April 14, 1953 P. L. KNIGHT 2,635,009

OIL ATOMIZER FOR BURNERS

Filed May 22, 1948 2 SHEETS—SHEET 1

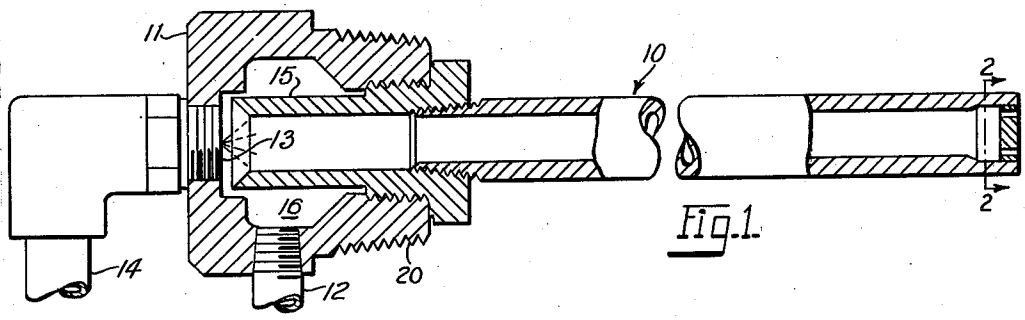


Fig. 1.

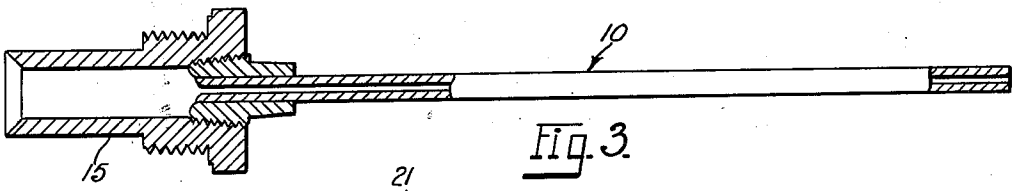


Fig. 3.

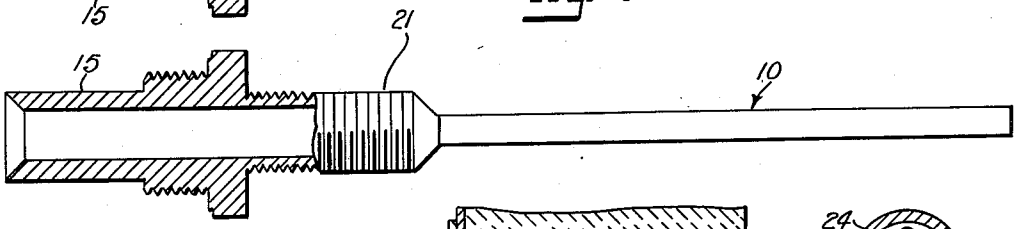


Fig. 4.

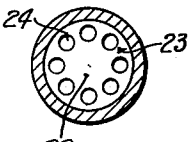


Fig. 2.

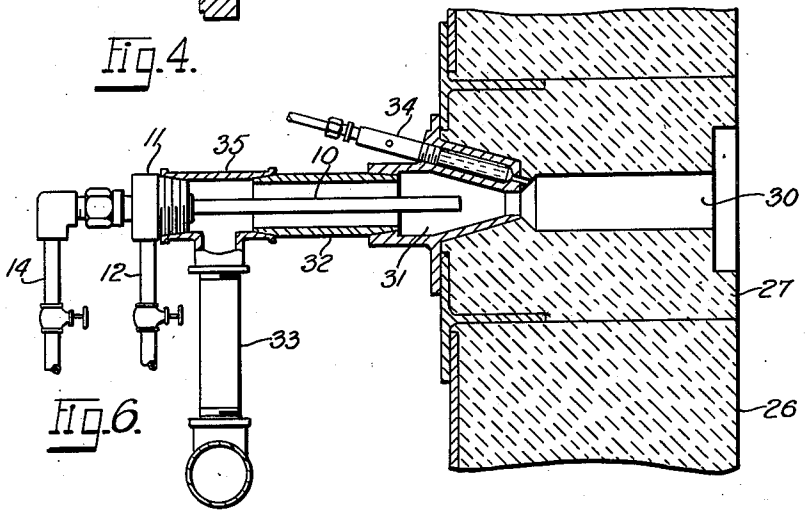


Fig. 6.

