July 1, 1941. P. M. FORSTER 2,247,548

OIL BURNER ADAPTER

Filed Feb. 3, 1939

Fig. 1.

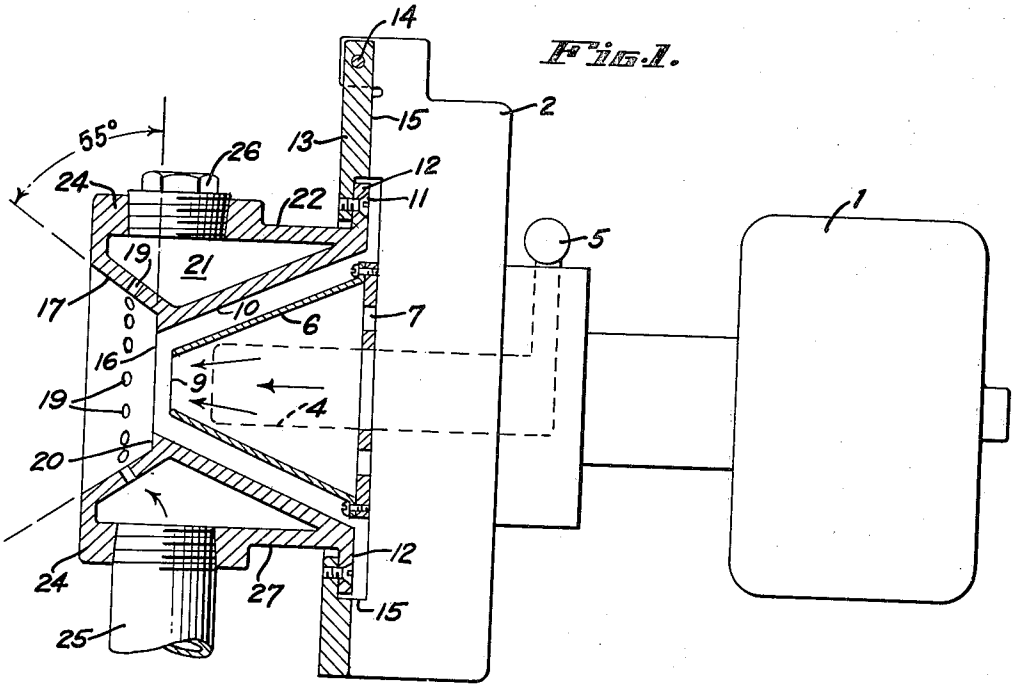


Fig 4.

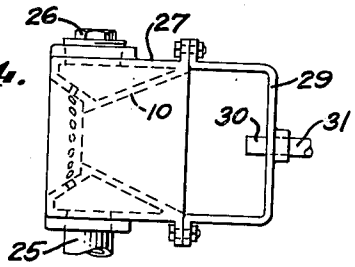
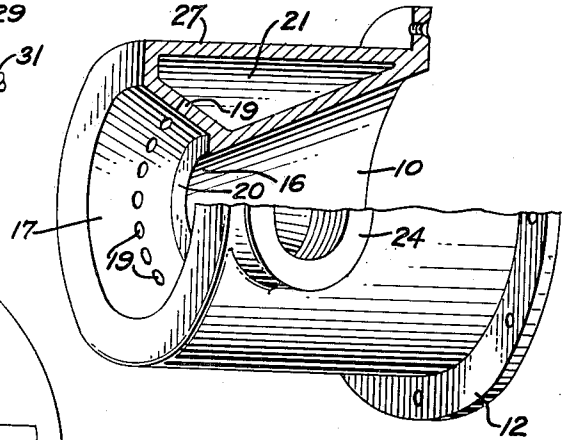


Fig 3.



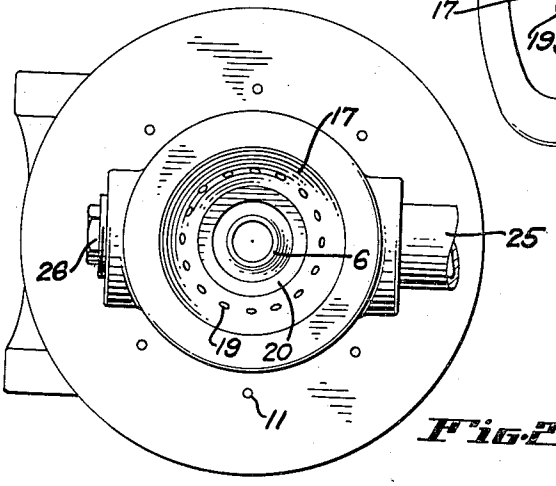


Fig 2.

