A heat pipe using water as the heat transfer fluid transports heat to the water within a water heater storage tank from a gas fired burner external to and separate from the tank. The heat pipe is attached to the water heater by means of an adapter which permits the removal of the heat pipe from the water heater for repair and cleaning. The tank may be constructed of a plastic material which resists corrosion. The burner is a forced combustion type which permits efficient combustion of the natural gas and which reduces the loss of heat from the burner area.

15 Claims, 7 Drawing Figures
HEAT PIPE WATER HEATER

BACKGROUND OF THE INVENTION

Most conventional commercial and residential gas fired storage water heaters consist of a steel tank heated by an atmospheric burner system that utilizes a large flue extending up through the center of the water tank to exhaust the combustion products and to heat the water within the tank. Typically, baffles in the flue add turbulence and aid in the transfer of heat from the central flue to the interior of the tank. To protect the tank against corrosion, the tank, when made of steel, is lined with a glass coating on the inside. Additional protection against electrolytic action is provided by a sacrificial magnesium anode. The storage water heaters have many limitations. Since the glass never quite covers the entire steel surface within the tank and since glass is somewhat water soluble, the tank soon begins to corrode. The magnesium anode helps to reduce this corrosion, but the anode lasts only a certain length of time, and thus the lifetime of the tank is limited and depends upon the lifetime of the magnesium anode and upon the thickness of the glass lining. Chemical reaction of the magnesium anode in some types of water may cause taste and odor problems in the water.

In some water, deposits form on the tank bottom. If deposits form, there may be rumbling noises emitted from the tank as heat from the burner causes water trapped between these deposits and the tank wall to boil and escape in a noisy manner from its confinement. The relatively small temperature gradient associated with heat pipe heat transfer essentially eliminates the possibility of such rumbling. Further, a plastic or plastic lined tank has a high resistance to deposit formation.

Conventional storage water heaters are also highly inefficient. Although the center flue is necessary to transfer heat from the burner to the water within the tank, large amounts of heat are lost through the top of the flue. In addition, when the burner is not operating, large amounts of heat are transferred from the hot water within the tank to the now somewhat cooler air within the flue and this heat is also lost through the top of the flue. The atmospheric burner system, requiring relatively large combustion volume, also permits sizable heat losses through the sides and bottom of the water tank support assembly. As a result the outer surfaces of the storage water tank tend to have rather high temperatures.

SUMMARY OF THE INVENTION

This invention pertains to residential and commercial hot water heaters generally and to gas fired hot water heaters with plastic tanks specifically. An object of this invention is to utilize the heat pipe principle to provide a water heater wherein heat may be transported to the water within a hot water storage tank from a gas or other fossil fuel fired burner system external to the tank so that the walls of the hot water storage tank are not subjected to the direct application of heat from the burner system.

Another object of this invention is to provide a storage water heater with a gas burner and a plastic lined or structural plastic hot water storage tank. Another object of this invention is to provide a storage water heater having a forced combustion burner as the heat source.

The corrosion, taste, and odor problems inherent in conventional steel water tanks may be overcome by the use of certain water resistant plastics in the construction of the water tank. The problems of heat loss from the combustion chamber in an atmospheric burner may be overcome by the use of forced combustion system. However, a plastic tank cannot be used with conventional gas fired burners, whether they are forced combustion or atmospheric burners, since most plastics lose their rigidity at relatively low temperatures and can't take a direct flame. This invention permits utilization of a plastic water tank and a forced combustion system with elimination of the central flue. The problems of heat losses through the central flue and from the combustion chamber, corrosion of the tank, and bad taste and odor of the water are thus eliminated.

The preferred embodiment of this invention comprises a plastic hot water tank, a heat pipe, a forced combustion gas fired burner exterior to the tank and an adapter which permits the heat pipe to be secured to the hot water tank. The tank may be either a plastic lined steel one or it may be a structural plastic tank which may or may not be reinforced by a fiber material. The heat pipe may be, in two preferred embodiments, either a length of copper finned tubing sealed at the ends or a sealed annular space between two concentric tubes. A good heat transfer fluid is water. In the preferred embodiments, the adapter may be a screw threaded disc to which the heat pipe is attached, and the entire assembly may fit securely into the wall of the tank.

