

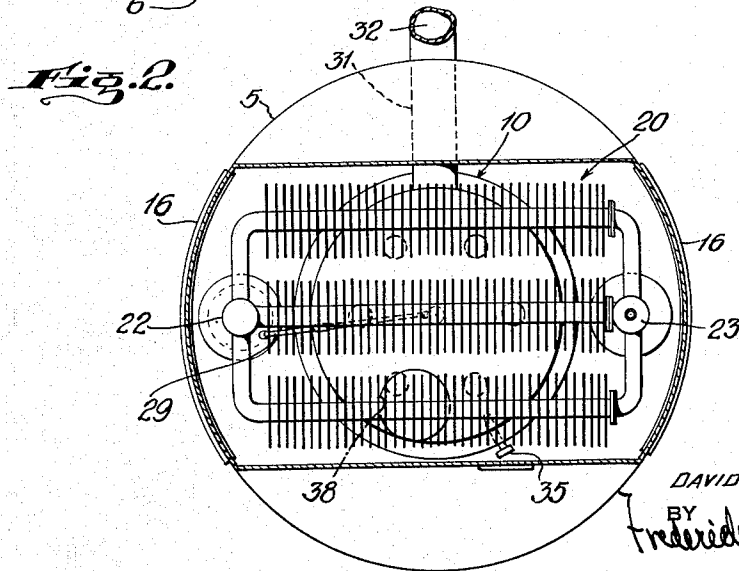
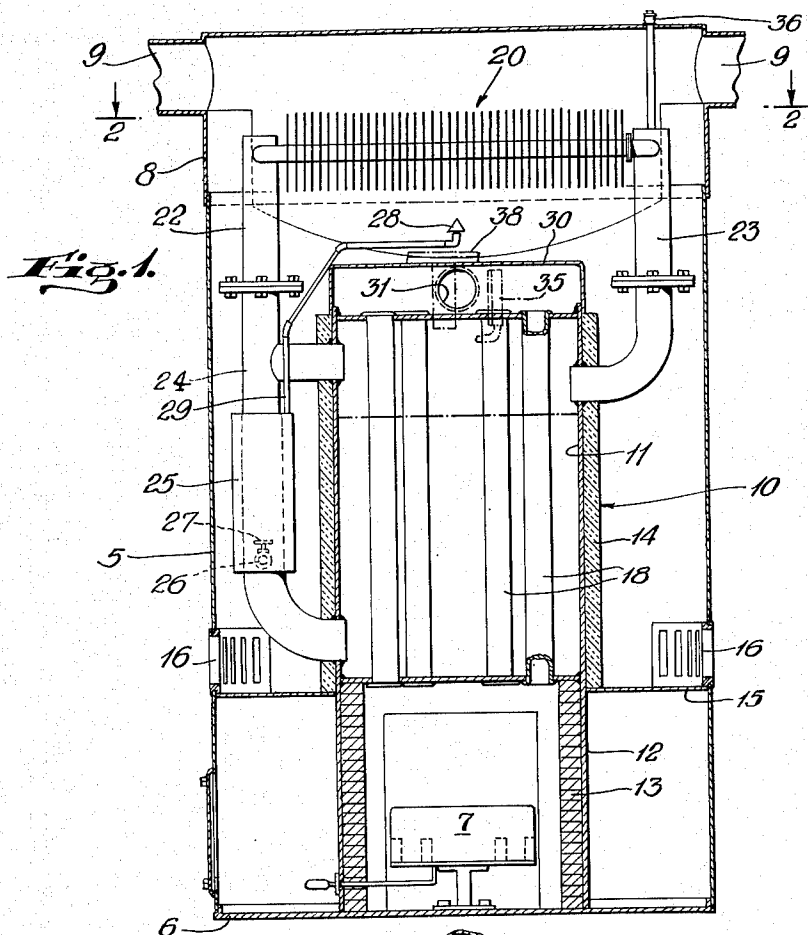
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HEATING APPARATUS

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HEATING APPARATUS

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6 Claims. (Cl. 126-101)

This invention relates to improvements in heating apparatus.

Among the objects of this invention is the provision of a light weight heating apparatus especially adapted for use as a portable heater and for installation in airplanes or the like where weight carrying capacity is of prime importance.

