

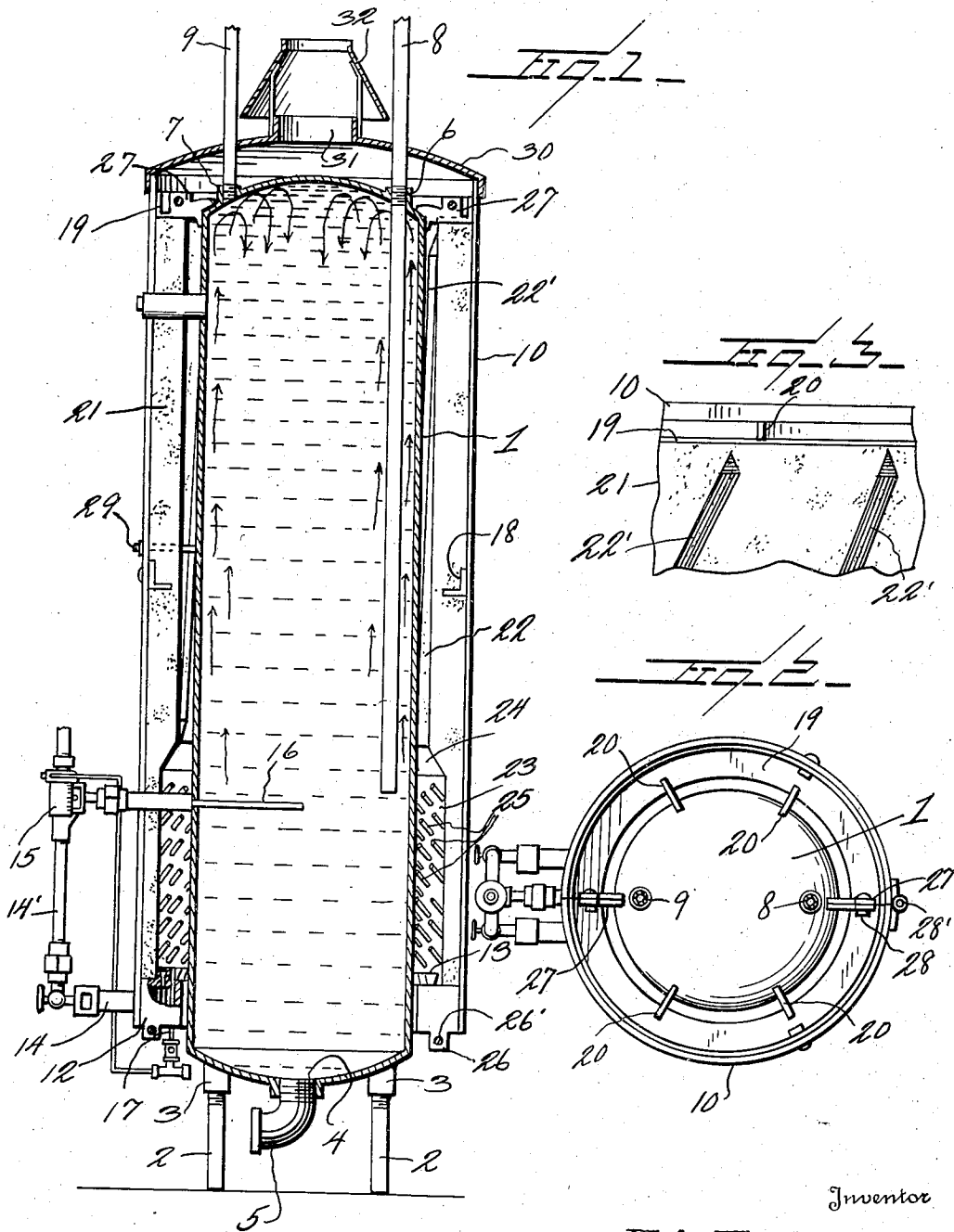
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WATER HEATER

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WATER HEATER

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3 Claims. (Cl. 122-19)

This invention relates to improvements in heat transfer means such as may be applied to water heaters, steam boilers, stills or the like, and such means is here particularly illustrated as applied to water heaters of the domestic and industrial type, but the principle used may be applied for the generation of steam.

