

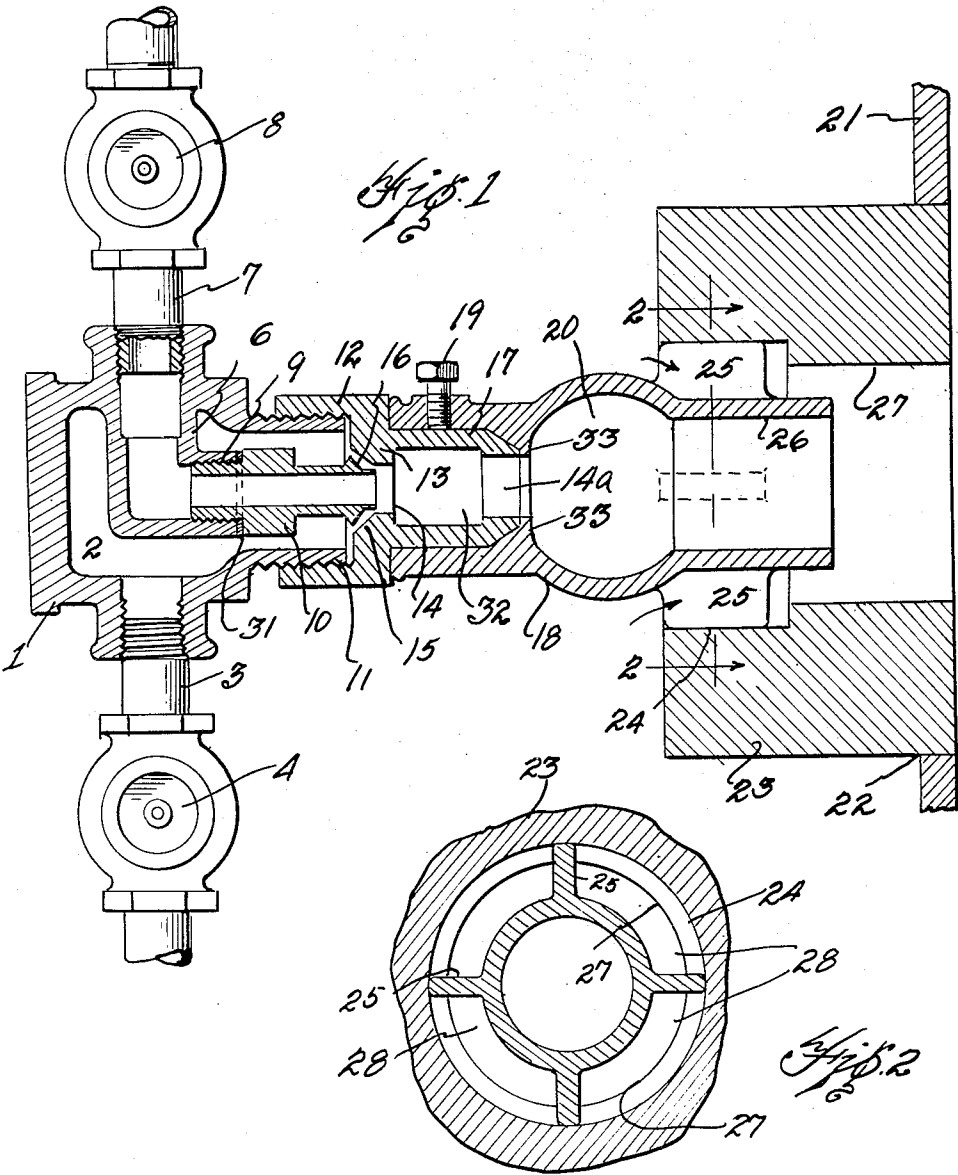
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GAS BURNER

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GAS BURNER

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This invention relates to gas burners for furnaces of various types, and an object of the invention is to provide a burner for the purpose stated in which the mixture of gas and air is produced and ignited in a body exteriorly of the furnace and discharged thereinto, provision being made whereby the volume of air in relation to the volume of gas may be readily varied without disassembling the parts and in conjunction therewith the provision of a means for causing cold air to flow about the device adjacent the point of the burning of the gas in order to prevent overheating thereof.

It is further an object of the invention to incorporate these features in a comparatively simple and inexpensive structure and thus to reduce the expense of manufacture.

These objects and novel features of the invention are hereinafter more fully described and claimed, and the preferred form of construction of a gas burner embodying my invention is shown in the accompanying drawing, in which—

Fig. 1 is a horizontal longitudinal section through the burner.

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

The burner consists of the hollow body 1 having a chamber 2 into which air may flow through the conduit 3 which is controlled by a hand valve 4. In this chamber 2 is a conduit 6 with which a pipe 7 is connected with the inlet end and provided with a hand valve 8.

