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H. H. MARSH ET AL.
GAS BURNER WITH GAS PREHEATING
CHAMBER AND FLAME NOZZLES
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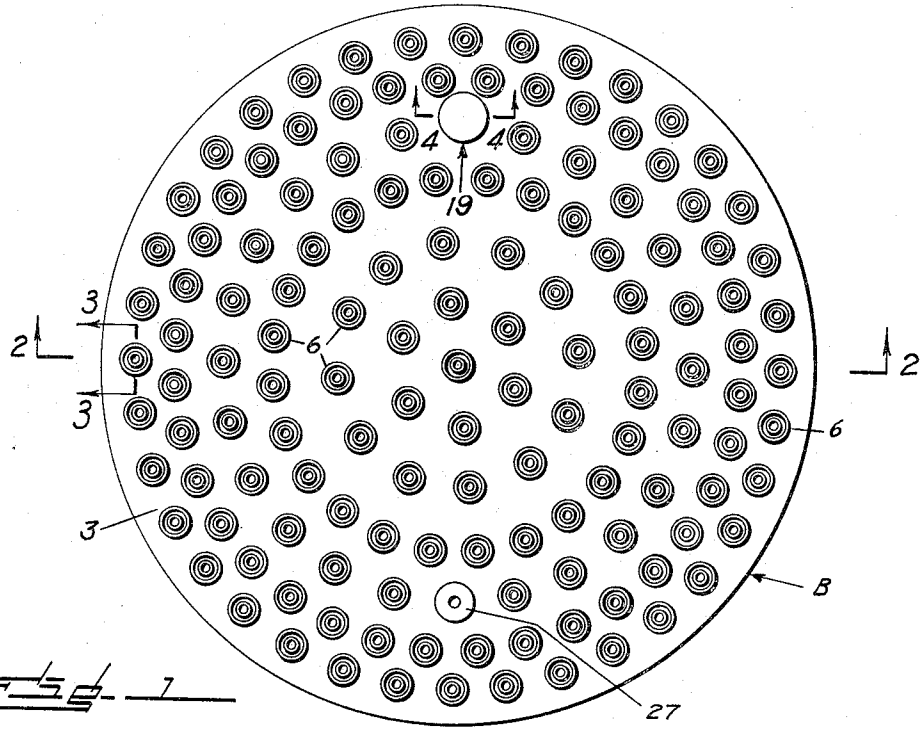


