June 10, 1930. H. F. SCHMIDT 1,762,356

LIQUID FUEL BURNER

Filed Nov. 19, 1924

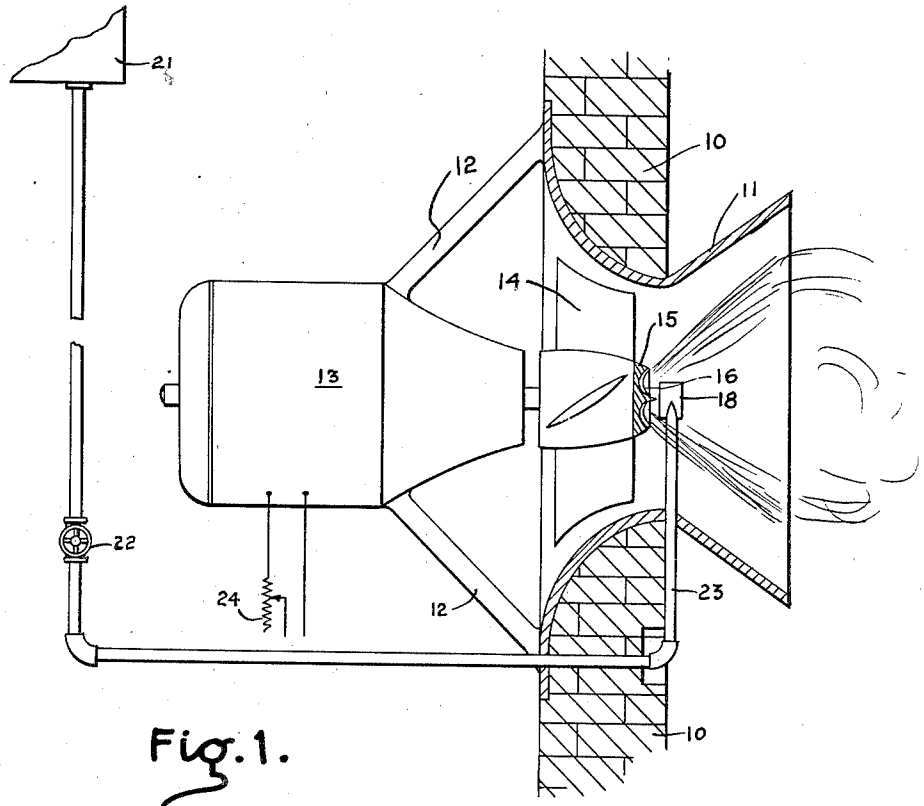


Fig. 1.

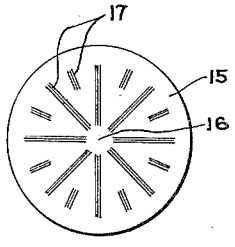


Fig. 2.

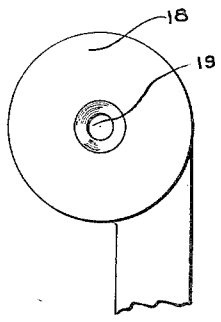


Fig. 3.

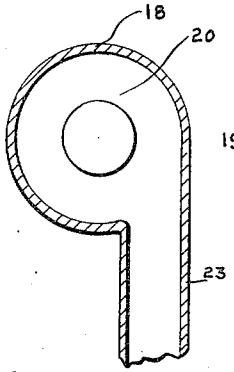


Fig. 4.

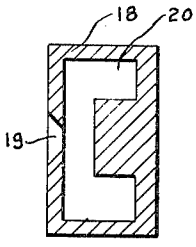


Fig. 5.

WITNESS

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UNITED STATES PATENT OFFICE

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LIQUID-FUEL BURNER

Application filed November 19, 1924. Serial No. 750,799.

My invention relates to liquid fuel burners and it has for an object to provide apparatus of the character designated which shall be effective to break the fuel up into an extremely minute form before combustion and which shall be flexible in operation in that it will provide and support a hot, steady flame throughout a wide range of demand.

In the accompanying drawing, Fig. 1 is a side view, partially in section and partially in elevation, of a burner embodying a preferred form of my invention; Fig. 2 is a plan view of the baffle employed for the deflection of the fuel into the air supply; and Figs. 3, 4 and 5 are detail views of the specific fuel-projecting nozzle employed in the device of Fig. 1.

In the installation of liquid fuel burners under boilers and in similar locations, it has been proposed to supply each burner with an individual motor or turbine-driven fan whereby the amount of air supplied to the combustion chamber may be quickly and accurately adjusted within wide limits.

