Jan. 30, 1945. W. S. PATTERSON 2,368,490

GAS AND OIL BURNER

Filed March 30, 1943

Fig. 1

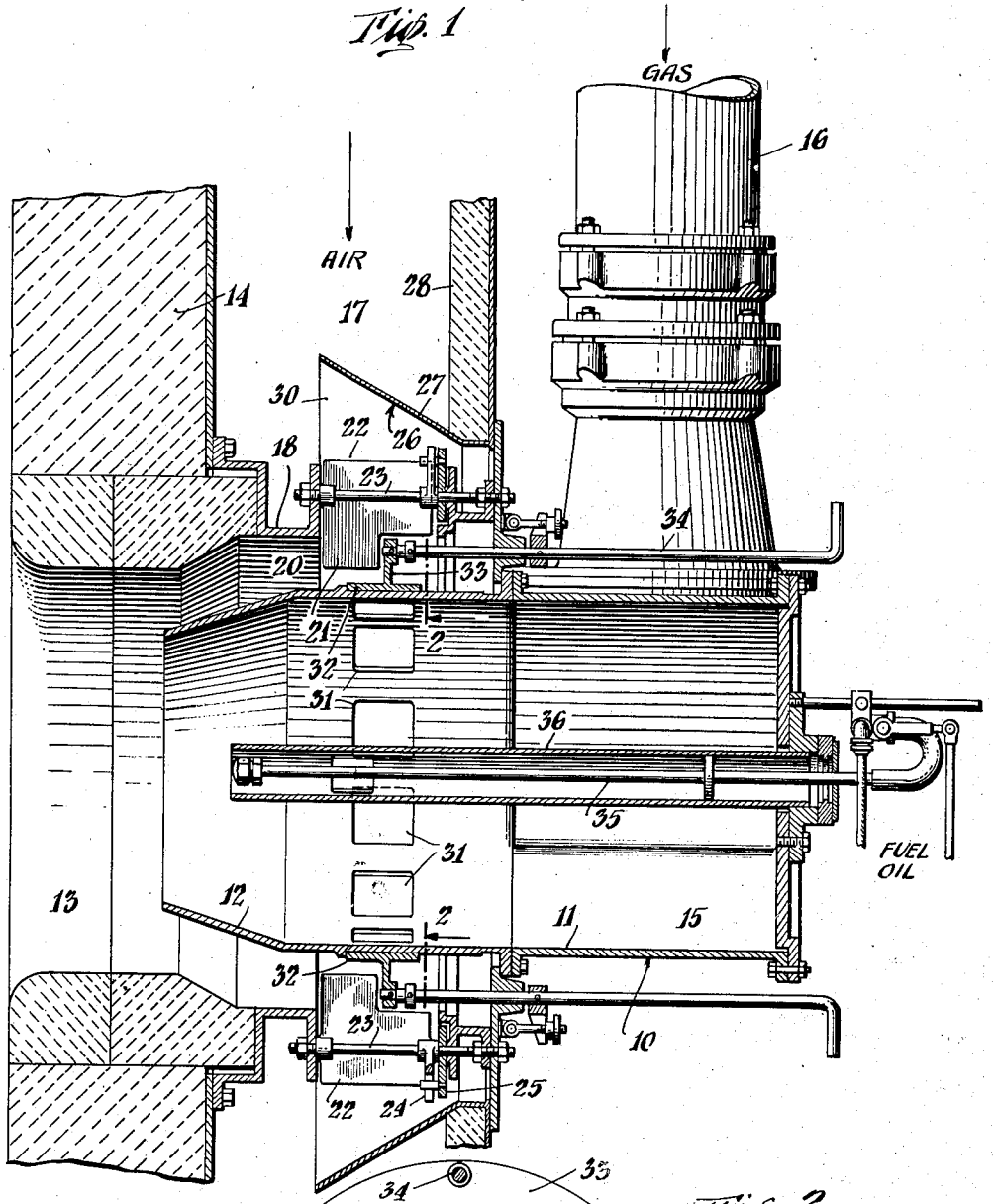
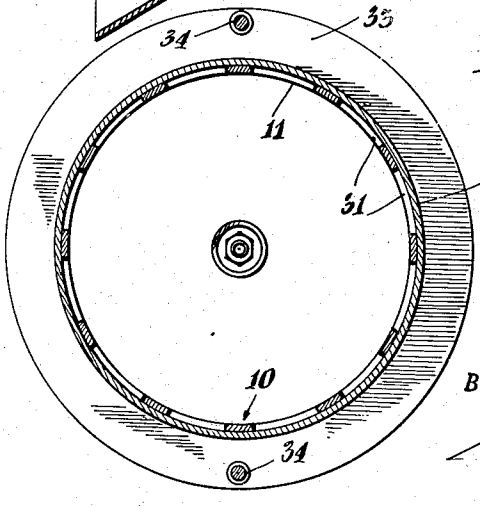


Fig. 2



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GAS AND OIL BURNER

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Application March 30, 1943, Serial No. 481,081

1 Claim, (Cl. 158—11)

This invention relates to fuel burners and particularly to burners for using two fuels alternatively.

When blast furnace gas is burned as fuel to release heat in a furnace, the burner has fuel and air passages with cross-sectional areas proportioned for the correct ratio of air to fuel and certain suitable air velocities. When oil is burned in the same burner to release approximately the same amount of heat in the furnace, the air passages of the burner being designed for the blast furnace gas are then insufficient in area to maintain suitable air velocities. This is accounted for by the different air quantities required by the two fuels, oil requiring about thirty percent more than blast furnace gas. Therefore, when using oil as fuel, the air velocities through the burner passages would be about thirty per cent higher than when using blast furnace gas. Such velocities are undesirably high and require more power to move the air.

