

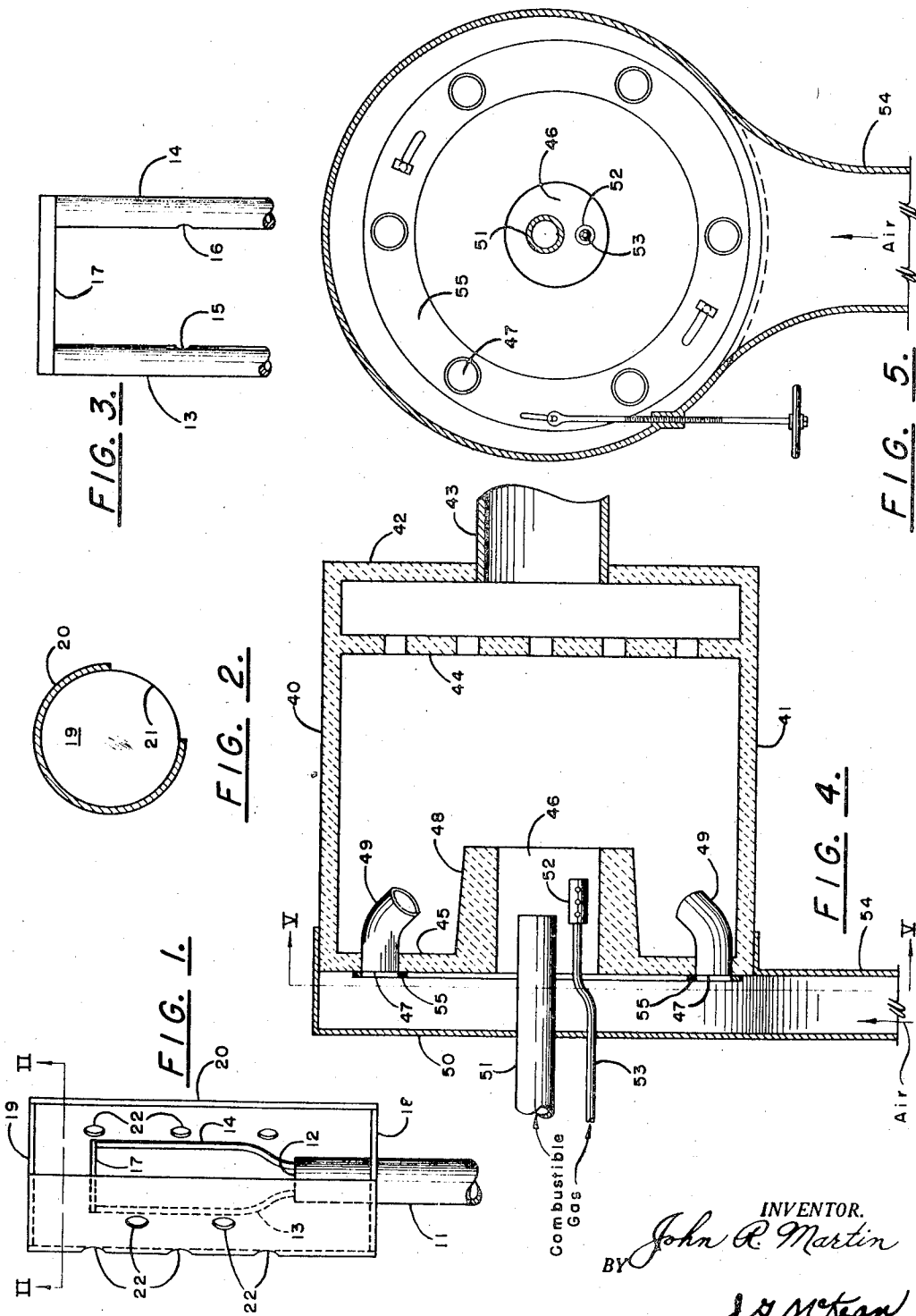
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BURNER FOR COMBUSTIBLE GASES

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BURNER FOR COMBUSTIBLE GASES

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1 Claim. (Cl. 158—7)

1

The present invention is directed to a device adapted for burning combustible gases. In its more specific aspects, the present invention is directed to a pilot burner adapted to be supplied with combustible gases and which remains ignited even when placed in a stream of gases having a relatively high velocity. The present invention is also directed to the arrangement of a combustion chamber provided with means for supplying relatively large amounts of combustible gases and oxygen-containing gases and having the pilot unit mounted in a stream of oxygen-containing gases adjacent the inlet for the combustible gases.