In operation, the evaporator is heated by the forced combustion gas fired burner outside the tank. Working fluid in the evaporator is vaporized. At the condenser end, this vapor condenses to reform a liquid again and the liquid returns to the evaporator by flowing along the tube under force of gravity or otherwise. Thus, the condenser is heated by the release of the heat of vaporization of working fluid and the condenser in turn heats the water in the tank. There is little or no heat loss except at the condenser and the resulting heat transfer is highly efficient while the vapor flow from the evaporator to the condenser is nearly adiabatic. Also, there is no undesirable heat heating of the tank wall which might cause the plastic to melt or cause the formation of scale; the heat is all transported from an external heat source to the water in a uniform manner promoting rapid heating of the water without damage to the tank.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cut-away perspective view of a preferred embodiment of this invention;
FIG. 1A is a cross-sectional view of FIG. 1 taken along the line 1A—1A;
FIG. 2 is a cut-away perspective view of an alternate embodiment of the invention;
FIG. 3 is a cross-sectional view of another embodiment of the invention;
FIG. 4 is a cross-sectional view of an alternate embodiment of a tank for use with this invention;
FIG. 5 is a cross-sectional view of an alternate embodiment of the heat pipe; and
FIG. 6 shows a further heat pipe configuration.

DESCRIPTION OF THE DRAWINGS

Referring to FIGS. 1, 1A, 2 and 3, the hot water
heater 10 includes a support stand 16, a tank 18 for holding an inlet pipe 14 for bringing tap water into the bottom of the tank, an outlet pipe 12 for extracting hot water from the top of the tank, a drain pipe 24 for draining the tank when it is not in use, heat pipes 20, 70, 120, shown in FIGS. 1, 2 and 3, and a forced combustion burner means 30.

The tank 18 is of a structural plastic construction. One suitable tank wall is composed of thermostoy polyester resin reinforced by a fiberglass filament wound matrix. The number of layers of fiber used depends on the tank specifications and for a hot water tank capable of withstanding 300 psi at 180°F the number should be not less than 2. Layers 82 may be wound in opposite directions and typically only two basic directions are used. This layered winding, as shown in FIG. 2A, gives the tank greater structural strength. Plastic foam insulation 80 covers the exterior of the tank while 82A, 82B, 82C, and 82D are the four layers of glass filament windings, every other layer 82 being wound in the same direction. There are, however, many other possible tank constructions within the scope of this invention. A plastic hot water tank may be of two basic types, either a structural steel tank with a plastic liner or a structural plastic tank with or without a reinforcing material. These tanks may be composed of many materials besides polymers. Thermoplastics such as acetal, fluoroplastics, polyethylene, and polyvinyl chlorides may be used. Thermoset plastics such as alkyds and acrylcs can also be used. If structural plastic tanks are reinforced, fibers are preferred. Glass fibers, silicon carbide fibers, various metal fibers, oxide fibers and wire sheet may be used.

In a steel tank with a plastic liner, as shown in FIG. 4, the liner 150 is separated from the steel 152 by a layer of foam insulation 154 which serves to insulate against heat loss as well as to cushion the plastic liner 150. In this tank, the steel 152 carries the entire load so that the plastic liner 150 need not be thick or have structural strength. The preferred material to be used for the liner is polypropylene, but many other plastic materials may be used. Some examples are thermoplastics such as chlorinated polyether, various fluoroplastics, phenylene oxide, and polysulphones or thermoset plastics such as alkyds and acrylcs.

Three embodiments of the heat pipe apparatus are shown by FIGS. 1, 2, and 3. Each embodiment comprises the following similar elements: a forced combustion burner means 30 comprising a gas inlet valve 28, an air inlet 34, a gas-air mixer chamber 36, a combustion blower 38, a thermocouple and pilot 40, a combustion manifold 42, a burner 44, and an exhaust vent 46 and insulation 48 surrounding the heat pipes 20, 70 and 120. Heat pipes 20, 70 and 120 appear respectively in FIGS. 1, 2 and 3. In addition, embodiments of FIGS. 1, 2 and 3 each include, respectively, an adapter means 50, 62 and 104 for mounting the heat pipes 20, 70 and 120 to the tank 18.

