Jan. 30, 1962 J. T. ALGER 3,018,823

FLAME SHAPERS

Filed April 28, 1958

FIG. 1

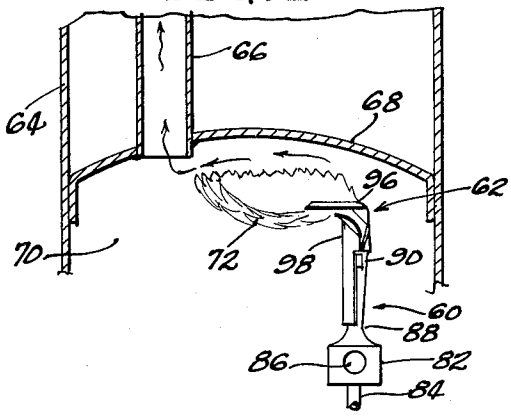


FIG. 2

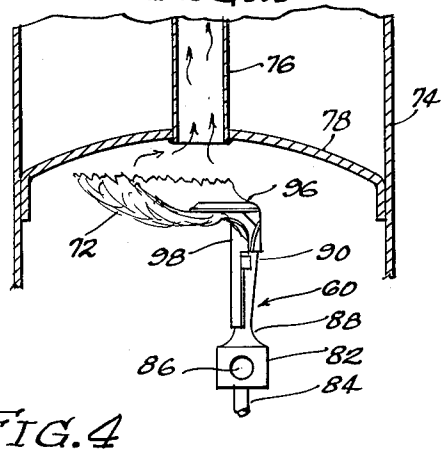


FIG. 3

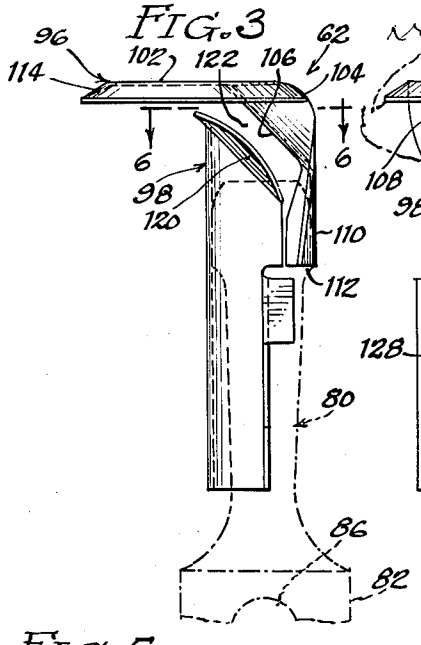


FIG. 4

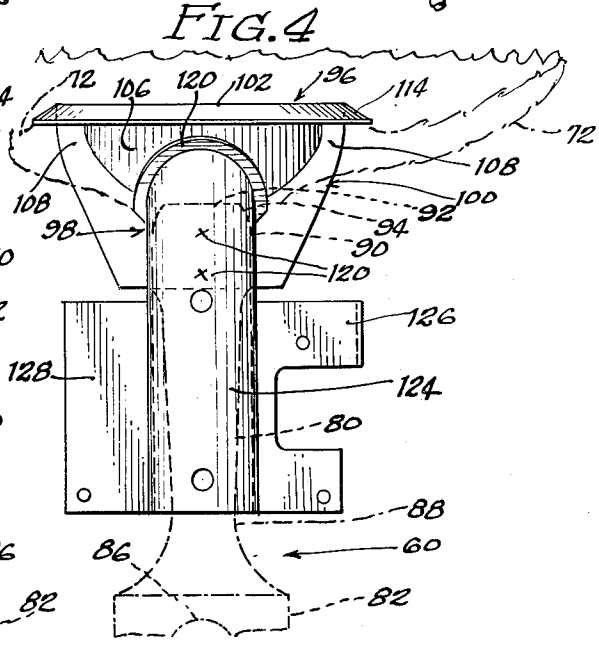
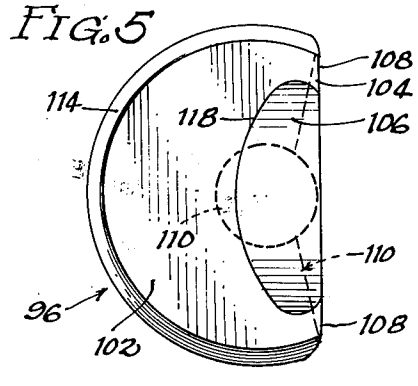


FIG. 5



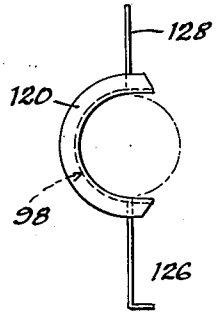


FIG. 6

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FLAME SHAPERS

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This invention relates to burners for gas or vapor fuels, and pertains particularly to flame shapers for use with such burners.