A principal object of the present invention is to provide an improved heat transfer means here shown as a water heater structure employing a boiler and a refractory material jacket therefor, wherein a novel means is made use of for directing the heat of a fuel burner against the lower part of the boiler and completely around the same and for maintaining the heated products of combustion in close contact with the wall of the boiler throughout the length of the same whereby the maximum heating action will be obtained from the heating fuel employed, without subjecting the boiler itself to the direct contact of the burner flame.

Another object of the invention is to provide in a water heating structure of the character above set forth, novel means for heating the boiler contents in such manner that the rapid establishment of convection currents is brought about along the inner surface of the wall of the boiler and completely around such inner surface so that the water is turned over or changed from the central part of the tank to the outside from a cold start, from three to five times before the desired temperature is reached as a result of which all of the water reaches the desired temperature from the top to the bottom of the tank at practically the same time.

Still another object of the invention is to provide in a water heater of the character stated, a novel means for applying heat to a water boiler above the bottom of the same and in an encircling belt in such manner that the maximum effect of the heat developed is obtained for raising the temperature of the contents of the boiler without applying a heating flame directly thereto and also in such manner that the formation and deposit of sediment in the bottom of the boiler cannot in any manner interfere with the heating of the contents by acting as an insulator.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming part of this specification, with the understanding, however, that

the invention is not to be confined to any strict conformity with the showing of the drawing but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawing:

Fig. 1 is a view in vertical section through a water heater constructed to illustrate the application of the heat transfer means constituting the present invention.

Fig. 2 is a view in top plan of the structure with the head or top wall of the outside jacket removed.

Fig. 3 is a fragmentary view of the inner side of the upper end of the refractory liner showing the heat deflector or baffle ribs.

Referring now more particularly to the drawing, the numeral 1 designates a vertically disposed water boiler which is supported upon the legs 2 threadably attached to the bottom of the boiler by the couplings 3 whereby, through turning of the legs, the boiler may be brought to a perfectly vertical or level position. The lower part of the boiler is provided with a central cleanout or drain opening 4 having a coupling 5 connected therewith to which may be attached a suitable carry-off pipe. At the top of the boiler bossed threaded outlets 6 and 7 are provided for coupling inflow and draw-off pipes 8 and 9, respectively, with the same, the inflow pipe being carried into the lower portion of the tank or boiler, as shown.

In accordance with the present invention, there is provided a cylindrical outer sheet metal jacket 10 which extends longitudinally of and encircles the major portion of the tank 1, the upper end of this jacket extending above the upper end of the tank whereas the lower end terminates above the lower end of the tank. Within the lower end of this jacket there is secured to the jacket the annular gas manifold 11 which encircles the tank 1 above the bottom thereof, as shown. Fig. 1 shows one half of this manifold, the same being in the present illustration in two parts and each of the parts has formed integrally with the top surface upwardly directed burner nozzles 13 and with each part there is connected a pipe section 14 which is joined by standard connections with a supply line 14'. The passage of gas through this supply line is controlled by a standard type of thermostatically operated valve unit 15 with which is connected the usual thermostat 16 which extends through the wall of the tank toward the longitudinal center thereof. A

pilot 17 supplies the burners with the necessary ignition or lighting flame, in the usual manner, whereby the burners will be ignited when the thermostat opens to permit gas to flow to the manifold.

The interior of the sheet metal jacket 10 is reinforced by a two-part annulus 18 which is disposed at substantially the transverse center of the jacket and at the upper end of the jacket is a two-part reinforcing annulus 19 which has formed integrally with each of the parts the inwardly directed supporting lugs or fingers 20 which, as shown in Fig. 1, engage the top of the tank and coact to support the jacket in spaced relation therewith.

