Feb. 14, 1967 L. S. RITHER 3,303,837

HUMIDIFIER FOR HEATING SYSTEMS

Filed June 23, 1965 2 Sheets-Sheet 1

Fig. 1.

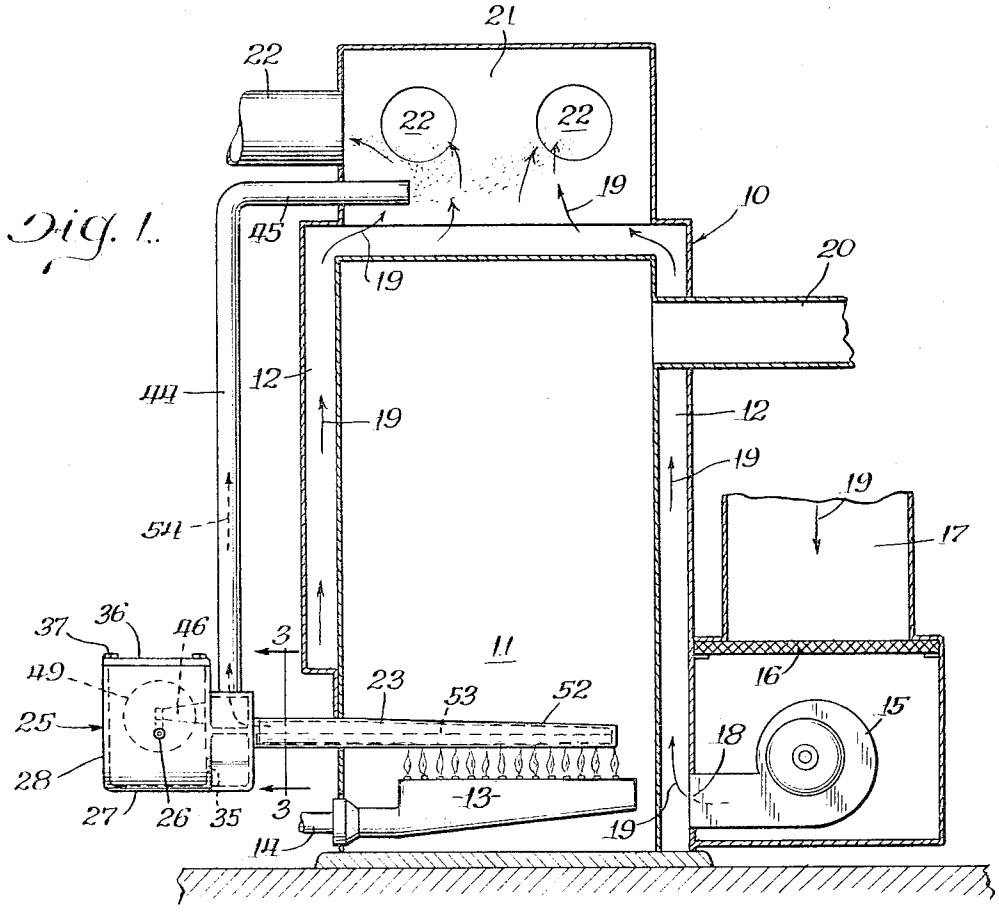
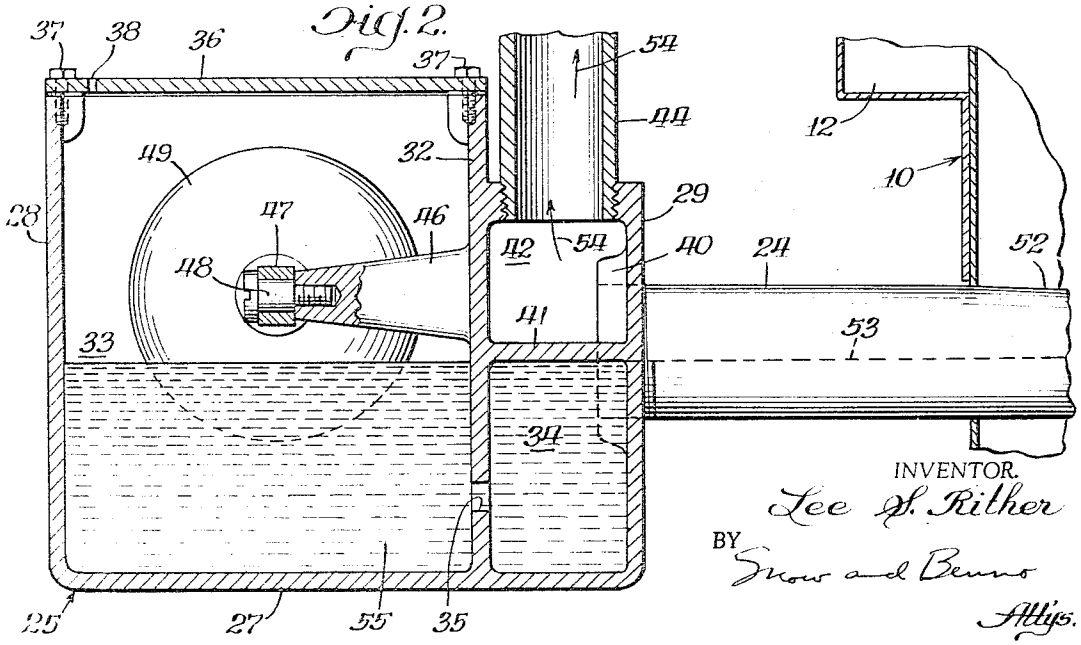