Referring to FIG. 1, the heat pipe 20 comprises a single length of cuffed airtight finned tubing. Extruded copper finned tubing with ⅛ inch inside diameter and a ⅛ inch fin diameter is suitable, but any tubing that resists heat and water corrosion could be used. The lower end 56 of the heat pipe 20 is substantially horizontal and is positioned over the burner 44; this is the evaporator 56. The burner 44 and the evaporator 56 are surrounded by an insulating material 48 to inhibit loss of heat to areas exterior of the hot water tank. The end 56 of the pipe extends horizontally for a distance and turns upward to enter the tank 18 above. The section 58 of the pipe from the point where it first starts to bend to where it enters the tank may be stripped of its fins since this together with the section of pipe which passes through the tank wall forms an adiabatic transitional zone. Zone 58 functions as a substantially adiabatic conduit for the hot gases upward from the evaporator 56 to the condenser 54 and as a conduit downward for the cool liquid from the condenser 54 to the evaporator 56. The transitional zone 58 is surrounded by an insulating material 52 to enhance adiabatic flow of vapor.

The heat pipe 20 enters the tank 18 through the bottom wall 32 and extends vertically for a short distance into the water in the tank 18. This section 54 of the heat pipe within the tank 18 is the condenser. The pipe needs not pass through the bottom wall 32 of the tank nor need it extend vertically into the tank 18, but it must enter the tank 18 somewhere below the water line 10 and it contacts the walls of the tank 18 at the transitional zone 58. The heat pipe 20 can be molded into the tank's bottom wall 32 (See FIG. 5) or as in the preferred embodiment, an insulating adapter 50. The adapter 50 should consist of the same material as that of the tank's bottom wall 32 or of some other material that has an equivalent coefficient of thermal expansion.

The adapter 50 comprises two flat rings, an inner ring 52 and an outer ring 53, of about the same thickness as the bottom wall 32 of the tank 18. The heat pipe 20 passes through a hole in the center of the inner ring 52 and the heat pipe 20 is bonded to the inner ring at a point on the transitional zone 58. The fins appear on the heat pipe 20 at this point, and these fins strengthen the bond but do not conduct a significant amount of heat away from the heat pipe 20. This bond is water tight. The outer rim of this inner ring 52 is screw threaded. The outer ring 53 has a hole in its center equal in diameter to the outer diameter of the inner ring 52 and it has an outer diameter equal to the diameter of a hole in the bottom wall 32 of the tank 18. The outer ring 53 consists of three symmetrically spaced holes through which the inlet pipe 14, the outlet pipe 12 and the drain pipe 24 respectively pass. Each pipe 12, 14 and 24 is bonded to the outer ring 53 in a water tight seal. The outer rim of the outer ring 53 and the outer ring 53 and the rim of the hole in the center of the outer ring 53 are both screw threaded, as is the inner rim of the hole in the bottom wall 32 of the tank 18. The inner ring 52 screws into the outer ring 53, and the outer ring 53 screws into the hole in the bottom wall of the tank in a water tight manner.

In another embodiment as shown in FIG. 2, the adapter 62 consists of one flat ring of the thickness of the bottom wall 32 of the tank 18, and this adapter 62 also is composed of a material with the same coefficient of thermal expansion as that of the bottom wall 32 of the tank. This single ring 62 has the heat pipe 20 bonded to a hole at its center as described in the preferred embodiment, and the holes for the inlet pipe 14, the outlet pipe 12 and the drain pipe 24 are all symmetrically arranged about the heat pipe 20. This adapter 62 also screws into a hole in the bottom wall 32 of the tank 18.
The double ring adapter 50, described in connection with FIG. 1, provides an advantage over the single ring adapter 62 since the heat pipe 20 can be removed without disturbing the inlet pipe 14, the outlet pipe 12 and the drain pipe 24. However, either adapter permits the removal of the heat pipe element to clean deposits from the heat pipe condenser and from the bottom of the tank 18 so as to increase the lifetime of the heat pipe element. Any convenient assembly, such as bolts, can be employed to attach the heat pipe adapter to a wall of the tank 18 so long as the seal is water tight.