It is an object of this invention to provide an improved burner in which the above difficulties are overcome.

In the accompanying drawing:

Figure 1 is a longitudinal section through a burner embodying the invention; and

Figure 2 is a transverse section through the air valve and ports taken on the line 2—2 of Figure 1.

In the drawing, the burner designated as a whole by the numeral 10 has a cylindrical tube 11 disposed horizontally and its tip 12 projects into an aperture 13 in the furnace wall 14. The burner 10 has a volute entrance section 15 through which blast furnace gas is supplied tangentially to the burner nozzle through a pipe supply 16.

Secondary air is delivered to the tip of burner 10 from a windbox 17 through which the burner projects. The nozzle section of burner 10 is enclosed in a casing 18 forming an annular chamber 20 surrounding the burner. At its outer end the annular chamber 20 is in communication with windbox 17 through a circumferential port 21 in the wall of casing 18. Dampers 22 pivoted on shafts 23 are arranged around the burner and each is provided with an arm 24 having a pin and slot connection to an operating ring 25. As ring 25 is rotated clockwise the dampers 22 separate with respect to one another and open to permit secondary air to flow through chamber 20 around burner 10 and when the ring is rotated counterclockwise the dampers close and reduce the air flow.

It has been found that when air enters the windbox 17 in one general direction, as downward in Fig. 1, a major part of the secondary air supply enters the annular chamber 20 around burner 10 through the upper part of port 21. Little air enters around other parts of the burner, as at the lower part thereof. This inequality of air supply through port 21 around the burner prevails in the travel of the air toward the furnace through the annular chamber 20 and results in an uneven distribution of the secondary air discharging into the furnace around the burner tip 12. This in turn causes an unbalance in the fuel-air mixture within the furnace and inefficient combustion.

A baffle 26 having a conical outer surface 27 extends inwardly from the casing 28 of windbox 17 across the circumferential port 21 in burner casing 18. The inner edge of baffle 26 is substantially in alinement with but spaced from the furnace-side edge of port 21 to provide a vertical annular opening 30 through which the windbox is in communication with the enclosed space around port 21.

Baffle 26 prevents air from flowing directly into port 21 from the windbox 17 and causes it to flow through annular opening 30 around the entire circumference of baffle 26 toward port 21 in a direction substantially parallel to the axis of the burner. Thence the air turns 90° into the port 21 and again 90° into chamber 20 to pass toward the burner tip 12. By blocking the direct entry of the air into port 21 from any direction by means of baffle 26 the velocity of the air from that direction is diminished and is no longer effective to cause an excess flow of air from that direction into the burner. Thus, all of the air is then forced to enter port 21 through opening 30 at right angles to its direction of flow in windbox 17 and then caused to make an abrupt turn into port 21 thereby substantially equalizing resistance to air flow into the burner.

Adjacent its juncture with its conical nozzle tip 12 the fuel nozzle is provided with a plurality of apertures or ports 31. Surrounding and covering the ports 31 is a cylindrical sleeve 32 provided with a flange 33. Movement of sleeve 32 to cover or uncover ports 31 is accomplished by rods 34 attached thereto.

When blast furnace gas is to be burned it flows from pipe 16 through burner tube 11 into the furnace while the air for combustion flows separately from windbox 17 through port 30 and annular conduit 20 around the nozzle tip 12 into the furnace to therein mix with and burn the

fuel gas. Port 21 and annular conduit 20 are so proportioned that suitable air velocities are maintained for proper combustion of furnace gas within the furnace.

When oil is to be burned it is introduced through a relatively small diameter pipe 35 projecting through the nozzle. A tube 36 which surrounds pipe 35 serves as a guide and support for the oil pipe as well as a protection when not in use.

As stated above the air for combustion for the same heat release when burning oil is about thirty percent more than when burning blast furnace gas and consequently the air velocities through port 21 and conduit 20 are unsuitably high. This would result in a high windbox pressure requirement and a poor control of the flame shape.

To overcome this difficulty and to permit a maximum heat release with a combination burner, the ports 31 are uncovered by moving sleeve 32 longitudinally of the fuel tube. Thus sleeve 32, acting as a valve, allows air from port 21 to flow into the burner tube 11 and thence to the furnace.

When the sleeve 32 is in its right hand position, port 21 is extended or widened as the flange 33 defining one side thereof recedes thereby proportionately increasing the area of the air opening from windbox 17 into the furnace via conduit 20, ports 31 and the burner tube 11. In order to maintain damper control of the increased amount of air, the dampers 22 are made L-shaped to lie alongside flange 33 and wide enough to extend over the extension of port 26 produced by retracting flange 33.

The burner may be used with other fuels than blast furnace gas and oil where such fuels require substantially different quantities of air for combustion.

What I claim is:

In a dual purpose fuel burner; a nozzle tube arranged to be supplied at one end with gaseous fuel and to discharge it into a furnace at its opposite end and provided with a plurality of air ports in the wall thereof near its discharge end; a casing surrounding said nozzle tube and forming therewith an annular chamber through which air may flow around said nozzle to the discharge end thereof; a windbox contiguous to said casing, said casing being provided with an air supply port in the wall thereof opposite the ports in said nozzle tube for admitting air to said chamber from said windbox; a secondary fuel nozzle co-axially positioned within said nozzle tube; a slide valve mounted on said nozzle tube; a flange on said slide valve extending across said annular chamber to the casing that forms the outer wall of said chamber and so located with respect to the edge of the port in said casing nearest the nozzle tip as to narrow the width of said port in said casing when said slide valve is positioned to close the ports in said nozzle tube; and means connected to said slide valve for moving it in a direction away from the tip of said nozzle to uncover said ports and for positioning said flange further away from the edge of the port in said casing to increase the width thereof.

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