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HOT WATER HEATER

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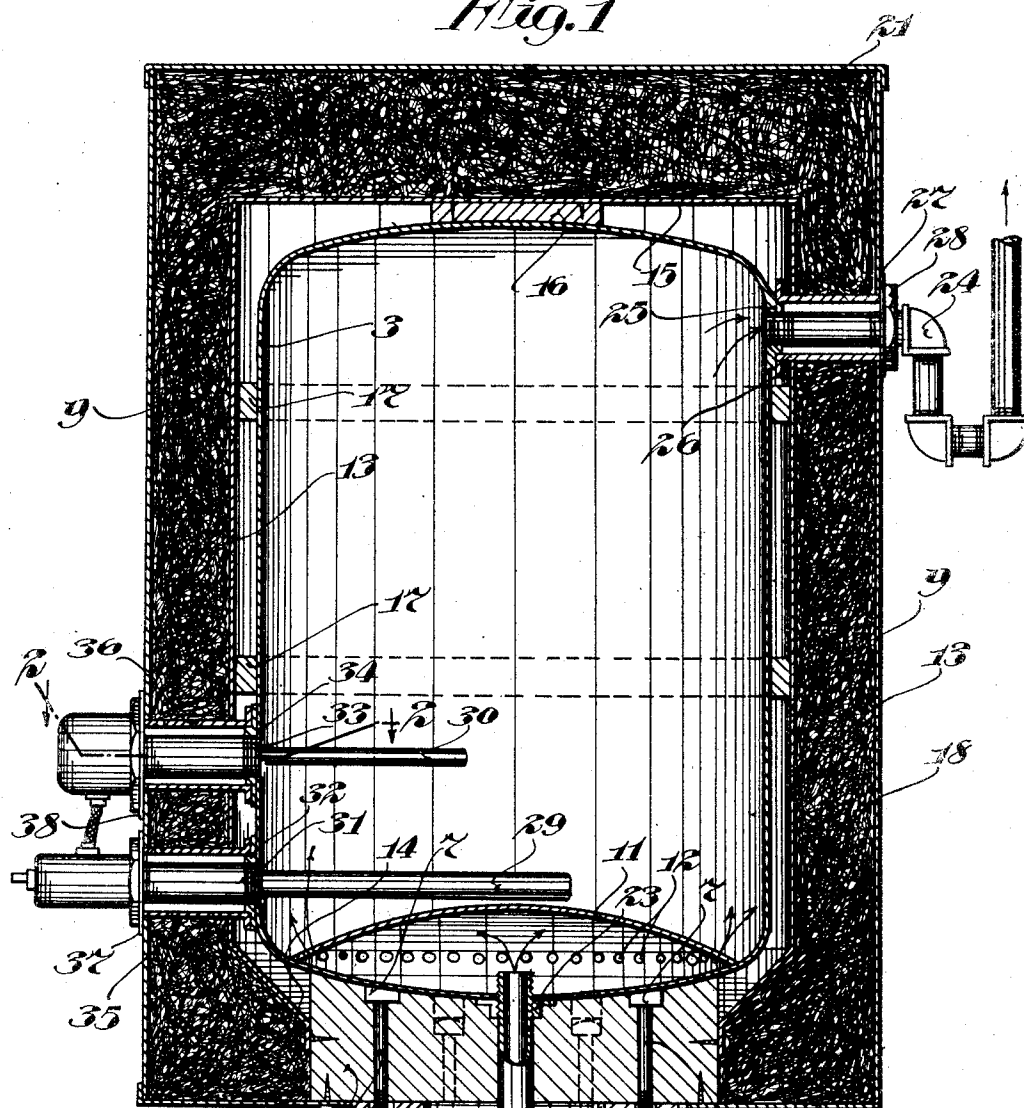
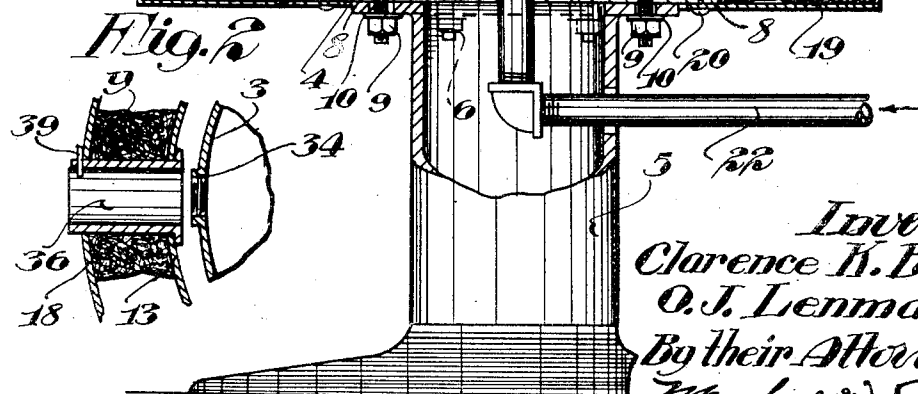
Fig. 1

