Oct. 11, 1932. W. J. HAMMERS ET AL 1,882,573

ELECTRIC WATER HEATER

Filed Dec. 29, 1930 2 Sheets-Sheet 1

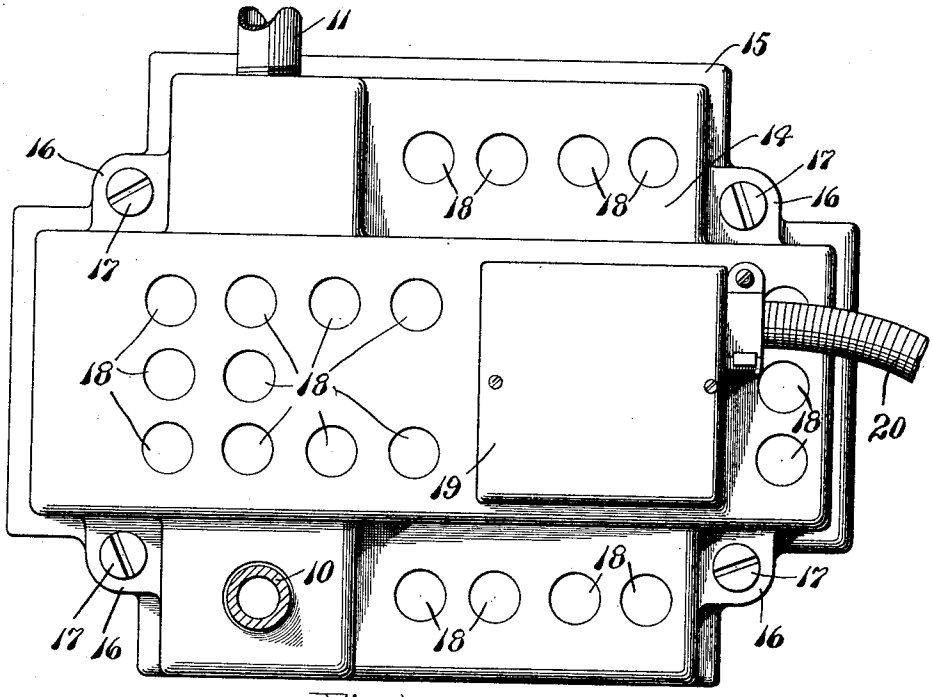

Fig. 1.

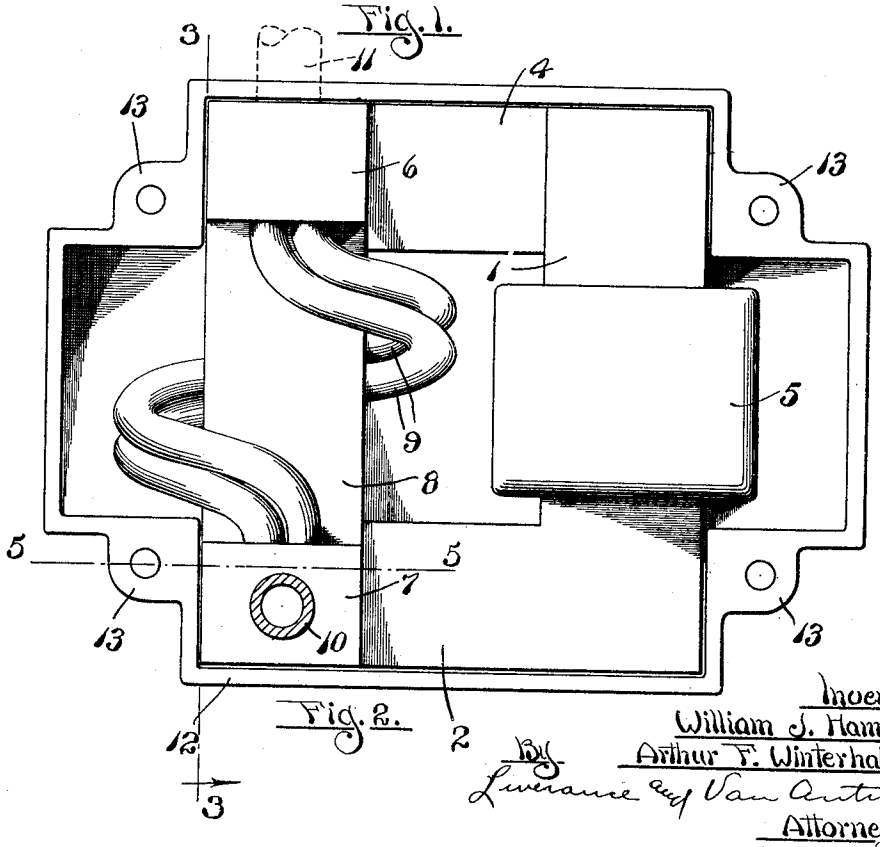

Fig. 2.

