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2,804,067

IMPROVED HUMIDIFIER SYSTEM

Filed Jan. 25, 1954

2 Sheets-Sheet 1

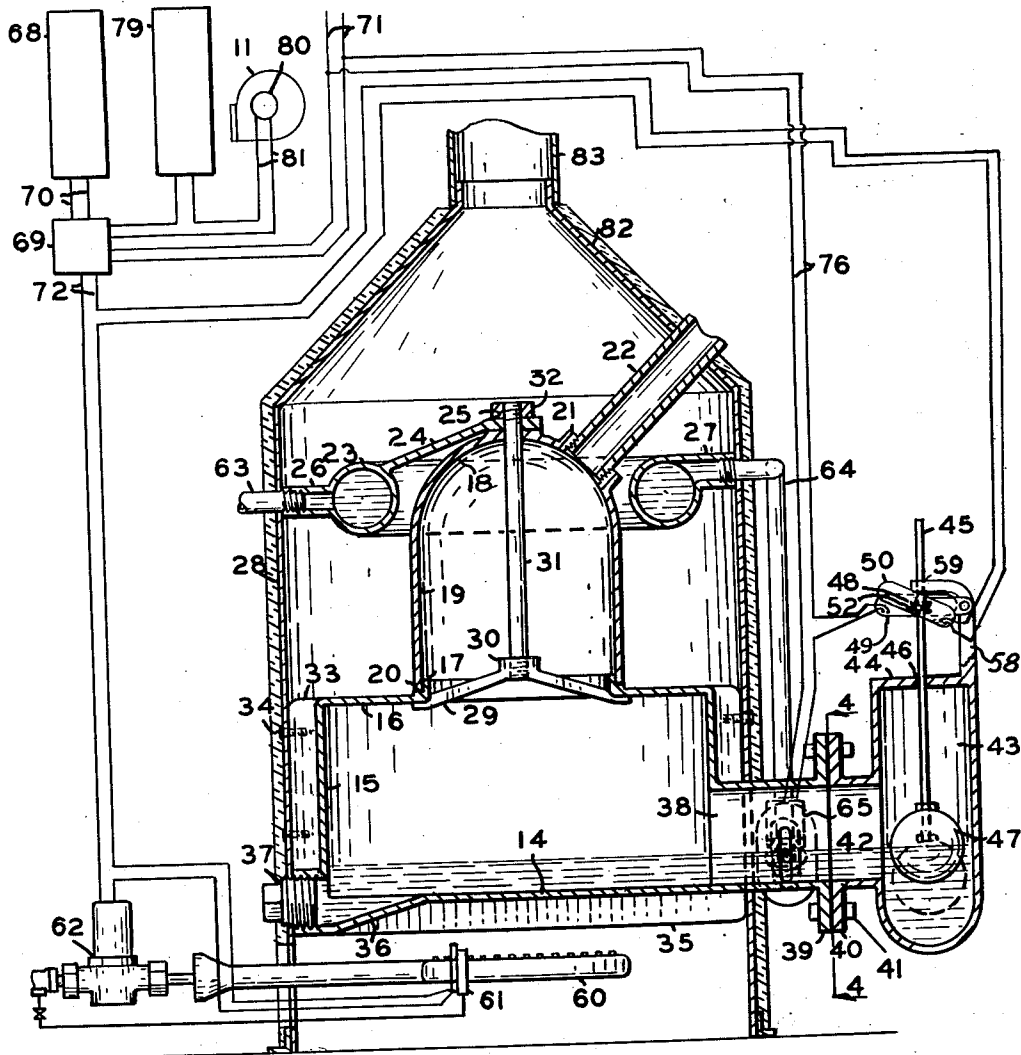


FIGURE 1.

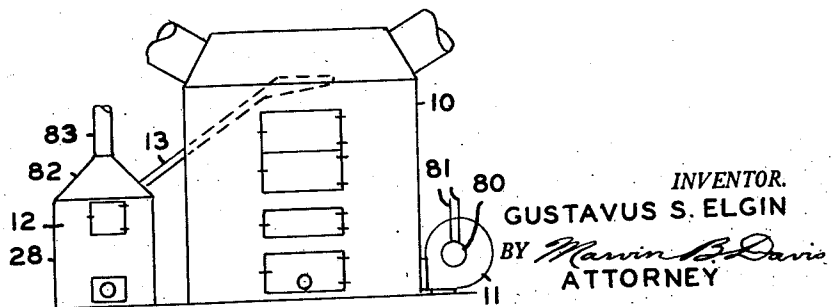


FIGURE 2.

