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BOILER AND HEAT EXCHANGER

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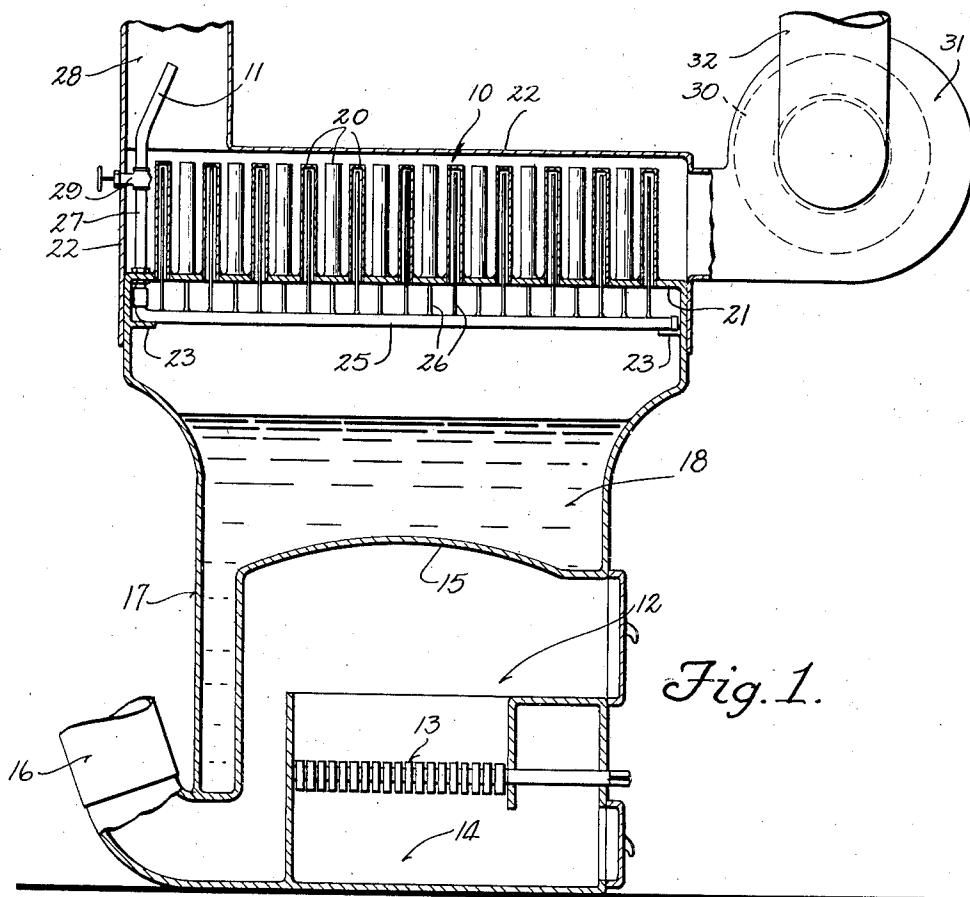


Fig. 1.

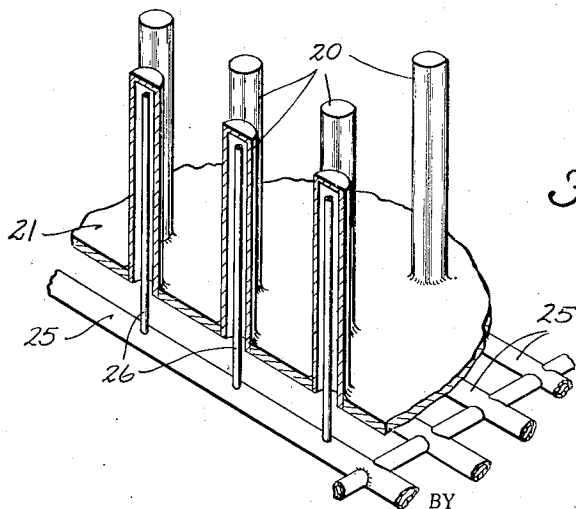


Fig. 2.

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BOILER AND HEAT EXCHANGER

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3 Claims. (Cl. 237-16)

Our invention relates to improvements in boilers and heat exchangers.

The object of our invention is to provide a combination boiler and heat exchanger in which provision is made for the most efficient transfer of heat from any source of heat to a fluid by means of which the heat may be conveyed to a point where such heat may be used.

Another object of our invention is to provide an improved type of heat exchanger with a circulation promoting device and humidifier.

In the drawing:

Figure 1 is a vertical section through the boiler heat exchanger and humidifier embodying our invention.

Figure 2 is a perspective of a portion of our heat exchanger with certain of the tubes shown in vertical section.