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ELECTRIC WATER HEATER

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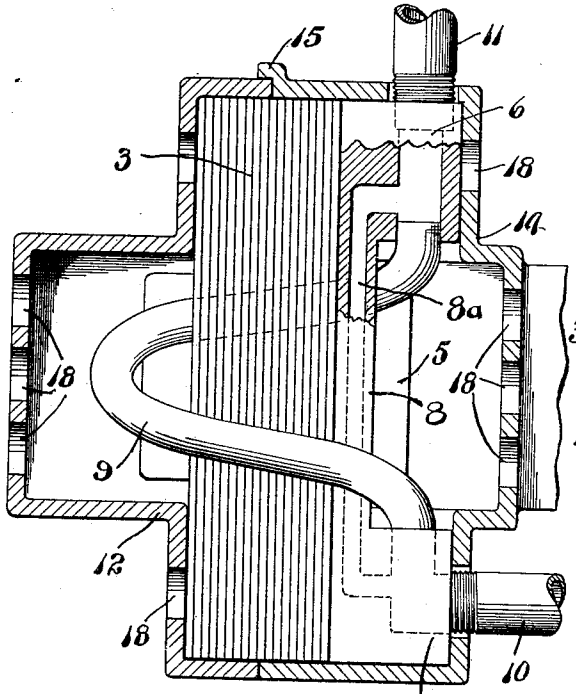

Fig. 3.

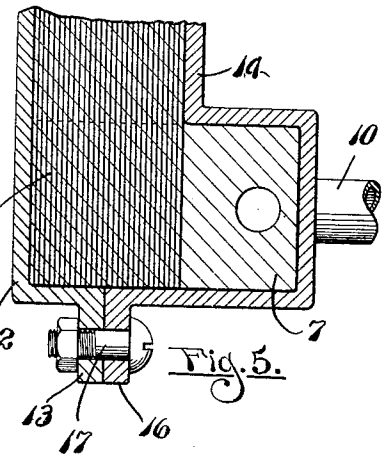

Fig. 5.

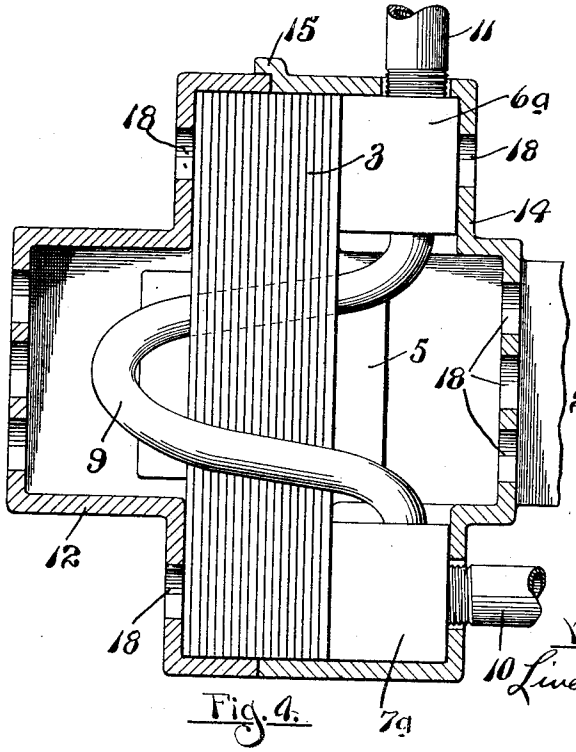

Fig. 4.

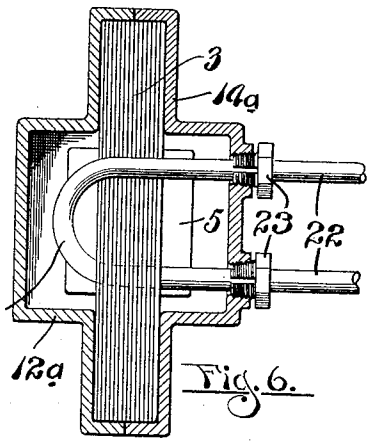

Fig. 6.

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UNITED STATES PATENT OFFICE

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ELECTRIC WATER HEATER

Application filed December 29, 1930. Serial No. 505,233.

This invention relates to electric water heaters and is primarily concerned with numerous improvements in the construction disclosed in my patent, Reissue #18,160, filed January 14, 1930.

The present invention relates to water heaters in which the water is heated through the application of electric current passing through a primary coil around a suitable core, whereby a current is induced in a secondary coil which, in practice, is a hollow tube forming a part of a water conduit, and the coil is short circuited and at the same time the construction is made strong and commercially practical and serviceable. The invention is directed also to further improvements in construction and arrangement of parts whereby a relatively simple but particularly practical water heating unit is provided and in which there is economy in the consumption of electric current consumed for heating the water, use being made of thin metal for the water tube coil which is short circuited.