Fig. 2



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HOT-WATER HEATER

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Our invention relates to hot water heaters, the term being used in a liberal sense to include devices used to heat water to temperatures either below or above the boiling point, and the object of the invention is to provide such a device in which there will be a minimum of heat lost by radiation and hence a maximum water-heating efficiency. Loss of heat by radiation is a serious matter in all heaters whether the source of heat be direct combustion, such as gas, or by electrical heating elements. Under the ordinary conditions, heat supplied by the combustion of gas or oil, for example, per B. t. u. is cheaper than that afforded by the application of electrical heating elements, but the waste of heat from gas or oil combustion is necessarily greater than that furnished by electrical heating elements. One of the objects of our invention is to so reduce the loss of heat by radiation that the water may be heated with electrical heating elements as cheaply or cheaper than by the use of gas or oil, and hence, in the designing of the heater hereinafter described, we provided means for conserving practically all of the heat units delivered by the electrical heating elements directly into the water of the heater. Some of the features of the invention, however, will be found desirable in other than electrical heaters. This improved heater has, in practice, been found highly efficient for use in supplying hot water service in dwellings, but it may be made in various different sizes and, where electrical current is supplied at reasonably low cost, it will be found efficient for heating the water of hot water, vapor and steam heating systems.

A commercial form of the device is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a vertical section taken axially through the improved heater, some parts being sectioned; and

Fig. 2 is a section taken on the line 2—2 of Fig. 1, but with the thermostat removed and the parts adjusted for the removal of the hot water tank.

The hot water tank 3 is preferably an up-

right structure of cylindrical horizontal section constructed of any suitable metal such as steel with walls of proper thickness. Preferably, but not necessarily, the upper and lower heads of this tank are outwardly bulged. The lower head of the tank rests upon a large base block 4 of heat insulating material such as wood and this block rests upon the flanged upper end of a suitable support such as a cast standard 5. The block 4 is rigidly secured to the flanged upper end of the standard 5 by nut-equipped bolts 6, the heads of which are countersunk down into the block. The lower head of the tank is provided with bosses 7 into which the upper ends of anchoring bolts 8 are screwed or otherwise rigidly secured. These anchoring bolts 8 are passed freely through quite large perforations in the flanged upper end of the standard 5 and are provided with clamping nuts 9 between which and the flange of said standard insulating washers 10 are preferably applied. Secured on the lower head of the tank 3 is an upwardly bulged distributing plate 11, the edge of which is secured to said bottom, said plate being provided near its secured edge with circumferentially spaced perforations 12 through which, as will presently appear, the incoming water will flow upwardly into the tank through a multiplicity of small streams.

