

May 17, 1932.

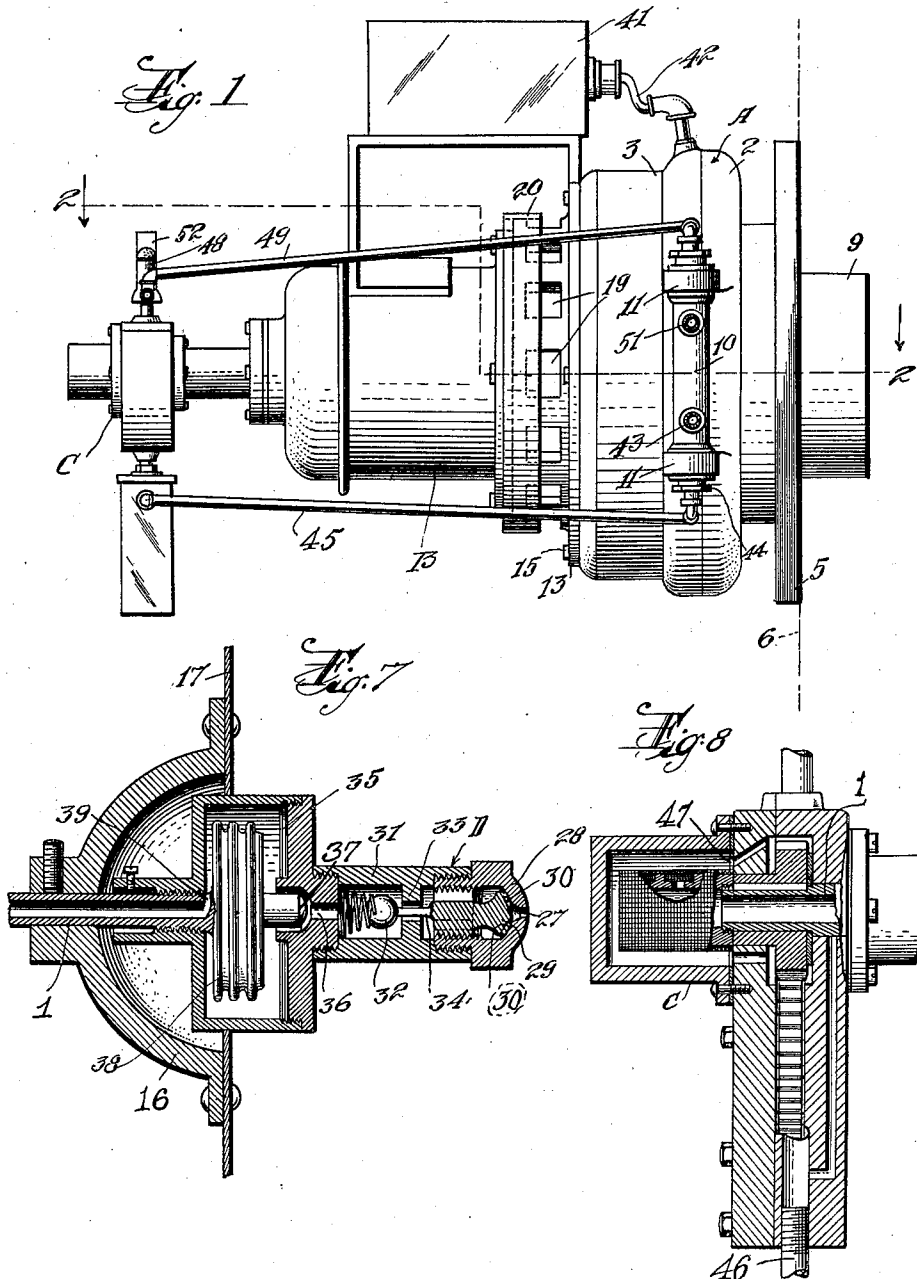
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1,858,837

