

May 3, 1955

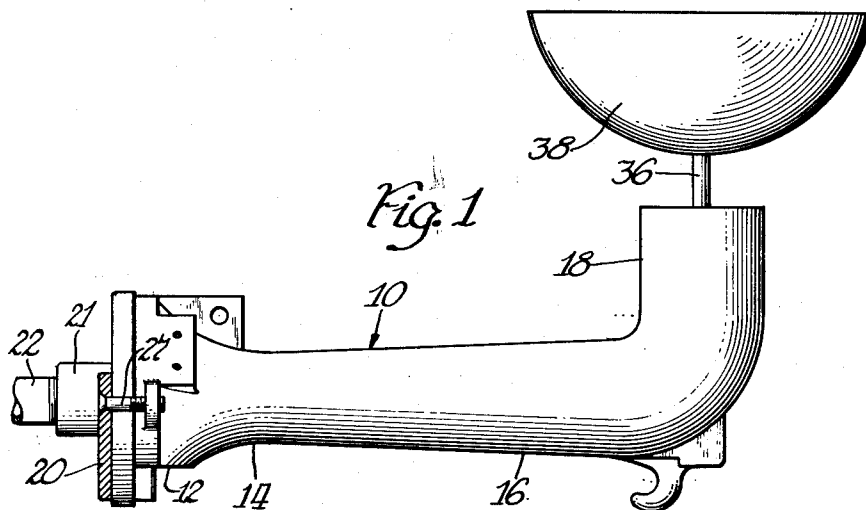
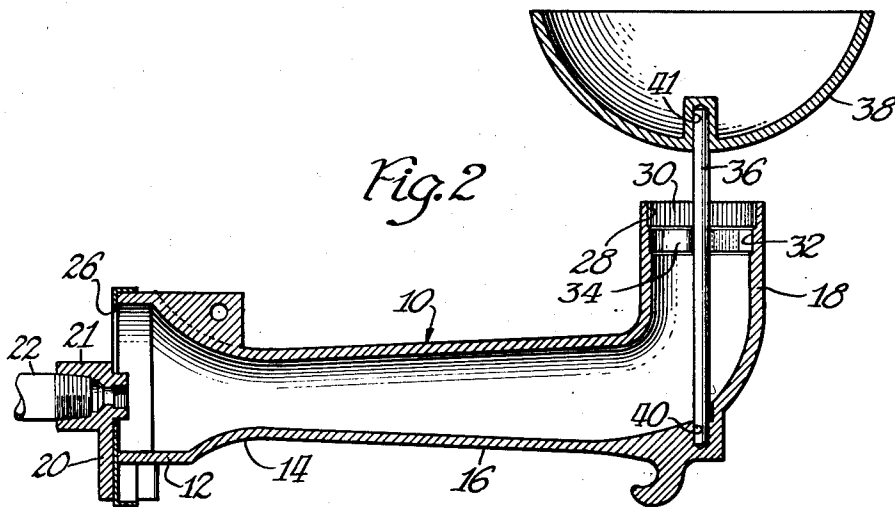
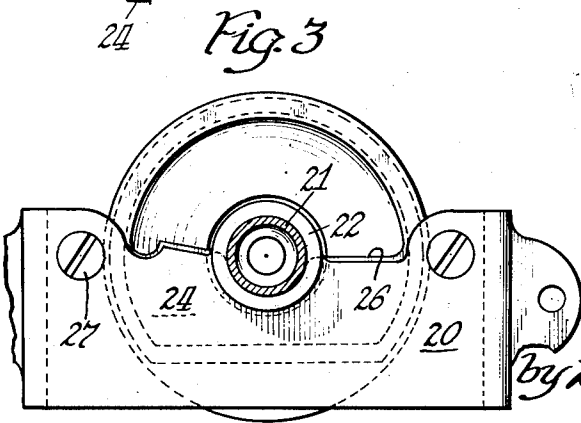
T. H. SMOOT

2,707,516

SINGLE PORT GAS BURNER CONSTRUCTION

Filed Aug. 25, 1951

2 Sheets-Sheet 1



Inventor
Theophilus Smoot
By *Bair, Freeman & Molinare*
Attys.

