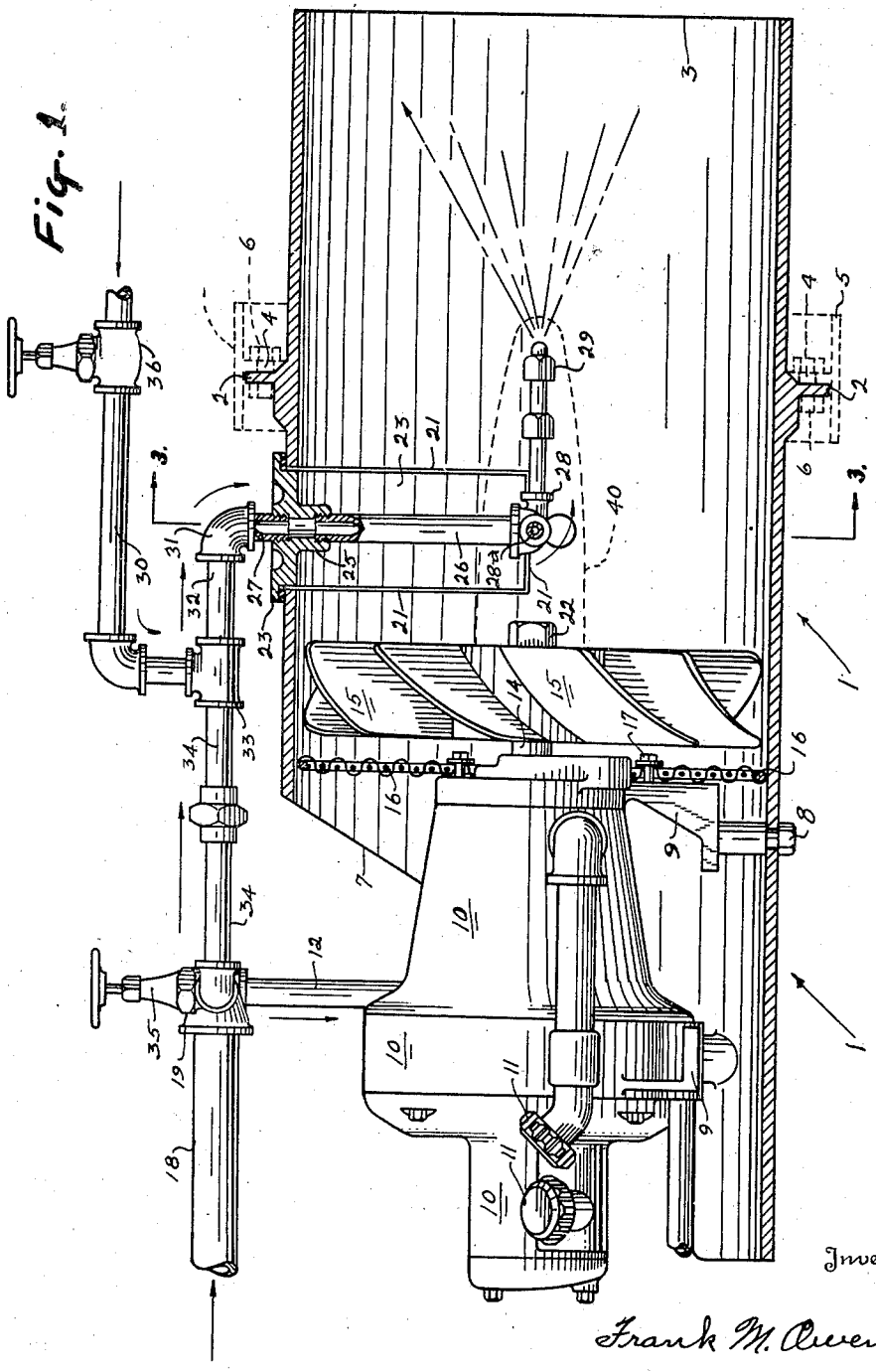
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OIL BURNER

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Fig. 1.