Another object of the invention is the provision of a concentrated source of heat in which the temperature may be readily controlled and in which also provision is made for humidifying the air heated and delivered by the heater.

Another object of the invention is to preheat the water used in humidifying the air being heated and in so arranging the parts of the heater that the flue gases leaving the boiler may be used to preheat the air and the convector.

Another object of the invention is the provision of means whereby the heavier or partially condensed portion of the evaporated liquid may be utilized to heat water or the like.

Other objects of the invention will appear from the following description taken in connection with the drawing in which—

Fig. 1 is a vertical section through my improved heating apparatus; and

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

I have shown my invention as being completely enclosed in a housing or shell 5 which may consist of an upright cylinder with a bottom wall 6 on which any suitable burner or heating element 7 may be supported, and with an upper closed end which may consist of a dome 8 of generally rectangular form as viewed from above, to the ends of which may be connected hot air conducting pipes 9 for carrying air heated by this apparatus to any desired points.

The boiler 10 consists of an upright cylinder 11 having an integral foot portion 12 resting on the base 6 of the shell 5 and lined with fire brick or the like 13. The side walls of the boiler are preferably insulated as indicated at 14, and if desired the space between the boiler and the walls of the housing or shell may be closed at the base of the boiler by means of an annular plate 15. The housing is preferably provided with fresh air inlets 16 above the plate 15, through which the air to be heated enters by natural draft.

The boiler is provided with the usual boiler tubes 18 which are preferably connected to the ends of the boiler by seal welding on both sides

of the walls of the boiler and all the pipes are preferably similarly seal welded to the parts to which they are connected.

In the upper end of the housing or shell is mounted a convector 20 which as disclosed may comprise several finned radiator units preferably substantially filling the space in the dome 8 at the upper end of the housing. This convector is connected to the boiler means of a supply pipe 22 and a return pipe 23 connected at different levels to the side wall of the boiler near the upper end thereof to cause the evaporated fluid to circulate clockwise in Fig. 1. Connected to the supply pipe 22 is a return pipe 24 connected to the lower end of the boiler. As the evaporated fluid enters the pipe 22 the lighter vapors will circulate through the convector and the heavier vapors will settle down into the return pipe 24, thus heating the working liquid in this pipe and because of this fact this pipe may be used for heating water for any desired use and for use also in humidifying the air heated by this heating apparatus. For this purpose a section of this pipe is surrounded by a jacket 25 providing a container for water to be heated and if the water to be heated is to be used for general purposes intake and outlet pipes may be connected to this jacket. If it is desired to use the water heated in this jacket for humidifying the air heated by the apparatus, then a pipe 26 supplying the jacket with water may be equipped with a valve 27 which may be adjusted to control the amount of water entering the jacket and delivered to a spray nozzle 28 located under the convector through a pipe 29.

The boiler tubes through which heat and gases of combustion in case oil or the like is used as a source of heat, are conveyed, open into a common chamber at the upper end of the boiler provided by a hood 30 which is connected by a flue 31 with a stack pipe 32. It is preferred to locate the nozzle centrally of and above this chamber in order that the water may be heated or kept hot as it enters the nozzle, and that the air in the immediate vicinity of the nozzle may be preheated. It is also desirable and advantageous to locate the convector as close to this chamber as possible in order that when the heating apparatus is first started the heat from the flue gases may heat the convector by direction radiation and also by convection by heating the air in the vicinity of said chamber and convector.

This system has been designed primarily for

use of diphenyl $C_6H_5-C_6H_5$, as the working substance. This substance solidifies at a temperature of 156° so that at ordinary room temperatures it is in solid form and as it has the property of shrinking into a smaller volume as it solidifies it will not burst the boiler or pipes. It has a further known property that it will evaporate at a very high temperature of 497.1° , at atmospheric pressure and has a high vapor density, so that it is possible to obtain a very high temperature at a low pressure and therefore the boiler and various pipes and the conveyor may be made of light weight material, whereas in the case of steam this high temperature can be obtained only at high pressures.