OIL BURNER SYSTEM

Filed Oct. 25, 1929

4 Sheets-Sheet 1



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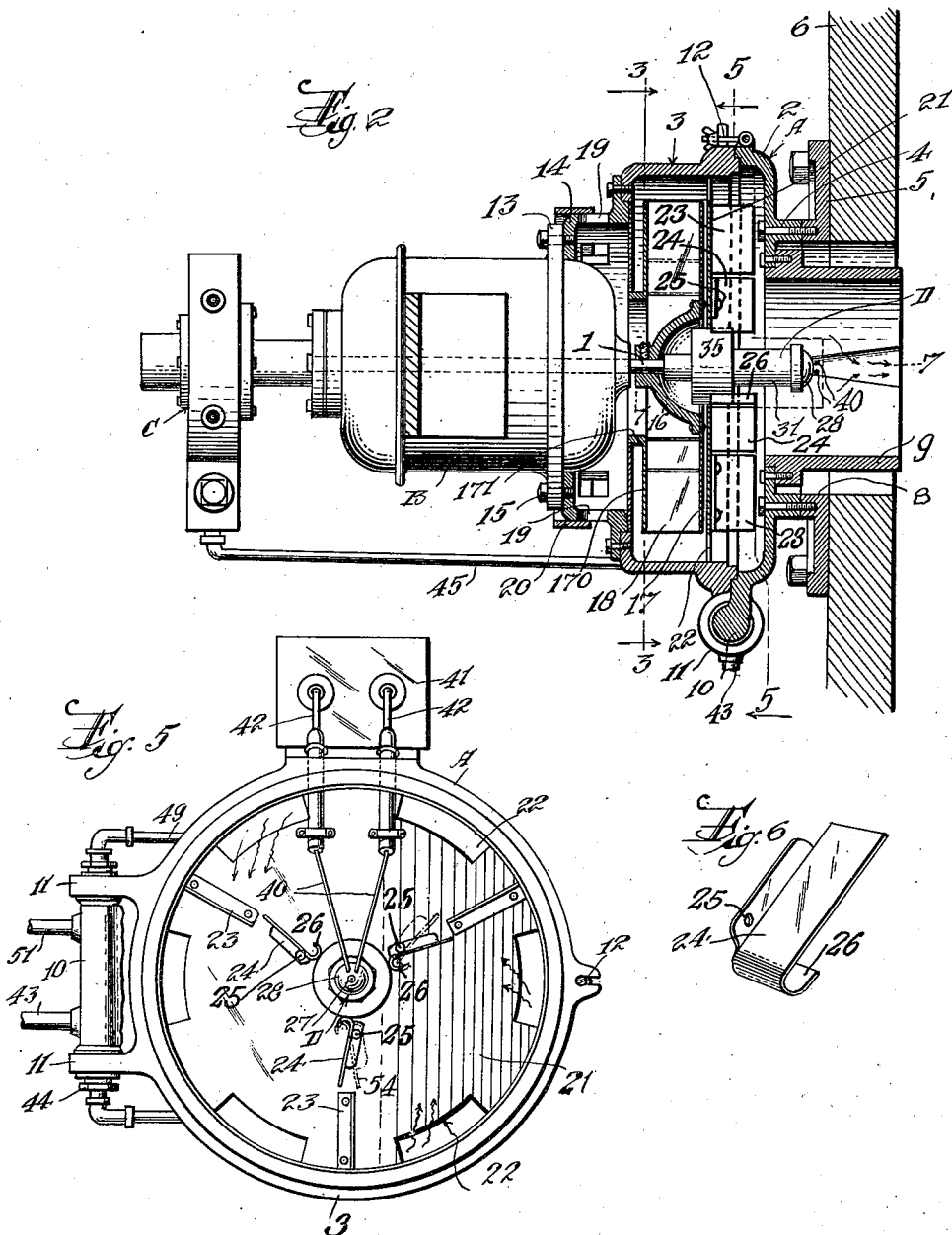
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4 Sheets-Sheet 2