FIG. 1

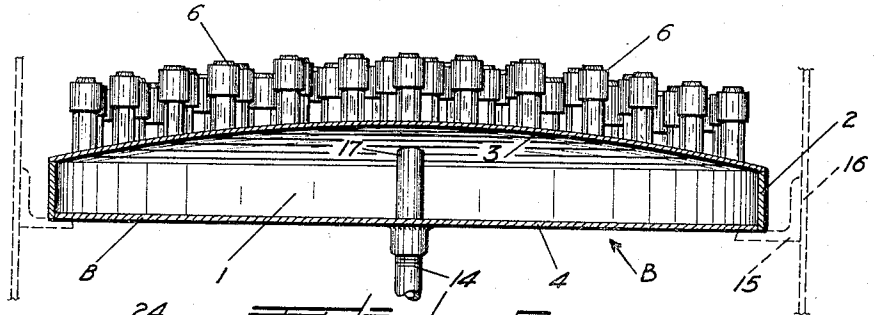


FIG. 2

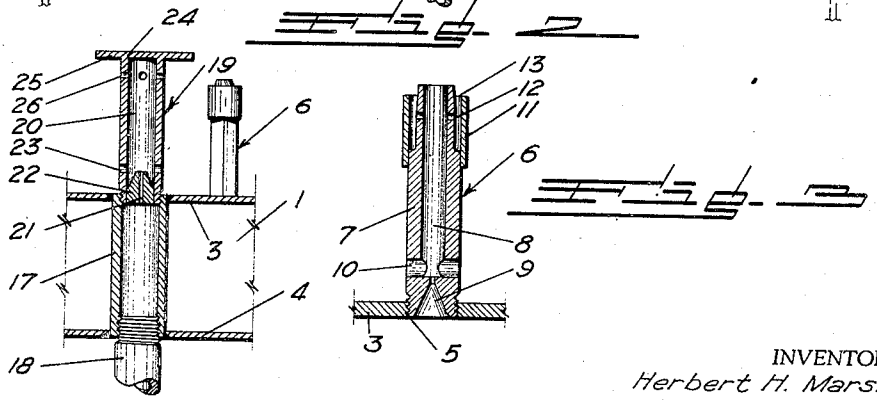


FIG. 3

FIG. 4

INVENTORS
Herbert H. Marsh
Glenn G. Short
BY
P. N. Lamphere
ATTORNEY.

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GAS BURNER WITH GAS PREHEATING CHAMBER AND FLAME NOZZLES

Herbert H. Marsh and Glenn G. Short,
Denver, Colo.

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2 Claims. (Cl. 158—104)

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Our invention relates to an improved burner for combustible substances such as natural and artificial gas.

One of the objects of our invention is to construct an improved gas burner which will produce efficient combustion of gas and thereby result in greater heat for a given volume of gas consumed.

Another object is to produce a gas burner which is simple in construction, highly efficient in operation and economical to manufacture.

Still another object is to so construct a gas burner that the gas, prior to combustion, will be considerably expanded by heat from the gas which is in the process of combustion.

A further object is to so construct an improved gas burner that jet members or tubes having individual inlets for mixing air with the gas can be efficiently employed.

A still further and more specific object is to produce a gas burner having a chamber for receiving unmixed gas only from the fuel source and a plurality of burner jet members or tubes provided with individual air inlets and in which the chamber is so constructed and the jet members so associated therewith that heat can be transferred from the flames to the chamber without interference of direct air currents passing in between jet members from the direction of the side of the burner remote from the jet members.

A further object is to provide improved means for associating a pilot jet member with a gas burner.

Yet another object is to produce an improved pilot jet member for a gas burner.

Other objects of our invention will become apparent from the following description taken in connection with the accompanying drawings in which:

Figure 1 is a top view of a gas burner embodying the invention;

Figure 2 is a cross sectional view of the gas burner shown in Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1 and showing details of the burner jet member; and

Figure 4 is a sectional view taken on the line 4—4 of Figure 1 showing the improved pilot jet member.

Referring to the drawings in detail and first to Figures 1 and 2, the gas burner disclosed, by way of example as embodying our invention, is generally indicated by the letter B and is shown as circular in shape. The burner comprises a

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cylindrical gas receiving chamber 1 formed by a cylindrical side wall 2, a convex top wall 3 (as viewed from the exterior) and a bottom wall 4. The walls may be separately formed and then welded together, or the side wall may be formed as a flange on either the top or bottom wall and then the remaining wall welded to the side wall. The walls are preferably made from sheet metal. The concave top wall is provided with a plurality of spaced apart threaded openings 5 and into each of these openings is screwed a burner jet member 6 shown in detail in Figure 3. The jet members are of the type which are provided with individual air inlet openings for mixing with the gaseous fuel which is fed to the jet from the chamber 1.

The spacing of the jet members may be in any desired manner, but preferably there is provided a circular row of jets closely adjacent the circular outer edge of the top wall to insure a series of flames close to the outer edge of the burner. The other jet members in the top wall may be regularly or irregularly spaced within this outer circular row of jet members and may or may not cover the entire top wall of the burner. In some instances it may be desired only to provide jet members closely adjacent the outer edge of the top wall of the burner and when such is done the jets can take the form of two circular rows with the outer row closely adjacent the edge, as indicated in Figure 1, and the next row just inwardly of this outer row, but with the jet members so spaced that they will be on radial lines which pass between adjacent jet members of the outer row. The two rows of jets will then assume a staggered relation, all as indicated in Figure 1.