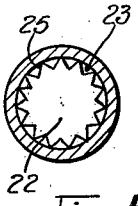


Fig. 5.

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Fig. 7.

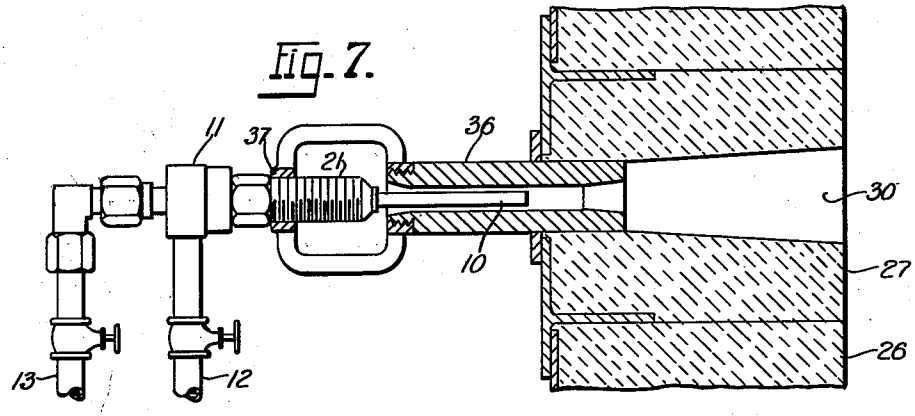


Fig. 8.

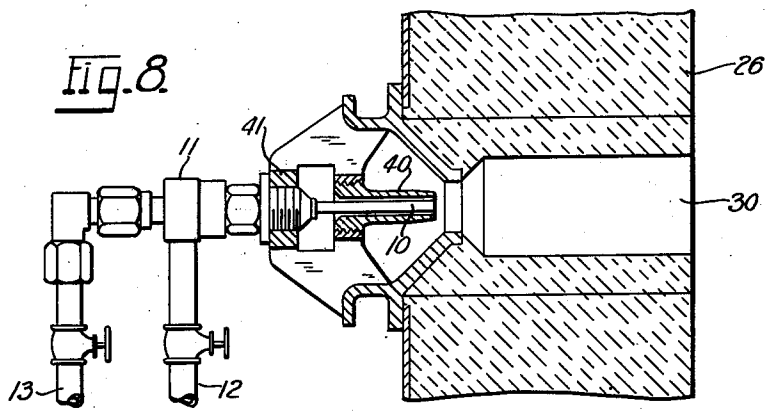
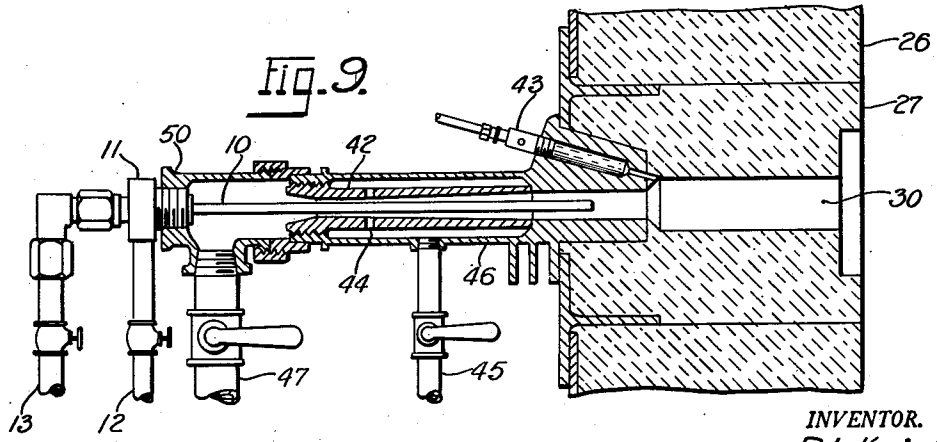


Fig. 9.



