

Aug. 13, 1940.

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2,211,059

BURNER FOR LIQUID FUEL

Filed May 19, 1937

Fig. 1.

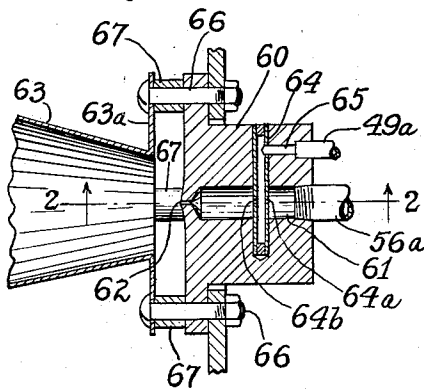
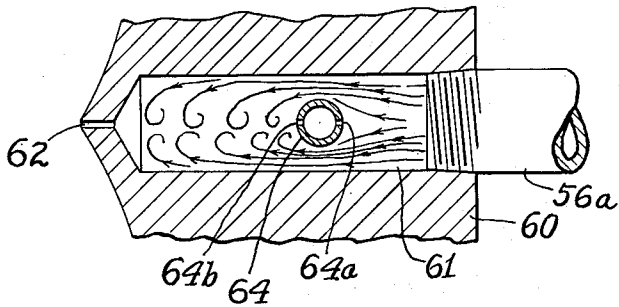


Fig. 2.



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2,211,059

BURNER FOR LIQUID FUEL

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Application May 19, 1937, Serial No. 143,435

4 Claims. (Cl. 299-140)

My invention is an improved construction of burner for liquid fuel, for example, heavy petroleum oil, and includes a burner casing provided with a mixing chamber into which the liquid fuel is projected and sprayed under pressure through a nozzle, air being also supplied thereto under pressure and independently, to the end that the atomized liquid fuel and rapidly moving air projected into the mixing chamber will be thoroughly blended and mixed, before delivery of the mixture from the mixing chamber, which is accomplished by forcing the mixture through a nozzle or jet having a small aperture, projecting the mixture at high velocity into an outer Venturi or mixing tube supplying additional air to the mixture for burning, in which tube the burning of the mixture is begun.

As a result of supplying the liquid fuel and air independently, and independently projecting the liquid fuel and air into the mixing chamber as described, I find I am able to produce a more perfect mixture than where the velocity of the flowing stream of air is dependent upon the fuel flow into and through the burner, and furthermore, as a result of the particular manner in which the fuel and air are projected into the mixing chamber, I am able to completely break up the liquid fuel into extremely minute particles which are thoroughly blended and mixed with the air projected into the mixing chamber, and as a result a fuel and air mixture is produced which is in ideal condition to be burned. In addition, by projecting the perfectly mixed and blended fuel particles and air at high velocity through a minute orifice in the delivery jet or nozzle into the Venturi tube with additional air in properly proportioned amount to effect perfect and complete combustion of the fuel without the presence of excess air, a hotter flame results and a greater amount of heat is produced from a given quantity of liquid fuel, than I have been able to produce from the same quantity of the same liquid fuel in any other way.

I have found by actual test that there are several constructions of burners embodying my invention referred to, which will effectively operate to produce the results described, which are adapted for different uses, and I illustrate in the present application the preferred construction which I have found to be particularly effective in carrying out my invention.

My invention will be best understood by reference to the accompanying drawing illustrating the improvements thereof, in which:

Fig. 1 shows my burner construction in vertical, longitudinal, sectional view, and

Fig. 2 is a horizontal, sectional view to an enlarged scale, of the construction shown in Fig. 1, taken along the line 2-2.

Similar numerals refer to similar parts throughout the several views.

In Figs. 1 and 2, I illustrate my burner construction, which may be supplied with liquid fuel and air under pressure in any desired manner known to the art. The burner 60 consists of a block of metal in which a central bore 61 is formed, which constitutes the mixing chamber of the burner, the air supply pipe 56a being connected with a tight fit into the outer end of said bore. The bore 61 extends nearly through the block of the burner 60, where it terminates in a delivery opening 62 of small size, so that the heated mixture of atomized fuel and air may be projected into the Venturi tube 63 and there burned. The bore 61 of the burner 60 is crossed by a transverse bore of smaller diameter containing with a snug fit, a fuel tube 64 having tightly closed ends, the outer end of said tube being sealed in the block of the burner 60 to prevent leakage, in any desired manner, for example, by brazing. The block of the burner 60 contains a small diameter bore 65 substantially parallel with the bore 61 and extending through the side wall of the fuel tube 64, the outer end of which bore 65 is tightly connected with the end of the fuel supply pipe 49a. The fuel tube 64 is provided with opposite apertures 64a and 64b, which are of small size and substantially in the axis of the bore 61. As a result of the construction described, by supplying liquid fuel and air to the pipes 49a and 56a under pressure and in any suitable manner, the liquid fuel and air are highly heated by the heated condition of the block of the burner 60 resulting from the action of the flame produced, and the flow of air under pressure from the pipe 56a into the mixing chamber 61, produces eddy currents as illustrated in Fig. 2, around the fuel tube 64, into which eddy currents the heated liquid fuel is projected through the small openings 64a and 64b, with the result that the fuel is effectively broken up and atomized, and thoroughly blended and mixed with the heated air in the mixing chamber 61, so that practically a perfect fuel mixture is projected at high velocity through the outlet opening 62 for burning in the Venturi tube 63. With this construction, the Venturi tube 63 is provided at its base with a flange 63a substantially parallel with the face of the block of the burner 60, and said flange is secured to said block by bolts 66, tubular separators 67 being placed on the bolts between