Each jet member 6, as disclosed in the section view Figure 3, is of known construction and comprises a tubular element 7, the lower end of which is threaded so as to permit it to be screwed into the hole 5 of the top wall of the burner. At the lower end of the passage 8 there is formed a conical passage 9, the large end of which forms the inlet for the jet and the small end of which communicates with the passage 8 which extends to the outer upper end of the jet. Just above the point where the small end of the conical passage 9 enters the passage 8 a plurality of radial openings 10 are provided to thus permit air to enter the passage 8 and be mixed with the gas after it is forced under pressure into the passage 8. At the upper end of the jet member there is provided a cylindrical baffle 11 which surrounds

the tubular element 7 and is slightly spaced therefrom to form an annular chamber 12 open at its upper end. Small radial passages 13 extend through the tubular element and connect the upper end of the passage 8 with this annular chamber 12 so that there can be burning gas in the chamber to aid in maintaining the gas ignited that passes out the outer end of passage 8.

Gas is arranged to be supplied directly to the chamber 1 of the burner through a pipe 14 connected to an opening in the bottom wall thereof. The gas comes directly from the pressure supply line and enters the chamber in an unmixed condition, that is, there is no air mixed with the gas prior to its entering the chamber. Although the supply pipe is shown as connected to the center of the bottom wall of the chamber, it could enter through a side wall if such is desired. The circular burner is to be mounted below any structure that it may be desired to heat such as, for example, a boiler. As indicated in Figure 2 by dotted lines, the burner can rest upon ledges 15 extending from the side walls 16 of the base of the boiler or other structure.

With a gas burner constructed as just described, it will be seen that there is provided a gas receiving chamber of considerable volume and which is provided with a top wall having considerable continuous area. Mounted on this top wall are upwardly extending jet members which are supplied with unmixed gas from the chamber. The jets are so constructed that air is individually mixed at each jet. Since there is a single chamber only which is supplied with unmixed gas from the gas line and the top wall of this single chamber is continuous between all of the jet members, it will be impossible for any upward currents of air to pass from a point below the bottom wall of the chamber directly upward and in between the jet members. Consequently, with the elimination of such currents of air, it will be possible for considerable heat from the burning jet members to be transferred by radiation to the top wall of the chamber. Such transfer of heat will result in an expansion of the unmixed gas entering the chamber 1. This gas, in its expanded condition when mixed with air upon entering the passages of the jet members and becoming ignited at the upper end of the jet members, will cause the burner to have a higher efficiency. It is also to be noted in this connection that the air, when mixed with the gas, will be preheated as it must pass over the top wall of the burner before entering the air inlets of each burner member 6. Due to the fact that the gas is expanded in the chamber 1 from radiated heat from the burning jet members, less gas will be consumed yet the B. t. u. heat produced by each flame will be greater than would be possible where no expansion chamber was present or there was such a small chamber that little expansion takes place prior to the air mixing and burning. Actual installations of burners embodying the construction disclosed have proven that as high as forty percent greater heating efficiency per unit of gas consumed is possible than by presently known types of burner construction. The B. t. u.'s of heat obtained with applicants' burner per cubic foot of gas consumed is considerably higher than burners which are known as the manifold type, that is, where a chamber is provided with burner holes in its upper walls and gas mixed with air by a manifold between the source and the chamber having the jet holes. In such known prior burners the chamber is relatively small and is generally so irregular in shape that air can pass directly upwardly from below the burner to the top thereof and create an upward draft between jets. By mixing the air with the gas by use of a manifold positioned ahead of the chamber which is provided with the jet openings, there will be little expansion of the gas and it is further prevented from any appreciable expansion by the cooling effect of the upward draft between the jet openings. The chamber being small, consequently the gas will move directly to the jet openings and be ignited before any appreciable expansion takes place. Also, with the manifold type burners, cool air is mixed with the gas, thus also tending to prevent expansion.