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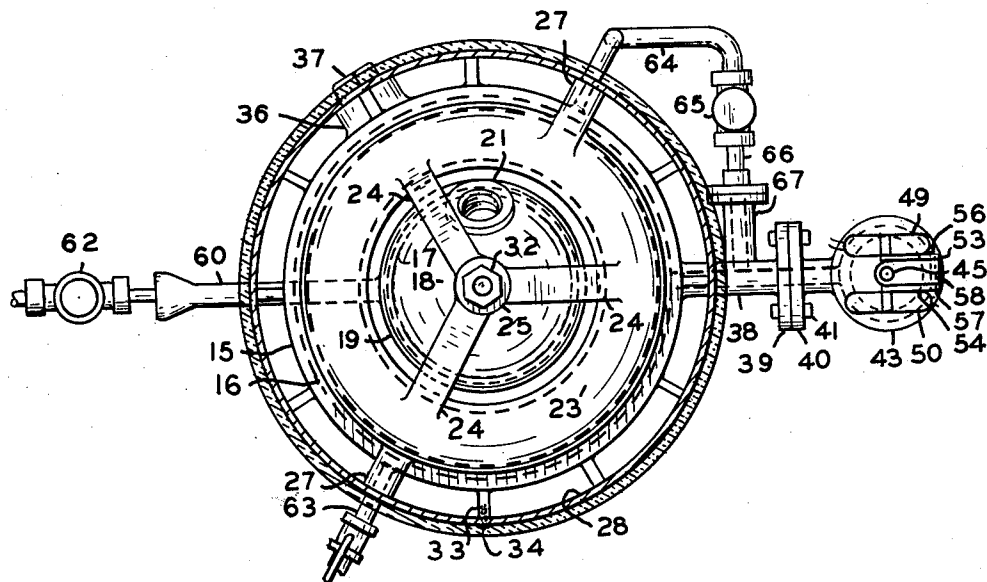


FIGURE 3.

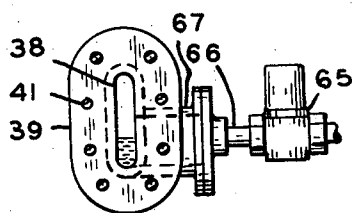


FIGURE 4.

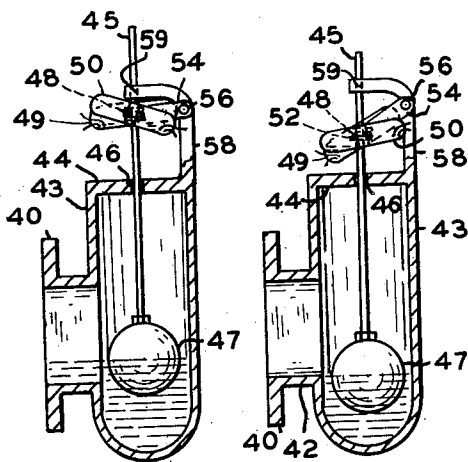


FIGURE 5. FIGURE 6.

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IMPROVED HUMIDIFIER SYSTEM

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7 Claims. (Cl. 126—113)

This invention relates to an improvement in a humidifier system with an evaporator responsive to the operation of a humidostat and more particularly to the simplicity of construction and control by electric equipment.

Heretofore humidifiers have been built in various forms with controls by electric equipment but are expensive to build and are not readily adapted for universal service and installation.

I have invented a humidostatically controlled evaporator system that operates independently of the furnace to automatically start the furnace fan, then generate steam in an enclosure over an evaporator plate and inject steam reasonably free from condensation through a conduit into the heating system where it is immediately circulated through the heating system in the form of warm moist air and also prevents condensation in the furnace or air ducts thereof. The steam pressure is just sufficient above the atmospheric pressure to deliver the steam to the heating system and the evaporator is safe for the reason that it cannot explode. Automatic means are provided to be responsive to the water level on the evaporator plate and a need for moisture from a humidostat to operatively control a gas supply to a gas burner spaced below the evaporator plate. I further provide a hollow preheater ring member to receive a supply of water and be located to preheat the water from the rising hot gases generated from under the evaporator plate before the preheated water is conducted to the evaporator plate.