The conduit 6 extends into the chamber 2 and is there turned at a right angle and threaded as at 9 to receive the threaded end of the nozzle 10 and through this pipe 7 and nozzle 10 the gas is discharged. A packing ring 31 is provided between a shoulder on the nozzle and the terminal end of the conduit 6 to prevent leakage of gas at that point. By making this nozzle 10 removable, nozzles of various sizes of apertures may be provided depending upon the volume of the gas that may be desired to be discharged therethrough.

The body 1 has a hollow extension 11 at one side in which the nozzle 10 is located

and this portion 11 is threaded to receive a threaded end of an adjusting element 12. This element 12 has a transverse wall 13 apertured as at 14 and coned as at 15 correspondingly with coned end 16 forming the terminal of the nozzle and relative to which the coned surface 15 is spaced to a greater or less extent by the threading of the member 12 toward or from the nozzle 10. This channel which is thus provided between the frusto-conical surface 15 and frusto-conical end 16 of the nozzle forms a passageway for air from the chamber 2 discharged into the chamber 2 under pressure. By varying the position of the part 12 longitudinally on the part 11 a greater or less volume of air may be discharged around the end of the nozzle 10. The volume of flow of air of course may also be controlled by the setting of a hand valve 4. The volume of gas to be supplied per unit of time is also controllable by means of a hand valve 8. The valves 4 and 8 may be of any desired type suitable for the purpose.

The forward end 17 of the member 12 is reduced in diameter and fits into an end of a combustion element 18 and a set screw 19 is provided by means of which the element 12, once it has been adjusted, may be held from turning to vary the adjustment for the air flow.

The parts 1 and 12 may be formed of brass while the mixing device 18, which is formed with an enlarged chamber 20 for the purpose, is preferably formed of chrome nickel steel alloy which is heat resistant in character and does not scale and oxidize by reason of becoming highly heated. To prevent the part 18 becoming too highly heated and transferring such heat to the elements 1 and 12, the structure is arranged to provide for a flow of atmospheric air about the discharge end of the member 18 which, being adjacent the flame, tends to become highly heated.

I have indicated a wall 21 which is to be understood as being representative of the wall of a furnace and provided with an aperture 28 through which the products of combustion pass into the furnace. In either case the pre-ignition or combustion chamber 20

in the member 18 is brought to such high temperature as to make it beneficial to construct the same of a material of high heat resistant quality and provide a means by which it may be air cooled.

This cooling arrangement is provided in the following manner—due to the high temperature attained by the gases at the point of combustion I provide a longitudinally apertured member 23 of a high heat resistant material such as porcelain or other convenient material and this device may be connected to the furnace wall in any approved manner or extended into the aperture 22 provided in the furnace wall to receive the same as indicated in Fig. 1 and this member 23 may conveniently extend into the furnace if desired although not so shown. The member 18 extends into this porcelain member 23, it being provided at the outer end with an enlarged cylindrical recess 24 of approximately the same diameter as the external faces of the ribs 25 provided on the exterior of the forward end 26 of the member 18. Thus, the member 18 is supported at its forward end by these fins or ribs which serve to position the end 26 axially of the central opening 27 of the porcelain element. It is to be noted that this member 26 is less in diameter than the diameter of the aperture 27 and thus there is a passageway 28 for air to flow about the forward end of the member 18 as is indicated by the arrows in Fig. 1. Air is induced to flow thereinto as stated by reason of the velocity of the products of combustion being discharged through the end 26 of the member 18.

The recess 24 is of greater length longitudinally of the porcelain member than the length of the ribs 25 and thus this member 18 may be moved inwardly of the porcelain body or outwardly thereof through adjustment of the member 12 which is connected with the body 1 which is fixed in position by reason of connection of the pipes 3 and 7 thereto.

Flow of gas through the pipe 7 and nozzle 10 is under normal pressure of the gas mains while the air supplied through the pipe 3 may be under high pressure. By reason of the form of the air channel provided between the end of the nozzle and the frustoconical portion 15 of the element 12, the gas is caused to flow into the air body and due to the direction of the air flow the gas and air are thoroughly mixed in the chamber 32 and discharged through the aperture 14a at the inlet end of the chamber 20. The chamber 20 is the pre-ignition or combustion chamber and the member 18 in which this chamber is provided is formed of chrome nickel steel alloy which is heat resistant in character and the end of the brass member 17 is protected from the high temperature of the combustion chamber by the inwardly

extending flange 33 which covers the end of the brass member 17. Practically the entire combustion takes place in the member 18 and in the porcelain member 23 so that only the heat or products of combustion pass through the wall of the furnace and into the furnace from this porcelain member.