May 3, 1955

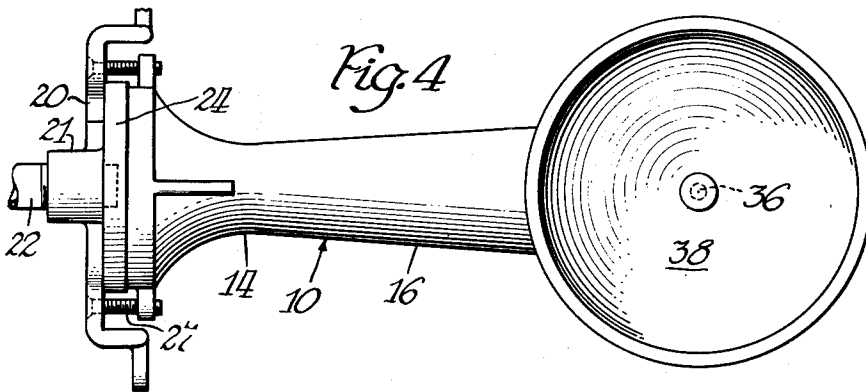
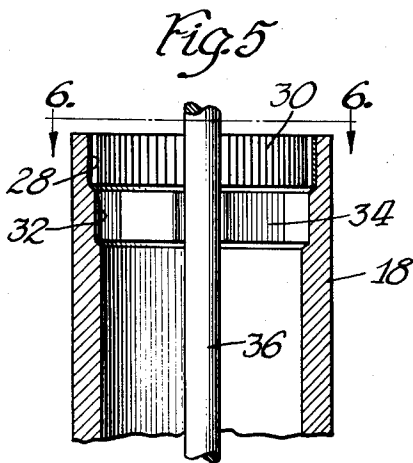
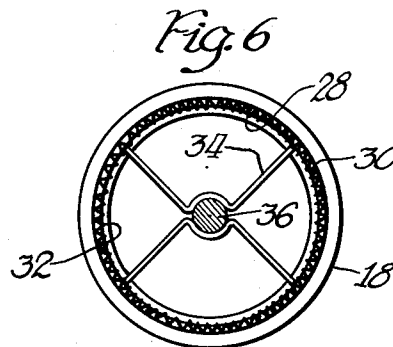
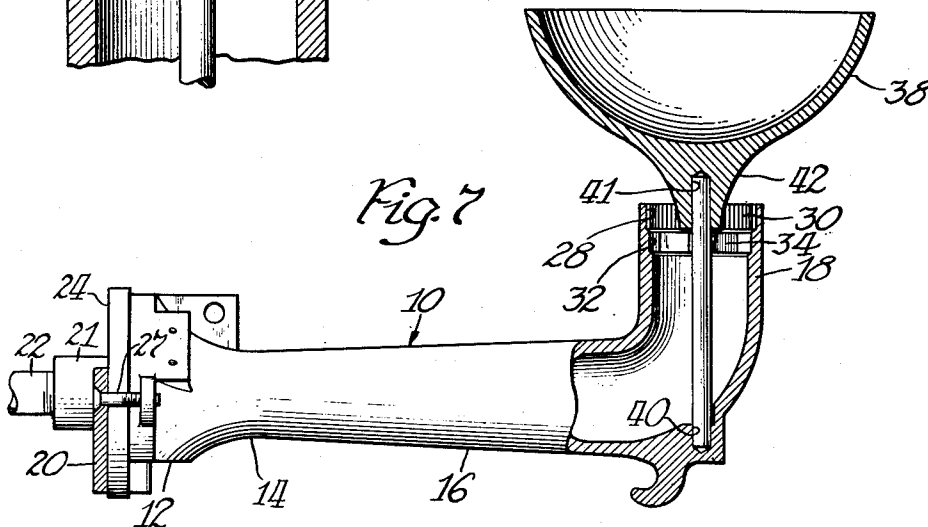
T. H. SMOOT

2,707,516

SINGLE PORT GAS BURNER CONSTRUCTION

Filed Aug. 25, 1951

2 Sheets-Sheet 2



Inventor
Theophilus Smoot
by *Dain, Freeman & Molinare*
Attys.

1

2,707,516

SINGLE PORT GAS BURNER CONSTRUCTION

Theophilus H. Smoot, Marshalltown, Iowa, assignor to
The Lennox Furnace Company, Marshalltown, Iowa,
a corporation of Iowa

Application August 25, 1951, Serial No. 243,619

2 Claims. (Cl. 158—113)

This invention relates to a single port gas burner construction. More particularly, the invention pertains to such a burner including a generally horizontal injector or mixer tube permitting gas flow therethrough at substantially no static pressure and terminating in a vertically extending portion having a circular upwardly opening port at its end, a flame spreader being arranged above this port and spaced therefrom so that the area of the vertical circumferential band between the top of the burner port and the underside of the flame spreader exceeds the burner port area as defined by the inside port diameter.