Fig. 2.



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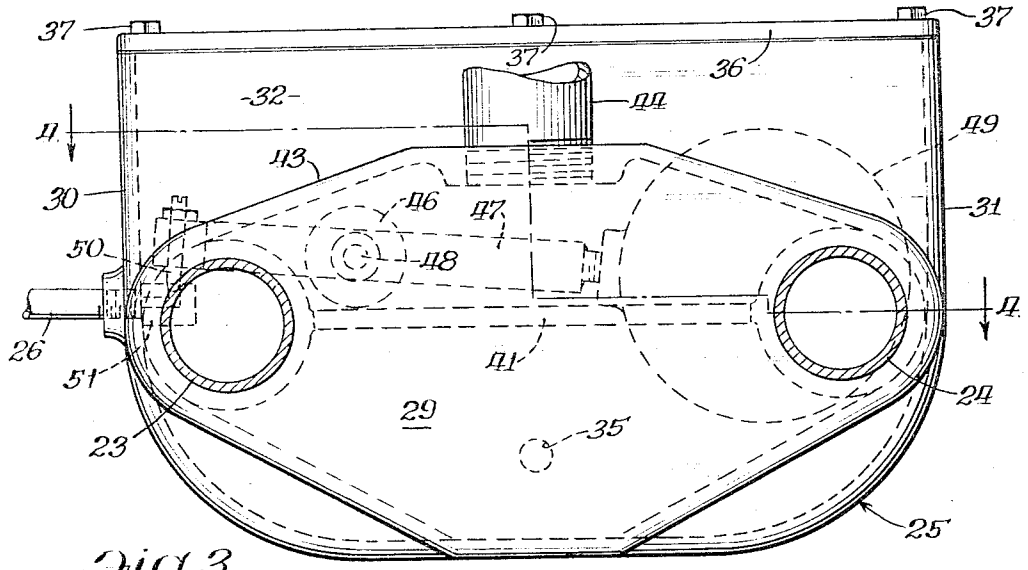


Fig. 3.