In accordance with the present invention, I provide a motor or turbo-driven fan, preferably of the propeller type, projecting into an opening in the furnace wall, said fan being provided at the inner end of its hub with a baffle member, said baffle member accordingly rotating with the fan. I then dispose immediately in front of said baffle member a fuel nozzle so designed as to project a conical shape spray of fuel against the baffle member. Each particle of fuel in this spray is projected against the baffle member in a general direction which is counter to the direction of rotation of said baffle member. Accordingly the fuel is broken up by impact upon the baffle into an extremely finely divided form and ejected out into the air blast where it almost immediately forms a highly combustible mixture for the support of the flame as is desired.

Referring to the drawing for a more detailed understanding of my invention, I show a furnace wall at 10—10 of any desired type, this wall being provided with a burner opening surrounded by a suitable housing 11. Carried from this housing by suitable arms 12—12 is a motor 13 carrying upon its shaft a fan 14 of the propeller type, all of any desired and convenient form.

The fan 14 is provided at the inner end of its hub with a baffle member 15 comprising a central cusp 16 surrounded by a relatively wide, shallow groove as shown. This baffle member 15 is shown in front view in Fig. 2 and it will be noted that said groove is provided with transverse lugs or impact members 17—17 the form of which may be widely varied without departing from the spirit of my invention.

Disposed immediately behind the baffle member 15 is a fuel nozzle 18 comprising a casing having a flaring opening 19 directed toward the cusp 16 of the member 15. Surrounding the orifice 19 is an annular chamber 20, as shown in Figs. 4 and 5, this annular chamber communicating directly with the orifice 19 as shown.

Fuel under pressure, as from an elevated reservoir 21, is supplied through a suitable control valve 22 and pipe 23 to the annular chamber 20, the arrangement of said supply pipe being such that the fuel enters the chamber 20 tangentially, as shown most clearly in Fig. 4. By reason of this construction and arrangement the particles of fuel are caused to rotate within the annular chamber 20 at an extremely rapid rate. The fuel will leave the opening 19 in a spray which will resemble somewhat a cone in shape. Two forces will be acting upon each of these particles of fuel as it leaves the opening, one of which acts in a direction which is tangential to the path of the particle previous to its exit, and the other of which acts in a direction parallel to the axis of rotation. The first force is the centrifugal force created by the rotation of the fuel within the annular chamber 20, and the other is that which is created by the pressure of the fuel within this chamber. The resultant of these two forces will be a straight line which extends from the opening 19 to the surface of the baffle member 15. This line will strike the baffle member at an acute angle as will be readily understood.

The design is such that the direction of rotation of the baffle member 15 is counter to

the general direction of the projected particles of fuel, whereby it results that the impact of the spray upon the roughened, concave surface of the member 15 produces an extremely violent, disruptive effect upon the fuel particles, breaking the same into extremely minute form and projecting the finely comminuted fuel into the air blast supplied by the fan 14, both by the centrifugal action imparted by the baffle 15 and also by the fact that the natural angle of reflection from the baffle member tends to spread the fuel in the path of the air blast.

It will be noted that upon the ignition of the combustible mixture thus formed, an extremely flexible and stable flame is produced, the stability rising from the extremely minute subdivision of the fuel particles and the flexibility arising from the fact that by cutting down the fuel spray and correspondingly reducing the speed of the fan, as by rheostat 24, it is still possible to secure a highly combustible mixture in far less volume than is produced when fuel is supplied at the maximum rate and the fan 14 is operating at maximum speed.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a liquid fuel burner, the combination with means for setting up an air blast, of means disposed within said air blast and providing an annular chamber having an axial discharge orifice facing toward the source of said blast, and means for supplying fuel tangentially to said chamber, whereby a rotary motion is imparted to said fuel prior to its ejection from said orifice into said blast.

2. In a liquid fuel burner, a propeller type fan disposed to project an air blast and having its exposed hub end provided with a baffle member comprising a central cusp surrounded by an annular groove having roughened walls, and means for projecting the fuel against the central portion of said baffle member, whereby the rotation of said baffle member breaks up the fuel into minute particles in the act of deflecting the fuel into said air blast.

3. In a liquid fuel burner, the combination of a fan for projecting an air blast; a baffle member disposed upon and rotatable with said fan; a nozzle member opposed to said baffle member and comprising an annular chamber having an axial nozzle opening directed toward said baffle member and a tangential supply passage for said chamber; and means for supplying fuel to said passage under pressure, whereby a conical spray is projected against said baffle member and deflected into said air blast in finely divided form.