A broad object of the humidostatically controlled evaporator system is to provide: means forming a cold water inlet to the hollow preheater ring member, means to pass water from the preheater into the evaporator chamber and on the evaporator plate, and automatic means operatively associated with the means to pass preheated water from the hollow preheater ring member to the evaporator plate and responsive to the water level of water on the evaporator plate to normally maintain the water at a predetermined level.

A still further object of the present invention is to provide means operatively associated with the humidostat responsive to operate the blower concurrently with the supply of gas to the gas burner.

The words "humidostat" and "humidistat" are not found in all dictionaries of current use and are derived from the words humidified and static. A humidostat or humidistat is generally used in the heating industry and has an electric switch contained therein operable by a device sensitive to the humidity of the atmosphere with means for adjustment to regulate the opening and closing of the switch according to the percentage of moisture desired in the atmosphere. The devices are manufactured and sold generally under the common name of "Humidistat" whereas the prior patent office art has adopted the spelling as "humidostat."

A further specific object of the improved humidifier system is to connect the humidifier evaporator plate therein with a float chamber enclosure having a float therein with automatic means operatively responsive to the float

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and adapted to control the supply of water through a solenoid operative valve to normally maintain the water at a predetermined level on the evaporator plate.

Another specific object of the improved humidifier system is to provide the float in the float chamber with automatic means operatively responsive to the float and adapted to control a supply of gas to the gas burner beneath the evaporator plate to normally operate between a predetermined high and low water level of water on the evaporator plate when the humidostat operatively indicates a demand for more moisture in the atmosphere.

Another object of the present improved invention is to provide a first automatic means responsive to the operation of a humidostat for maintaining a shallow water level on the evaporator plate, and when the water level lowers to the evaporator plate a second automatic means will be responsive thereto and shut off the gas supply from the gas burner to protect the evaporator plate from excessive heat.

A still further object of the present invention is to provide automatic means to force air through the hot air heating system to utilize the heat of the steam from my evaporator when the hot air heating system fails to respond to the heating requirements of a dwelling.

With these objects in view the invention will be further understood from the accompanying drawings, the following specification and the scope of the appended claims.

In the drawings:

Figure 1 is a vertical elevation of my improved evaporator with certain parts being broken away to illustrate the interior construction thereof, the automatic control means being shown with certain diagrammatic parts and electrical circuit.

Figure 2 is an elevation of a hot air furnace provided with a forced air fan or blower with portions of hot air ducts in a hot air heating system, my improved evaporator being spaced therefrom and a steam conduit leading from the evaporator into the hot air furnace jacket or heating system.

Figure 3 is a plan of my improved evaporator with portions being broken away to illustrate the interior, the water preheater and steam dome being rotated to different angles than illustrated in Figure 1 to show the flexibility of the evaporator for universal installations.

Figure 4 is a fragmentary view taken on line 4—4 of Figure 3 illustrating only the solenoid valve and water inlet parts for the evaporator plate and float control.

Figure 5 is a fragmentary view of the interior of the float control with the water level being illustrated at normal low, the mercury switch being in position for the automatic means to open the solenoid valve for water to flow therethrough.

Figure 6 is the same as Figure 5 with the exception that the water level is illustrated lowered to the evaporator plate level and the mercury switch therefor is in position to cause the automatic means of control to shut off the gas from the gas burner when the water supply has failed or the first automatic means has an electrical failure.

In Figure 2 a furnace 10 is a part of a hot air heating system and is provided with a forced air fan or blower 11. Spaced from the furnace is my improved humidifier or evaporator 12 with a steam conduit line 13 leading therefrom into the hot air heating system of the furnace 10.

The evaporator plate 14 is preferably of horizontal disk shape and is integral with the bottom edge of a vertical cylinder 15. A flat horizontal closure ring 16 is spaced from the evaporator plate 14, is integral with the top edge of the cylinder 15 and is provided with a collar 17 integral with the inner edge of the closure ring 16 and is projected upward therefrom.