The hot water tank 3 is enclosed within a quite closely surrounding shell which, for distinction, is herein designated as the primary enclosing shell 13. Advisably, this shell is spaced approximately one-half inch to one and one-fourth inches from the tank, but such distance may, of course, be varied. The shell 13 is preferably of metal and its lower end is contracted and secured directly to the insulating block 4 by screws 14 or otherwise. At its upper end, shell 13 is provided with a flanged removable cover 15 at the central portion of which is a block 16 of insulating material that normally rests on the upper head of the hot water tank. Spacing rings 17 of heat insulating material such as wood fiber are preferably interposed in the space between the tank 3 and shell 13 so as to stop circulation of air under the action

of convection from bottom to top of the intervening space. As a very important feature of this invention, the shell 13 including its cover on their inside surfaces are polished, plated or otherwise treated for the inward or backward reflection of heat radiated from the exterior of the hot water tank. This is a highly important feature that will be further discussed later on.

Spaced from but enclosing the primary shell 13 is a secondary or outer shell 18 also preferably of sheet metal. This outer shell has an annular bottom plate 19 that underlaps the outer portion of the insulating block 4 and is rigidly attached thereto by screws 20 or other suitable devices. At its upper end, shell 18 is provided with a flanged removable cover 21. The space between the two shells 13 and 18 is filled in with a suitable insulating material γ such as mineral wool, asbestos or the like. The water to be heated is brought in through a supply pipe 22, which, as shown, is extended into the hollow standard 5 and thence axially upward from the bottom or lower head of the tank 3 being, as shown, detachably secured by threaded engagement to a flange 23 on the bottom of said tank. The water is thus delivered into the chamber formed between the bottom of the tank and the perforated plate 11 so that it will, as already indicated, be divided into a large number of streams and evenly distributed throughout the lower portion of the tank. The vertical portion of the pipe 22 as is obvious, is extended centrally upward through the insulating block 4.

The hot water is arranged to be drawn off from the upper portion of the tank through a hot water pipe 24. The inner end section of this pipe 24 is screwed into a flange 25 provided on the inside of the upper portion of the tank 3. A sleeve 26 of heat insulating material such as vulcanized wood fiber is spaced from and surrounds the inner section of the pipe 24 and is extended through the two shells 13 and 18. At its inner end, sleeve 26 has a flanged inner end that is telescoped over the hub of the flange 25 and normally is spaced inward from the shell 13. A washer 27 of heat insulating material such as wood fiber is placed on the inner section of the pipe 24 and against the outer end of sleeve 26 and a nut 28 which has threaded engagement with the inner section of said pipe 24 is applied against said washer.

The numeral 29 indicates an electrical heating element of commercial form and the numeral 30 indicates a thermostat of a well known immersion type. Both of said devices 29 and 30 are of general cylindrical form with flanged heads at their outer ends. Heating element 29 has a threaded portion 31 that has threaded engagement with a flange 32 on the exterior of the tank 3; a thermostat 30 is provided with a threaded

portion 33 that is engageable with a flange 34 on the exterior of the tank 3. Heating element 29 is extended into the tank as closely as practical above the bottom plate 11 and thermostat 30 is preferably extended at a point higher up. The numerals 35 and 36 indicate sleeves of insulating material extended through the shells 13 and 18 and spaced from but surrounding, respectively, portions of the heating element 29 and thermostat 30. Sleeve 35 has a flanged inner end that is telescoped over the hub of flange 32 while sleeve 36 has a flanged inner end that is telescoped over the hub of the flange 34. The flanged inner ends of the said sleeves are normally spaced inward of the shell 13. A washer 37 of heat insulating material such as wood fiber is placed against the outer end of the sleeve 35 and a similar washer 38 is placed against the outer end of the sleeve 36. The flanged head of the heating element 29 is normally tightly clamped against the washer 37 and the flanged head of the thermostat 30 is normally clamped against the washer 38.