With a burner constructed in accordance with the present invention, a positive and accurately controlled flame is possible. This renders the burner particularly adaptable for use in connection with many and varied types of furnaces wherein either a reducing atmosphere or an oxidizing atmosphere is required. It is possible to accurately control the products of the burner because of its characteristics wherein the gaseous fuel and air are thoroughly intermixed and ignited in a combustion chamber wherein a localized explosion of the combustible mixture occurs. By providing for this localized explosion the proportion of the air in the mixture when ignited and exploded may be accurately measured and controlled so that the products of combustion which ultimately enter the furnace can be accurately and properly proportioned to produce either the required excess of carbon monoxide (CO) and hydrogen (H) if a reducing atmosphere is required or to provide an excess of air if an oxidizing atmosphere is required.

In practice the gaseous fuel and air, the air being preferably under pressure, are introduced into chamber 32. The amount of air and gaseous fuel are regulated so as to provide a combustible mixture. Chamber 32 acts as a primary mixing chamber and inasmuch as the inlet aperture 14 thereof is of smaller diameter, an expansion of the gaseous fuel and air takes place upon its introduction into chamber 32. Following their expansion the fuel and air are contracted by their passage through the constricted outlet aperture 14a. The expansion and contraction of the fuel and air produces a turbulent action thereof which results in a partial intermixing of this fuel and air.

The fuel and air in this partially mixed condition are then introduced into combustion chamber 20 which, by reason of its larger diameter, permits another expansion of the then partially mixed combustible mixture. The combustible mixture is thereupon ignited in combustion chamber 20, this ignition causing a localized explosion in the combustion chamber 20. This explosion creates a further turbulence in the mixture and produces a pressure in all directions. This explosion and the resulting turbulence causes a further mixing of the fuel and air and by virtue of the construction of the combustion chamber, causes a portion of the gases, heated to a temperature sufficient to create further ignition of the incoming mixture, to flow rearwardly toward the aperture 14a.

This causes the ignition of the incoming mixture wherein the heretofore referred to action again takes place. The result is a continuity of localized explosions in the combustion chamber 20. The expansion due to the explosion and liberation of the heat units then follows the path of least resistance toward the mouth of the burner from whence it is directed into the furnace.

Theoretically and for all practical purposes the products of the burner can be controlled within permissible limits to supply exactly the atmosphere desired in the furnace. However, because of the intense heat generated by the combustion chamber, it is expedient from the practical standpoint to introduce air around the combustion chamber and into the furnace. This air wipes the outer wall of the combustion chamber and sufficiently cools the same to make the burner practical. If a completely reducing atmosphere is desired in the furnace, it obviously is necessary to provide in the products of combustion originating in the burner, an excess of carbon monoxide and hydrogen to compensate for this extra air supply which is introduced into the furnace.

From the foregoing description it is evident that the burner consists of few parts, is of simple form and inexpensive in construction requiring but little machine work in the production thereof.

Having thus briefly described my invention, what I claim and desire to secure by Letters Patent of the United States is—

1. A gas burner for furnaces comprising a hollow body having an extension on one side open to the interior thereof, a valve controlled conduit for air discharging into the body, a conduit for gas extending into the body and terminating in a threaded end portion, the axis of which coincides with the axis of the side extension, a valve controlled gas conduit connected with said conduit in the body, a nozzle member adapted for threaded relation with the said threaded end of the conduit in the body, a cap member for said side extension, the extension and cap being in threaded relation permitting variation in position thereof longitudinally of the extension, said cap member having a portion of less diameter extending outwardly therefrom and having a transverse wall formed with an aperture, the wall being countersunk to provide a coned recess coextensive with the aperture, said nozzle having a cone shaped terminal portion relative to which the coned recess of the cap member may be adjusted to vary the volume of flow of air per unit of time, a tubular element having an end portion fitting over the extension of the cap member and detachably connected therewith, fins provided on the exterior surface of the opposite end of the tubular element, a conduit formed of refractory material hav-

ing a central aperture counterbored at its outer end to receive the fins and spacing the inner end of the tubular member from the wall of the refractory element and providing channels for flow of air about the tubular element to the interior of the refractory element, said refractory element being connected with the furnace in a manner to allow the products of combustion to pass therein.

2. A gas burner for furnaces comprising a chambered body having an inlet on one side and an extension open to the chamber, an integral conduit extending into the chamber of the body and having a terminal portion positioned on the axis of the said extension of the body and providing an inlet for gas, a nozzle detachably connected to the said terminal portion of the integral conduit, a cap member for the extension having an opening therethrough into which the nozzle extends, the opening having a shape corresponding to the external shape of the nozzle and being adjustable to vary the space between the nozzle and the wall of the aperture through which air from the chamber may flow, a tubular device providing an extension for the cap connected with the said cap in a manner to permit adjustment of the cap on the said body and through which the gas and air may pass, a refractory element having a central aperture from which the products of combustion pass into the furnace, said refractory element and the end of the tubular device being so arranged that the end of the tubular device is supported in spaced relation with the wall of the aperture providing for a flow of air about the exterior of the forward end of the said tubular element for cooling the same.

In testimony whereof I sign this specification.

WILLIAM H. FOSTER.