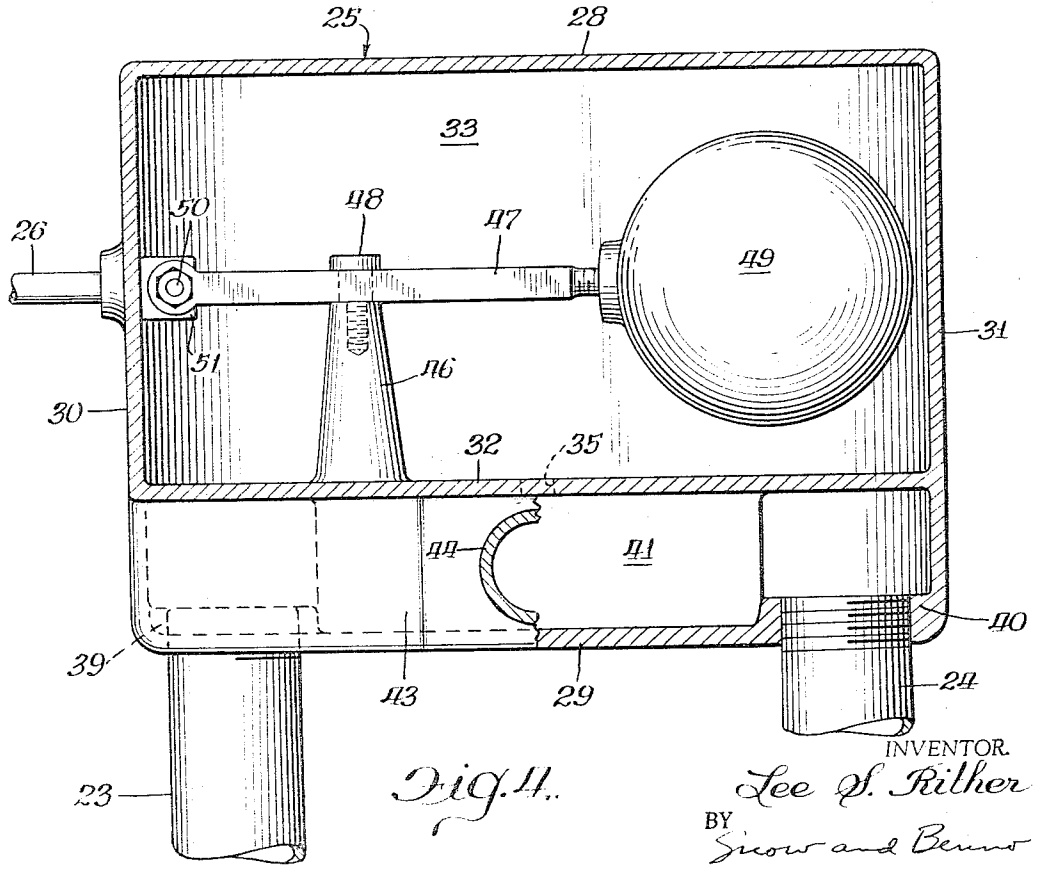


Fig. 11.

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United States Patent Office 3,303,837 Patented Feb. 14, 1967

3,303,837

HUMIDIFIER FOR HEATING SYSTEMS

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Filed June 23, 1965, Ser. No. 466,362
4 Claims. (Cl. 126—113)

This invention relates to a new and improved humidifier for heating systems.

One difficulty presently encountered in heating systems for buildings is the inability of the heating system to deliver an adequate amount of moisture conducive to good health and proper humidity with the heated air. There have been many types of humidifiers made and tried throughout the years. Some of these prior humidifiers were associated with furnaces or central heating plants and still others were used independently of a heating system. During the heating season buildings often lack proper moisture causing the building materials to dry out. Dryness also is conducive to respiratory ailments in humans, and creates a condition of undesirable static electricity. The humidifier of this invention overcomes these undesirable conditions.

Present heating systems are usually provided with an intermittently operable burner of fire of an instantly ignitable fuel dependent upon the heat requirements of the building as determined by a thermostat or other automatically operable control mechanism. Furnaces do not generally operate continuously as they did when coal was the commonly used fuel but rather operate only intermittently dependent upon the call for heat by the automatic controls. The humidifier of this invention is particularly adapted for use with intermittently operable central heating furnaces.

It is therefore a principal object of this invention to provide a novel humidifier for forced air central heating systems.

An important object of this invention is to provide a novel device producing an indoor humidity directly related to the heat supplied to heat a building.

Another important object of this invention is to provide a new and novel humidifier for use with heating systems which use gas, oil, or other instantly ignitable fuels which are operable in response to thermostats or other automatic control mechanisms.

It is another important object of this invention to provide novel means for activating a humidifier in conjunction with an intermittently operable furnace.

Another and still further important object of this invention is to provide novel means utilizing the heat of an intermittently operable burner of a furnace to generate steam and deposit that steam in the form of water vapor into a furnace plenum chamber where the water vapor is thereupon distributed through suitable ducts and conduits with the warm air to the various locations in the building being heated.

Still another important object of this invention is to provide novel means for easily adjusting the relative humidity desired in the building being heated.

Another and still further important object of this invention is to provide an automatically operable humidifier with but a single moving part for the control of water to a supply tank which feeds the humidifier device.

Other and further important objects and advantages will become apparent from the disclosures in the following specification and accompanying drawings.

In the drawings:

FIGURE 1 is a vertical sectional view taken through a furnace with the humidifier of this invention mounted thereon.

FIGURE 2 is an enlarged vertical sectional view of a portion of the device shown in FIGURE 1 and particularly the water storage tank for the humidifier.

FIGURE 3 is a sectional view taken on the line 3—3 of FIGURE 1.

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 3.