Overlying the inner surface of the jacket 10 above the burner manifold is a relatively thick liner of refractory material which is indicated generally by the numeral 21 and which is divided into two portions or sections, each of which sections is carried by a section of the jacket. The inner surface of this liner lies in relatively close proximity to the wall of the tank from the upper end of the tank downwardly through the major portion of the length of the same to provide a relatively narrow annular gas escape passage 22, and the inner surface of the liner has formed integrally therewith the upwardly and circumferentially directed deflector ribs 22'. Through a portion of its length from the lower end, the refractory liner 21 is recessed to form the relatively wide combustion area or chamber 23, at the upper end of which the refractory material is formed to provide the upwardly and inwardly inclined heat deflecting shoulder 24. The burners lie within and are directed upwardly in this combustion area and the deflector ribs terminate at the upper part of the shoulder 24.

The wall surface of the combustion area or chamber 23 has fixed therein throughout the height of the chamber, upwardly and inwardly extending heat radiants or pins 25, formed of refractory material, the free ends of these radiants coming in close proximity to the wall of the tank. These pins or radiants serve to direct heat inwardly toward the wall of the tank, by which arrangement the wall of the tank will receive the maximum effect of the heat developed by the burning gas issuing from the burners and the wall of the tank will not be subjected to direct contact with the flame. In addition, since the flame does not contact the wall of the tank, the combustion temperature of the gas will not be lowered and, therefore, the formation of carbon will be reduced to a minimum or completely eliminated as a result of the complete burning of the gas.

The jacket 10 and the refractory liner therefore have been illustrated as being formed in two sections, but it will be readily obvious that the jacket and liner may be formed in more than two sections if desired, or that the principles of the present invention as embodied in the construction and disposition of the combustion chamber, the heat radiants, flue passage and deflector ribs, with the disposition of the burner ring around the tank within the metal jacket, may be embodied in a single or one-piece jacket within which the tank may be positioned. In the present two-part construction illustrated, the two portions of the manifold 12 will be secured each in the lower portion of a metal jacket so that the ends of the ring sections will be brought into abutting relation when the jacket portions are assembled on the tank, and these

abutting ends of the gas manifold sections will be provided with suitable coupling means such as the depending ears 26 which may be joined together and secured by bolts 26', and also the adjacent ends of the two-part ring 19 will be provided with ears 27 which are secured together by bolts 28. By this means, the assembling of the two sections, or three sections as the case may be, of the tank enveloping structure is facilitated and if desired, the two sections of this structure may be initially joined together by two or more hinges 28', one of which is shown in Fig. 2.

Suitable recesses may be made in two abutting edges of the jacket sections to receive the thermostat element 16, so that when the sections are closed together about the tank, this element will be held therebetween and a tight connection will be established between it and the sections.

In order to maintain the tank enclosing structure in proper position with respect to the tank and also to relieve some of the strain upon the supporting lugs 20, the tank may have one or more stud bolts 29 welded thereto or otherwise secured to its outer surface to extend radially therefrom, to pass through suitable openings in one of the sections of the tank enveloping structure. This section would naturally be first applied and mounted on the supporting stud bolts and the other section then swung into position, where the sections are hinged together, or if the sections are mounted independently of one another, then suitable bolts might be provided to pass from the tank through each section.

The upper end of the jacket is covered by the cap or head plate 30 which is spaced a substantial distance above the upper end of the tank and which is provided with a central gas escape opening 31 which is covered by the back draft preventing hood 32.

It will be noted that the thermostat 16 is located within the tank adjacent the upper part of the combustion and heating chamber 23 as a result of which a substantial amount of water will be heated in the lower part of the tank and adjacent the wall before the gas valve is shut off. It will also be noted that the burners are above the bottom of the tank and that, as previously stated, the water circulation is upwardly along the inner side of the tank wall, being deflected back at the top central part of the tank, as indicated by the arrows. With this arrangement of burner, the gradual collection of sediment in the bottom of the tank is permitted without having the same interfere with the efficient heating of the water, and when cleaning or flushing of the tank is necessary this sediment can be readily drawn off through the discharge opening 4.

The present water heater is found to function much more efficiently than water heaters of other designs as a result of the novel manner in which the burner is located and in which the heat from the burner is radiated inwardly toward the wall of the tank by the refractory jacket and the pins of refractory material which line the wall of the combustion chamber. As a result of this arrangement also the present heater may be much more economically operated than heaters of other types where a large proportion of the heat from the burner is lost because no means is provided for directing it in toward and bringing it into contact with the wall of the tank. With the present structural arrangement practically every square inch of tank wall surface above the burner is contacted by the heat from the burner instead of having only a small area

at the bottom of the tank contacted by the burner heat or flame as in ordinary water heaters.