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Fig. 2.

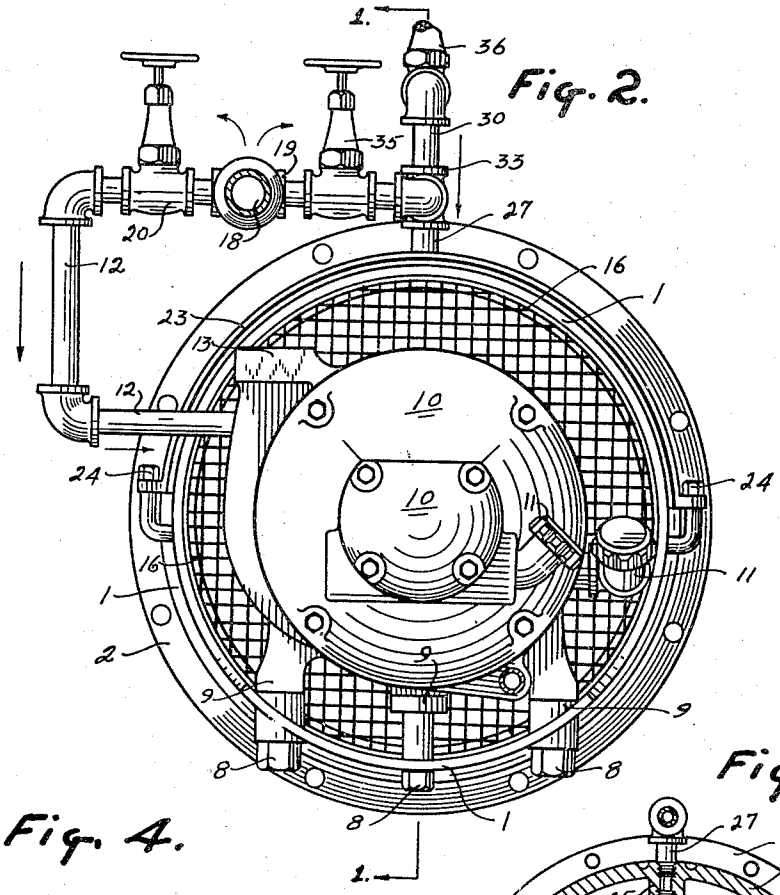


Fig. 3.

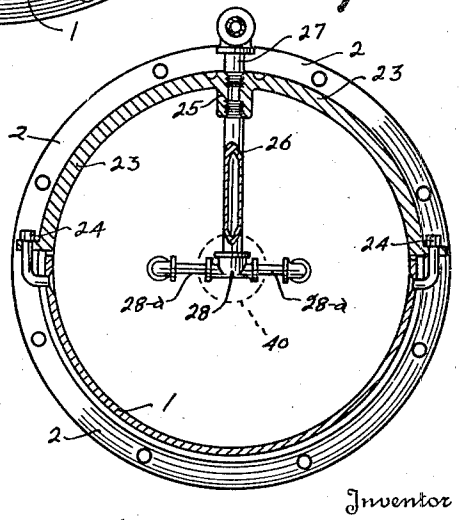
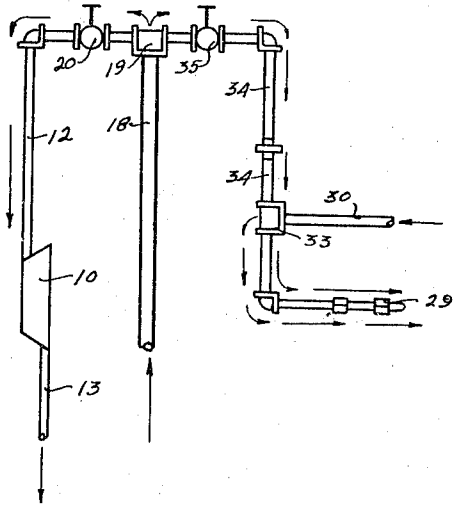


Fig. 4.



