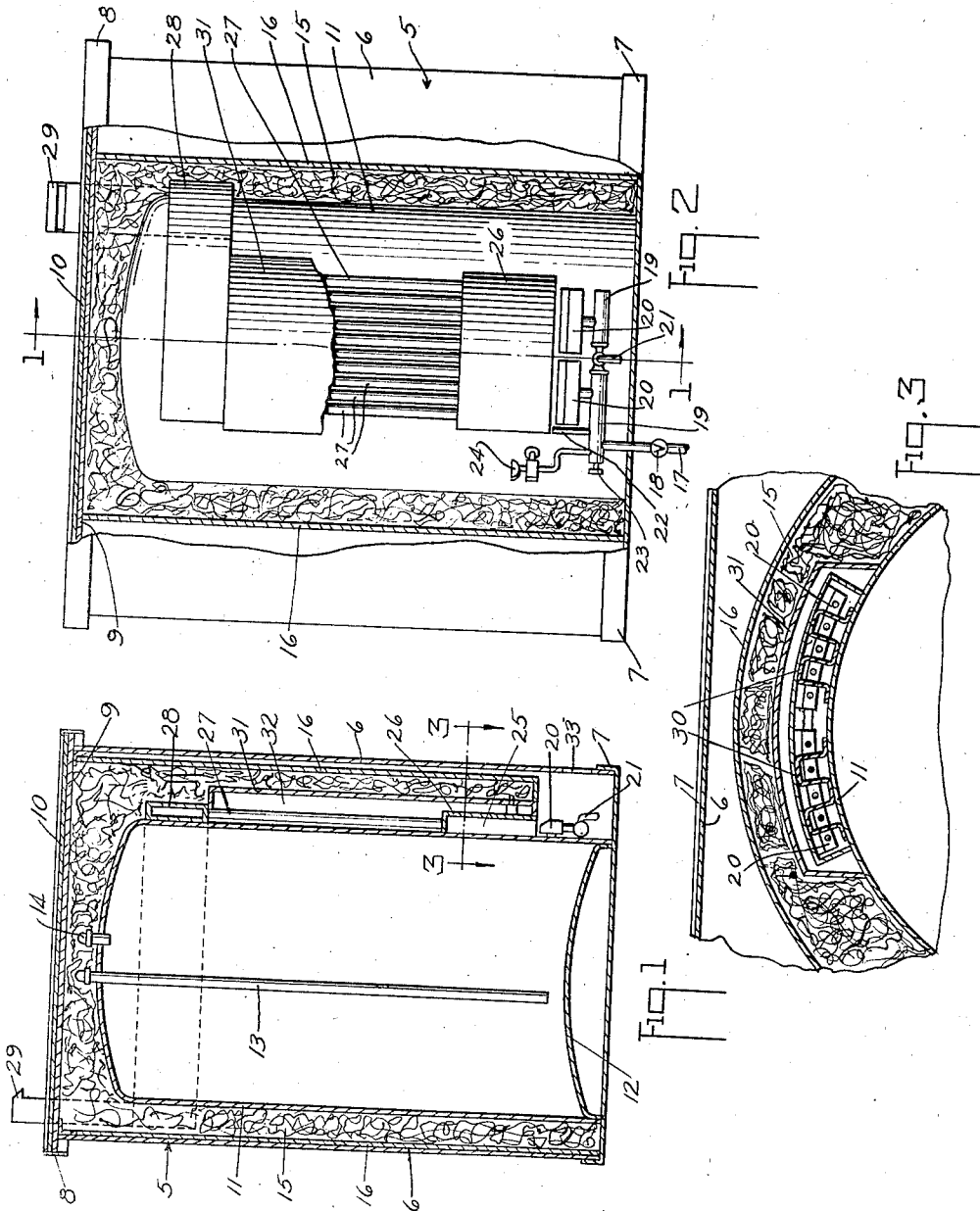


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APPARATUS FOR HEATING FLUIDS

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APPARATUS FOR HEATING FLUIDS

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This invention relates to an apparatus for heating fluids. It has particularly to do with an improvement in hot water heaters.

In the heaters of the past, some of the gases resulting from combustion of a fuel condense upon the cooler portions of the surface to be heated and have united with impurities in the fuel to form corrosive substances. These eat away any nearby metal and shorten the life of the apparatus. This corrosion has been looked upon as a necessary evil and has been treated as such in the usual designs which tend toward efficient heating results.