A hemispherical shaped dome or head 18 is provided with a vertical cylinder 19. The bottom edge of the vertical cylinder 19 is fitted over the collar 17 and against the shoulder 20 of the flat closure ring 16. This shoulder 20 may be provided with any type of suitable sealing compound or gasket. A steam conduit connection or boss 21 is provided on the hemispherical shaped dome or head 18 to receive a steam conduit line 22.

A water preheater member 23 is preferably of tubular cross section, is formed in a hollow ring spaced around the hemispherical dome 18, is provided with supports 24 having a boss 25 and has a cold water inlet 26 and hot water outlet 27, each being extended through a cylindrical shaped jacket 28.

A cross member 29 spans the opening in the collar 17, overlaps the underside of the flat closure ring 16 and is provided with a threaded boss 30 located in the center of the length thereof. A threaded member 31 is screwed into the boss 30, and extends upward through the center of the hemispherical dome 18 through the boss 25 and these members are tightly drawn together by a nut 32 threaded on the upper end of the threaded member 31.

The vertical cylinder 15 is provided with a plurality of vertical ribs 33 spaced apart around the outer surface thereof. The vertical ribs are of uniform breadth and have one edge of each integral with the cylinder 15. The outer edges of the ribs are tap threaded to receive screws 34 to hold the cylinder jacket 28 to the vertical cylinder 15 for support. The bottom of the evaporator plate 14 is provided with a plurality of spaced horizontal ribs 35 for strength and to increase the heating surface thereof.

A sump 36 is provided in the evaporator plate 14 and is normally closed with a drain plug 37. A narrow and deep conduit 38 is integral with the vertical cylinder 15 and evaporator plate 14 and extends through the cylinder shaped jacket 28 to the bolting flange 39. The bolting flange 39 is bolted to a companion flange 40 by bolts 41 and a short length of narrow and deep conduit 42 extends to and is integral with a float chamber 43. The float chamber 43 extends below the bottom of the narrow and deep conduit 38, is of cylindrical shape, and extends upward to the head 44. The head 44 receives a float rod 45 slidable in the opening 46. The float rod 45 extends downward and is connected to the float 47. The upper portion of the float rod received the fixed collar 48 to raise and lower the mercury switches 49 and 50, by means of a yoke member 52. The mercury switches 49 and 50 are supported by arms 53 and 54 secured to a shaft 56. The shaft 56 is fulcrumed in the bearing 57 of the post 58. The upper end of the post 58 is curved and provided with a bearing opening 59 to permit the float rod 45 to slide freely and vertically therein.

A gas burner 60 is spaced below the evaporator plate 14, is provided with the usual pilot light 61 and a solenoid operated valve 62. The valve is opened when the solenoid coil is energized to admit the gas under pressure to the burner.

A cold water pipe 63 is connected to inlet 25 of the hollow preheater ring member 23, a water pipe line 64 is connected to outlet 27 and extends to solenoid operated water valve 65, and a pipe 66 connects the solenoid valve 65 with the narrow deep conduit 67 integral with conduit 38.

The humidostat 68 is connected to relay switch 69 by electrical conductors 70. Electrical voltage supply lines 71 are connected to the relay switch 69, and the secondary circuit of electrical conductors 72 connects the relay switch in series with; the solenoid operated gas valve 62, pilot light 73, and mercury switch 50.

The solenoid operated water valve 65 is normally electrically energized to open by means of the mercury switch 49 being connected in series therewith and elec-

trical conductors 76 joining electrical conductors 71 of the electrical voltage supply.

The thermostat 79 is electrically connected in series with the relay switch and the furnace forced air fan motor 80 by electrical conductors 81.

In the installation of the improved humidifier the selected location for placing it near the furnace is determined, and the preheater member, steam dome and evaporator plates are each manually rotated to suit the side of the furnace selected, the location of water and gas lines and the steam conduit line to the furnace or hot air heating system. The jacket 28 is normally fitted thereto and secured to the ribs 33 by screws 34. Openings are cut to correspond with the burner and pipe fittings and the jacket 28 extends to the floor below the gas burner for support. Flue frustum 82 is attached to the top of the jacket 28 and is provided with a flue member 83. The humidostat and thermometer are located in a selected room to be heated and the relay switch 69 is preferably located near the improved humidifier.