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OIL BURNER ADAPTER

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1 Claim. (Cl. 158—99)

My invention relates to gas burner heads, and particularly to a form of head which is adapted to burn gaseous fuel under forced draft.

It has been my discovery that better combustion is secured under such conditions by forming the burner head with certain angular relations between the draft opening and the fuel inlet apertures. While my invention is applicable to a wide variety of conditions and services, I have shown it in the drawing as applied to use with compressed air and dry steam drafts, and with oil burner units which require a stand-by fuel source or are to be changed from oil to gas. I have found it makes possible a very satisfactory change over from oil to gas or vice versa.

The horizontal type of forced draft oil burner is very widely used, and will be taken for an example in explaining my contribution to the art. Essentially, such a burner comprises a rotating oil-atomizing cup or cone and an enclosing air nozzle. The atomizing cup may be driven by an extension shaft attached to a motor, on which shaft may also be mounted the fan and in some cases the oil pump. The atomizing cup effects an intimate mixture of primary air and very fine oil particles. This mixture is blown from the cup centrally of a conical air nozzle where it mixes with a flow induced of secondary air. The primary air supplied for atomization is only a part of that necessary for complete combustion, the remainder being secured from the secondary source.

Often the motor, fan, air nozzle, atomizing cup, and other parts are built as a unit which is hinged to a face plate set in the furnace opening. The face plate commonly has a conical opening which receives the air nozzle, enough separation being provided between the two so that additional air may be drawn in around the outside of the nozzle. The hinged mounting permits the unit to be easily inspected and repaired without touching the furnace itself. In practicing my invention in conjunction with such a burner, I replace the conically apertured face plate portion by a cone which has an annular gas chamber surrounding it, and gas inlet apertures formed at a preferred angle to the small cone end. The gas is burned with the draft from the oil burner unit, the oil itself being cut off. One feature of my invention is providing a lip or recess between the surface having the gas inlet apertures and the mouth of the face plate.

In other cases, I may desire to use the cone and surrounding gas chamber without an oil burner unit hinged to the face plate, the draft being supplied by dry steam or compressed air delivered axially of the cone through a suitable nozzle supported, for example, on a bracket attached to the cone or the face plate. Here the same lip or recess feature is a factor.

These embodiments may be better understood by reference to the drawing, wherein:

Fig. 1 is a top view, partially in section, of my invention applied to an oil burner unit;

Fig. 2 is a front view of the embodiment shown in Fig. 1;

Fig. 3 is a perspective view, partially in section, of a face plate cone embodying my invention; and

Fig. 4 shows a modified face plate cone embodying my invention and suitable for use with compressed air or dry steam draft.

It will be seen from the following description that an important object of my invention is to provide a burner head for the most efficient combustion of gaseous fuel under forced draft. Another object is the production of a burner head which will permit alternative use of gaseous fuel with an oil burner unit. Still another object is to make a source of stand-by fuel available for use with an oil burner. It is also an object to control the position of the flame relative to the burner ring when burning gas under draft. Another object is to provide a device having means to permit the proper maintenance of a gas flame under draft conditions.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of a preferred form of my invention which is illustrated in the drawing accompanying and forming a part of the specification. It is to be understood that I do not limit myself to the showing made by the drawing and description as I may adapt a variation of the preferred form within the scope of my invention as set forth in the claim.

In Fig. 1, I have shown a motor 1 which drives a fan element, not shown, mounted within housing 2. A suitable oil-conducting tube and atomizing cup 4 to which oil is supplied through an intake pipe 5 rotates with the fan shaft. Primary air is supplied to cone 6 through openings 7 by the fan where the air picks up the fuel. A secondary air blast is induced along the outside of cone 6 by the primary air stream and mixes with the vaporized oil and primary air. Cone 10 is mounted by suitable means, such as screws 11, passing through a peripheral flange 12 and engaging a face plate 13, which is suitably secured

in a furnace opening, not shown, and to which is hinged at 14 the fan casing 2 and the entire oil burner unit attached thereto. The burner unit is hinged so that it may be swung out of engagement with the face plate, for easy access, and is held away from the face plate 13 by a number of studs 15 projecting from the casing 2. The clearance provided by these studs 15 permits secondary air to be drawn in between the casing and the face plate, and thence through the conical space between the cone 10 and the outside of air nozzle or cone 6, through negative pressure created by the passage of the fuel and air stream emerging from the air nozzle mouth 9 at the mouth 16 of the outer cone 10.

