

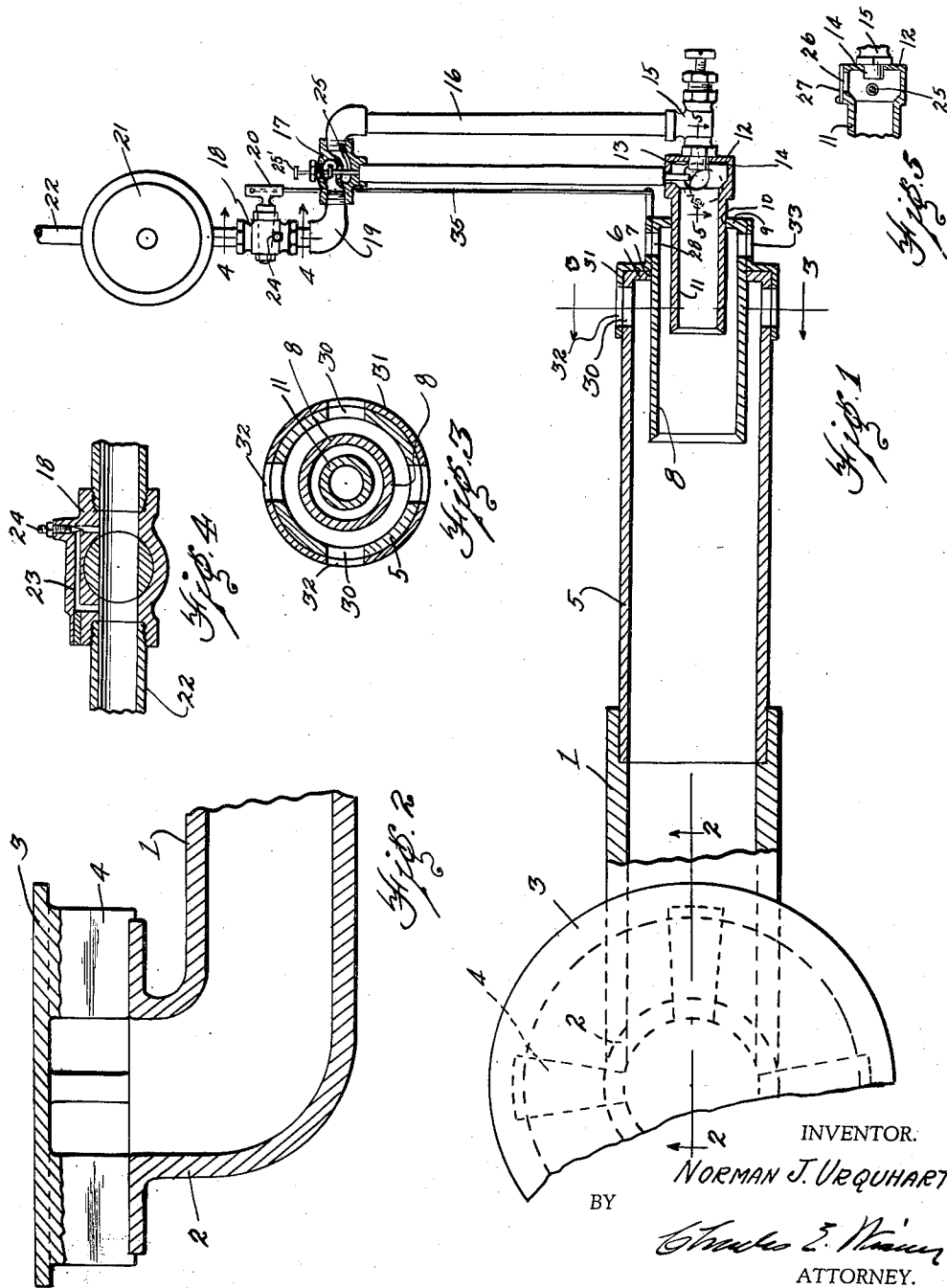
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GAS BURNER

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GAS BURNER

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2 Claims. (Cl. 158—118)

This invention relates to gas burners and the principal feature and object of the invention resides in the provision of a burner for burning natural or manufactured gas and which is so constructed as to permit the temperature of the flame to be controlled without loss of thermal efficiency.

Another object of the invention resides in the provision of a burner which is so constructed as to create a long, luminous flame the gas being so mixed with air as to provide for proper combustion thereby eliminating carbon monoxide losses in the stack.

Another object of the invention resides in the provision of a burner which is so constructed as to provide for progressive steps of firing of the gas, the burner having means for admitting preheated air at the different steps of the firing thereby preventing blasting or quick expansion of the gas.

Another object of the invention resides in the provision of a gas burner which may be installed in the combustion chamber of a boiler the burner being so constructed that all of the expansion and combustion of the gas is completed in the burner thereby permitting the total absorption area of the boiler to become available.