As shown in the drawings:

The reference numeral **10** indicates generally a furnace on which and in which the humidifier of this invention is mounted. The furnace includes a combustion chamber **11** which is substantially surrounded by hollow walls **12**. A burner **13** is disposed in the lower part of the furnace and generally near the bottom of the combustion chamber **11**. A gas supply line **14** is shown leading to the burner **13**. When the burner **13** is ignited the gas or other fuel used burns within the combustion chamber **11** thereby generating heat.

A blower **15** is provided in the furnace **10** at one side thereof. A filter **16** is positioned above the blower **15** and acts to separate the blower chamber from an air intake duct **17**. Oftentimes this intake duct is referred to as a cold air return for the furnace. The furnace shown herein constitutes a central heating plant of the forced air type. The blower **15** has a discharge nozzle **18** communicating directly with the hollow walls **12** of the combustion chamber. Air is thus drawn into duct **17** and moves in the direction of the arrows **19** through the duct **17**, through the filter **16** where it is cleaned of dust and dirt particles, and thence moves into the fan **15**. From the fan the air is then forced through the discharge nozzle **18** and up the hollow side walls **12** of the combustion chamber **11** where it is heated. A flue **20** joins the combustion chamber **11** and is utilized to exhaust the gases of combustion. It is preferable that the flue be joined to a chimney, not shown, for removing these combustion gases to the exterior of the building in which the heating plant is used. Following the transfer of heat to the air forced upwardly through the hollow walls **12** of the combustion chamber the heated air is assembled in a plenum chamber **21** located at the top of the furnace and generally spaced above the combustion chamber **11**. No details of the interior of the combustion chamber have been shown, although it should be understood that the upper portion thereof may be equipped with various types of heat exchange elements to cause maximum transfer of heat from the fire before exhausting the gases of combustion out through the flue **20**. The air moving upwardly through the hollow walls **12** is thus heated to its maximum degree when it reaches the plenum chamber **21**. Conduits or ducts **22** join the plenum chamber **21** and are utilized to distribute heat from the central heating furnace to remote locations of the building. The description of the furnace to this point represents an ordinary furnace construction and it is to such a furnace that the humidifier of this invention is applied.

The humidifier of this invention includes a heat exchanging element located directly above the burner **13** within the combustion chamber **11** in order to utilize the burner heat to vaporize water for admixture with the furnace heated air which is distributed through the heat carrying conduits **22**. In the particular arrangement shown the heat exchanger element in this instance includes spaced apart heat exchanger tubes **23** and **24** both of which pass through the exterior wall of the furnace and are located above the burner **13**. A water reservoir tank **25** for the humidifier is supplied by water from a conduit **26** leading to the tank **25**. The reservoir tank **25** is provided with a bottom **27**, side walls **28** and **29**, and end walls **30** and **31**. A vertical partition **32** within the tank **25** defines a first chamber **33** and a second chamber **34** within the tank **25**. A small hole **35** is located in the partition **32** near the bottom thereof to provide for liquid communication between the first and second chambers **33** and **34** respectively. The first chamber is equipped

with a removable cover 36. The cover is held in position over the first chamber 33 by a number of screws 37. An air vent opening 38 is provided in the cover 36 and thus facilitates the exhausting of air from the tank when water is admitted to the tank. If there were no opening or vent 38 there would be a tendency for the admission of water through the supply pipe or conduit 26 to the tank 25 to cause a compressing of air trapped within the chamber.

Spaced apart bosses 39 and 40 are provided on the outer side wall 29 within the second chamber 34. These bosses 39 and 40 are adapted to threadedly receive the outer ends of the heat exchanger tubes 23 and 24. A horizontal partition 41 is provided in the second chamber 34 at approximately the desired water level in the tank 25. The location of the partition 41 is substantially mid-way of the height of the heat exchanger tubes 23 and 24. A chamber 42 is defined within the second chamber 34 above the horizontal partition 41. A top 43 is provided for the second chamber 34. A vapor duct 44 is threaded into the top 43 and has communication with the interior of the second chamber and particularly the chamber 42 located above the horizontal partition 41. The vapor duct 44 is generally vertically disposed and is provided with a right angle bend 45 at the top thereof to provide for the discharging of water vapor directly into the plenum chamber 21 as clearly shown in FIGURE 1 of the drawings. There is thus no attempted admixture of extremely hot air with water vapor or steam in the furnace prior to this admixture of hot air with water vapor in the plenum chamber at the top of the furnace. In previous central heating systems it has been attempted to mix moisture either within the combustion chamber or immediately thereabove or in the hollow walls with the result that the moisture was dried out and dissipated before it could be distributed throughout the building being heated. In the present instance, the heat exchanger tubes provide the generation of steam whereupon the steam is carried outwardly from the location of the combustion chamber and delivered upwardly through the externally located vapor duct 44 where it is reconverted to a substantially water vapor by the time it is delivered into the plenum chamber 21. The complete operation of the humidifier will be described later in this specification.

