March 23, 1965 R. D. REED ETAL 3,174,527

COMBINATION OIL AND/OR GASEOUS FUEL BURNER

Filed June 13, 1962 2 Sheets-Sheet 1

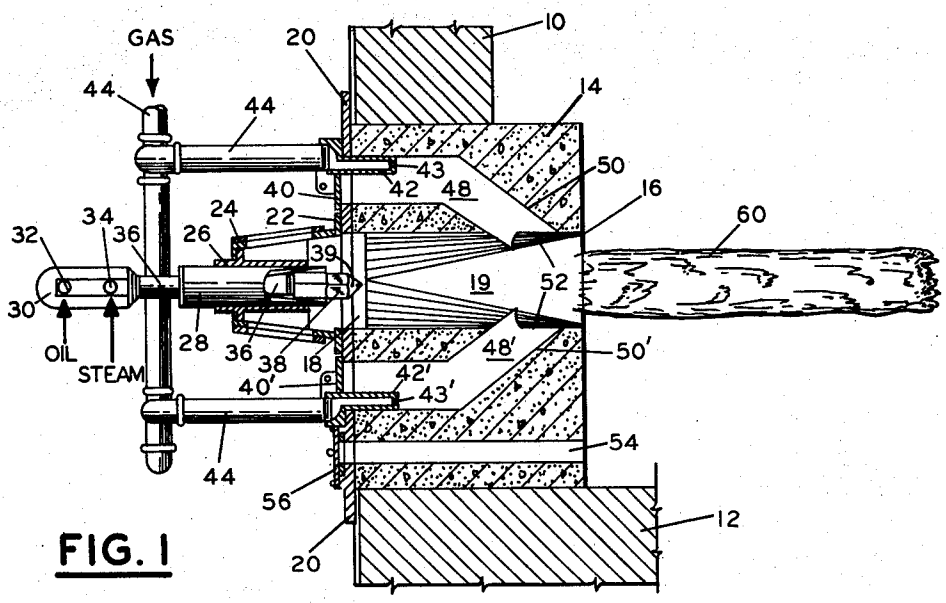


FIG. 1

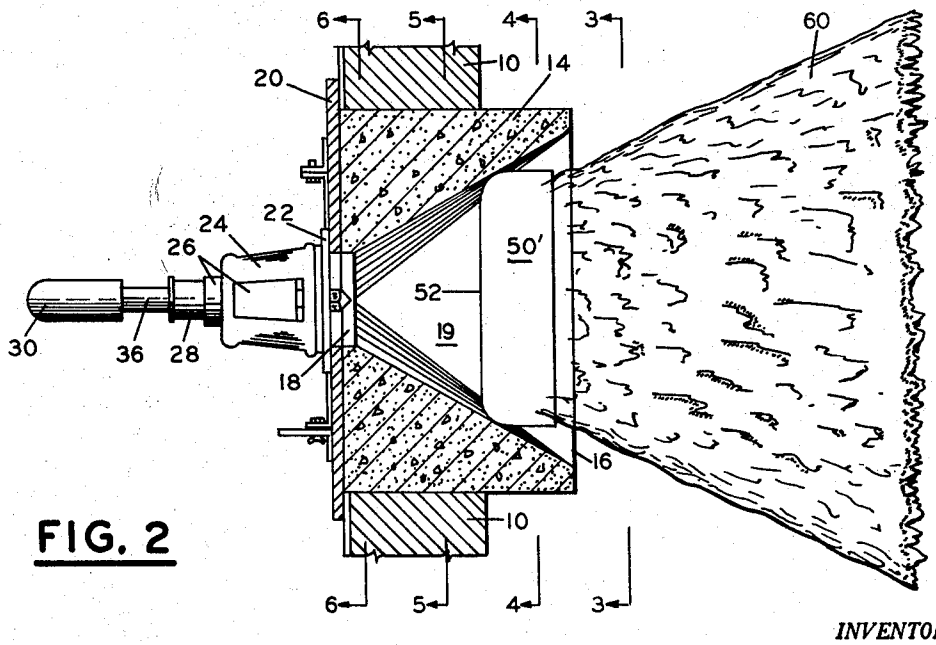


FIG. 2

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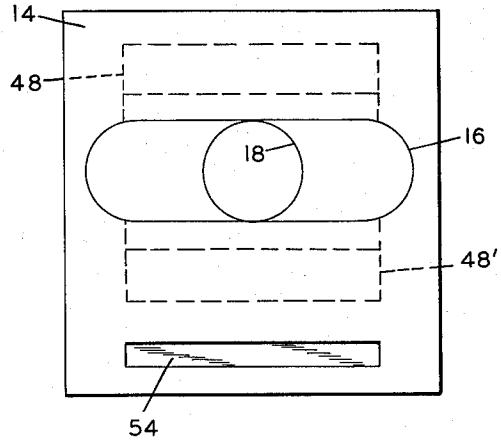