Those designs which have sought to escape this trouble are expensive and complicated as compared to the standard hot water heater. Other designs which are cheaper mitigate the trouble at the expense of efficiency. It was not until the invention of indirect heating, Patent No. 2,084,287, that a satisfactory solution was reached with a simple and efficient design. The invention employed a heated air chamber of large extent attached to a storage tank, which chamber received its heat from conduits passing through it containing products of combustion. Also, reflectors directed all heat to the tank that did not radiate directly to it. This design resulted in an efficient heating apparatus free from condensation. The purport of my present invention is to obtain this desirable result, freedom from condensation, in more efficient form.

My present invention employs the principle of indirect heat, as described in the paragraph above, in combination with direct application of heat. At one point on a tank containing the water or other fluid, the heat from the products of combustion is applied directly, heating the retained liquid by conduction through the tank walls. The products of combustion are then led through numerous small tubes which break up the gases into small units and remove the remaining heat units. These tubes pass through a chamber attached to the tank, the tank forming one side, or all sides, as is the case when the chamber is passed through the tank. The sides of the chamber not consisting of the tank are preferably lined with reflecting surfaces which direct the radiated heat to the tank.

The objects of my invention are several. First is high efficiency. This is obtained because direct heating is used at the stage when there is the greatest amount of heat in the products of combustion, and where the greatest heat loss would occur if all of the heat transfer were indirect. The remaining heat is removed when

the products of combustion are led through tubes, heating the chamber attached to the tank. Thus complete utilization of heat results in high efficiency. Actual tests have shown my present invention to have an appreciably higher efficiency than indirect heating alone.

Secondly is condensation. This, with its attendant problems and loss, is eliminated.

Thirdly, heating tanks may be made in more convenient forms. This method of heat transfer passes such a large number of heat units per square unit of tank surface exposed, as compared to the indirect heating alone, that a short tank can be used with the heating apparatus attached to the side. In practice, it has been found desirable to enclose the tank with a cabinet such that the top may be used as a table and thus augment the furniture of the room in which the hot water heater is placed.

Other features and objects of my invention having to do with details of construction and operation will be further brought out in the following description and claims.

In the drawing:

Fig. 1 is a vertical cross section of the cabinet and tank taken on lines 1-1 of Fig. 2.

Fig. 2 is a cut away front view of the cabinet exposing the tank.

Fig. 3 is a partial section taken on the lines 3-3 of Fig. 1.

Referring to the drawing, an outside cabinet for the water tank is shown generally at 5. This cabinet consists preferably of sheet metal walls 6, an angle iron bottom frame 7, and a top frame 8 which surrounds a top 9. Covering the top 9 is a linoleum sheet 10 for decorative and table purposes.

Centrally located within the cabinet 5 is a water tank 11 which is provided with the usual curved bottom 12 and which has a water supply pipe 13 entering the tank from the top and extending to a point near the bottom. A hot water outlet 14 also enters the top of the tank. Around the tank is an insulating substance 15 which is preferably enclosed with a cardboard container 16 surrounding the tank and having a diameter larger than that of the tank. The insulation 15 may be of any suitable material but is preferably a rock wool.

The heating apparatus for the tank is attached to the front as shown in the drawing. A gas supply pipe 17 leads through a suitable valve 18 to a distributing pipe 19. Burners 20 are located above the distributing pipe connected thereto by suitable conduits and a valve 21 is

located in the distributing pipe 19 so that gas may be cut off from one of the burners if such is desired. Leading from the distributing pipe 19 is a pilot light 22 and a shut-off cock 23 may be used to adjust the pilot. An adjustable thermostat 24, the details of which have not been shown, controls the flow of gas to the burners 20. Directly above the burners 20 is located a combustion chamber 25 which is formed by a box 26 and by the side of the tank 11. The box 26 is welded directly to the side of the tank and the burners 20 are fastened to the tank. Extending upward from the combustion chamber box 25 are a series of parallel pipes 27 arranged so that they are spaced slightly from the tank and from each other. These pipes lead to a flue gas header 28 which serves as a manifold and which leads around the tank 11 to an outlet vent 29. The pipes 27 are preferably formed of brass and are sealed into the box 26 and the flue header 28.