The improved pilot burner of the present invention may be described generally as involving a vessel adapted to be connected to a source of gaseous fuel and a pair of conduits fluidly attached to said vessel with the axes of the pair of conduits parallel, the conduits defining outlets lying on a common axis and in apposition whereby the gaseous fuel flows from the vessel through said conduits and leaves the conduits through the outlets in the form of opposing jets. The projection of the two streams of gas against one another results in a condition of turbulence at the point of impact of the streams and when the gas is ignited the resultant flame is extremely difficult to extinguish. In its preferred form, the pilot burner of the present invention includes a conduit adapted to be connected to a source of gaseous fuel having its end closed and having connected thereto a pair of relatively small conduits arranged coaxially with respect to the tubular conduit and each conduit of the pair defining an outlet making a right angle with the axis of the conduit and in opposition to the other outlet, and a shield, defining generally a tubular shape with a portion or portions removed, of a diameter substantially greater than the diameter separating the pair of smaller conduits arranged over the smaller conduits and mounted coaxially on said tubular conduit.

The pilot burner of the present invention is suitable for use generally in combustion chambers which are provided with a gaseous fuel and an oxygen-containing gas and where it is necessary or desirable to maintain a flame under adverse circumstances. The pilot burner is particularly adapted for use in hot gas generators of the type employed to supply hot gases to sulfuric acid plants for the purpose of regenerating spent acid. In such hot gas generators it is necessary to supply large amounts of heated gases under a pressure greater than atmospheric and

2

such generators are often designed to supply an oxygen-containing gas, such as air, at very high velocities to the burners. For example, the stream of air supplied to the burners may have a velocity of the order of 60 feet per second and this blast of oxygen-containing gas renders it difficult to maintain combustion within the combustion chamber.

The invention will now be described in greater detail in conjunction with the drawing in which

Fig. 1 is an elevation, partly in section, showing a preferred construction of the pilot burner assembled with its shield,

Fig. 2 is a view taken along section II—II of Fig. 1,

Fig. 3 is a detailed view of internal elements shown in Fig. 1,

Fig. 4 is an elevation, partly in section, of a hot gas generator adapted to supply large amounts of hot gas for industrial purposes, and provided with a pilot burner of the design shown in Figs. 1 and 2, and

Fig. 5 is a view taken along line V—V of Fig. 4.

Turning now specifically to the drawing and first to the pilot burner shown in detail in Figs. 1, 2 and 3, a conduit 11, adapted to be connected to a source of fuel gas, not shown, has its end closed by means of a plate 12 to which is attached a pair of smaller conduits 13 and 14. It will be understood that plate 12 is provided with openings corresponding to the passages in the conduits 13 and 14 to allow fluid communication between these conduits and conduit 11. Conduit 13 is provided with an outlet 15 defining substantially less area than the area of the conduit and similarly, conduit 14 is provided with outlet 16 of substantially less area than the area of flow of conduit 14. Outlets 15 and 16 are arranged so that the gases passing through conduits 13 and 14 respectively form jets which impinge upon each other to form a turbulent area at the point of impact of the jets. In the drawing, the outlets 15 and 16 are shown as lying on a common axis and in opposition to each other and as making an angle of 90° with the axes of conduits 13 and 14. It will be understood that conduits 13 and 14 are provided with no outlets except outlets 15 and 16, respectively; it is convenient to close the ends of conduits 13 and 14 by means of a flat member 17 which serves not only to close the ends of the conduits 13 and 14 but in addition serves as a brace to maintain these two conduits in a spaced relationship.

The combination described, including conduits 11, 13 and 14, in itself is a complete pilot burner

which remains ignited under adverse circumstances. It will usually be desirable, however, to provide a shield member in order to protect the jets projected through outlets 15 and 16 from direct contact with high velocity gases. A suitable means for protecting the jets of gas includes a shield formed by an annulus member 18 arranged around and secured to conduit 11, a circular end member 19 and a wall member 20 with one end secured to end member 18, its other end secured to end member 19 and from which a section 21 has been removed. It is desirable to provide the wall member 20 with perforations 22.

The arrangement of the pilot burner shown in detail in Figs. 1 to 3, inclusive, in a hot gas generator is shown in Figs. 4 and 5. In the embodiment shown, members 40 and 41 define wall sections which are connected to end section 42 provided with outlet 43. Adjacent end section 42 is a perforate wall section 44, formed, for example, by laying up brick in a checkerwork pattern, and arranged to prevent flames from impinging upon end section 42.