One object of the present invention is to provide new and improved flame shapers adapted to produce a broad, somewhat flat, laterally directed flame from a single burner tube of the single port type.

A further object is to provide flame shapers which produce a steady, quiet flame, protected from being blown out or agitated by secondary air.

Another object is to provide flame shapers which are extremely effective, yet are easy to manufacture and low in cost.

Further objects and advantages of the present invention will appear from the following description, taken with the accompanying drawings in which:

FIG. 1 is an elevational sectional view showing a water heater or the like equipped with a burner having a flame shaper constituting an embodiment of the present invention.

FIG. 2 shows the burner of FIG. 1 as applied to a different type of water heater.

FIGS. 3 and 4 are side and front elevational views, respectively, of the burner and flame shaper of FIGS. 1 and 2.

FIG. 5 is a top view of the upper hood or deflector embodied in the flame shaper of FIGS. 3 and 4.

FIG. 6 is a top view of the lower deflector embodied in the flame shaper of FIGS. 3 and 4, the view being taken generally as indicated by the line 6—6 in FIG. 3.

It will be seen that FIGS. 1–6 illustrate a burner 60 having a flame shaper 62. In FIG. 1, the burner 60 is shown as applied to a water heater 64 having a flue or stack 66 which is positioned off-center near the left-hand side portion of the heater. The flue 66 extends upwardly through a dome-shaped lower wall 68 which is provided on the water heater 64. The burner 60 is positioned in a compartment 70 below the wall 68 and is disposed off-center, toward the right-hand side portion of the heater. The flame shaper 62 directs the flame from the burner 60 to the left so that the hot gaseous products of combustion will heat the bottom wall 68 and then will pass up the flue 66. The flame shaper 62 also spreads out the flame in a direction perpendicular to the section plane of FIG. 1 so that the heat from the flame is spread over a large area of the bottom wall 68. In FIG. 1, the flame from the burner 60 is indicated generally at 72.

FIG. 2 shows an application of the burner 60 to a somewhat different type of water heater 74, having a flue 76 which is centrally positioned. As before, the heater 74 has a dome-shaped lower wall 78. The burner 60 is positioned near the center portion of the heater 74 so that the flame 72 will heat a considerable area of the lower wall 78 around the flue 76. The hot products of combustion will then pass up the flue 76 and will heat the water around the flue.

The details of the burner 60 and the flame shaper 62 are illustrated to best advantage in FIGS. 3–6. It will be seen that the burner 60 comprises a straight burner tube 80 having an entrance portion 82 which receives gas or other suitable fuel from an axial jet 84. Primary air is drawn into the entrance portion 82 through lateral ports 86. The gas and primary air pass from the entrance

portion 82 into a venturi portion 88 of the burner tube. It will be seen that the venturi portion 88 flares into a terminal portion 90 having an open upper end forming a large single discharge port 92. An inturned flange 94 is formed around the port 92.

The flame shaper 62 of FIGS. 1–6 has an upper hood or deflector 96. In addition, the illustrated shaper 62 has a lower deflector 98, mounted below the hood 96 and on the opposite side of the burner tube 80 therefrom. The illustrated upper deflector or hood 96 may be regarded as being in the form of an angle member, having generally vertical and horizontal flange portions 100 and 102. A curved bend 104 is formed between the flanges 100 and 102. It will be seen that the bend 104 is interrupted by a curved, inclined deflecting wall portion 106 which overlies much of the discharge port 92. In this case, the curvature of the deflecting wall 106 is generally cylindrical in character. The curved deflecting wall 106 divides the generally vertical flange 100 into a pair of wings 108 which extend to the left and to the right from the curved wall 106, as shown to best advantage in FIG. 4.

The lower end portion of the generally vertical flange 100 is formed into a cylindrically curved mounting stub 110 adapted to be welded or otherwise secured to the terminal portion 90 of the burner tube 80. The welds may be at the lower margin of the stub 110 as indicated at 112.