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2,635,009

OIL ATOMIZER FOR BURNERS

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Application May 22, 1948, Serial No. 28,583

1 Claim. (Cl. 299—140)

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This invention relates to fluid fuel burners and more particularly to method and apparatus atomizing oil and for changing gas burners over to oil and the invention has for its object to provide an atomizing device which shall be particularly well adapted for application to many different types of burners.

For a consideration of what I consider to be novel and my invention, attention is directed to the following specification and the claim appended thereto.

In the accompanying drawings forming part of this specification—

Fig. 1 is an axial sectional view of the improved oil converting device with an intermediate portion broken away.

Fig. 2 is a cross section on line 2—2 of Fig. 1.

Fig. 3 shows an alternative form of a part embodied in Fig. 1.

Fig. 4 shows still another alternative form of a part embodied in Fig. 1.

Fig. 5 shows a modified form of Fig. 2.

Figs. 6 to 9 each shows a different kind of gas burner with the present invention applied thereto.

In the present invention, the apparatus comprises a relatively slender tube or nozzle 10 from which the oil issues in a finely divided state in a high velocity carrier stream of gaseous medium which will ordinarily be air under pressure rather than steam because of its ready availability. The tube 10 extends from a hollow head 11 to which air under pressure is delivered by a supply pipe 12 and to which oil is delivered by a metering nozzle 13 mounted in an end wall of the head, the oil being delivered to the nozzle under pressure by an oil supply pipe 14. The metering nozzle is of conventional atomizing type and the oil issues therefrom as a fine spray.

The metering nozzle 13 discharges into an oil collecting barrel 15 which in turn delivers to the said tube 10, the barrel being screwed into the head 11 and having its inlet and terminating short of the end wall wherein the metering nozzle is positioned. Because the oil issues from the said metering nozzle as a fine spray it will be readily appreciated that on striking the inner wall surface of the barrel it tends to convert to a thin layer or film thereon and therefore that it is the gaseous medium flowing through said barrel 15 and tube 10 with relatively high velocity that moves the oil along said surface and along the inner surface of the tube 10. The space 16 within the head 11 to which the air supply pipe 12 delivers is annular and therefore the air flows

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into the intake end of the barrel 15 by initially flowing across the rim thereof next adjacent the metering nozzle 13 and thereby tends to help in directing spray from said nozzle into said barrel.

Threads 20 on an exterior portion of the head 11 permit it to be secured to a support associated with the gas burner which is to be converted to burn oil. However, instead of the head itself being thus threaded, the threads may be provided on an outwardly extended portion 21 of the barrel 15 (see Fig. 4).

Bearing in mind that a gaseous propelling medium for the oil must also flow through the tube 10, the oil feeding capacity of said tube, other things being equal, is directly dependent on the perimeter of the bore of the tube rather than on the cross sectional area thereof. In cases where the oil feeding capacity of the said tube 10 is relatively small (as for example where the bore of the tube has a diameter of about one-sixteenth of an inch which may be taken to be the size of the bore of the tube 10 in Fig. 3), it is not necessary to provide any special flow restricting orifice at the discharge end of the tube to insure that the oil shall be ejected from the tube in finely divided state, primarily for the reason that in a relatively small tube the center of the air stream is not sufficiently remote from the oil film on the tube to permit any substantial quantity of the air to escape without exerting an atomizing effect on the oil film as the latter is ejected from the tube. On the other hand, in the larger size tubes 10, the greater is the quantity of air which tends to escape from the center of the air stream without doing its quota of work on said film of oil. To reduce this wastage of high pressure air to a minimum in the larger size tubes, the present invention provides a disk-type baffle or filler 22 at the discharge end of the tube whereby to restrict the normal discharge area of the tube to an annular type of discharge orifice 23 of relatively narrow width. As shown in Fig. 2, the said orifice may consist of a circular series of relatively small size holes 24 or as shown in Fig. 5 it may consist of a series of notches 25 in the rim of the baffle. By thus reducing the escape of air from the center of the air stream, only a relatively small proportion (say not more than one-fifth) of the air for complete combustion of the oil need be passed through the oil tube 10 to obtain the necessary propelling and atomizing effect on the oil, it being understood that the additional air for complete combustion being otherwise supplied as will more fully appear hereinafter. It will also be understood that because

the oil issues from the tube 10 already dispersed in a stream of air the resulting flame of combustion will be much shorter than would be the case if steam instead of air were used to propel the oil through the tube.