In the operation cold water is turned into the preheater 23, flows through solenoid operated water valve 65, through conduits 38 and 67 to evaporator plate 14 until the water level preferably reaches a depth of about an inch, the water also flowing to the float chamber 43 where the float 47 rises with rod 45 and collar 48 to lift and tilt the mercury switch 49 as illustrated in Figure 1 to break the electrical circuit and also close the solenoid operated water valve 65.

The humidostat 68 closes the circuit 70 for increased moisture thus energizing the solenoid operated gas valve to admit gas to the burner 60 provided the pilot light 61 is burning. The gas flows through the burner to combustion and the hot gases heat the evaporator plate to boil the water, pass upward between the vertical ribs 33, jacket 28 and cylinder 15 where the hot gases contact the cylinder 19 and hemispherical dome 18 to dry the steam before the steam flows through the conduit 2. The hot gases also preheat the water in the preheater 23. When the water level on the evaporator plate lowers preferably one fourth inch the float 47 lowers the rod 45 and mercury switch 49 to close the electrical circuit and add water to the former level.

When the humidostat circuit opens, the solenoid operated gas valve is closed to shut off the gas from the burner.

When the water supply fails to flow to the evaporator plate and the water is lowered by boiling to the plate level the float 47 lowers the rod 45 and mercury switch 50 tilts to open the electrical circuit 72 to shut the solenoid operated gas valve 62 to prevent overheating of the evaporator plate 14.

When the hot air heating system fails to heat and the temperature falls below normal and the improved humidifier is generating steam the thermostat 79 closes a circuit 81 through the relay switch 69 to operate the furnace blower or forced air fan motor 80 to circulate the generated steam with air through the hot air heating system thus improving the comfort of the inhabitants of the heating rooms under lowered temperatures and to prevent condensation in the hot air heating system.

What I claim as new and desire to secure by Letters Patent is:

1. An improved humidostatically controlled evaporator comprising, a hollow preheater ring member, a horizontal evaporator plate, a shell enclosure, said shell enclosure being integrally attached to the upper side of said horizontal evaporator plate so as to form an evaporator chamber, said hollow preheater ring member being spaced above said shell enclosure, said hollow preheater ring member being supported from said shell enclosure, a conduit, said conduit being connected to said shell enclosure and adapted for connection with a hot air heating system, vertical rib members, said vertical rib members

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being spaced apart around the shell enclosure and having one edge attached thereto, a jacket member, said jacket member being fitted around the outer edge of said vertical rib members, means to attach said jacket member to said vertical rib members, said jacket member being extended vertically above and over the hollow preheater ring member so as to form a heating chamber around the hollow preheater ring member, a flue member, said flue member being connected to the top portion of said jacket member, a gas burner spaced below said evaporator plate, said jacket member being extended downward with the lower edge thereof spaced below said gas burner, means forming a cold water inlet to said hollow preheater ring member, means to pass water from said hollow preheater ring member into the evaporator chamber to said horizontal evaporator plate, automatic means operatively associated with the means to pass preheated water from the hollow preheater ring member to the evaporator plate, said automatic means being responsive to the level of water on the evaporator plate to normally maintain the water at a predetermined level, a humidostat, means to control the supply of gas to the gas burner, the last mentioned means being operatively associated with the humidostat for control thereby, said humidostat being responsive to the water vapor delivered by the conduit, and said humidostat control means being responsive to a predetermined low moisture content of the space supplied by the hot air system to energize the gas control means to supply gas to the gas burner.

2. An improved humidostatically controlled evaporator as claimed in claim 1, and means operatively associated with the control of the supply of gas responsive to a water level below the level of the evaporator plate to deenergize the gas control means to discontinue the supply of gas.