An understanding of the invention may be had from the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is an elevation of the electric water heating unit of our invention.

Fig. 2 is a like elevation with one part of the enclosing housing removed illustrating the interior construction.

Fig. 3 is a vertical section substantially on the plane of line 3—3 of Fig. 2.

Fig. 4 is a vertical section similar to Fig. 3 illustrating a slight modification in structure.

Fig. 5 is a fragmentary horizontal section substantially on the plane of line 5—5 of Fig. 2, and

Fig. 6 is a vertical section showing a still further form or modification of structure in which the invention may be embodied.

Like reference characters refer to like parts in the different figures of the drawings.

In the construction, a core of rectangular form is made up of laminated sheets of metal, one side of the core having vertical legs 1 and horizontal lower legs 2 at right angles thereto, and the other side of the core vertical legs 3 and upper horizontal legs 4 thereby providing an open rectangular laminated core as stated. Around the side or leg 1 of the core a winding 5 of wire is located which is connected with any suitable source of alternating electric current whereby the electric current may flow continuously therethrough when the device is in operation.

Against a side of the other vertical leg 3 of the core a metal member is located comprising an upper block 6, a lower block 7 and a vertical integral connecting bar 8 (see Fig. 3). The upper block 6 has a vertical passage through it and, either one or more pipes 9, of thin metal bent and coiled as shown around the vertical leg 3 of the core are attached at their upper ends so as to communicate with the passage through the block 6. The lower end of the coiled pipe or pipes used is connected permanently with the upper side of the lower block 7 which has a passage therethrough from the lower ends of the pipes to an inlet water pipe 10 which threads into the outer side of the block 7 to carry water therethrough, through the block 7, thence through the coiled pipes 9, and through the block 6 to an outlet pipe 11 which is threaded into the upper side of the block 6 as shown.

The connecting bar 8 may have a passage 8*a* lengthwise thereof which joins with the passages through the blocks 6 and 7, through which water may pass to absorb heat which is generated and absorbed in said bar 8 in the operation of the appliance.

The construction described is housed within a casing made in two parts. One part, indicated at 12, and of the outline best shown in Fig. 2, has lugs 13 at suitable points through which openings are made. The other part 14 of the housing is formed with an overlapping of set flange 15 (Fig. 3) to locate the two parts of the housing with respect to each other and it likewise (Fig. 1) has lugs or bosses 16 fitting over the like parts 13 on the housing member 12 and with openings therethrough whereby connecting bolts 17 may pass through the lugs or bosses and secure the housing member together so

as to completely house and enclose the construction described. The member 12 at one side has suitable space provided for the water pipe coil 9 and the other housing member 14 bears against the outer sides of the blocks 6 and 7. The upper and lower sides of the core and of said blocks fit fairly closely within the upper and lower sides of the housing members so that when the housing members are placed over the structure and connected together a compact construction is made and one which holds the parts against movement. The housing members 12 and 14 at various places therein have a plurality of openings 18 made for the entrance of air for cooling purposes.

On the outer side of the housing member 14 an electric control or junction box 19 is fastened and a flexible metallic tube 20 joins therewith through which the wires carrying current from the source of current supply are carried to the box. The mechanism within the box is of conventional construction and in no sense novel in the present invention.

In Fig. 4 the blocks 6*a* and 7*a* between which the water tube coils 9 are located are separated from each other and are not connected by a tie bar 8. This is the only difference in structure over that shown in Fig. 3.

In Fig. 6, instead of using the blocks 6 or 6*a* and 7 or 7*a*, a U-shaped coil 21 passes around the side 3 of the core and the legs of said coil extend through a side of the housing member 14 and are joined with inlet and outlet pipes 22, and at the same time electrically connected by split nuts 23 with the housing member 14*a*, said nuts being of tapered shape and threading into tapered openings through the side of the housing member 14*a*.

With this construction it will be noted that the pipe coil or coils 9 are electrically connected in the structure shown in Figs. 2 and 3 by reason of the connecting tie 8 between the blocks 6 and 7, and also by reason of the contact of the blocks 6 and 7 with the housing member 14. In Fig. 4 the electric connection and short circuiting of the coil 9 is by contact of the blocks 6*a* and 7*a* with the housing member 14, it being understood that both housing members 12 and 14 are of suitable metal of good electric conductivity. And in Fig. 6 the coil is short circuited through the electric connection of the ends therewith with the housing member 14*a* through the intervening clamping nuts 23. The structure shown in Figs. 2 and 3 is the preferred one. The tie 8 being integral with the blocks 6 and 7 there is no liability of any breakage or deterioration in the short circuited connection which may come from mere contacts as in Figs. 4 and 6.

