Feb. 26, 1963 C. G. BIGELOW, JR 3,078,914

BURNER

Filed Jan. 29, 1959

Fig. 1

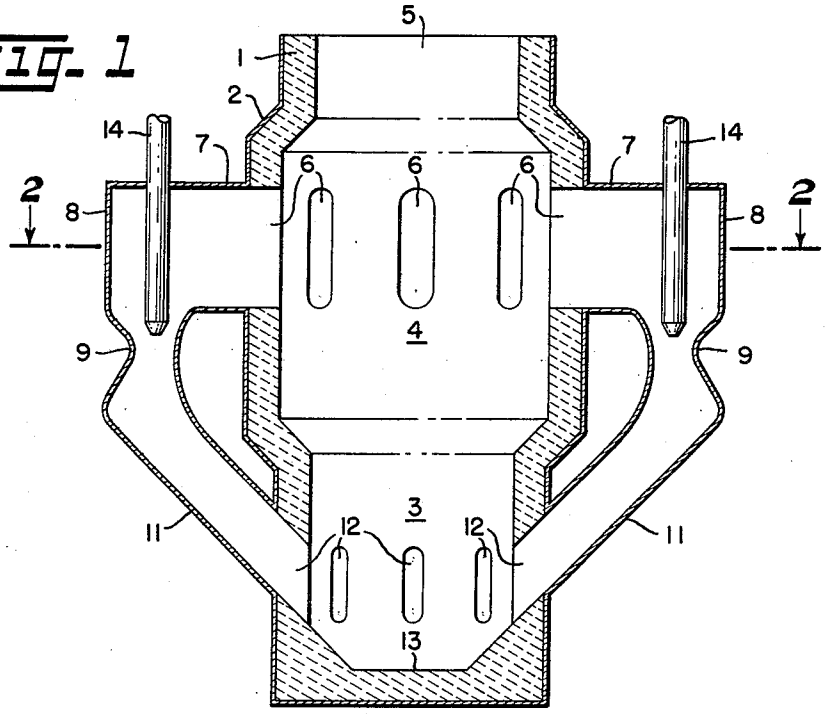
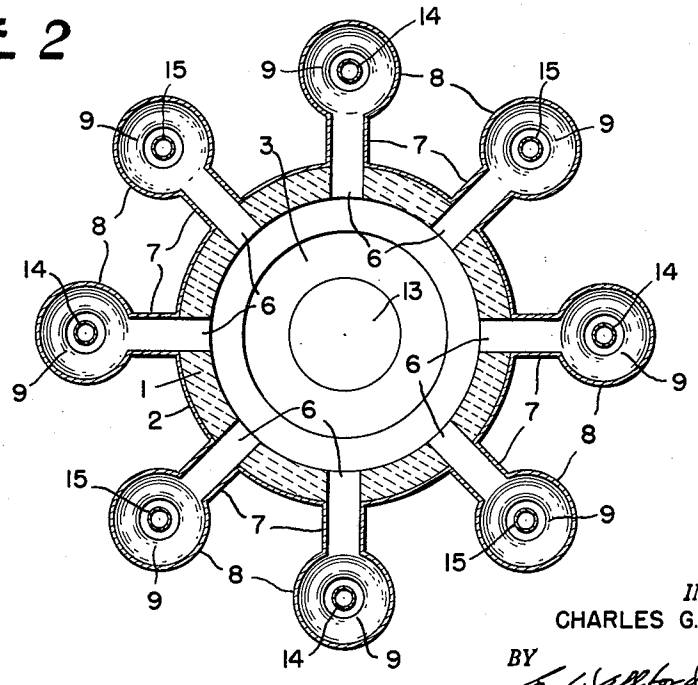


Fig. 2



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BURNER

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3 Claims. (Cl. 158—99)

The present invention relates to burners, and more particularly to a burner which is particularly adapted for high temperature application.

It is known that the more intimately the fuel and the combustion supporting gas are mixed the more rapid combustion can take place. It is also known that if the combustion ingredients are preheated that higher combustion temperatures can be obtained. The problem has been to obtain these two desired conditions in a single piece of apparatus, and one which is self-contained.

It is an object of the present invention to provide a burner which has a high capacity and one which will produce a high temperature.

It is a further object of the invention to provide a burner in which the fuel and the combustion supporting gas can be preheated as they are being introduced into the burner.