An important object of this invention is to provide a compact burner of the above type which can easily be adjusted to burn fuel gases of various compositions flowing through said burner at various rates and in various admixtures with air in an efficient manner and with uniform generation of heat throughout the circumference of the flame formed in said burner.

Another important object of this invention is to provide a compact burner of the above type in which the flame is spread over a predetermined area and thereafter is caused to flow in a predetermined generally vertical direction over the whole circumference of the burner, regardless of the composition of the burning gas mixture and independently of the rate of flow of the burning gas mixture.

Other and further objects and features of the present invention will become apparent from the following description and appended claims as illustrated by the accompanying drawings showing diagrammatically, and by way of examples, gas burners according to the present invention. More particularly:

Figure 1 is a side elevation of a gas burner constructed according to the present invention;

Figure 2 is a longitudinal vertical cross sectional view through the burner of Figure 1;

Figure 3 is an enlarged end view of the intake end of the burner of Figure 1;

Figure 4 is a plan view of the burner of Figure 1;

Figure 5 is an enlarged fragmentary view similar to Figure 2 showing the outlet end portion of the burner tube;

Figure 6 is an enlarged fragmentary view taken along the line 6—6 of Figure 5; and

Figure 7 is a side elevation, with parts broken off, of a burner including a flame spreader of modified construction.

In all the figures of the drawings, identical or corresponding parts are indicated with the same reference numerals.

The burner shown in the drawings comprises a gas mixer tube indicated generally at 10 which is made up of parts including, in sequence, a flared inlet end 12, a constricted portion defining a venturi throat 14, a gradually expanded portion 16 (the parts 12, 14 and 16 extending axially in a generally horizontal direction) and an upstanding terminal portion 18 having an internal diameter at least as wide as that of the thereto adjacent portion of the ex-

2

panded part 16. Apart from the inlet end portion 12, the tube 10 is generally circular in cross section, as is also the port defined by the upper rim of the vertical terminal tube part 18. The inlet end 12 of the tube 10 has its lower half closed by a casting 20 attached thereto in slightly spaced relationship. The central portion of the casting 20 is formed as a perforated internally threaded hub 21 receiving the end of a gas supply pipe 22 extending generally coaxially with respect to the constricted tube portion 14. The aperture thus formed in the upper part of the inlet portion 12 serves as an inlet for primary air. The size of this inlet may be adjusted by rotating a flanged disc 24 formed with an aperture 26 centrally conforming with an inward extension of the casting hub 21 and outwardly of fragmentary annular shape generally coinciding with the above noted primary air inlet. Screws 27 threaded into appropriate peripheral projection of the tube 10 and the casting 20 may be loosened to permit adjustment of the size of the primary air inlet by rotation of the disc 24. The casting 20 and disc 24 are thereafter held together by tightening the screws 27.

The upstanding end part 18 of the mixer tube may be recessed internally at its end as shown at 28, to receive a corrugated flame retaining ring 30. A small fraction of the air-gas mixture passing through the tube 10 flows through the small passages defined between the ring corrugations and the inside of the recess 28 and is thereby decelerated and kept burning even when as may happen, the main gas flame should be extinguished for instance, due to flash back.

Immediately below the recess 28, another relatively less deep recess 32 may be formed on the inside of the vertical tube part 18 for receiving a spider 34 supporting a rod 36 carrying a flame spreader 38. The lower end of the rod 36 may be seated in a socket 40 formed in the curved portion of the lower wall of the tube 10 at the transition from the expanded tube part 16 to the vertical tube part 18.

The flame spreader 38 shown in Figure 2 is a hollow member shaped in the form of a segment of a sphere extending symmetrically about the rod 36 which is arranged along a diameter thereof. A socket 41 may be formed in the bottom of the spreader 38 to receive the upper end of the rod 36. The distance between the upper rim of the vertical tube part 18 and the lower surface of the spreader 38 may be varied (while keeping the area of the opening between the flame spreader 38 and the upper rim of the tube part 18 greater than the area of the port defined by said upper rim), as by using rods 36 of various lengths or by any other suitable conventional means.

The flame spreader 38 of Figure 7 is formed at its bottom with a depending tapering projection 42 which may extend down into the port defined by the upper rim of the vertical tube part 18. The outline of this projection 42 is formed to merge smoothly (tangentially) with that of the flame spreader 38. In this construction of the spreader 38, the socket 40 receiving the end of the rod 36 is formed within the projection 42.