Another object of the invention resides in the provision of a burner which will automatically draw the correct amount of air into the burner.

A still further object of the invention resides in the provision of a burner which is formed with three combustion chambers concentrically arranged the gas being ignited in the first combustion chamber then allowed to expand in the second expansion chamber where it is mixed with additional air and then allowed to expand in the third expansion chamber where it is again mixed with the correct amount of air to provide for substantially perfect combustion.

These objects and the several novel features of the invention are hereinafter more fully described and claimed and the preferred form of construction by which these objects are attained is shown in the accompanying drawing in which—

Fig. 1 is a sectional plan view of my improved burner.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is a section taken on line 3—3 of Fig. 1.

Fig. 4 is a section taken on line 4—4 of Fig. 1.

Fig. 5 is a section taken on line 5—5 of Fig. 1.

Referring to the drawing, the tubular section 1 is formed with the upturned end 2 above which is superimposed the plate 3 suitably spaced by the legs 4 from the upper end of the section 1. It will

be understood of course, that the section 1, while not so shown, may be made of some refractory material or may be lined with the same to prevent deterioration of the section 1 due to the heat.

The plate 3 acts as a flame spreader to cause the flame to spread outwardly through the space between the plate and the upper end of the section 1. The tubular section 5 has approximately the same inner diameter as the section 1 and is formed with the end wall 6 apertured at 7 to receive the intermediate tubular section or combustion chamber 8, the same extending toward the section 1 away from the end wall 6 for a purpose to be hereinafter described. The section 8 is formed with the end wall 9 apertured at 10 to receive the primary tubular member or combustion chamber 11, the same extending from the end wall 9 toward the section 1 and stopping short of the open or discharge end of the section 8. The tubular section 11 is formed with the end wall apertured at 13 to receive the end 14 of the hand operated gas valve 15 the same receiving gas from the pipe 16 opening at one end into the valve 15 and at its opposite end to the valve 17. A manually controlled valve 18 connects to the valve 17 by means of the elbow 19, the valve being provided with the operating handle 20. A pressure control valve 21 is positioned in the gas line 22 and is normally set to maintain an even pressure on the burner below the pressure normally in the line 22. The valve 18 is formed with a by-pass 23 as shown in Fig. 4 the same having the needle valve 24 positioned therein to control the volume of gas flowing through the by-pass.

It will be seen therefore that when the valve 18 is completely shut off by the handle 20 that gas will flow through the by-pass 23 and when once ignited at the end 14 will act as a pilot light so that the burner may be turned on at any time. The valve 17 is controlled by the thermostatic member 25 the lower end of the same being positioned adjacent the end 14 of the valve 15 and when heated either by the pilot light or by the burner when operating will remain in the position as shown in Fig. 1. If for some reason, however, the pilot light is extinguished the member 25 will contract and will prevent flow of gas through the valve 17 thereby providing a safety device for preventing unignited gas passing into the burner. The valve 17 may be opened by lifting the handle 25' to permit relighting of the burner. The section 11 is provided with the aperture 26 for admitting air into the section 11 the amount of air being controlled by the positioning

of the disc valve 27. The section 8 is provided with a plurality of openings 28 and the section 5 is provided with a plurality of openings 30 each set of openings being controlled by the valve 31 having the openings 32 adapted for alignment with the openings 30 and the openings 33 adapted for alignment with the holes 28. By referring to Fig. 3, it will be seen that when the valve 31 is rotated the amount of air admitted to the section 5 and the section 8 may be properly regulated.

I have shown a link 35 connected to the valve 31 and to the handle 20 so that as the handle 20 is turned to control the amount of gas passing therethrough the valve 31 will be moved to properly adjust the openings 28 and 30 for receiving the correct amount of air. It will be understood, of course, that this showing is more or less diagrammatic and may be dispensed with entirely in which instance the valve 31 will be set by hand to adjust for the correct amount of air.