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UNITED STATES PATENT OFFICE

2,369,367

OIL BURNER

Frank M. Owen, Houston, Tex.

Application January 10, 1944, Serial No. 517,738

3 Claims. (Cl. 158—76)

My invention relates to apparatus for feeding liquid to a boiler fire-box or other combustion chamber.

One important object of the invention is to provide a burner for liquid fuel which will obtain maximum efficiency in fuel combustion and a minimum loss of heating units.

Another object is to provide a burner apparatus which will create a forced draft for mixing air with the fuel in a mixing chamber, not only for the purpose of obtaining proper combustion when the mixture is ignited, but also for the purpose of carrying from the combustion chamber all excess or un-consumed gases and oxygen.

In carrying out my invention, as a whole, the following elements are included: a tubular mixing chamber having its exhaust end presented to a combustion chamber; a fuel atomizer therein for projecting fuel toward the exhaust end of the mixing chamber; a blower fan behind the atomizer and pointed in a like direction; control means for regulating the volume and pressure at the atomizer; and, means for controlling the speed at which the fan is rotated.

One object of the invention is therefore to provide a blower-type burner which is minutely adjustable as to fuel volume and fuel pressure, as well as to air volume and force.

In a burner of the present type, there is a region of low pressure or partial vacuum extending forwardly from the impeller fan and located in axial alignment with the rotative axis thereof. This region of partial vacuum elongates as the speed of the fan increases, and my experiments have shown that proper atomization of the liquid fuel is practically impossible, if the atomizer tip is located within the low pressure region of partial vacuum.

It is therefore an important object of the present invention to provide an obstruction within the region or space of partial vacuum to decrease its extent, and to locate the atomizer tip or tips in such a position or positions that the low pressure region does not effect atomization of the fuel.

Another object is to provide a burner of the present class which is so designed that its moving parts are not damaged by heat from the combustion chamber.

Yet another object is to provide a blower-type burner so designed that its fan or air impeller may be easily and quickly removed for replacement or repairs without disconnection or removal of the other apparatus from the fire-box.

A still further object is to provide a burner mechanism so designed that the fuel injecting and atomizing elements may be easily and quickly removed as a single unit, without disconnection of the mixing chamber or other elements from the fire-box.

One further object is to provide a blower-type fuel burner in which the fan and its power plant may be easily and quickly removed from the mixing chamber without disconnecting its atomizing element.

Other objects are: to provide a device of the class described which is economical to manufacture; simple to install; which will be durable; and, which will be efficient in accomplishing all of the objects for which it is intended.

With these and other objects in view as will more fully appear, one embodiment of the invention is illustrated in the accompanying two-sheet drawings, wherein:

Figure 1 is a side elevational view, partially in section, and taken substantially along the line 1—1 of Figure 2;

Figure 2 is an end elevational view looking from the left hand end of Figure 1;

Figure 3 is an elevational sectional view taken substantially along the line 3—3 of Figure 1; and,

Figure 4 is a diagrammatic view of a preferred form of plumbing arrangement for steam and fuel lines.

Like characters of reference designate the like parts in all of the figures.

In the drawings:

The reference numeral 1 indicates as a whole a hollow cylindrical or tubular body preferably constructed of metal pipe and having a suitable anchoring means 2 intermediate its ends, which may consist of an outstanding annular flange or rib as shown. The body 1 may be operatively mounted rigidly by inserting its outlet or exhaust end 3 through a perforation in the web 4 of a usual I-beam 5, and then fastening the web and rib 2 together as with bolts or rivets 6.

Rigidly mounted within the opposite or intake end 7 of the body 1, and connected to the body by bolts 8 are base brackets 9 of a usual power unit 10, which is preferably in the form of a steam driven turbine. As illustrated, the turbine 10 has fittings 11 for the purpose of lubrication, has a steam inlet pipe line 12 for the purpose of power, and has a suitable exhaust 13. The turbine 10 has a driven shaft 14 co-axial with the body 1 and extending toward the exhaust end 3 thereof, and keyed or otherwise rigidly mounted upon the shaft 14 is an impeller fan 15 substantially filling the cross-sectional area bore of the

body 1. The blades of the fan 15 are pitched to force air toward the end 3 of the body 1 when the turbine is in operation. A suitable wire-cloth screen 16 is mounted on the fan end of the turbine 10 by bolts 17 and acts to exclude foreign objects from the body 1.