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Fig. 3

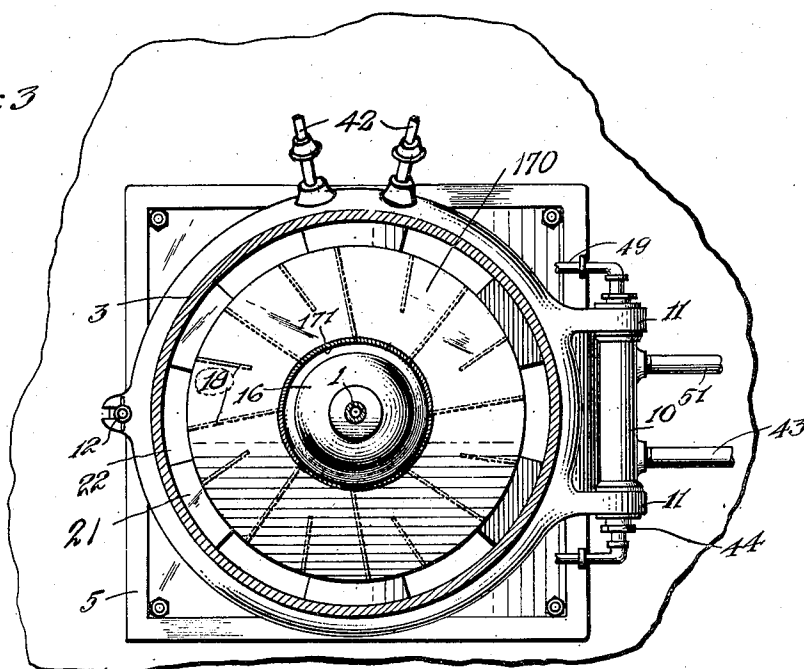
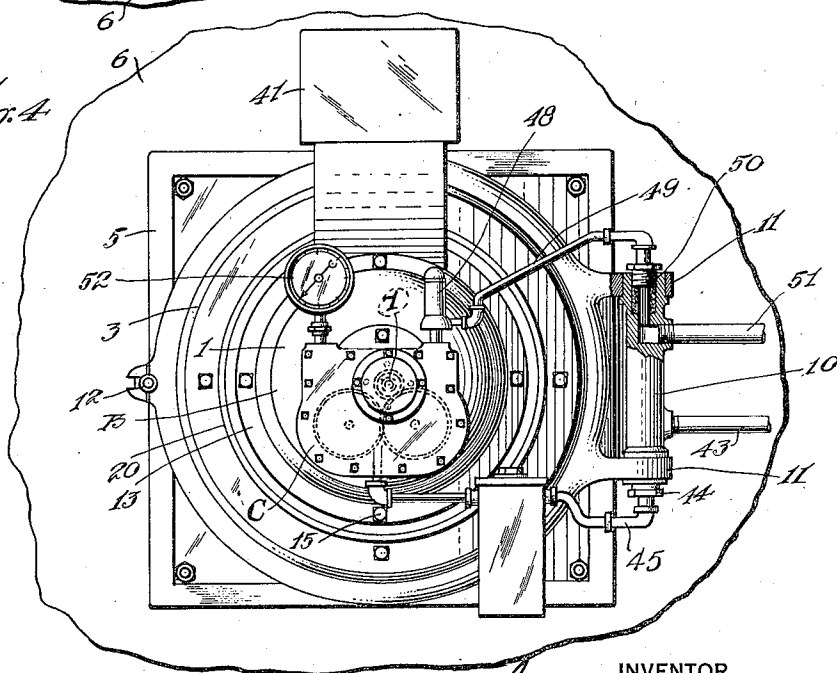