The embodiment of FIG. 2 is most suitable for larger water tanks where a greater heat transport is necessary. The heat pipe 70 comprises a single length of copper finned tubing having a U-shaped bend near its middle producing two arms. The U-shaped section and horizontal sections 66 of the arms are positioned over the exterior gas fired burner 44, and serve as two evaporators 66. The evaporators 66 and the burner 44 are surrounded by an insulating material 48. Both arms of the heat pipe 70 contain a right angle bend at a point 67 beyond the burner 44. The sections of the arms beyond the point 67 extend vertically upwards through the bottom wall 32 of the tank 18 and form two adiabatic transitional zones 68 and two condensers 64. The heat pipe is constructed of copper, but other materials such as aluminum, steel and plastic may also be used. It is desirable that tubing be finned, since greater quantities of heat can be transported by a heat pipe constructed of finned tubing than can be transported by one constructed of non-finned tubing, but such a feature is not essential to the invention.

In FIGS. 1 and 2 of the invention gravity works to return condensed heat transfer fluid to the evaporator. If, however, a condenser is on level with or below an evaporator, wicking may be needed to maintain the flow of fluid from the condenser to the evaporator. Also, if the burner were to completely surround the evaporator instead of just being below it, wicking would be needed to maintain a supply of fluid on all sides of the evaporator. FIG. 5 shows wicking 130, such as a fine mesh wire screen lining the interior walls 132 of an evaporator.

FIG. 6 shows a further embodiment of a heat pipe. The evaporator 125 and adiabatic zone 127 are similar to the evaporator 56 and adiabatic zone 58 shown in FIG. 1. The condenser 129 comprises a plurality of hollow plates 131 to form a highly effective unit for transferring heat to the surrounding water.

FIG. 3 shows a third embodiment of the invention wherein the heat pipe 120 comprises an annulus with the heat transfer fluid being confined within the space 96 between two concentric tubes, an inner one 100 and an outer one 78. The lower section of the heat pipe 120 located completely external to the tank 18 is the evaporator 112 and the upper section wholly contained within the tank 18 is the condenser 114. The walls of the tubes 78 and 100 within the annular space 96 defining the evaporator 112 extending from a point opposite the outside edge of the tank’s bottom wall 32 to the end of the evaporator 112 with a wicking material 116 to aid in the return of fluid to the evaporator 112 and to maintain an equal distribution of the heat transfer fluid throughout the evaporator 112. The preferred wicking material 116 is a fine mesh wire screen.

The boundary separating the condenser 114 from the evaporator 112 lies substantially along and parallel to the tank’s bottom wall 32. Within the inner tube 100 the boundary separating the condenser 114 from the evaporator 112 comprises a metal plate 102 secured to the inner wall of the inner tube 100. Above this plate 102 is a cavity 120 defined by the inner wall of the inner tube 100 and since the upper end of this cavity 120 is open, the cavity 120 contains water from within the tank 18. A second similar cavity 122 defined by the inner wall of the inner tube 100 lies below this metal plate 102. Within this second cavity 122 is the burner 44 into which a blower 38 feeds a gas and air mixture from a mixer 36. Other than this mixture, the only permitted flow of gases to or from the second cavity 122 is through passages 94 through the heat pipe 120. These passages 94 are located at evenly spaced intervals around the evaporator 112 below the metal plate 102 and above a baffle cylinder 90 configured as the frustum of a cone.

