings, a sheet of insulating material interposed between each of the adjacent pairs of said casings corresponding in dimensions to a side of the casings, a resistance coil wound about each of said insulating sheets longitudinally thereof, an insulating sheet disposed upon each side of each of the insulating sheets carrying the resistance wires, and means whereby the resistance wires may be connected to a source of electric current supply.

8. An electric heater, comprising a plurality of casings arranged in close proximity with each other, and a resistance element interposed between each adjacent pair of casings.

9. An electric heater, comprising a plurality of casings, each adapted to retain a liquid and being arranged in close proximity with respect to each other, and a plurality of resistance elements associated with said casings whereby a relatively large surface of the casings will be exposed to the resistance elements for the purpose described.

10. An electric heater, comprising a plurality of casings, each adapted to retain a liquid and being arranged in close proximity with respect to each other, a plurality of resistance elements associated with said casings whereby a relatively large surface of the casings will be exposed to resistance elements for the purpose described, and insulating means for supporting said resistance elements.

11. An electric heater, comprising a plurality of casings arranged in close proximity with each other, a resistance element interposed between each adjacent pair of casings, and heat insulating means surrounding said casings.

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