It is believed that the reason for the high efficiency of our improved burner resides in the fact that the unmixed gas is allowed to enter a chamber of considerable volume having a top wall of considerable area, which will receive heat by radiation from the jet members mounted in the top wall and thus insure expansion of the unmixed gas before air is mixed with the gas individually at the jet members, which air will be preheated. That our improved burner with the chamber and arrangement of the jet members having individual air mixing openings obtains improved results is further evidenced by the fact that it is considerably more efficient than a burner which is constructed to have cross piping or radial piping as the gas receiving chamber with jet members extending upwardly from this piping. In such a burner the chambers formed by the pipes are small and the small top wall areas receive little heat from the ignited gas. Consequently there will be no appreciable amount of expansion of gas before it is consumed. Expansion will further be held to a minimum by the fact that cold currents of air are constantly moving upwardly between the pipe chambers and jet members and thus interfere with radiation of heat, together with the fact that relatively cool air will be mixed with the gas.

With a convex top wall provided for our improved burner, expansion of the gas in the chamber will be efficiently compensated for without any undue stresses being present. Furthermore, with the convex wall, dirt and foreign matter will have a tendency to roll off the top wall, thus aiding in keeping the burner clean. It is, of course, obvious that the burner may take shapes besides the circular one shown by way of example. However, to be efficient the chamber of the burner must be considerable volume and its top wall must be of considerable area and continues between any and all jet members to thus eliminate updrafts of air currents.

In order to provide an efficient pilot jet member for igniting our improved gas burner, there is extended through the gas receiving chamber 1 a tube 17. The upper end of this tube is welded or otherwise sealed in an opening in the upper wall 3 and its lower end is welded into an aligned opening in the bottom wall 4. With this arrangement of the tube a passage is provided through the chamber from the bottom of the burner to the top and within the outline of the burner. The lower end of the tube is connected by a conduit 18 to the gas supply so as to furnish gas to the pilot jet member 19 which is threaded into the upper end of the tube and of such height that its

flame end is above the top of the surrounding jet members 6. The pilot jet 19 is of special construction so as to efficiently ignit the jet members 6 when gas is allowed, by suitable valving, to flow to said jet members through the chamber 1. The position of the tube 17, which provides the passage through the chamber 1, is preferably located closely adjacent and just inwardly of the second circular row of the jet members. The pilot jet member is of special construction so as to insure that the jet members 6 will be fully and efficiently ignited. As clearly shown in Figure 4, the pilot jet 19 is of tubular construction providing a passage 20 which is arranged to be connected at its lower end to the tube 17 through a small orifice 21 formed in a plug 22. Just above the plug the tubular jet member is provided with two small air inlet openings 23, thus causing the gas coming from the source of supply to be mixed with air. The openings 23, if desired, can be replaced by a single opening of larger area. The upper end of the passage 20 of the pilot jet is closed off by an end wall 24 which is provided with an extension 25 so as to provide a baffle in the form of an annular flange at the top of the pilot jet member. Just below this baffle at the upper end of the pilot jet member there is provided small outlets 26 which extend in a radial direction.

With this construction of the pilot jet member 19, it will be seen that unmixed gas will be conducted into the jet members where it will be mixed with air and then forced out of the small radial outlet openings 26 just below the baffle 25 at the upper end. When this gas is ignited, small flames will shoot out in various horizontal directions and since the length of the pilot jet member is such that the flame openings 26 are somewhat above the level of the upper ends of the burner jet members 6, the gas coming from these jet members will be ignited. The annular baffle 25 will protect the radial pilot flames from any vertical drafts of air and thus prevent the flames from being blown out. The pilot jet member 19 is what can be termed a manual pilot jet and is allowed to burn at all times.