Like parts are designated by the same reference characters throughout the several views.

The most important structural portions of our invention are shown in the upper part of Figure 1 where our heat exchanger 10 and humidifier 11 are clearly shown in their relation to a heating plant.

The drawing shows our invention installed in connection with a coal fire in a fire box 12 with the usual grates 13, ash pit 14, arch 15, and flue 16.

About the fire-pot 12 is a jacket 17 for "boiler" water and above the arch 15 is a quantity of water 18 which, when heated to the point of vaporization, will cause vapor to rise into the dead-end tubes 20 of the heat exchanger 10. The dead-end tubes 20 are formed from or set into a header-plate 21, as shown most distinctly in Figure 2. They extend upwardly from the header-plate 21 to within a very short distance from casing 22 which surrounds and covers the heat exchanger.

Below the header-plate 21 and supported upon flanges 23 in the interior of the boiler we provide a number of reduced pressure headers 25 which are provided with upstanding reduced pressure tubes 26, each tube extending upwardly in one of the dead-end tubes 20 to a point adjacent the upper end of such dead-end tube. The reduced pressure headers 25 extend to a humidifier pipe 27 which extends upwardly into the heat exchanger space within the jacket 22, and preferably into the outlet 28 of the heat exchanger. A valve 29 in the humidifier pipe permits of adjustment of the opening there-through.

A fan 30 in casing 31 draws air from a cold

air inlet pipe 32 and forces it into the heat exchanger.

Our heat exchanger and humidifier operates as follows: Assuming that the boiler water 18 has been brought to a vaporizing temperature by the fire in the fire-pot 12, the vapor will pass upwardly into the dead-end tubes 20 according to the amount of heat that may be required in the space to be heated. This result is obtained because the fan 30, when operated to cause our heat exchanger to be effective, will cause a certain amount of Venturi action upon the opening of the humidifier pipe thus reducing the pressure in the reduced pressure headers 25. The reduced pressure in the reduced pressure headers will in turn cause the vapors rising in the dead-end tubes 20 to be passed into the reduced pressure pipes 26 thus carrying heat to the extreme ends of the dead-end tubes 20. Air from the fan casing 31 will then pick up heat units from the exterior surfaces of the dead-end tubes and the heated air will pass out through the outlet pipe 28 to the rooms or other space to be heated.

The vapor passing from the humidifier pipe 11 will naturally mix with the air passing out of the outlet pipe 28, and, obviously, the greater amount of heat passed through the walls of the dead-end tubes 20 will cause the greater amount of humid vapor from the boiler to pass through the humidifier into the space to be heated.

The valve 29 is manually adjustable for easy and rapid escape of vapor through the humidifier or for merely such bleeding of such vapor as may be necessary to promote vapor circulation through dead-end tubes and reduced pressure tubes as may be required for efficient heat transfer in the heat exchanger. However, it will be obvious to those skilled in this art that when a large volume of heat is to be transferred to the air passing through the outlet pipe 28, the requirements for humidification automatically will be increased and a proper balance of heat exchange and humidification according to one setting of the valve will be obtainable whether the heat exchange system is being operated at full capacity or at moderate load.

We claim:

1. In a heat exchange structure a header plate provided with dead-end tubes, reduced pressure tubes extending into said dead-end tubes and extending to vacuum headers, a casing about said dead-end tubes whereby to guide a fluid to be heated around said dead-end tubes into and through an outlet, a source of heated vapor to

be passed into said dead-end tubes and through said vacuum tubes and headers and a humidifier pipe extending from said headers to said outlet said humidifier pipe being positioned for Venturi action in said outlet.

2. In a boiler and heat exchanger a header plate between said boiler and said heat exchanger, dead-end tubes in the heat exchanger and mounted with reference to said plate whereby to receive vapor from the boiler, an inlet and an outlet for fluid passing into and out of the heat exchanger, means for moving fluid through the outlet under pressure, a humidifier pipe and vacuum tubes extending from the outlet to the dead ends of the dead-end tubes, said humidifier pipe being positioned in the outlet for Venturi action whereby to place the space in the dead-end tubes under reduced pressure.

3. A boiler provided with a source of heat and a confined receptacle for vaporizable fluid to be heated from said source of heat, a header plate forming part of said receptacle and provided with dead-end tubes extending from said plate and opening into said receptacle, a vacuum header within the receptacle and provided with a vacuum tube extending into each dead-end tube, a casing comprising a housing over said plate and said dead-end tubes, said casing being provided with an inlet and outlet opening, said vacuum header having a portion extending into the space within said casing and having an outlet in alignment therewith whereby to induce circulation in said header.

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