Opposite end section 42 is end section 45 defining a central opening 46 and a plurality of smaller inlet openings 47 arranged symmetrically around central opening 46. Annulus 48 surrounds central opening 46 and extends inwardly. Inlet members 49 are secured to furnace wall 45 adjacent the inlet openings 47 and are arranged to project oxygen-containing gases tangentially with respect to annulus 48. Spaced away from wall 45 to define a chamber or passage for conducting oxygen-containing gases to central opening 46 and openings 47 is a breaching member 50. An inlet member or conduit 51 having a diameter substantially smaller than the inside diameter of annulus 48 extends through breaching 50 and is arranged co-axially with annulus 48 with an end of member 51 projecting through wall 45 and within annulus 48. Between inlet 51 and annulus 48 is an annular space within which is arranged the pilot burner, designated by numeral 52. The pilot burner is connected to a suitable source of combustible gas, not shown, by means of a relatively small conduit 53 which is generally parallel to inlet 51 and extends through breaching 50. A conduit 54 is connected with breaching 50 to supply oxygen-containing gases to the chamber defined by breaching 50 and wall 45. These gases pass via inlet members 49 and the annular space between inlet 51 and opening 46 into the combustion chamber defined by walls 44, 45, 40 and 41. To control the flow of gases through these openings, dampers 55 are provided.

In the embodiment shown it will be evident that relatively high velocity of flow occurs in the passage in which the pilot burner 52 is arranged. However, the construction of the pilot burner is such that it remains ignited even though gases flow through the passage in which it is arranged at a relatively high velocity.

In order to illustrate further the present invention, dimensions which have been found advantageous in the construction of the embodiment shown in the drawing are given. It will be understood that these dimensions are given only by way of illustration and are not intended to limit the invention disclosed herein. Conduit 11 may be constructed of $\frac{3}{4}$ -inch tubing. Conduits 13 and 14 may be constructed of $\frac{1}{4}$ -inch tubing with a length of approximately 4 inches and spaced approximately $1\frac{1}{2}$ inches apart. The

outlets 15 and 16 may have a diameter of $\frac{1}{8}$ -inch. Shield 20 may be $2\frac{1}{2}$ inches in diameter and 8 inches long and perforations 22 may be $\frac{3}{8}$ -inch in diameter and spaced 2 inches apart. The longitudinal opening 21 is preferably from $\frac{1}{4}$ to $\frac{1}{3}$ the circumference of the tubing. A pilot burner having the dimensions given above may be arranged in a hot gas generator wherein inlet 51 is 4 inches in diameter and supplies combustible gas to the hot gas generator; the combustible gas may be supplied to inlets 51 and 53 under a pressure of 30 pounds per square inch and the air may be supplied to the hot gas generator in an amount within the range of 10,000 to 14,000 cubic feet per minute. The hot gas removed through outlet 43 may have a pressure within the range of 2 to 3 inches of water.

In a gas generator having the dimensions given above, a burner constructed in accordance with the dimensions given in the examples was supplied with combustible gases and ignited. Combustible gases were supplied to the burner through inlet 51 and air was supplied to the burner through conduit 54. It was found that when the pilot burner was provided with a shield the burner remained lighted at all times even though the velocity of the gases adjacent the burner were increased to about 60 feet per second. When the shield comprising members 18, 19 and 20 was removed from the burner and the gases passed into the combustion chamber, the burner remained ignited when the velocity of flow was below about 40 feet per second but was extinguished when the velocity of flow was increased to about 40 feet per second.

While I have disclosed specific embodiments of the present invention and specific dimensions which have been found useful in the construction of the device, it will be obvious to a workman skilled in the art that various changes may be made without departing from the scope of the invention.

The nature and objects of the present invention having been described and illustrated, what is claimed as new and useful and is desired to be secured by Letters Patent is:

An apparatus adapted for burning combustible gases in a high velocity air stream comprising, in combination, wall members defining a combustion chamber, with one of the wall members defining an opening and an annulus surrounding the opening and projecting into the chamber to serve as an air inlet, means adapted to supply a high velocity air stream through the opening of said annulus to said chamber, a conduit adapted to be connected to a supply of combustible gas having a cross-sectional area substantially less than the area of the opening of said annulus and extending into the opening of said annulus, and a pilot burner mounted adjacent the end of said conduit within the opening of the annulus within the space defined by the inner wall of the annulus and the outer wall of the conduit, said pilot burner comprising a tubular conduit adapted to be connected to a combustible gas supply means, a spaced pair of smaller conduits connected in communication with said tubular conduit and defining a first and a second outlet of substantially equal area, said first and second outlets lying on a common axis and in opposition to each other, and a cylindrical shield having closed ends and a longitudinal section of its wall removed and having a diameter substantially greater than the distance separating said pair of smaller conduits

5

arranged over said conduits and mounted coaxially on said tubular conduit.

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