The exterior chamber 92 is an annular space defined by the outer tube 78, a third tube 124 concentric with and surrounding the outer tube 78, the tank’s bottom wall 32, and a plate 126 below and substantially parallel to the bottom wall 32 of the tank 18. This exterior chamber 92 is completely sealed except for the passages 94 into the second cavity 122 and an exhaust vent 46. Within the exterior chamber 92 is the baffle 90. The baffle has a plurality of equally spaced substantially circular openings. It is fixedly attached along its upper rim to the outer wall of the outer tube 78 at a point just below the edge of the passages 94 and along its lower rim to the wall of the third tube 124. The exhaust vent 46 is a pipe that passes from a hole in the exterior chamber 92 to the outside.

The heat pipe 120 is mounted to the bottom wall 32 of the tank 18 by means of an adapter 104 similar to the one used in the embodiment of FIG. 1. The heat pipe 120 passes through the hole in the center of the adapter 104 and is securely attached to the adapter 104 so that the metal plate 102 is substantially parallel to and on a line with the adapter 104.

The inlet pipe 14 extends down from a hole in the top of the tank 18 to just below the top of the heat pipe 120 and the drain pipe 24 pierces a side wall of the tank 18 and drains out the side of the tank 18. The outlet pipe, the inlet pipe 14 and the drain pipe 24 may all pass through holes in the adapter 104.

The preferred heat transfer fluid is water. However, other fluids such as Dowtherm, obtainable from the Dow Chemical Company, Midland, Michigan 48640, silicone oils or freons may be employed as alternatives. The heat pipe is substantially evacuated except for the heat transfer fluid, and the heat transfer fluid may be introduced into the heat pipe by vacuum distillation. The heat pipe is then sealed. Small amounts of a gas such as argon may be introduced into the heat pipe along with the heat transfer fluid to aid in the regulation of the vapor pressure within the heat pipe.

The burner means 30 is forced combustion system. Air is drawn into the burner means 30 from the atmosphere at the air inlet 34 and natural gas is fed into the system from an external source at the gas inlet 28. The air and gas are fed into the mixer 36 where they are completely mixed in the proper proportion to give the most complete and efficient combustion of the gas which, in the case of natural gas, is about 1 part gas per 10 parts air. The blower 38 then forces the mixture into the combustion manifold 42 which channels the mixture into the burner 44 where combustion takes place.
Because the mixture of air and gas is complete, the burner flame is very low and is quite hot. The combustion products then are forced out of the burner and through the exhaust vent, since the blower maintains a constant flow throughout the system. This exhaust vent needs only be a small pipe through which the combustion products may be carried to any external point. No large stack or chimney is required, since the combustion products are contained and pressure-vented.

When the apparatus illustrated in FIGS. 1 and 2 is in operation, cold water flows into the tank through the inlet pipe to the bottom of the tank only as water is extracted from the tank at the top by the outlet pipe. The whole operation is driven by the pressure of the local water system. The water in the tank is heated by the heat pipe, 20 or 70 of FIGS. 1 or 2, respectively. As some water becomes warmer and less dense, it rises. The warmest water is removed from the top of the tank as needed by the outlet pipe.

The heat pipe, 20 or 70, in turn, transports heat from the burner through the bottom wall of the tank to the water within. The flame from the burner directly heats the evaporator or the heat pipe, 20 or 70, respectively. Working fluid present in the evaporator absorbs the heat from the flame, and vaporizes. The vapor rapidly fills the entire space within the heat pipe. In the transition zone or of the heat pipe, 20 or 70, respectively, this vapor atmosphere stays at a constant temperature, such temperature being a function of the vapor pressure within the heat pipe and the evaporator. Simultaneous with these events, the condenser or of the heat pipe, 20 or 70, respectively, is being cooled by the tank water surrounding it. Thus, the vapor condenses to form a fluid again in the condenser and the heat of vaporization is released to the condenser wall and in turn to the water in the tank. This working fluid then returns to the evaporator by flowing down the walls of the condenser and the transition zone under the force of gravity. Wicking can be used to aid in the process of returning and distributing the working fluid in and to the evaporator.