The generally horizontal flange 102 is substantially flat, but is formed with a downturned, inclined marginal lip 114. In the plan view of FIG. 5, the lip 114 is generally in the form of a segment of a circle. The flange 102 is approximately crescent shaped, with the curved lip 114 extending along the outer edge thereof. The curved deflecting wall 106 intersects with the flange 102 to form a curved inner edge or fold 116. The lip 114 is spaced horizontally from the edge 116.

The illustrated lower deflector 98 corresponds generally in shape to a portion of a cylinder, as clearly shown in FIGS. 3 and 6. The lower deflector 98 is electrically welded or otherwise secured to the terminal portion 90 on the burner tube, and is mounted around the left-hand side portion thereof, in opposed relation to the mounting stub 110, as shown in FIG. 3. Thus electric welds 119 are indicated in FIG. 4. The lower deflector 98 extends upwardly beyond the terminal portion 90. The upper end of the deflector 98 is formed with a flared, inclined lip or flange 120 which is generally parallel to the curved deflecting wall 106 and is spaced rather closely thereto. Thus, both the deflecting wall 106 and the lip 120 slant upwardly from right to left as shown in FIG. 3. A narrow slot or exit orifice 122 is thereby provided between the deflecting wall 106 and the lip 120.

In the illustrated construction, the deflector 98 has a lower portion 124 which serves merely as a support for the burner 60. Suitable mounting bracket or flange portions 126 and 128 may be formed on the lower portion 124.

In the operation of the burner 60, the gas or other fuel is mixed with the primary air in the burner tube 80 and is discharged upwardly through the port 92. The mixture is deflected by the curved wall 106 and is spread laterally to the left and to the right, as indicated by the flame pattern 72, as in FIG. 4, as well as being deflected under the flange 102.

The lower deflector 98 is shaped to follow and contain the normal flow of the gas-air mixture issuing from the port 92 and shaped by the upper spreader 96. The lip 120 on the lower deflector deflects the flow of high-velocity secondary air away from the flame, and thereby prevents such secondary air from lifting or tearing the flame. In

this way, the lip **120** prevents noisy, unstable operation of the burner.

The mixture escapes through the narrow slot **122** between the deflecting wall **106** and the lip **120** and thus is spread into a thin flat flame which extends generally in a horizontal direction from the margin of the flame **102**, as shown in FIGS. 1 and 2. The flange **102** guides or directs the mixture outwardly, while the downturned marginal lip **114** turns the mixture downwardly so that the flame will extend outwardly for a considerable distance from the flange **102** before being turned upwardly by secondary air. The wings **108** protect the base of the flame from secondary air coming from the rear of the flame shaper **62**.

Another function of the deflectors **96** and **98** is to increase to a considerable extent the effective port depth of the burner, so as to stabilize the flame and largely prevent the flame from flashing back into the burner tube.

It will be apparent that the flame shaper provides a flat, broad, generally horizontal flame which is adapted to spread over a wide area of a water heater or the like, so as to provide efficient heat transfer between the flame and the heater. The burner operates with exceptional stability and quietness, and is virtually immune to flashing back. Nevertheless, it will be recognized that the burner and the flame shaper may be readily manufactured at low cost.

Various other modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the invention as exemplified in the foregoing description and defined in the following claims.

I claim:

1. In a burner, the combination comprising a burner tube having an axial discharge port therein, an outer flame deflector comprising a generally L-shaped angle member having first and second angle flanges with an angular bend therebetween, said first angle flange having mounting means thereon secured to one side portion of said burner tube, said first angle flange extending outwardly from the end of said burner tube and generally parallel thereto, said second angle flange extending across and generally perpendicular to the axis of said discharge port and being spaced outwardly therefrom, a curved inclined deflecting wall portion formed into said bend and into portions of said angle flanges, said deflecting wall portion being disposed at an oblique angle in front of said discharge port with the convex side of said deflecting wall portion directed toward said port to spread the fuel mixture therefrom laterally under said second angle flange, and an inner cylindrically curved deflector secured to said burner tube in opposed relation to said first angle flange and extending outwardly from the end of said burner tube toward said second angle flange, the concave side of said inner cylindrically curved deflector being directed toward said outer flame deflector, said inner deflector having an inclined upper margin opposite said curved deflecting wall portion to form an exit slot therebetween for the discharge of the fuel mixture.