In following the invention there is provided a mixing chamber into which fuel such as gas and a combustion supporting gas such as air are introduced at high velocity and mixed. Communicating with this chamber is a combustion chamber in which combustion is initiated and substantially completed. The hot products of combustion are discharged from this chamber to a space which is to be heated. Some of the hot products of combustion are withdrawn from the combustion chamber and mixed with the gas and air to preheat them prior to the time they are introduced into the mixing chamber.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a sectional view through the burner, and

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

Referring to the drawings, the burner is shown as being a hollow, cylindrical body made of some suitable high temperature refractory 1 that is provided with a metal casing 2. The casing has formed in it a mixing chamber 3 that is in direct communication with a combustion chamber 4 which is larger in diameter than the mixing chamber. There is provided a restricted discharge opening 5 that may be of any convenient length for the purposes for which the burner is used.

A plurality of discharge ports 6 are formed around the combustion chamber. These ports connect with short ducts 7 that in turn open into enlargements 8 into which products of combustion from the combustion chamber 4 may enter. The lower end of each of the portions 8 is formed as a discharge, each of which is generally in the shape of a venturi. The lower end of the venturis supply the gases directly to ducts 11 which discharge through ports 12 formed in the walls of the mixing chamber. It will be seen that the ducts 11 have an inclination such that all of the gases passing through them impinge upon a wall 13 forming the lower portion of mixing chamber 3 and opposite the combustion chamber. While ducts 7 and 11 are shown as being radial to the chambers, it will be obvious that they can be at other angles between radial and tangential.

Fuel in the form of gas and a combustion supporting gas which may be air, oxygen enriched air or oxygen or a combination of them is introduced into the burner through pipes 14 and 15 which extend into alternate ones of the compartments 8. It will be seen that the lower ends of pipes 14 and 15 extend into a constricted portion of the venturi so that as the fuel and air are discharged into the venturis hot products of combustion will be aspirated from the combustion chamber through ports 6 to be mixed with these gases, thereby preheating them as they are flowing through the passages formed by the ducts toward the mixing chamber 3.

In the operation of the burner, gas and air are introduced at a suitable pressure through alternate pipes 14 and 15 in stoichiometric proportions. As these gases impinge against the wall 13 of the mixing chamber, the various streams of gas and air strike against each other and the wall 13, and are reversed in their direction of flow. A large amount of turbulence is created that produces an extremely intimate mixing, resulting in almost instantaneous combustion. The burning process takes place almost entirely in chamber 4 which has a larger volume than the mixing chamber.

During the process products of combustion will circulate through passages 6 into the enlargements 8 and on into ducts 11. As these products travel with the gas and air, respectively, the latter are preheated to increase further the temperature of combustion. The hot products of combustion with some flaming gases are discharged through opening 5 directly to the space to be heated.

It will be seen that ports 6 are larger in size than ports 12. This permits some of the pressure head of the gases entering duct 7 to be changed to velocity head as the gases are discharged into mixing chamber 3, thus creating greater turbulence and better mixing of the gas and air. The circulation of products of combustion through the passages formed by ducts 7 and 9 is, of course, helped by the aspirating action of the fuel and air being discharged in the venturi sections 9 from pipes 14 and 15.

The burner can be attached to the side of a furnace to discharge hot products of combustion into the same for heating purposes. The apparatus can be made in sizes such that the combustion chamber or discharge outlet itself can be used directly as a furnace with work located therein while it is being heated. If desired, the fuel injection pipes can take the form of atomizers to introduce liquid instead of gaseous fuel into the mixing chamber. When this is done, the heat of the chamber and the circulating gases will substantially vaporize the fuel prior to the time it is ignited. Consequently the term gas used in the claims should be understood to include fuel initially supplied as either a gas or a liquid.

It will be apparent from the above that large volumes of preheated air and gas can be intimately mixed and burned. Because of the intimate mixing combustion is extremely rapid, and the temperatures produced are high. The intimate mixing and preheating also permit a larger volume of fuel to be burned in a given space than would otherwise be possible.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. In a burner, structure forming a hollow body having

a mixing chamber and a combustion chamber in open communication with each other, said mixing chamber having a target wall spaced from and facing said combustion chamber, means forming a plurality of passages around said hollow body extending between said chambers and terminating in said mixing chamber in a direction pointed towards the center of said wall, and a plurality of supply pipes for fuel and for air, one of said supply pipes for fuel or for air terminating in each of said passages in a direction towards said mixing chamber whereby fuel and air discharged through said pipes into said passages will help circulate gases from said combustion chamber to heat the fuel and air in said passages as they move towards said mixing chamber.

2. The combination of claim 1 in which the area of said passages leaving said combustion chamber is larger than the area of the passages where they enter said mixing chamber.

3. The combination of claim 1 in which a portion of each passage has a venturi shape with said pipes terminating in the constricted portion of the venturi.

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