If the heat pipe is insulated, especially in the transition zone, substantially no heat is gained or lost from the heat pipe except at the evaporator and condenser respectively. Thus, the vapor flow from the condenser or of the heat pipe, 20 or 70, respectively, is nearly adiabatic, a condition necessary to the proper and efficient operation of the heat pipe. In practice, some heat may be lost at the tank’s bottom wall, but such losses are minor. The tank is plastic or a plastic adapter is used since the plastic is a poor conductor of heat and it serves as an insulator. If a metal tank is used, insulating material between the adapter and heat pipe may be used.

The fins on the heat pipes serve to increase the heat transfer surface of the condensers and evaporators and the evaporators and fins, respectively, thereby permitting greater heat transfer. However, in the transition zone of the fins, only the fins help secure the heat pipe and to the adapter 20 and 70. The principle of operation of the third embodiment of the heat pipe as shown in FIG. 3 is identical to that of the first two embodiments. Heat transfer fluid is vaporized in the evaporator by the heat from the burner and the vapor is condensed in the condenser where the heat of vaporization is released to the water within the tank. However, in the third embodiment, the entire process transpires within an annular space instead of within a tubular space. Thus, heat is absorbed onto and released from two surfaces instead of one. The water in the tank is in contact with both the inner surface of the condenser. Thus, heat is released from two tubular surfaces to the water in the tank. In the evaporator, the flame from the burner heats the inner wall of the outer pipe directly thus imparting heat to the fluid from that wall. Combustion products from the burner under pressure from the blower flow from the second cavity through the passages and into the exterior chamber. The combustion products are then forced through openings in the baffle to form a plurality of jets that impinge upon the outer wall of the outer tube of the evaporator, thus achieving an increased convective transfer of heat. The combustion products then pass out of the exterior chamber through the exhaust vent. Thus, the evaporator is heated along both annular walls. Since the evaporator is heated along vertical walls, wicking may be used to maintain a uniform layer of working fluid along the walls.

Since the evaporator and the condenser are not direct one another in the annular heat pipe, a transitional zone as described in the first two embodiments is present only at the point where the heat pipe passes through the bottom wall of the tank. In this very narrow section of the heat pipe, the gaseous flow is also nearly adiabatic. Little or no heat is lost to the bottom wall of the tank since the bottom wall or the adapter are composed of a low heat conducting material.

This invention has many desirable attributes. Since a structural plastic tank or is used, corrosion is virtually eliminated. Thus, the tank is increased, the water has no corrosion-caused taste or odor and deposits on the bottom wall of the tank is reduced. The use of a heat pipe to transport heat to the water within the tank permits the elimination of the central pipe and its large chimney and this results in a much smaller heat loss during periods of inoperation; thus the efficiency of the system is greatly increased. The use of an adapter allows the heat pipe to be easily removed from the tank. Thus, the heat pipe and the bottom wall of the tank may be cleaned of deposits so that the life of the system is lengthened.

Finally, the use of a forced combustion burner means allows containment of the combustion products. Therefore, heat losses from the burner means are reduced and the exterior surface temperatures of the tank and burner means are also correspondingly reduced. The forced combustion burner means also permits the use of a small exhaust vent rather than a large chimney.

While I have described my invention with respect to the details of various specific embodiments thereof, many changes and variations which may be made without departing from the scope of my invention will be apparent to those skilled in the art.

I claim:

1. A storage water heater comprising tank means for containing water, wherein the tank means comprises a plastic material; inlet means for bringing water into the tank means; outlet means for extracting water from the...
tank means; fossil fuel fired burner means external to the tank means for producing heat; and heat pipe means for transporting heat from the burner means to the interior of the tank means; the heat pipe means comprising a heat transfer fluid, an evaporator exterior to the tank means heated by the burner means for evaporating the heat transfer fluid, a condenser located within the tank means and immersed in the water for condensing the heat transfer fluid, and transitional means between the evaporator and the condenser for transportation of hot heat transfer vapor from the evaporator through a wall of the tank means to the condenser.

2. A storage water heater as defined in claim 1 wherein the heat pipe means comprises a single metal tube.

3. A storage water heater as defined in claim 2 wherein the heat pipe means comprises one condenser section and one evaporator section.

4. A storage water heater as defined in claim 2 wherein the heat pipe means comprises greater than one condenser section.