With the construction described and with the current passing through the primary coil 5 a current of very heavy amperage and low voltage is induced in the pipe coils 9 which passes through the coils and the short circuiting connection between them thereby producing very high temperature and heat in the coils 9 which is absorbed by water passing therethrough upwardly as the water heats. The tubes 9 are of thin metal, preferably copper, affording resistance to the passage of the induced current of heavy amperage and thereby producing heat in large amount in accordance with the well settled law of heat production that when electric currents pass through an electric conduit, the heat generated is directly in proportion to the resistance offered and as to the square of the current which passes therethrough.

The construction described has proved very practical and serviceable and with it water may be heated with economy and with much greater economy than has been previously possible where heating of water has been attempted electrically. The construction and design shown is of a practical commercial unit. The unit is designed to be made in different sizes for a greater or less consumption of electricity and in the larger sizes the number of pipes 9 used may be increased, there being shown in Fig. 3 two of the pipes but the invention in no sense being limited to either one or two of the pipe coils.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within the scope thereof.

We claim:

1. A heater comprising, a core, a primary coil through which electric current is passed wound around said core, blocks having passages therethrough located against the core in spaced relation, a secondary coil comprising a tube of thin metal disposed around the core and having its ends connected with said blocks at the ends of the passages therethrough, liquid carrying pipes connected with the blocks at the other ends of said passages and a short circuiting connection between said blocks.

2. A heater comprising a core, a primary winding adapted to carry electric current located around the core, spaced apart blocks, an integral bar connection between said blocks, each of said blocks having a passage therethrough, a coil of thin tubular pipe material forming a secondary coil around said core connected with the blocks in conjunction with the passages therethrough, and liquid carrying pipes connected with the blocks in conjunction with the other ends of said passages.

3. A heater comprising, a core, a primary coil adapted to carry electric current wound around said core, spaced apart blocks having passages therethrough, a thin pipe conduit providing a secondary coil located around said core and connected at its opposite ends to the blocks in conjunction with

the ends of the passages therethrough, liquid carrying pipes connected with the blocks in conjunction with the opposite ends of said passages, and a housing of electro-conductive material within which said core, blocks and primary and secondary coils are located the housing contacting with the blocks and providing a short circuiting connection between the same.

4. A heater comprising a core, a primary coil around said core adapted to carry electric current, a secondary coil comprising a tube of thin material located around said core, and a housing of electro-conductive material within which the core and primary and secondary coils are contained, said housing electro-conductively connecting the ends of said secondary coil.

5. A heater comprising a core, a primary coil in an electric circuit wound around said core, a secondary coil comprising a conduit of thin tubular material associated wth the primary coil to receive an induced electric current therefrom, a member comprising spaced apart blocks connected by a tie, each of said blocks having a passage therethrough with which the secondary coil is connected with its ends in connection with ends of the passages in said blocks, liquid carrying pipes connected with the blocks in conjunction with the opposite ends of said passages, and a housing enclosing the core, primary and secondary coils, blocks and connecting tie between the same and holding said blocks against a side of the core.

6. A heater containing the elements in combination defined in claim 5, said housing at a plurality of places having openings made through its sides, for the purpose specified.

7. In combination, means for producing a varying field of magnetic flux, a housing surrounding said means, a secondary induction coil comprising a metal conduit extending into the housing and into the said flux field and then out of the housing and means for tightly connecting the metal conduit to the housing at its junctures therewith for the purpose described.

8. A heater comprising, a core, a primary coil associated with said core and located in an electric circuit, a secondary coil associated with the primary coil and core to receive an induced electric current from said primary coil, said secondary coil comprising an electric conductor having a fluid passage therethrough, and an electric short circuit connection between turns of said secondary coil, said connection being located against the core.

9. A heater comprising a core, a primary coil in an electric circuit wound around said core, a secondary coil comprising a conduit of thin tubular material associated with the primary coil to receive an induced electric current therefrom, a member comprising spaced apart blocks connected by a tie, each of said blocks having a passage therethrough with which the secondary coil is connected with its ends in connection with ends of the passages in said blocks, and liquid carrying means connected to the blocks.

10. A water heater comprising, means for creating a varying field of magnetic flux, a coil located therein, said coil carrying water therein, and a housing of electro-conductive material located around and contacting with the ends of said coil for short circuiting the same.

11. A heater comprising a core, a primary coil in an electric circuit wound around said core, a secondary coil comprising a conduit of thin tubular material associated with the primary coil to receive an induced electric current therefrom, spaced apart blocks each having a conduit therein to receive the respective ends of the said secondary coil, and a housing enclosing the core, primary and secondary coils and abutting against said blocks whereby the secondary coil is held in proper relationship to the said core.

In testimony whereof we affix our signatures.

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