the flange and the block, to permit the air to enter into the smaller end of the Venturi tube 63, between the tubular separators 67. This construction operates efficiently, due to the smaller end of the Venturi tube 63 being open to the atmosphere around the burner 60, so that the production of eddy currents in the Venturi tube 63 around the outlet opening 62, is impossible. The flange 63a is spaced such a distance from the block of the burner 60, that the air required for complete combustion with maximum fuel consumption for which the burner is designed, will readily flow into the smaller end of the Venturi tube 63, without admitting excess air that would cool the combustible gases and interfere with efficient heat production.

In using the burners described, I find air pressures of from four to twelve pounds per square inch are effective in preparing heavy fuel oil for practically perfect burning, depending upon the burner construction and upon the amount of heat it is required to produce. The flame produced with a discharge orifice of from one thirty-second of an inch to one-sixteenth of an inch in diameter, can readily be varied from a length of about one foot to four feet or more by varying the pressures on the air and fuel oil supplied to the burner.

The fuel oil employed with the burners described, can be as heavy as number 5 oil with entirely satisfactory results, referring to the system of numbering fuel oils commonly in use by which the oils designated by lower number are lighter and contain different proportions of volatile constituents, the number 4 oil containing little of such volatile constituents, the number 5 oil being a heavy, opaque oil containing practically no readily volatile elements, and the number 6 oil, the heaviest in the series, being practically a solid at freezing temperatures. The heavier oils contain more heat units per unit volume than the lighter oils, which in part accounts for the large heat production made possible by the burner construction above described.

While I have shown my invention in the particular embodiment above described, I do not limit myself thereto as I may employ equivalents thereof without departing from the scope of the appended claims.

What I claim is:

1. In a liquid fuel burner, the combination of a metallic body portion having a first cylindrical bore constituting a mixing chamber, one end of said bore being adapted to receive air under pressure and the other end of said bore having a small discharge opening of mixture-atomizing size, said body portion having a second cylindrical bore of substantially smaller diameter than said first bore and with its axis extending transversely across said first bore, whereby said second bore comprises end portions extending from opposite sides of said first bore, and a metal tube tightly fitting the end portions of said second bore and crossing said first bore, said tube having closed ends and having also a liquid-atomizing discharge opening in said first bore, said body portion having a third bore for receiving liquid fuel and extending in a direction crossing said second bore, said third bore being continued through a side wall of said tube between the closed ends of the latter.

2. In a liquid fuel burner, the combination of a metallic body portion having a first cylindrical bore constituting a mixing chamber, one end of

said bore being adapted to receive air under pressure and the other end of said bore having a small discharge opening of mixture-atomizing size, said body portion having a second cylindrical bore of substantially smaller diameter than said first bore and with its axis extending transversely across said first bore, whereby said second bore comprises end portions extending from opposite sides of said first bore, and a metal tube tightly fitting the end portions of said second bore and crossing said first bore, said tube having closed ends and having also a liquid-atomizing discharge opening in said first bore, said body portion having a third bore for receiving liquid fuel and extending in a direction crossing said second bore, said third bore being continued through a side wall of said tube between the closed ends of the latter, the discharge opening of said first bore being cylindrical and having a diameter of the order of from one thirty-second to one-sixteenth of an inch.

3. In a liquid fuel burner, the combination of a metallic body portion having a first cylindrical bore constituting a mixing chamber, one end of said bore being adapted to receive air under pressure and the other end of said bore having a small discharge opening of mixture-atomizing size, said body portion having a second cylindrical bore of substantially smaller diameter than said first bore and with its axis extending transversely across said first bore, whereby said second bore comprises end portions extending from opposite sides of said first bore, and a metal tube tightly fitting the end portions of said second bore and crossing said first bore, said tube having closed ends and having also two oppositely disposed liquid-atomizing discharge openings of cylindrical form in said first bore, said body portion having a third bore for receiving liquid fuel and extending in a direction crossing said second bore, said third bore being continued through a side wall of said tube between the closed ends of the latter, the oppositely disposed discharge openings in said tube being substantially coaxial with said first bore.

4. In a liquid fuel burner, the combination of a metallic body portion having a first cylindrical bore constituting a mixing chamber, one end of said bore being adapted to receive air under pressure and the other end of said bore having a small discharge opening of mixture-atomizing size, said body portion having a second cylindrical bore of substantially smaller diameter than said first bore and with its axis extending transversely across said first bore, whereby said second bore comprises end portions extending from opposite sides of said first bore, and a metal tube tightly fitting the end portions of said second bore and crossing said first bore, said tube having closed ends and having also two oppositely disposed liquid-atomizing discharge openings of cylindrical form in said first bore, said body portion having a third bore for receiving liquid fuel and extending in a direction crossing said second bore, said third bore being continued through a side wall of said tube between the closed ends of the latter, the oppositely disposed discharge openings in said tube being substantially coaxial with said first bore, the discharge opening of said first bore being cylindrical and having a diameter of the order of from one thirty-second to one-sixteenth of an inch.

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