5. A storage water heater as defined in claim 2 wherein the heat pipe means comprises greater than one evaporator section.

6. A storage water heater as defined in claim 2 wherein the heat pipe means comprises a metal tube with spaced metal fins mounted externally thereon.

7. A storage water heater comprising tank means for containing water; inlet means for bringing water into the tank means; outlet means for extracting water from the tank means; fossil fuel fired burner means external to the tank means for producing heat; and heat pipe means for transporting heat from the burner means to the interior of the tank means; the heat pipe means comprising a heat transfer fluid, an evaporator exterior to the tank means heated by the burner means for evaporating the heat transfer fluid, a condenser located within the tank means and immersed in the water for condensing the heat transfer fluid, and transitional means between the evaporator and the condenser for transportation of hot heat transfer vapor from the evaporator through a wall of the tank means to the condenser; wherein the heat pipe means comprises plastic material surrounding the transitional means of the heat pipe means; said adapter means being fixedly attached to the heat pipe means at the transitional means, coupling the heat pipe means to a wall of the tank means at a locus below a predetermined minimum water level in the tank means, and providing a fluid tight seal between the tank means and the heat pipe means.

8. A storage water heater comprising tank means for containing water; inlet means for bringing water into the tank means; outlet means for extracting water from the tank means; fossil fuel fired burner means external to the tank means for producing heat; and heat pipe means for transporting heat from the burner means to the interior of the tank means; the heat pipe means comprising a heat transfer fluid, an evaporator exterior to the tank means heated by the burner means for evaporating the heat transfer fluid, a condenser located within the tank means and immersed in the water for condensing the heat transfer fluid, and transitional means between the evaporator and the condenser for transportation of hot heat transfer vapor from the evaporator through a wall of the tank means to the condenser wherein the tank means comprises plastic material surrounding the transitional means of the heat pipe means.

9. A storage water heater comprising tank means for containing water; inlet means for bringing water into the tank means; outlet means for extracting water from the tank means; fossil fuel fired burner means external to the tank means for producing heat; heat pipe means for transporting heat from the burner means to the interior of the tank means; the heat pipe means comprising a heat transfer fluid, an evaporator exterior to the tank means heated by the burner means for evaporating the heat transfer fluid, a condenser located within the tank means and immersed in the water for condensing the heat transfer fluid, and transitional means between the evaporator and the condenser for transportation of hot heat transfer vapor from the evaporator through a wall of the tank means to the condenser.

10. A storage water heater comprising tank means for containing water; inlet means for bringing water into the tank means; outlet means for extracting water from the tank means; fossil fuel fired burner means external to the tank means for producing heat; and heat pipe means for transporting heat from the burner means to the interior of the tank means; the heat pipe means comprising a heat transfer fluid, an evaporator exterior to the tank means heated by the burner means for evaporating the heat transfer fluid, a condenser located within the tank means and immersed in the water for condensing the heat transfer fluid, and transitional means between the evaporator and the condenser for transportation of hot heat transfer vapor from the evaporator through a wall of the tank means to the condenser; wherein the tank means comprises plastic material surrounding the transitional means of the heat pipe means.

11. A storage water heater as defined in claim 10 wherein the tank means comprises a plastic material.

12. A storage water heater as defined in claim 11 wherein heat transfer fluid in the heat pipe means is water.

13. A storage water heater as defined in claim 1 wherein the heat transfer fluid in the heat pipe means is water.

14. A storage water heater as defined in claim 1 wherein the burner means comprises a forced combustion means comprising a mixer for forming a homogeneous fuel and air mixture, a burner for combusting the homogeneous mixture, a blower means for directing the homogeneous mixture to the burner under pressure, an insulation means for confining the combustion products, and an exhaust vent for exhausting the combustion products.

15. A storage water heater as defined in claim 1 wherein the evaporator comprises a single metal tube and the condenser comprises a plurality of hollow plates, further comprising a central hollow pipe connecting the condenser and the evaporator, the hollow plates being adapted for immersion in water contained by the tank means to deliver to the water the heat of condensation released by condensing vapor in the condenser.