The device will operate in the following manner: Gas will be admitted to the primary section 11 through the end 14 of the valve 15 and will be ignited by the pilot light, and will be mixed with air entering through the hole 26 and when passing from the discharge end of the primary section 11 will expand and will mix with the air drawn through the apertures 28. The gas will then pass from the discharge end of the intermediate section 8 where it will again expand and be mixed with air drawn by expansion through the apertures 30. The flame will then pass through the sections 5 and 1, due to the stack draft, and will spread out through the openings between the plate 3 and the upper end of the section 1. It will be noted by referring to Fig. 1 that the air drawn through the openings 28 will be pre-heated by contact with the heated wall of section 11 before it comes in contact with the flame from the end of the primary section 11 and likewise air drawn through the apertures 30 will be pre-heated due to coming in contact with the outer surface of the intermediate section 8. The volume of air passing through the apertures 28 and 32 is in direct proportion to the expansion required and the air lift is created by the furnace flue plus the expansion pull and in measuring the quantities of air required at these points the burner itself tends to automatically determine the correct mixture for the reason that when a sufficient quantity of air is allowed through the opening 28 to ignite in the firing chamber formed by the tube 8 the expansion will create ring friction on the inner wall of the member 8 and therefore control the volume passing therethrough. The same condition exists in the tube 5 to which the tube 8 discharges and when the openings 32 have been adjusted to permit a sufficient quantity of air to flow thereinto the ring friction in the tube 5 will control the volume of air passing thereto. It is also to be noted that preferably the rate of expansion from the combustion chamber 11 through the combustion chamber 8 to the final combustion chamber within the tube 5 is in the following proportions, that is, if the combustion chamber 11 has an internal diameter of one-half inch the tube 8 should be one inch and must extend at least two inches beyond the discharge end of the chamber 11 to provide the proper heat radiating surface and the last chamber 5, being the completed combustion chamber, may be of any length but the heat radiating surface must be at least four inches long in the proportion of parts above enumerated. The successive com-

bustion chambers are of cylindrical form differing in length to provide proper heat radiating surfaces and of progressively greater internal diameters to prevent too great velocity of the air stream at the burner and the arrangement provides a construction in which combustion is completed in the tube 5 prior to discharge into the furnace beneath the plate 3. By this completion of combustion before discharge into the furnace proper there is no cold air area in the boiler or furnace chamber and no opportunity for air stratification.

The air therefore will be pre-expanded before coming into contact with the flame thereby preventing blasting or too quick expansion of the burning gas when mixed with the air. It will be understood that the length of the sections 8 and 11 may be increased when the gas used requires air of a higher temperature to be mixed therewith to provide for perfect combustion or if the gas is of such character as to require it being mixed with air of a lower temperature the sections 8 and 11 may be shortened. The disc valve 27 may be adjusted to compensate for various stack conditions. For instance, if the burner is installed in a furnace in which the stack draft is below normal the valve may be opened to permit a greater volume of air to pass through the aperture 26. If the draft conditions of the stack are very good however, the valve 27 will be partly closed to prevent an excess quantity of air being drawn into the primary section 11. It will be noted that the volume of air for the three steps of firing gradually increases. In other words, a predetermined volume of air is admitted into the section 11, a greater amount admitted into the section 8 and a still greater amount into the section 5. By having three progressive steps of expansion and combustion the flame temperature is below that of a single jet burner. It will be understood, however, that although the temperature of the flame is decreased, the thermal efficiency of the flame is extremely high, from actual tests being approximately ninety-seven percent.

In order to have a flame of extremely high temperature a greater volume of air is admitted into the primary chamber, a less amount in the secondary chamber and a still smaller amount in the outside chamber. It will thus be noted that the flame temperature may be controlled while still having a high efficiency. By having a flame of relatively low temperature deterioration by heat of the burner and the spreader plate 3 is prevented. It will be further noted that since all of the expansion and combustion takes place in the burner itself that the total absorption area of the boiler, in which the burner is placed, becomes available as there is no cold air area in the boiler itself and no opportunity for air stratification to occur. It will be further noted that the flame when expanding into the intermediate section 8 will draw a sufficient amount of air through the apertures 28 to form a second step of combustion and when the flame passes into the section 5 the expansion will draw air through the apertures 30 to insure practically complete combustion of the gas.

From the foregoing description it becomes evident that I have provided a burner for burning manufactured or natural gas which is so constructed as to permit the flame temperature to be controlled while still retaining the high thermal efficiency of the gas, further that the device

is simple and efficient in operation and will burn with a flame practically free from monoxide.

Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

1. In a gas burner, a series of three axially aligned tubular sections of different diameters through which gas may be discharged, the discharge end of the first section of smallest diameter extending into the second section of larger diameter a certain distance and terminating short of the discharge end thereof, the second section extending a greater distance into and terminating short of the discharge end of the third section of greatest diameter, means for admitting gas and air into the inlet end of the first section, variable means for admitting a volume of air to the second section in excess of that discharged into the first section, and variable means for admitting a still larger volume of air to the third section.

2. In a gas burner, a series of axially aligned

telescopically arranged tubular sections of successively greater diameters through which gas may be discharged, the discharge end of the first section of smallest diameter extending into the second section of larger diameter in spaced relation with the wall thereof and terminating a distance short of the discharge end thereof, the second section extending into and terminating short of the discharge end of the third section of greatest diameter and in spaced relation with the wall thereof, means for admitting gas and air to the inlet end of the first section, means for admitting a volume of air to the second section and about the wall of the first section extending thereinto, and means for admitting a greater volume of air to the third section and about the wall of the second section extending thereinto, the arrangement providing a means for progressive combustion of the gases discharged to the first section to practically complete consumption on discharge from the third section.

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