In the foregoing description, it is thought to be evident that all of the vital parts of the device are protected against outward conduction as well as radiation of heat. The insulating block 4 supports but keeps the hot water tank, the primary and secondary enclosing shells and the supporting base out of conducting contact; the insulating sleeves 26, 35 and 36 prevent direct conduction of heat from said water tank and primary and secondary enclosing shells; and the insulating washers 10, 27, 37 and 38 reduce to a minimum the slight conductivity of the metallic elements that contact therewith.

The hot water tank 3 may be quite readily removed as follows: Unscrew and remove the water pipes 22 and 24, unscrew and remove the heating element 29 and thermostat 30, remove the nut 9 from anchor bolts 8 and also remove covers 15 and 21 and intervening insulating material γ . After this has been done, the insulating sleeves 26, 35 and 36 may be moved slightly outward so as to disengage the same from the flanges 25, 32 and 34, respectively, as illustrated in Fig. 2. If desired, the sleeves may be secured in their retracted positions shown in Fig. 2 by temporarily applying small pins 39 through perforations in their outer ends. When all of these things have been done the hot water tank 3 may be lifted out of the enclosing shell 13 and the shells 13 and 18 with the interposed insulating material and other attached devices may be left undisturbed and properly connected for the reapplication of a hot water tank.

Highly improved results by way of increased heating efficiency and heat conserving economy have been accomplished by providing the inner or primary enclosing shell with

an inner heat-reflecting surface. It has been found that this heat-reflecting surface will, to a very large extent, prevent outward radiation of heat and will reflect the same back against the exterior of the hot water tank. By tests made in practice it has been found that when the temperature of the water in the tank 3 is at 150 degrees, the temperature at the exterior of the inner shell 13 would not be more than 130 degrees, and this, as is evident, is a very considerable stoppage of radiation before the heat reaches the insulating material γ which, under the older practice would be relied upon solely for the insulation against outward conduction of heat. In practice it has also been found that the parts of this heater may be made at comparatively low cost and may be very rapidly and accurately assembled.

While we have described a preferred or one commercial form of the improved heater, it will, of course be understood that the heater is capable of modifications within the scope of the invention as herein disclosed and claimed.

What we claim is:

1. A hot water heater comprising a hot water tank, connections for circulating water through said tank, means for heating the water in said tank, and a shell spaced from but enclosing said hot water tank and provided with a polished heat-reflecting surface for intercepting the heat waves and reflecting the same inward toward or against said hot water tank.

2. A hot water heater comprising a hot water tank, connections for circulating water through said tank, means for heating the water in said tank, a shell spaced from but enclosing said hot water tank and provided with a polished heat-reflecting surface for intercepting the heat waves and reflecting the same inward toward or against said hot water tank, a second shell spaced from but surrounding the first noted shell, and heat insulating material between the two enclosing shells.

3. A hot water heater comprising a hot water tank, connections for circulating water through said tank, means for heating the water in said tank, a shell spaced from but enclosing said hot water tank and provided with a polished heat-reflecting surface for intercepting the heat waves and reflecting the same inward toward or against said hot water tank, and heat insulating means in the space between said tank and enclosing shell for preventing circulation of air from bottom to top of the intervening space.

4. In a hot water heater, a hot water tank, a block of insulating material secured to the bottom of said tank, a shell enclosing and surrounding but spaced from said hot water tank and at its lower end secured to said insulating block and thereby spaced from the bottom of said tank, connections for cir-

culating water through said tank, means for applying heat to the water in said tank, and a second or outer shell spaced from but enclosing said first noted enclosing shell and provided at its lower end with a flange secured to said insulating block and by said block spaced from the bottoms of said tank and first noted enclosing shell.

5. In a hot water heater, a hot water tank, a block of insulating material secured to the bottom of said tank, a shell enclosing and surrounding but spaced from said hot water tank and at its lower end secured to said insulating block and thereby spaced from the bottom of said tank, connections for circulating water through said tank, means for applying heat to the water in said tank, a second or outer shell spaced from but enclosing said first noted enclosing shell and provided at its lower end with a flange secured to said insulating block and by said block spaced from the bottoms of said tank and first noted enclosing shell, and a standard on the upper portion of which said insulating block is secured.