So far, the description is applicable to many of the horizontal forced draft oil burners in use. The conical face plate member 10 is modified, however, by adding beyond the mouth 16 of the outer cone a diverging conical surface 17, through which there is formed a number of gas inlet apertures 19, symmetrically distributed in a plane normal to the axis of the cone 10. Cone 10 is terminated by a plane surface 20, which is also normal to the axis of the cone, and which surrounds the mouth 16. The angle between the plane surface 20 and any line lying in the conical surface 17 is preferably 55°. This is indicated on Fig. 1. Surrounding cones 10 and 17, I form an annular fuel chamber 21 by the addition of a cylindrical outer wall 22. Bosses 24 formed on wall 22 may be drilled and tapped to permit connection of a fuel supply pipe 25. Those bosses not used for fuel connections may be closed by threaded plugs 26.

Obviously, all the drilled bosses may be sealed by such plugs 26, and the entire head unit 27 used in the same manner as in a conventional oil burner cone. Conversion then simply requires the removal of a plug and connection of the gas supply line. If a quick change is desired for stand-by service, the fuel supply connection 25 should be provided with a valve, not shown, which may be opened when gas is needed. If the unit is to be changed permanently from oil to gas, rigid pipe connections may be used.

The exact arrangement and general proportions of the annular chamber 21 may be varied to suit the wishes of the designer, but I have found it very desirable that the specified angular relations between the face of outer cone 17 and the end face or lip 28 of nozzle 16 be preserved. With such an angular proportion and with the arrangement of the gas inlet apertures 19 substantially as shown in the drawing, the forced air draft emerging at 16 is prevented from sweeping across the openings 19 with sufficient force to move the flame away from these apertures. In other words, the purpose is to prevent an outward transference of the flame away from its normal position.

In Fig. 2, I have shown a front view of the unit of Fig. 1, wherein may be seen the conical face 17 pierced at regularly spaced intervals by apertures 19. In this view also the nozzle face 29 may be seen, as well as the nozzle 9 which lies therebehind, and the surface of the inner cone 6.

In Fig. 3, I have shown the burner head unit 27 separated from the blower unit by removing the screws 11 (shown in Fig. 1). The relation between the gas chamber 21 and the conical surfaces 10 and 17 may be easily seen, as well as that between the nozzle face 29 and the conical surface 17.

The burner head design so far set forth is suited for use not only with oil and gas burning under a forced draft of air from a fan, but can also be modified to burn gaseous fuel using dry steam or compressed air draft. In Fig. 4, I have shown such an embodiment. Here the burner head unit 27 is constructed precisely as previously described, while a U-shaped yoke 29 holding a nozzle 30 is substituted for the oil burner unit. The burner head may be mounted in an opening in the fire door of a furnace in any desired manner. Gas is supplied through source 25, and the compressed air or dry steam blast is directed axially of the conical surface 10 through a jet or nozzle 30 connected by a line 31 to a suitable source. The negative pressure created around the entrance to cone 10 by the blast of steam or air from nozzle 30 draws in a sufficient additional quantity of air to provide complete combustion of the gaseous fuel.

From the discussion above, taken in conjunction with the drawing, it may be seen that I have provided a form of burner head in which gaseous fuel may be properly burned under forced draft. By forming a proper angle of approximately 125° between the face 20 of the nozzle and the surface of the outwardly flaring conical portion 17 disposed immediately therebeyond, the air blast is prevented from driving the fuel away from the openings 19. It is obvious that some variation either side of 125° may be made without relinquishing the benefits of my invention. I have found 125° to be the best in all-around service. I have shown this invention applied to embodiments suited for use with compressed air and steam, as well as air supplied by a blower unit. In the latter case, I have shown a burner head which may be substituted for the conical face plate member used with conventional types of forced draft horizontal oil burner units. This embodiment may then be used for stand-by purposes in connection with the regular use of the oil burner or may make use of the blower equipment in conjunction with a regular supply of gaseous fuel. My invention is also applicable to burning fuels such as powdered coal. All such uses and embodiments, as well as others which will be obvious to those skilled in the art, are deemed to fall within the scope of the appended claim.

What I claim is:

A Venturi-type forced draft burner head comprising an annular burner body having a truncated conical throat therein with the truncated end of the throat provided with an annular planar outer face normal to the axis of the throat, a truncated conical primary air nozzle of less diameter than said throat within and co-extensive with the latter providing an annular secondary air passage therebetween, an end of said truncated conical nozzle terminating inwardly of said planar face to provide a Venturi passage for the secondary air, said burner body having an oppositely flaring truncated conical burner face with the truncated end thereof joined to the periphery of said annular planar face, said conical burner face having burner apertures axially spaced from said planar face providing an annular expansion chamber for said secondary air between said inlet apertures and said truncated end of the primary air nozzle.

PERCY M. FORSTER.