It is obvious that disconnection of the bolts 8 will permit removal of the complete turbine, fan and screen as a single unit from the body 1.

As a means for delivering steam to the pipe 12, there is provided a supply line 18 entering a pipe T 19 and a control valve 20. It is obvious that operation of the valve 20 will control the speed of rotation of the turbine and the fan 15, and that through this speed control, the amount and speed of air delivered through the body 1 is controllable.

As best illustrated in Figures 1 and 3, the top of the body 1 is provided with a transverse opening which is indicated as being bounded by lines 21, and which extends down the side walls of the body to approximately its vertical center. This opening 21 is of a width greater than the width of the fan 15 so that should it be desirable to remove the fan from the body, such removal may be accomplished through the opening or window by removal of a nut 22 which holds the fan on the shaft 14.

For closing the opening 21 there is an arcuate closure plate 23 which is held in place over the opening by suitable detents 24. The plate 23, intermediate its ends, is equipped with an enlargement or boss 25 which is through bored, and which receives an inwardly projecting nipple 26 and an outwardly extending nipple 27. The inner end of the nipple 26 is located approximately at the axial center of the body 1 and receives a pipe T 28 having horizontal legs extending transversely of the body 1. The T 28 is located in alignment with the longitudinal axis of the shaft 14 for a purpose more fully described hereinbelow.

Each horizontal leg of the pipe T 28 has a short nipple 28*a* which is connected through an elbow with a suitable spray nozzle or atomizer 29 which projects forwardly or toward the exhaust end 3 of the body 1, and which is adapted to emit at its free end, atomized fuel toward said end 3 as is more fully described hereinbelow.

For delivering liquid fuel to the pipe T 28 and consequently to the two atomizers 29, the nipple 27 is connected with a fuel supply pipe 30 through an elbow 31, a nipple 32, and a pipe T 33. One leg of the T 33 is connected to a pipe 34 leading through a control valve 35 from the pipe T 19 of the steam supply line 18. The fuel pipe 30 is of course equipped with a control valve 36 for regulating the fuel flow into the T 33.

With this plumbing arrangement, the valve 35 may be cracked to supply steam to the T 33 which is also receiving fuel from the pipe 30, and therefore both steam and liquid fuel are delivered to the atomizers 29. Through manipulation of the valves 35 and 36, the pressure and volume of the fuel at the nozzles can be accurately regulated. It is to be understood, of course, that in order to prevent the steam pressure in the T 33 from backing the fuel into the line 30, the fuel carried in the pipe 30 must be at a greater pressure than that of the steam in the pipe 34, or a suitable injector, not shown, must be provided at the junction of the pipes 30 and 34.

With the nozzles 29 emitting properly atomized fuel into the body 1, and with the fan 15 rotating at a controlled speed of approximately 3000 R. P. M., the air blast of the fan 15 meets the atomized fuel in the front portion of the body 1 at a comparatively high velocity. This body portion is in effect a mixing chamber, and the mixture thus attained is emitted from the end 3 of the body 1 into the fire-box or combustion chamber, not shown. This mixture of air and steam-atomized fuel is, of course, ignited in the fire-box, and by proper manipulation of the control valves 20, 35 and 36, a flame can be obtained having almost perfect combustion efficiency.