6. A hot water heater comprising a hot water tank, connections for circulating water through said tank, an enclosing shell spaced from but surrounding said tank, said shell having an interior polished reflecting surface, and an electrical heating element extended into said tank through the walls of said shell and tank.

7. A hot water heater comprising a hot water tank, connections for circulating water through said tank, a primary enclosing shell spaced from and enclosing said tank, a secondary or outer shell spaced from but enclosing said primary shell, heat insulating means supporting but separating said tank and primary and secondary shells, and an electrical heating element passed into said tank through the wall thereof and through the walls of said two enclosing shells.

8. A hot water heater comprising a hot water tank, connections for circulating water through said tank, a primary enclosing shell spaced from and enclosing said tank, a secondary or outer shell spaced from but enclosing said primary shell, heat insulating means supporting but separating said tank and primary and secondary shells, an electrical heating element passed into said tank through the wall thereof and through the walls of said two enclosing shells, and a sleeve of insulating material extended through said enclosing shells, surrounding said heating element, said tank having an exterior flange that has telescope engagement with said sleeve and threaded engagement with said heating element, said sleeve being slidable out of engagement with said flange when said heating element is removed.

9. A hot water heater comprising a hot water tank, a primary enclosing shell enclos-

- ing said tank but spaced therefrom, a secondary shell enclosing said primary shell but spaced therefrom, a sleeve of insulating material inserted through said enclosing shells, said tank having an external flange with which the inner end of said sleeve is normally telescopically engaged and the said sleeve having an outward sliding movement for disengagement with said flange, to permit removal of said tank from said primary shell, the latter having a removable head permitting the removal of said tank therefrom.
10. A hot water heater comprising a standard with an upper end flange, a block of insulating material placed on the flanged upper end of said standard, a hot water tank seated on said insulating block and having nut-equipped bolts passed through said insulating block and flanged upper end of said standard, nut-equipped bolts independently securing said insulating block to the flanged upper end of said standard, spaced inner and outer enclosing shells enclosing said tank and secured to said insulating block out of contact, the one with the other, a water supply connection extended through the said insulating block and delivering through the bottom of said tank, a hot water delivery pipe extended from said tank outward through the upper portions of said enclosing shells, and an electrical heating element extended through said shells and the wall of said tank to the interior of the latter.
11. A hot water heater comprising a hot water tank, insulating means enclosing said tank, means for circulating water through said tank, including a supply pipe delivering through the bottom of said tank, said tank having a distributing plate extended over its bottom and formed with circumferentially spaced water delivery passages, and means for heating the water in said tank.
12. A hot water heater comprising a hot water tank, insulating means enclosing said tank, means for circulating water through said tank, including a supply pipe delivering through the bottom of said tank, said tank having a distributing plate extended over its bottom and formed with circumferentially spaced water delivery passages, and an electrical heating element extended through the wall of said tank and its heat insulating means and immediately overlying said perforated distributing plate.
13. A hot water heater comprising a hot water tank, a casing entirely enclosing said tank and insulated therefrom, said casing comprising inner and outer metallic shells and interposed insulating material, the inner shell of said casing being separated from said tank by an intervening air space, said casing further comprising a block of insulating material to which said tank and the metallic shells of said casing are secured.
14. A hot water heater comprising a hot water tank, a casing entirely enclosing said tank and insulated therefrom, said casing comprising inner and outer metallic shells and interposed insulating material, the inner shell of said casing being separated from said tank by an intervening air space, said casing further comprising a block of insulating material to which said tank and the metallic shells of said casing are secured, a water supply pipe leading to said tank through said insulating block, a hot water outlet pipe leading from the upper portion of said tank outward through said casing, said casing having an insulating sleeve surrounding said outlet pipe.
- In testimony whereof we affix our signatures.
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