This manual pilot jet 19 should, for safety, be associated with an automatic pilot jet member and such a jet is shown at 27 in Figure 1, preferably being placed diametrically opposite the pilot jet 19 and just inside the second row of circular jet members 6. This automatic pilot jet member may be of any known construction and is arranged to control the gas being conducted to both it and the manual pilot jet 19. The automatic pilot jet member can be mounted at the upper end of a tube which extends through the chamber 1 in a manner similar to the tube 17, or a larger tube can be provided through the chamber 1 and a conducting tube with the automatic pilot jet member connected thereto and arranged to extend through this larger tube. The automatic pilot will be arranged to cut off the supply of gas to both it and the manual pilot 19 in the event the flame of the automatic pilot goes out, as is well known practice in connection with the operation of combined manual and automatic pilot jet members. With the two pilot jet members associated with the burner jet members 6 in the manner shown, it will be seen that the burners can be quickly and efficiently lighted. The pilots are arranged to be positioned inwardly of the outer two rows of jet members 6 and by providing tubes, such as 17, through the burner chamber, there will be no necessity of extending conduits across the top of the burner in order to bring gas to the pilot jet members. The pilot jet arrangement insures for efficient lighting of the burner which could not be accomplished by the usual practice of placing pilot jets at the side of the burner.

Being aware of the possibility of modifications in the particular structure described without departing from the fundamental principles of our invention, it is to be understood that we do not intend that the scope of the invention be limited in any manner except in accordance with the appended claims.

What is claimed is:

1. A burner for the burning of gas fuel from a supply conduit without any introduction of air into the gas coming from the fuel line and prior to entry into the burner, said burner comprising a chamber for receiving gaseous fuel and having a depth which is substantially less than one-half of any crosswise dimension of its top wall and said chamber also having its outer peripheral wall so constructed that no portion of such wall can be intercepted by a direct line drawn across the chamber between any two spaced points on the outer peripheral wall, means providing a gas inlet to the chamber for connection with the supply conduit for furnishing gas unmixed with air to said chamber from the source of supply with the area of said inlet being a small fraction of the area of the top wall, and tubular spaced jet members mounted on said top wall for receiving gas directly from the chamber and being distributed in closely spaced relation throughout the entire area of the top wall and without obstructions therebetween, said jet members each having an air intake adjacent the top wall and a flame end thereabove but spaced closely to the top wall in order to effect transfer of heat from said flame end to the top wall, said top wall having continuity in order to assure that the jet members when ignited are capable of transmitting heat to the entire top wall and therethrough to the gas in the chamber all without interference from any air currents moving directly upward in a vertical direction outside the peripheral wall from below the bottom of the chamber to the top thereof, the number of jet members being such in relation to the volume of the chamber and also the size of the supply conduit being such in relation to the size of the chamber that unmixed gaseous fuel passing through the chamber from the conduit to the burner will remain in the chamber a sufficient period of time as to have appreciable expansion due to heat radiated from the burners.

2. A burner for the burning of gas fuel from a supply conduit without any introduction of air into the gas coming from the fuel line and prior to entry into the burner, said burner comprising a chamber made from sections of sheet metal welded together for receiving gaseous fuel and having a circular top wall curved to present a convex exterior surface and an annular straight side wall and said chamber having a depth which is substantially less than one-half of any crosswise dimension of its top wall and said chamber being free of any obstructions between any two points on its side wall, means providing a gas inlet to the chamber for connection with the supply conduit for furnishing gas unmixed with air to said chamber from the source of supply with the area of said inlet being a small fraction of the area of the top wall, and tubular spaced jet members mounted on said top wall for receiving gas directly from the chamber and being distributed in closely spaced relation throughout the en-

tire area of the top wall and without obstructions therebetween, said jet members each having an air intake adjacent the top wall and a flame end thereabove but spaced closely to the top wall in order to effect transfer of heat from said flame end to the top wall, said top wall having continuity in order to assure that the jet members when ignited are capable of transmitting heat to the entire top wall and therethrough to the gas in the chamber all without interference from any air currents moving directly upward in a vertical direction outside the peripheral wall from below the bottom of the chamber to the top thereof, the number of jet members being such in relation to the volume of the chamber and also the size of the supply conduit being such in relation to the size of the chamber that unmixed gaseous fuel passing through the chamber from the conduit to the burner will remain in the chamber a sufficient period of time as to have appreciable expansion due to heat radiated from the burners.

HERBERT H. MARSH.
GLENN G. SHORT.

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