FIG. 3

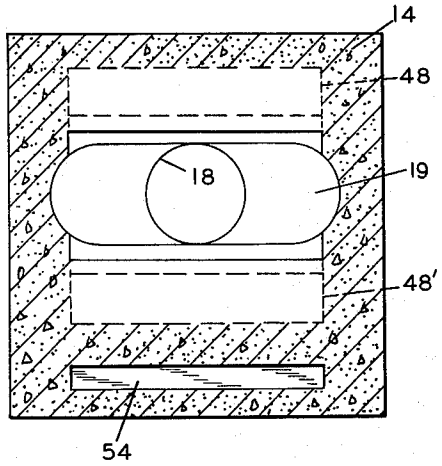


FIG. 4

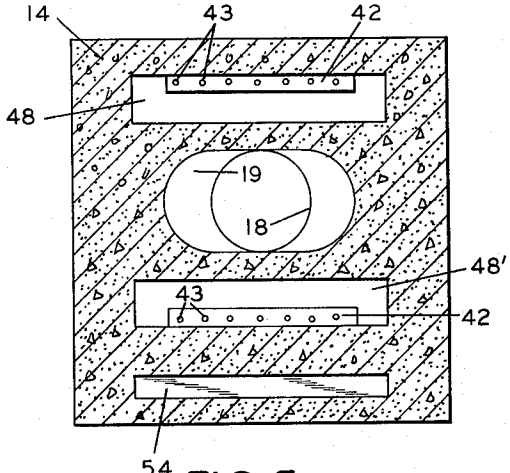


FIG. 5

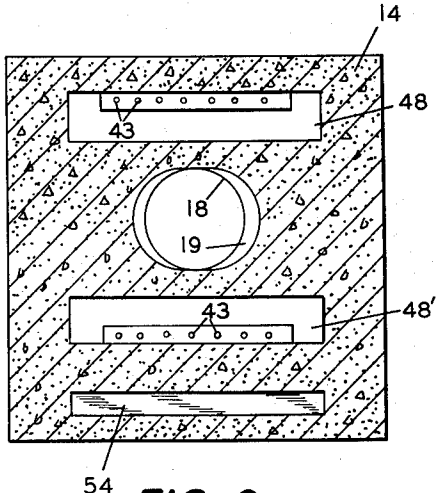


FIG. 6

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COMBINATION OIL AND/OR GASEOUS FUEL BURNER

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Filed June 13, 1962, Ser. No. 202,254
4 Claims. (Cl. 158—11)

This invention relates to a burner construction and more particularly to a combination liquid and/or gas fuel burner for use in producing high temperatures.

A primary object of this invention is to provide a burner construction capable of burning either gaseous and/or liquid fuels to produce a relatively thin, flat, substantially triangular flame shape. Such a flame occurs from the burning of either fuel or with both fuels fired simultaneously.

Another object of this invention is to provide a burner construction capable of creating a relatively flat, thin and substantially triangular flame which can be readily manufactured and is economical to construct and operate.

These and other objects of this invention will become more apparent upon further reading of the specification and claims when taken in conjunction with the following illustrations, of which:

FIGURE 1 is a side elevation view partly in cross-section depicting the burner construction of this invention and the resultant flame therefrom.

FIGURE 2 is a top elevational view view, partly in cross-section depicting the burner construction of this invention and the resultant flame.

FIGURE 3 is a frontal view taken along the line 3—3 of FIGURE 2.

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 2.

FIGURE 5 is a sectional view taken along the line 5—5 of FIGURE 2.

FIGURE 6 is a sectional view taken along the line 6—6 of FIGURE 2.

Briefly, this invention is directed to a burner block construction having an opening or port which is defined herein as being substantially frusto-conical-pyramid in its peripheral shape. That is, a substantially rectangular base with rounded corners defines the frontal opening which converges rearwardly to a substantially circular opening. A typical liquid fuel injection system is axially located adjacent the circular opening and directed toward the frontal opening. The injection system includes means to mix the liquid fuel with combustion supporting gas such as air.

A gaseous fuel-air mixture is separately injected and ignited and forced to flow through upper and lower channels. Each of the upper and lower channels specifically include a horizontal portion and an angular portion, the latter of which terminates at junction with the opening defined by the frusto-conical-pyramid walls. An input gas-air mixture is admitted into each channel and flows along the horizontal portion until diverted by the angular portion, which is, typically, a refractory surface. The issuing gases substantially intersect with the liquid fuel-air mixture, above and below, in the burner opening to form a resultant flame of relatively flat, thin and of substantially triangular shape extending substantially forward of the opening. At best, the flame will form a shape substantially identical to the burner opening, i.e., frusto-conical-pyramidic.

Description

Referring now to the drawings in detail. The numerals **10** and **12** represent a furnace wall and floor construction within which the burner block **14** of this invention is typically installed. It is to be understood that this is given by way of example only as the burner block **14** is adaptable to other types of construction where high temperature is required. The burner block **14** is molded or constructed of a suitable refractory material. A refractory material which is capable of becoming incandescent to assist the combustion of the gaseous and/or liquid fuel-air mixtures is preferred.