A relatively long boss 46 is formed on the vertical partition 32 in a manner to project inwardly of the first chamber 33. The elongated boss 46 is adapted to carry an arm 47 which for convenience will be termed a float arm. The float arm is pivotally mounted at 48 at the outer end of the boss 46. A ball float 49 is carried on one outer end of the arm 47 and is adapted to be raised or lowered within the first chamber 43 of the tank 25 by the water level within the tank 25. A valve such as a needle valve is shown at 50 at the end of the float arm 47 opposite the ball float 49. The needle valve cooperates with and engages a valve housing 51 which is in communication with the water supply pipe 26 leading to the tank 25. Thus the admission of water through the pipe 26 to the tank 25 is controlled by the needle valve 50 in its cooperation with the valve housing 51.

The heat exchanger tubes 23 and 24 are provided with gradually tapering top surfaces 52 as shown in FIGURE 1 such that the space or volume of the tube diminishes from the point of its outer end communication to the tank 25 to its inner closed end disposed the maximum distance within the combustion chamber 11. A dashed line 53 indicates the generally desired water level within the heat exchanger tubes 23 and 24 and is in substantial alignment with the horizontal partition 41. A plurality of arrows 54 indicate the path of travel of the generated steam from the heat exchanger tubes upwardly through the vapor duct 44, into the right angle bend 45 and thence into the warm air plenum chamber 41 for admixture with the heated air in the form of water vapor.

In the operation of the device of this invention the float 49 with its pivoted arm 47 is arranged with its needle valve to admit water as shown at 55 in FIGURE 2 to generally the level of the horizontal partition 41 and of the dashed line 53 in the heat exchanger tubes 23 and 24. When the water is below the level of the line 53 the ball 49 falls downwardly thus opening the valve 50–51 and admitting water from the supply line 26 through the valve housing 51 to the chamber 33. By means of the small port 35 in the vertical partition 32 the water 55 also seeks its level in the chamber 34.

When the burner 13 is ignited by reason of the thermostat or other automatic controls calling for heat or operation of the furnace, there is an immediate heating of the small quantity of water in the heat exchanger tubes 23 and 24 such that portions of that water are converted to steam and the continued application of heat causes an expanding of that steam to cause the steam to move out of the heat exchanger tubes and thence upwardly in the vapor duct 44 on the outside of the furnace. Obviously, there is some cooling effect of the steam in the vapor duct by reason of its remoteness from the burner 13 so that when it is discharged from the end 45 of the vapor duct, it is substantially a water vapor rather than steam when it is mixed with the heated air in the plenum chamber 21. The heated air laden with water vapor is distributed through the heat passage ducts 22 to the various locations in the building being heated. There is thus an immedaite transfer of water vapor from the humidifier to all parts of the building and a feature of this invention is the fact that the humidifier operates only when the furnace is operating which in turn operates only when the automatic controls call for heat. During periods of quiescence when the furnace is inactive, the humidifier is also inactive and there is no feeding of water either in the form of vapor or steam to the building at this time. However, immediately upon the burner being ignited, the humidifier automatically comes into operation and moisture is delivered with the heat to all parts of the building. This of course prevents drying out of the building materials and is conducive to good health. The amount of moisture which is mixed with the heated air and transmitted through the building may be regulated by adjusting the water level in the heat exchanger tubes 23 and 24. This is accomplished by adjusting the angle of the end of the float arm 47 carrying the ball 49 whereby the valve at the other end is opened or closed with different effective levels of water. The tapering of the heat exchanger tubes 23 and 24 to their inner ends provides for the more ready movement of the created steam outwardly toward the vapor duct 44. Actually the enlarging of the tubes outwardly facilitates the outward movement of the steam from the heat exchanger tubes 23 and 24 and thus it is believed that the tapering is an important feature of this invention.

The presently described humidifier may be readily mounted or affixed to existing furnaces or may be made integrally with new furnaces and for that reason it appears advantageous over other complex humidifiers which as a rule are not attachable to existing heating plants and which as a rule consist of numerous moving parts.