In Fig. 3 I have shown a section 3-3 of the combustion chamber taken on Fig. 1, this being a horizontal section through the combustion chamber formed by the tank and the box 26. In the combustion chamber are corrugated plates 30 which extend through the chamber to provide vertical passageways therein. Burners 20 are located directly beneath the combustion chamber, as shown. A reflecting jacket or plate 31 surrounds the combustion box 26 and the tubes or pipes 27 so that a closed radiation or absorption chamber 32 is formed between the reflecting plate 31 and the tank. This chamber is preferably sealed from the atmosphere and the inside of the plate 31 is to be highly polished so that its mirrored surface will reflect heat toward the tank. The surface of the tank which is within the combustion chamber 25 and the radiation chamber 32 is preferably roughened and blackened so that it will absorb heat readily. The side walls 6 of the cabinet are provided with an aperture 33 near the burner so that secondary air may pass to the burner.

In the operation of the device, after the thermostat 24 is set at the desired temperature, the line valve 18 may be opened and the pilot 22 lighted. If the water is below the temperature desired, the burners 20 will light and the products of combustion will be directed upwardly into the chamber 25. Here, it will be seen, they are directly exposed to the tank 11. The upward moving combustion products will then pass into the tubes 27 and will heat these tubes as they pass therethrough to the header 28 and the outlet 29. The heat from the tubes 27 will be directed to the tank by radiation and also by convection. Any remaining heat in the gases will be absorbed into the tank as the gases pass through the header 28 which surrounds a portion of the tank. It has been found that by the use of the direct heating in the chamber 25 in combination with the indirect heating that a considerable increase in efficiency may be obtained without causing condensation on the tank. Condensation does not form in the direct heating combustion chamber due to the fact that there is more heat available than the conductivity of the cooling surface will carry. Consequently, the cooling surface remains at a sufficiently high temperature that condensate does not form. Condensate cannot accumulate in the chamber 32 since this is preferably sealed from the atmos-

phere and also the tubes never become cooled. No condensation occurs in header 28 since this surrounds the hottest part of the tank.

The described construction makes possible the placing of the burner and combustion chamber on the side of the tank, rather than underneath the tank as is the usual practice. This results in a shorter heater of equal storage capacity.

The apparatus described works best when the thermostat is set for a desired temperature, thus insuring that there will always be hot water in the tank. If the burners are lighted by hand only, when hot water is desired, the apparatus will be less efficient.

What I claim is:

1. In a hot water heater, the combination of a storage tank, inlet and outlet means for water, a heating means, said heating means consisting of a combustion chamber, having a portion of its sides formed by the tank, a gas burner inside said combustion chamber, metal tubes leading from said combustion chamber and spaced from the tank, an absorption chamber having a portion of its sides formed by the tank, and through which the tubes pass, a header at the ends of said tubes which passes around said tank and connects with a vent passage, mirrored surfaces on the inside of the absorption chamber, and a roughened black wall on the parts of the tank forming said absorption and combustion chambers.

2. In a hot water heater, the combination of a storage tank, inlet and outlet means for water, a heating means, a sheet metal cabinet enclosing said storage tank of such shape, finish and dimensions as to serve as a table, said heating means comprising a combustion chamber having a portion of its sides formed by the tank, a gas burner inside said combustion chamber, metal tubes leading from said combustion chamber and spaced from the tank, an absorption chamber having a portion of its sides formed by the tank and through which the tubes pass, a header at the ends of said tubes which passes around the tank and connects to a vent passage.

3. A water heating apparatus comprising a tank for water, means forming a combustion chamber comprising an open metal shell having the edges of the open side fastened and sealed to a wall of said tank, metal corrugated strips having substantially square corrugations with alternate flat surfaces connected to said tank and an inner surface of said shell to provide flue formations within said chamber and heat conducting means from a flame in said chamber to said tank, means forming an air chamber directly above said combustion chamber and tube means for conducting combustion products from said combustion chamber through said air chamber.

4. A water heating apparatus comprising a tank for water, means forming a combustion chamber comprising an open metal shell having the edges of the open side fastened and sealed to a wall of said tank, flame forming means below said shell and means within said shell above said flame forming means, forming relatively small combustion chambers located to expose small portions of said tank directly to flame, and means directly above said shell for conducting flue gases from said chambers.

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