3. An improved humidostatically controlled evaporator comprising, a hollow preheater ring member, a horizontal evaporator plate, a shell enclosure, said shell enclosure being integrally attached to the upper side of said horizontal evaporator plate so as to form an evaporator chamber, said hollow preheater ring member being spaced above said shell enclosure, said hollow preheater ring member being supported from said shell enclosure, a conduit, said conduit being connected to said shell enclosure and adapted for connection with a hot air heating system, vertical rib members, said vertical rib members being spaced apart around the shell enclosure and having one edge attached thereto, a jacket member, said jacket member being fitted around the outer edge of said vertical rib members, means to attach said jacket member to said vertical rib members, said jacket member being extended vertically above and over the hollow preheater ring member so as to form a heating chamber around the preheater ring member, a flue member, said flue member being connected to the top portion of said jacket member, a gas burner spaced below said evaporator plate, said jacket member being extended downward with the lower edge thereof spaced below said gas burner, a cold water inlet to one portion of the hollow preheater ring member, means forming a cold water inlet to said hollow preheater ring member, a pipe line conducting warm water from another portion of the hollow preheater ring member to the evaporator chamber, a solenoid operative valve connected with the pipe line so as to control the supply of water through the pipe line to the evaporator chamber, a float chamber enclosure and a float therein, said float chamber enclosure connected with the shell enclosure and opening into the evaporator chamber, automatic means operatively responsive to the float and adapted to control the supply of water through the solenoid operative valve to normally maintain the water at a predetermined level on the evaporator plate, a humidostat, means to control the supply of gas to the gas burner, and the last mentioned means being operatively associated with the humidostat for control thereby, said humidostat being responsive to the water vapor delivered

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by the conduit, and said humidostat being responsive to a predetermined low moisture content of the space supplied by the hot air system to energize the gas control means to supply the gas to the gas burner.

4. An improved humidostatically controlled evaporator as claimed in claim 3, and means operatively associated with the control of the supply of gas responsive to a water level below the level of the evaporator plate to deenergize the gas control means to discontinue the supply of gas.

5. An improved humidostatically controlled evaporator comprising a vertical cylindrical shaped evaporator shell, an evaporator plate, said evaporator plate integrally closing the bottom of the cylinder, a horizontal closure ring, said horizontal closure ring integrally closing the top of the cylinder with the center opening of the horizontal closure ring being concentric with the cylinder, a hollow vertical cylinder, said hollow vertical cylinder fitted against the top of the closure ring and opening into the evaporator shell through the opening in the concentric ring, a head member, said head member being integrally attached to and closing the top of the hollow vertical cylinder so as to form a steam dome, a hollow preheater ring member, said hollow preheater ring member having a tubular cross section and being spaced around and from the head member, a web member support, said web member support being attached to the hollow preheater ring member and extending inwardly to rest on the head member, a cross member, said cross member spanning the lower side of the opening in the ring member, a bolt member; said bolt member concentrically securing the hollow preheater ring member web member support, cylinder head, ring member and cross member together; a gas burner spaced below the evaporator plate, a conduit, said conduit being connected to said head member forming the steam dome and adapted for connection with a hot air heating system, a jacket member, said jacket member spaced from and surrounding all of the heretofore mentioned elements to form a heating chamber therefor, said jacket member being extended downward with the lower edge thereof spaced below said gas burner, means forming a cold water inlet to said hollow preheater ring member, means to pass preheated water from said hollow preheater ring member into the evaporator chamber to said horizontal evaporator plate, automatic means associated with the means to pass preheated water from the hollow preheater ring member to the evaporator plate, said automatic means being responsive to the level of water on the evaporator plate to normally maintain the water at a predetermined level, a humidostat, means to control the supply of gas to the gas burner, and the last mentioned means being operatively associated with the humidostat to be responsive to a predetermined low moisture content of the space supplied by the hot air system to energize the gas control means to supply gas to the gas burner.

6. An improved humidostatically controlled evaporator as claimed in claim 5, and means operatively associated with the control of the supply of gas responsive to a water level below the level of the evaporator plate to deenergize the gas control means to discontinue the supply of gas.

7. An improved humidostatically controlled evaporator as claimed in claim 5, in combination with a hot air heating system having an air circulating blower, said conduit being connected to said hot air heating system, and means operatively associated with said humidostat and responsive to a need for heat from said heating system to operate said blower concurrently with the supply of gas to said gas burner.

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