The boiler may be equipped with a thermometer 35 of any suitable type and having knowledge of the relation of the temperatures and pressures of the substance used it will not be necessary to equip the boiler with a pressure gauge though it is desirable to equip it with a relief valve as indicated at 36. The temperature of the vapor in the boiler may be controlled by controlling the source of heat. The boiler may be equipped with a refill pipe as indicated at 38. The shell may if desired be equipped with a door for access to the refill pipe etc. The thermometer may be read through a window in the shell 5.

While the invention has been described with particularity with reference to the single embodiment disclosed, it is to be understood that I reserve the right to all such changes as fall within the principles of this invention and the scope of the appended claims.

I claim:

1. A heating apparatus comprising a boiler for converting liquid into vapor, a source of heat, a heat exchanger, supply and return connections between said boiler and said heat exchanger, said return connection entering the boiler above the liquid level therein, said supply connection being located above said return connection and above the level of the liquid in the boiler and comprising a vertically extending section connected to said heat exchanger and a laterally extending section entering the side wall of the boiler, and a vertically extending pipe connecting the lower end of said vertically extending section of said supply connection to said boiler at a point below the level of the liquid in the boiler.

2. A heating apparatus comprising a boiler for converting a liquid vaporizing at a higher temperature than water into vapor, a source of heat, a heat exchanger, supply and return connections between said boiler and said heat exchanger, said supply connection being located above said return connection and above the level of the liquid in the boiler and comprising a vertically extending section connected to said heat exchanger and a laterally extending section entering the side wall of the boiler, and a vertically extending pipe connecting the lower end of said vertically extending section of said supply connection to said boiler at a point below the level of the liquid in the boiler, and a jacket surrounding said pipe and forming therewith a container for water to be heated.

3. A heating apparatus comprising a boiler for converting a liquid vaporizing at a higher temperature than water into vapor, a source of heat, a heat exchanger, supply and return connections

between said boiler and said heat exchanger, said supply connection being located above said return connection and above the level of the liquid in the boiler and comprising a vertically extending section connected to said heat exchanger and a laterally extending section entering the side wall of the boiler, and a vertically extending pipe connecting the lower end of said vertically extending section of said supply connection to said boiler at a point below the level of the liquid in the boiler, a jacket surrounding said pipe and forming therewith a container for water to be heated, and a casing surrounding said boiler, heat exchanger, connections, pipe and jacket.

4. A heating apparatus comprising a boiler for converting a liquid vaporizing at a higher temperature than water into vapor, a source of heat, a heat exchanger located centrally above said boiler, supply and return connections between said boiler and said heat exchanger, said supply connection being located above said return connection and above the level of the liquid in the boiler and comprising a vertically extending section connected to said heat exchanger and a laterally extending section entering the side wall of the boiler, and a vertically extending pipe connecting the lower end of said vertically extending section of said supply connection to said boiler at a point below the level of the liquid in the boiler, a jacket surrounding said pipe and forming therewith a container for water to be heated, a spray nozzle located between said boiler and said heat exchanger, a pipe connection between said container and spray nozzle, and a casing surrounding said boiler, heat exchanger, connections, spray nozzle, pipes and jacket.

5. A heating apparatus comprising an upright boiler for converting liquid into vapor, a source of heat, a heat exchanger located centrally above said boiler, supply and return connections between said boiler and said heat exchanger, boiler tubes extending vertically through said boiler, a common chamber at the upper end of said boiler with which said boiler tubes communicate, a flue pipe connected to said chamber, a spray nozzle located above and adjacent to said common chamber and below said heat exchanger and a casing enclosing said boiler, heat exchanger, and spray nozzle.

6. A heating apparatus comprising a boiler for converting a liquid vaporizing at a higher temperature than water into vapor, a source of heat, a heat exchanger, supply and return connections between said boiler and said heat exchanger, said supply connection being located above said return connection and above the level of the liquid in the boiler and comprising a vertically extending section connected to said heat exchanger and a laterally extending section entering the side wall of the boiler, and a vertically extending pipe connecting the lower end of said vertically extending section of said supply connection to said boiler at a point below the level of the liquid in the boiler, a jacket surrounding said pipe and forming therewith a container for water to be heated, means insulating the side walls of said boiler and a shell concentric with and spaced from said boiler and enclosing said boiler, heat exchanger, connections, pipe and container.

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