Due to the formation of the combustion chamber, that is, the narrowness of this chamber, the flame of the burning gas is lengthened so that an increased amount of the tank area is covered or contacted by the direct heat from the burning flame and, therefore, the absorption of the heat by the tank content is much more thorough and less heat escapes through the outlet.

By the provision of the obliquely directed heat deflector ribs or baffles 22', the stratification of the gases in passing lengthwise of the tank is prevented and such gases are kept in contact with the tank a longer period than would be the case if they passed directly upwardly, thus giving additional time for the absorption by the tank wall and the water of all of the heating units in the gases.

It will be noted that in the water heater structure illustrated, a space is provided between the burner ring 12 and the water boiler or tank 1 through which secondary air for the burners may pass, such air in flowing upwardly over the surface of the boiler coming between the boiler and the flame and thereby serving to prevent direct contact of the flame with the boiler. It will be readily apparent also that if additional air is required, the jacket may be provided with suitable air apertures.

While the novel heat transfer means of the present invention has been illustrated as being applied particularly to a water heater of the domestic or industrial type, it is to be understood that the invention is not to be limited to this specific application as it will be readily apparent that the heating means may be employed in connection with steam boilers, stills or any other structures where a heat transfer is desired.

What is claimed is:

1. In a water heater of the character described, an elongated vertically disposed water tank, a cylindrical jacket of refractory material encircling said tank and extending from the upper end thereof to a point closely adjacent the lower end, a cylindrical outer jacket enclosing said first jacket and projecting above and below the same, a cover overlying the upper end of the tank and joined to the upper edge of said outer jacket and having an outlet for the escape of products of combustion, means coupled with the upper ends of said jackets for engaging the top of the tank for the support of the jackets therefrom, the said first jacket being of an interior diameter from its upper end through the major portion of its length slightly greater than the overall diameter of the tank whereby is formed a narrow passageway and then being of increased interior diameter to the lower end of the first jacket

to form an annular combustion chamber around the tank, a plurality of burner units disposed in encircling relation with the lower part of the tank and within said chamber, said units being in a plane above the bottom of the tank, means for supplying fuel to said units, and means disposed within and extending throughout the circular extent of said combustion chamber for deflecting heat upwardly and inwardly from the refractory material wall of the chamber toward the tank.

2. In a water heater of the character described, an elongated vertically disposed water tank, a cylindrical jacket of refractory material encircling said tank and extending from the upper end thereof to a point closely adjacent the lower end, a cylindrical outer jacket enclosing said first jacket and projecting above and below the same, a cover overlying the upper end of the tank and joined to the upper edge of said outer jacket and having an outlet for the escape of products of combustion, means coupled with the upper ends of said jackets for engaging the top of the tank for the support of the jackets therefrom, the said first jacket being of an interior diameter from its upper end through the major portion of its length slightly greater than the overall diameter of the tank whereby is formed a narrow passageway and then being of increased interior diameter to the lower end of the first jacket to form an annular combustion chamber around the tank, a plurality of burner units disposed in encircling relation with the lower part of the tank and within said chamber, said units being in a plane above the bottom of the tank, means for supplying fuel to said units, and means disposed within and extending throughout the circular extent of said combustion chamber for deflecting heat upwardly and inwardly from the refractory material wall of the chamber toward the tank, said last means consisting of a plurality of pin members of refractory material.

3. A water heater, comprising a tank, a jacket of relatively thick refractory material encircling the tank and extending throughout substantially the entire length thereof, the jacket being in relatively closely spaced relation with the wall of the tank from its upper end downwardly to a predetermined horizontal level and then recessed from said level to its lower end to form in conjunction with the tank a combustion chamber, a burner unit encircling the tank at the lower end of the combustion chamber, a gas outlet leading from the upper end of the area between the jacket and the tank, said burner being disposed in a plane above the lower end of the tank, and heat deflecting ribs disposed upon the inner surface of the jacket from the upper end downwardly to said level and extending obliquely of the length of the tank.

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