The frusto-conical-pyramid opening in the burner block **14** tapers inward from forward face **16** rearwardly to opening **18** to form burner chamber **19**. As shown in the drawing, the forward opening **16** is relatively rectangular in shape with rounded ends while the rear opening **18** is circular. The maximum vertical width of the opening is substantially epual to the diameter of rear opening **18**.

Suitably attached to the rear face of the burner block **14** and/or furnace wall **10** or floor **12** is support mounting plate **20** to which the stator portion **22** of a liquid fuel or oil register is axially located with respect to the burner chamber. Rotor **24** is suitably attached to the stator and rotatable therewith to control the primary air supply to the oil register. A concentric hub **26** is adapted to receive the liquid fuel guide tube **28** which is axially movable therein. A liquid fuel manifold **30** is adapted to receive, singularly or simultaneously, oil from inlet **32** and/or steam at inlet **34**. Steam is used to atomize the oil and assist in the combustion process. The combined oil plus steam passes through conduit **36** into nozzle **38** where a multiplicity of horizontal openings **39** are adapted to fan vaporized liquid fuel, such as oil, into the opening within the burner block. The combined configuration of the burner block opening and the horizontally aligned ports **39** at the tip of the oil atomizing gun initially assists to form the desired flame shape, i.e., flat, thin, substantially triangular or fan shape.

Adjustably attached to the support mounting plate **20** are upper and lower air control doors **40** and **40'** suitably arranged with respect to upper and lower gaseous fuel inlet heads **42** and **42'** which are rearwardly attached to gaseous fuel supply conduits **44**. The gaseous fuel, such as methane, or liquified petroleum gas (L.P.G.) such as butane or propane, passes through a multiplicity of horizontal ports **43** and **43'** into mixing and combustion channels **48** and **48'**. The gaseous fuel passing through ports **43** and **43'** mixes with controlled amounts of air entering through doors **40** and **40'**. The upper and lower channels **48** and **48'** are of substantially constant rectangular cross-section and extend horizontally a short distance and thence angularly until junction **52** with the opening **19**, slightly rearwardly of but substantially adjacent the forward opening **16**. Channels **48** and **48'** intersect with the chamber at an angle more than 90° with respect to forward opening **16**. Upper and lower surfaces **50** and **50'** respectively serve to deflect and direct the expanding and burning gas-air mixture into the burner opening. The upper and lower combustion streams passing through channels **48** and **48'** intersect in the burner chamber, the resultant force of which produces forward flow and a flat, thin flame **60** (FIGURE 1), substantially triangular or trapezoidal in shape (FIGURE 2).

Surfaces **50** and **50'** being of a refractory material, become heated by the burning gas-air mixture within channels **48** and **48'**. The heated surface of the refractory becomes incandescent or a heat source to accelerate the burning of the combustible gaseous fuel-air mixture.

A tertiary air supply is admitted through opening **54** which extends from the forward burner block face to the rearward face on support plate **20** where the air supply is controlled by a draft or shutter apparatus **56**. The tertiary air supply provides not only a cooling medium for the re-

fractory surface, but also an aid to complete combustion of the fuel. The air passing outward from opening 54 into the forward flame area is drawn into the flame because of its relatively high velocity.

The burner chamber 19 is designed such that when liquid fuel-air mixtures are fired and burned, there is little or no contact of partially burned oil with the peripheral surface, hence coking and carbonizing of the surface is eliminated.

The preceding description makes it apparent that the construction is susceptible to some modification. For example, although the construction has been shown for a typical horizontal installation, i.e., the flat, thin, trapezoidal shaped flame is horizontal, it is to be understood that the burner block may be so rotated as to form a substantially vertical flame. Accordingly, these changes and others can be made without departing from the spirit and scope of this invention as set forth in the appended claims.

What is claimed:

1. A combination burner for combustible mixtures of gaseous and/or liquid hydrocarbon fuels comprising the combination of:

a support block having substantially parallel forward and rear faces,

a burner chamber in said block peripherally transitioned from a substantially circular opening at said rear face to an opening at said forward face of vertical width substantially equal to the diameter of said circular opening and a horizontal length greater than said diameter,

said block being formed with upper and lower channels extending from said rear face and angularly terminating into said chamber toward said opening at said forward face,

means to inject a combustible fuel mixture axially of said chamber toward said opening at said forward face, and

means to inject a combustible fuel mixture into each of said upper and lower channels to cause a resultant flame of a relatively flat, thin and substantially triangular shape.

2. A combination burner as defined in claim 1 wherein said upper and lower channels extend substantially across the horizontal length of said chamber walls where said channels terminate into said chamber.

3. A combination burner as defined in claim 1 wherein said upper and lower channels angularly intersect said chamber at an obtuse angle toward said forward face.

4. A combination burner as defined in claim 1 wherein an auxiliary air supply conduit extends from said rear face to said forward face parallel to the horizontal axis of said chamber.

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