In dotted lines in Figures 1 and 3 the normal low pressure or partial vacuum region or space in the body 1 is indicated by the reference numerals 40. By the word "normal" as used above, is meant the low pressure or partial vacuum region which would occur with fan 15 rotating at around three thousand to thirty-six hundred revolutions per minute, and with no obstruction being placed in the air path to break up the partial vacuum space normally occurring at its axis. It can readily be visualized by observation of Figure 1, that if the tip of an atomizer was located in axial alignment with the fan shaft 14, it would be discharging into the partial vacuum region. In the present instance, however, provision of the laterally extending nipples 28—*a* has taken the atomizer tips out of the partial vacuum region. Further, by locating the pipe T 28 in alignment with the fan shaft 14, the normal partial vacuum region 40 has been disturbed, and the air travel at the vortex of the air stream is sufficiently diffused by the pipe T 28 and nipples 28—*a* that the normal low pressure or partial vacuum region is materially shortened. Atomization is therefore not effected by the vacuum region present in the body 1.

It has been found possible with the present structure to use only one of the atomizing nozzles 29 and to locate that one in axial alignment with the fan shaft 14 when sufficient obstruction is placed between the nozzle and the end of the fan shaft to materially shorten the normal low pressure region 40.

It will be understood that when the above described blower-type burner mechanism is installed upon a usual boiler, the smoke-stack capacity normally required with usual burners may be materially decreased due to the fact that the impeller fan assists in carrying or driving off unburned gases from the combustion chamber of the boiler.

It may also be seen that the fan and the front fan shaft bearing of the turbine are protected from being over heated from the heat in the fire-box, because of the fact that cool air is constantly being drawn into the intake end 7 of the body 1, and its ejection toward the exhaust end 3 prevents heat from the fire-box from reaching the fan or turbine.

From the foregoing description it is believed to be apparent that all objects previously set forth hereinabove are attainable by the apparatus disclosed.

It is obvious that, if desired, the fan 15 could be driven by an electric motor, or other means of power, without affecting the combustion efficiency of the mechanism. Also, that the air blast could possibly be delivered by an air compressor if conditions so dictate.

I claim:

1. In a burner mechanism for liquid fuel, the combination of: a substantially cylindrical mixing chamber having an intake end and a discharge end, the wall of said chamber having a transversely extending elongated opening; a turbine

removably mounted adjacent the intake end of said chamber; an axial-flow type fan driven by the turbine and located within the chamber adjacent its intake end for directing an air stream toward said discharge end at a velocity sufficient to normally create a region of partial vacuum in front of, adjacent, and in substantial alignment with the fan axis, said fan being of such diameter and length that it is removable through said transverse chamber opening; a closure for said transverse chamber opening; an atomizer for said fuel, said atomizer being attached to and movable with the closure, and located in said air stream in front of the fan and directed toward the discharge end of said chamber when the closure is in its closing position; and means carried by said closure and located between the fan axis and the atomizer for deflecting said air stream to prevent formation of said normal vacuum region.

2. In a burner mechanism for liquid fuel, the combination of: a straight tubular cylindrical mixing chamber of unrestricted cross-sectional area and having fully open intake and discharge ends; an axial-flow type fan within and substantially filling the transverse area of the chamber, said fan being adapted to create an anti-cyclonic air stream within the chamber, the velocity of said stream being sufficient to create a low pressure region of much less diameter than said chamber within the chamber in front of and adjacent the fan, and in alignment with its rotative axis; and an atomizer for liquid fuel in the chamber in front of the fan and directed toward said discharge end, said atomizer being located eccentrically in the chamber transversely outside of said low pressure region, and nearer to the fan than is the outer end of said low pressure area.

3. In a burner mechanism for liquid fuel, the combination of: a straight tubular cylindrical mixing chamber of unrestricted cross-sectional area and having fully open intake and discharge ends; an axial-flow type fan within and substantially filling the transverse area of the chamber, said fan being adapted to create an anti-cyclonic air stream within the chamber, the velocity of said stream being sufficient to create a low pressure region of much less diameter than said chamber within the chamber in front of and adjacent the fan, and in alignment with its rotative axis; and an atomizer for liquid fuel in the chamber in front of the fan and directed toward said discharge end, said atomizer being located eccentrically with relation to the rotative axis of the fan and transversely outside of said low pressure region, and nearer to the fan than is the outer end of said low pressure area.

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