The above burner may be equipped with conventional auxiliary devices such as a pilot burner, an ignition device and the like.

In the operation of the above described burner practically no static gas pressure is generated within the mixer tube 10. Therefore, the burner quickly purges itself of its content of combustible gas when shut off.

The above noted form and location of the primary air inlet 24 makes possible complete intermixing of the air with the fuel gas as well as uniform distribution of the resulting gas mixture over the circumference of the circular burner port even when, as shown, the horizontal and vertical portions of the mixer tube extend at a sharp

3

angle to each other (rather than having a long sweeping elbow therebetween), and when the vertical tube portion is quite short. This feature of the present burner makes the burner particularly suitable for use where only a small combustion space is available and where it is impossible to use a mixer tube having a long sweeping elbow joining a long vertical terminal tube portion to the horizontal portion of the mixer tube.

The segmental spherical shape of the underside of the flame spreader makes possible an ultimately generally vertical flow of the burning gas mixture, regardless of its initial rate of flow (out of the burner port) and regardless of even sudden variations in such initial rate of flow. A primary function of this flame spreader is that of diverting the flame laterally to bring about mixture of secondary air with the burning gas mixture. But, after such admixture of secondary air, the burning gas mixture should then be made to flow generally vertically. In the instant gas burner, the gas mixture initially contacts the spreader at an acute angle, and without an abrupt impact, and immediately thereafter the gas mixture flows more or less laterally. This lateral flow is progressively converted into a vertical flow as the spreader distributes the burning gas mixture over a progressively greater area (thereby decelerating the gas and keeping the gas in contact with the spreader surface) while also progressively turning the direction of gas flow toward the vertical. In other words, as the gas flows outwardly, progressive reduction in gas velocity is matched by a progressively increased change in direction of gas flow toward the vertical, so that the gas will leave the rim of the spreader flowing in a generally vertical direction.

It should be understood that the gas leaves the rim of the spreader 38 in a direction generally tangential to the curvature of the spreader at the rim. If the spreader is hemispherical, the gas will flow vertically. If the spreader includes only a segment less than a hemisphere, then the burning gas will flow at a small angle to the vertical, although the direction of flow still may be designated as being generally vertical at the moment the flame reaches the rim of the flame spreader, and the direction of flow thereafter tends to become more vertical. Thus, the flame can be caused to flow, for instance, at an angle of 15° with respect to the vertical, if it is desired to spread the flame slightly immediately above the flame spreader. However, such flow at a small angle to the vertical will still be smooth.

The tapering projection 42 shown in Figure 6 (which need not but may extend into the port of the vertical burner part 18) reduces eddy formation at the base of the

4

flame spreader and prevents reentry of partly or completely burned gas into the flame at the burner port, thus eliminating dilution of the combustible mixture issuing from the burner port.

Many details of construction may be varied without departing from the principles of this invention and it is, therefore not my purpose to limit the patent granted on this invention otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A gas burner having a mixer tube including a horizontally extending inlet portion constricted to define a venturi throat and a vertically extending outlet portion having an upper rim defining a port, said tube being expanded downstream of said venturi throat and being devoid of constrictions past the expanded portion thereof, said vertically extended portion of said tube being formed internally thereof with a first annular recess closely adjacent said port and adapted for supporting and positioning a flame retaining ring, said tube being formed with second annular recess below said first recess, a flame spreader having a lower surface facing said port shaped in the form of substantially half of a sphere, and means for positioning said spreader concentrically above said port at a distance therefrom such that the open area between said rim and the line of said spreader above said rim will exceed the area of said port, said spreader positioning means including a rod extending concentrically through said vertically extending portion of said tube with the lower end thereof connected to said tube and the upper end thereof connected to said flame spreader, and a spider seated on the inside of said vertical tube portion within said second recess and having arms embracing said rod.

2. A gas burner according to claim 1 in which said flame spreader is formed with a central depending tapering portion having an outline smoothly merging with the outline of said spreader.

References Cited in the file of this patent

UNITED STATES PATENTS

160,789	Neff	Mar. 16, 1875
780,594	Burke	Jan. 24, 1905
1,601,857	Heymsfield	Oct. 5, 1926
1,837,549	Herwig	Dec. 22, 1931
2,183,836	Gordon	Dec. 19, 1939
2,389,027	Corbin et al.	Nov. 13, 1945
2,467,626	Norman	Apr. 19, 1949
2,475,240	Hassmer	July 5, 1949
2,541,315	West	Feb. 13, 1951