Numerous details of construction may be varied throughout a wide range without departing from the principles disclosed herein, and I therefore do not propose limiting the patent granted hereon otherwise than as necessitated by the appended claims.

What is claimed is:

1. A furnace construction comprising a housing, a combustion chamber in said housing, said furnace housing having hollow walls surrounding said combustion chamber and defining an air passageway, a flue conduit passing through said hollow walls of said furnace housing and joining said combustion chamber, a burner in the lower portion of said combustion chamber, a warm air plenum chamber above said combustion chamber, a pair of gen-

erally horizontally disposed laterally spaced apart heat exchanger tubes lying in a common plane and extending into said combustion chamber in close proximity to and above said burner, means supplying water to some desired level in said heat exchanger tubes, said means supplying water including a tank positioned externally of said furnace housing, said tank having a generally vertical wall therein defining first and second side-by-side horizontally disposed chambers, a water supply line leading to the first of said side-by-side chambers in said tank, a combination float and valve means in the first of said side-by-side chambers arranged and constructed to automatically control the admission of water from said supply line to said tank, said generally vertical wall having a relatively small opening therein in a lower portion thereof providing communication between said first and second chambers, said laterally spaced apart heat exchanging tubes joining said second chamber at a position above the level of said relatively small opening, and said combination float and valve means arranged and constructed to provide a level of water in said tank above said relatively small opening and at a level between the bottoms and tops of both of said laterally spaced apart heat exchanger tubes, a vapor duct joined to the top of said second chamber at a position between the joining of said heat exchanger tubes with said second chamber, said vapor duct disposed generally vertically to a position above said combustion chamber, and said vapor duct having an outlet portion reentering said furnace housing at the plenum chamber whereby water vapor created in the pair of heat exchanger tubes near said burner is delivered to the plenum chamber for admixture with air which travels upwardly through the hollow walls around the combustion chamber and into the plenum chamber.

2. A humidifier attachment in combination with a central forced air heating plant of the type having a combustion chamber, a burner in the combustion chamber and a warm air plenum chamber disposed generally over said combustion chamber, the humidifier attachment comprising heat exchanger means disposed generally horizontally in said combustion chamber over said burner, tank means disposed externally of said combustion chamber, means supplying water to said tank means, means limiting the level of water in said tank means, means joining said heat exchanger means to said tank means at approximately the level of the water in said tank means, a vapor duct having its lower end joined to the top of said tank means, and said vapor duct having a discharge end joining said plenum chamber, said heat exchanger means comprising a tubular element closed at its inner end, said tubular element positioned so that a lower portion thereof is disposed below the level of the water in said tank means and an upper portion thereof is disposed above the level of the water in said tank means, and the upper portion of said tubular element constituting a steam space and having a top surface tapering downwardly from the outer end of the tubular element near its juncture with the tank means to the inner closed end of the tubular element whereby steam created in the upper portion of said tubular element heat exchanger means moves more readily outwardly toward said vapor duct.

3. A humidifier attachment in combination with a central forced air heating plant of the type having a combustion chamber, a burner in the combustion chamber and a warm air plenum chamber disposed generally over said combustion chamber, the humidifier attachment comprising heat exchanger means disposed generally horizontally in said combustion chamber over said burner, tank means disposed externally of said combustion chamber, means supplying water to said tank means, means limiting the level of water in said tank means, means joining said heat exchanger means to said tank means at approximately the level of the water in said tank means, a vapor duct having its lower end joined to the top of said tank means, and said vapor duct having a discharge end joining said plenum chamber, said tank means comprising a tank, a vertically disposed partition in said tank dividing it into first and second chambers, said partition having an opening therein near the bottom, the first of said chambers carrying the means limiting the level of water in said tank means, and the second of said chambers receiving the heat exchanger means on the side thereof and the vapor duct at the top thereof, said second chamber of the tank including a generally horizontally disposed partition over a portion thereof spaced from the position of receiving the heat exchanger means and at approximately the desired level of water in the tank means, and the position of receiving the vapor duct in the top of said second chamber lying over said horizontally disposed partition and laterally spaced from the receiving position of the heat exchanger means in said second chamber whereby there is an effective separation of the second chamber into a lower water portion and an upper steam or water vapor portion.

4. A device as set forth in claim 1 in which said second chamber includes a horizontally positioned partition wall extending between the joining of the spaced apart heat exchanger tubes with the second chamber and disposed at a level therein substantially the same as the water level, and said vapor duct disposed directly over said partition wall.

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