4. In a liquid fuel burner, the combination of a fan for projecting an air blast; a baffle member concentrically mounted upon the fan and rotatable therewith; said baffle member comprising a central outwardly projected cusp surrounded by a groove provided with roughened walls; a fixed nozzle member disposed immediately in front of said cusp; said nozzle member comprising an annular chamber having an axially arranged discharge opening directed toward said cusp and a tangentially arranged oil supply passage for the chamber; and means for supplying liquid fuel under pressure to said chamber through said tangential supply opening, whereby said fuel is ejected from said discharge opening and onto the baffle member in the form of a rapidly moving conical spray in such a manner that the impingement of the spray on the baffle member tends to break up the fuel into particles for projection into said air blast.

5. In a liquid fuel burner, the combination of means for producing an air blast, a rotatable baffle member disposed within said air blast and having its axis of rotation arranged substantially parallel to the general direction of the blast, a nozzle member opposed to the baffle member and comprising an annular chamber having an axial nozzle opening directed toward the baffle member and a tangential supply passage for said chamber, and means for supplying fuel to said supply passage under pressure whereby a conical spray is projected against said rotatable baffle member and deflected into said air blast in finely divided form.

6. In the liquid fuel burner, the combination of means for producing an air blast, a member disposed within and extending transversely of the air blast, said member having a baffle surface thereon facing in the general direction of the blast, means for rotating the member about an axis arranged substantially parallel to the air blast, nozzle means for projecting fuel on to the baffle surface, the nozzle means and the member being so constructed and arranged that each particle of fuel is projected toward the baffle surface in a direction contra to the general direction of rotation of the member and strikes the baffle surface at acute angles thereto.

7. In combustion apparatus, the combination of a housing providing a converging-diverging passage, a driving shaft arranged coaxially of said housing and having one end extending interiorly to a point intermediately of the length of the latter, a propeller disposed within said housing and including a hub connected to said end of the shaft and having radial blades for translating air

axially of said housing, and means disposed within the housing at the down-stream side of the propeller for supplying atomized fuel interiorly of the air stream flowing axially in said housing, said means embodying a baffle disposed transversely of the housing at the down-stream end of said hub and rotatable with the propeller and a nozzle member spaced from the baffle in a down-stream direction and having a passage directed toward said baffle.

8. In combustion apparatus, the combination of a housing providing a converging-diverging passage; a driving shaft arranged coaxially of said housing, supported from the forward end of the latter and having one end extending interiorly to a point intermediate the length thereof; a propeller disposed within said housing and including a hub connected to said end of the shaft and having radial blades for translating air axially of said housing; means disposed within the housing at the down-stream side of the propeller for supplying atomized fuel interiorly of the air stream flowing axially in said housing, said means embodying a baffle disposed transversely of the housing and provided at the down-stream end of said hub and a nozzle member spaced in a down-stream direction from the baffle and having a passage directed toward the latter; and a conduit extending transversely through the housing wall at the down-stream side of the propeller for supplying liquid fuel to said nozzle member.

9. In a fuel burner, the combination of a casing having an axial passage, a propeller arranged in the passage, an impact member rotatable with the propeller and arranged centrally of and at the discharge side of the propeller, a nozzle passage at the discharge side of the propeller and directed toward said impact member, and means for supplying liquid fuel to the nozzle passage inlet with high-velocity circular or vortical motion in a direction opposed to the direction of rotation of the propeller.

10. In a fuel burner, the combination of a housing providing a horizontal converging-diverging passage, a power shaft arranged coaxially of the passage and having one end located at a point intermediate the length of the latter, a shaft-supporting means carried by the forward end of the housing, a propeller in said passage and connected to said end of the shaft, the propeller including a hub and radial vanes, a baffle provided at the down-stream end of the hub and rotatable with the propeller, a nozzle passage arranged coaxially of the passage and spaced from and directed toward the baffle, a conduit extending through the housing wall at the discharge side of the propeller for supplying liquid fuel under pressure, and means supplied with liquid fuel by said conduit and providing for circular or vortical motion in a direction opposed to the direction of rotation of the propeller of the fuel supplied to said nozzle passage.

11. In a fuel burner, the combination of a horizontal annular housing having a converging-diverging passage and adapted to extend through a furnace front wall and be supported thereby, a motor extending forwardly of said casing and having a shaft extending axially of the passage and into said casing, means connected to the motor and to the front end of the casing for supporting the former from the latter, a radial-vaned propeller arranged in said passage and connected to the rearward end of said shaft, means disposed centrally of the passage at the discharge side of the propeller for dispersing finely divided fuel into the axial and whirling air stream issuing from the propeller, and a conduit extending substantially radially through the housing wall at the discharge side of the propeller for supplying fuel to said means.

In testimony whereof, I have hereunto subscribed my name this twelfth day of November, 1924.

HENRY F. SCHMIDT.