2. In a burner, the combination comprising a burner tube having an axial discharge port therein, an outer flame deflector comprising a generally L-shaped angle member having first and second angle flanges with an angular bend therebetween, said first angle flange having mounting means thereon secured to one side portion of said burner tube, said first angle flange extending outwardly from the end of said burner tube and generally parallel thereto, said second angle flange extending across and generally perpendicular to the axis of said discharge port and being spaced outwardly therefrom, a curved inclined deflecting wall portion formed into said bend and into portions of said angle flanges, said deflecting wall portion being disposed at an oblique angle in front of said discharge port with the convex side of said deflecting wall portion directed toward said port to spread the fuel mixture therefrom laterally under said second angle flange, and an inner cylindrically curved deflector secured to said burner tube in opposed relation to said first angle flange and extending outwardly from the end of said burner tube toward said second angle flange, the concave side of said inner cylindrically curved deflector being directed toward said outer flame deflector, said inner deflector having an inclined outer margin opposite said curved deflecting wall portion to form an exit slot therebetween for the discharge of the fuel mixture, said second angle flange having a curved marginal portion thereon turned toward said port at an inclined angle for deflecting the fuel mixture downwardly, said inner deflector having a flared lip along its inclined upper margin for protecting the base of the flame from high-velocity secondary air.

3. In a burner, the combination comprising a burner tube having an axial discharge port therein, an outer flame deflector comprising a generally L-shaped angle member having first and second angle flanges with a bend therebetween, said first angle flange having mounting means thereon secured to one side portion of said burner tube, said first angle flange extending outwardly from the end of said burner tube and generally parallel thereto, said second angle flange extending across and generally perpendicular to the axis of said discharge port and being spaced outwardly therefrom, a curved inclined deflecting wall portion formed into said bend and into portions of said angle flanges, said deflecting wall portion being disposed at an oblique angle in front of said discharge port with the convex side of said deflecting wall portion directed toward said port to spread the fuel mixture therefrom laterally under said second angle flange, said curved surface corresponding in shape to a side portion of a solid surface generated by revolution of a straight line, said curved surface extending through an arc corresponding to a fraction of a circle, and a channel-shaped deflector secured to said burner tube in opposed relation to said first angle flange and extending outwardly from the end of said burner tube toward said second angle flange, the concave side of said channel-shaped deflector being directed toward said outer flame deflector, said second deflector having an inclined upper margin opposite said curved deflecting wall portion to form an exit slot therebetween for the discharge of the fuel mixture.

4. In a burner, the combination comprising a generally vertical burner tube having an axial discharge port in the upper end thereof, an upper flame deflector comprising a generally L-shaped angle member having first and second angle flanges with an angular bend therebetween, said first angle flange having a cylindrically curved mounting step on the lower end thereof and secured to one side portion of said burner tube, said first angle flange extending upwardly from the end of said burner tube and generally parallel thereto, said second angle flange extending generally in a horizontal direction across and generally perpendicular to the axis of said discharge port and being spaced upwardly therefrom, a curved inclined deflecting wall portion formed into said bend and into portions of said angle flanges, said deflecting wall portion being disposed at an oblique angle above said discharge port with the convex side of said curved deflecting wall portion directed toward said port to spread the fuel mixture therefrom laterally under said second angle flange, said curved surface corresponding in shape to a side portion of a solid surface generated by revolution of a straight line, said curved surface extending through an arc corresponding to a fraction of a circle, and a lower cylindrically curved deflector secured to said burner tube in opposed relation to said first angle flange and extending upwardly from the end of said burner tube toward said second angle flange, the concave side of said lower cylindrically curved deflector being directed toward said upper flame deflector, said lower deflector having an inclined

upper margin opposite and generally parallel to said curved deflecting wall portion to form an exit slot therebetween for the discharge of the fuel mixture, said second angle flange having a curved downturned inclined marginal portion thereon for deflecting the fuel mixture downwardly, said lower deflector having a flared inclined lip along its inclined upper margin for protecting the base of the flame from high-velocity secondary air.

References Cited in the file of this patent

UNITED STATES PATENTS

353,169	Shipman	Nov. 23, 1886
2,372,953	Hurlbut	Apr. 3, 1945
2,731,009	Pocrass et al.	Jan. 17, 1956
2,766,819	Little	Oct. 16, 1956
2,867,272	Morrison	Jan. 6, 1959