The practical application of the invention is shown in Figs. 6 to 9. In each of these views a portion of the wall of an industrial furnace is indicated at 26, the wall comprising a refractory block 27 formed with a combustion tunnel 30 to which the gas burner delivers.

In Fig. 6, a gas burner comprises a nozzle 31 from which the gas admixed with its full complement of air for complete combustion is delivered directly to the combustion tunnel 30, the mixture being delivered to said nozzle by a tube 32 to which a mixture supply pipe 33 delivers. A premix pilot is indicated at 34. To convert the burner over to oil, the oil tube 10 is inserted part way into the nozzle 31 by screwing the tube supporting head 11 into the outer end of a pipe T 35 which interconnects the burner tube 32 and the mixture supply pipe 33. The supplemental air for complete combustion of the oil is delivered to the burner tube 32 by a supply line which will ordinarily comprise the pipe 33 and thence flows to the combustion tunnel 30 by way of the burner nozzle 31 as will now be readily understood.

In Fig. 7, the burner comprises a mixing tube 36 which discharges directly into the combustion tunnel 30. To convert this burner over to oil, the oil tube 10 is inserted part way into the said mixing tube 36 by screwing the extension 21 of the tube supporting head 11 into the support 37 in place of the gas discharge nozzle which normally discharges into the mouth of the mixing tube 36 from said support. In a converted gas burner of this type the tube 10 is small enough to permit the necessary secondary air to be drawn into the mixing tube 36 around the oil tube by the suction effect of the air and oil mixture issuing from the oil tube 10.

In Fig. 8, the burner comprises a mixing tube 40 set to discharge into the combustion tunnel 30 across an intervening air space. To convert this burner over to oil, the oil tube 10 is inserted into the said mixing tube 40 by screwing the supporting head thereof into the support 41 in place of the gas discharge nozzle. The necessary additional air for complete combustion of the oil is drawn into the combustion tunnel 30 by the velocity of the air stream from the tube 10 as it flows towards the tunnel across the intervening air gap.

In Fig. 9, a gas burner comprises a mixing tube 42 which delivers directly to the combustion tunnel 30. A premix pilot is indicated at 43. The air-gas mixture is formed by delivering air under pressure to the mouth of the mixing tube and by delivering gas at atmospheric pressure about the tube for flow thereinto through radial gas inlet ports 44 intermediate the ends of the tube. The gas supply pipe is indicated at 45, the same delivering to a chamber formed by a casing 46 around the mixing tube proper. The air supply pipe is indicated at 47, the same delivering to the mixing tube by way of a passage formed by an interconnecting pipe T 50. To convert the burner over to oil the oil tube 10 is inserted into the mixing tube 42 to a point short of the entrance to the combustion tunnel 30 by screwing the supporting head 11 of the tube 10 into the outer end of the pipe T 50. The necessary additional air for complete combustion of the oil is supplied under pressure by the pipe 47.

From the foregoing description it will now be seen that the present invention provides a relatively simple and practical method and apparatus for atomizing oil for burners and which is very useful in converting many types of gas burners over to oil. Certain of the apparatus herein disclosed but not claimed is disclosed and claimed in my application Serial No. 15,326 filed March 17, 1948, now Patent No. 2,518,025, granted August 8, 1950.

What I claim is:

A device for use with burners comprising, in combination, a hollow head defining a chamber for gaseous medium under pressure, an oil inlet to said chamber consisting of a metering nozzle of the atomizing type for discharging oil into said chamber in a fine spray, and an imperforate oil conducting tube having an inlet end, an outlet end, a relatively unrestricted tube passage therebetween and at its outlet end at least one relatively small discharge orifice, said tube being mounted on said head axially aligned with and spaced from said metering nozzle to receive oil therefrom and gaseous medium from said chamber, whereby said oil is substantially converted to a film within said tube, propelled as such through the passage thereof and atomized upon discharge therefrom by said gaseous medium as it passes through said discharge orifice.

PHILIP L. KNIGHT.

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