Fig. 4



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4 Sheets-Sheet 4

Fig. 9

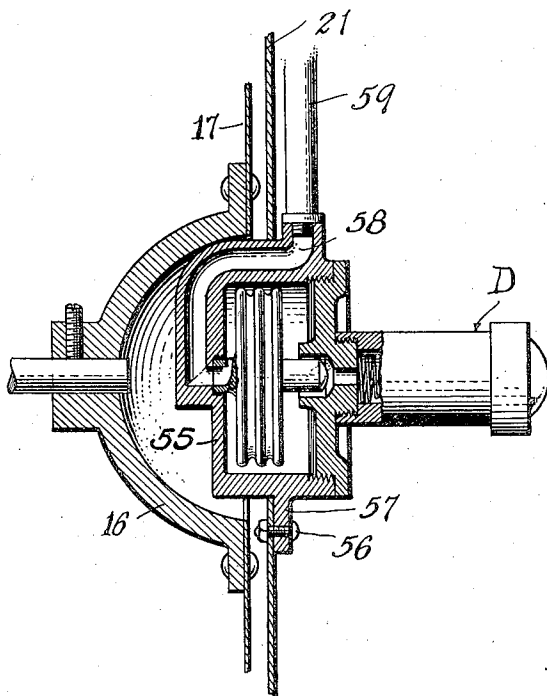
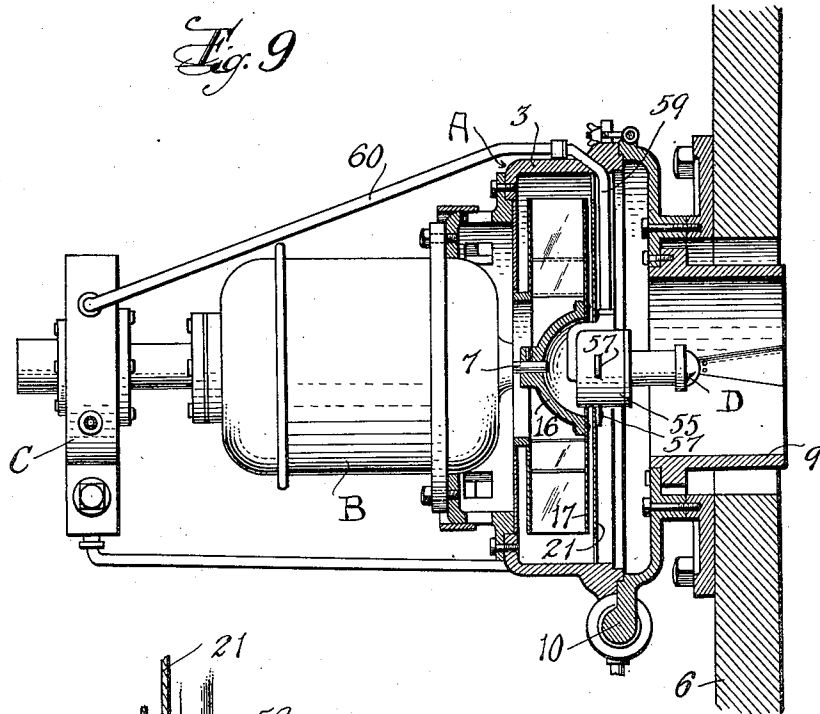


Fig. 10

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UNITED STATES PATENT OFFICE

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OIL BURNER SYSTEM

Application filed October 25, 1929. Serial No. 402,364.

This invention relates in general to oil burners, one object of the invention being to provide a novel and improved combination of oil pump, air pump or fan, motor and fuel atomizing nozzle, whereby a simple, compact, efficient, reliable and substantially noiseless construction is obtained at small expense.

Other objects are to provide a novel and improved low pressure and large volume air pump or fan having an outlet coaxial with its axis of rotation, and means for controlling the discharge of air currents therefrom; to provide a novel and improved combination of such an air pump and an atomizing fuel nozzle so that accurate control and regulation of the character and location of the flame relative to the nozzle can be obtained; to thus provide a centrifugal fan and a plurality of vanes or baffles for directing the air currents inwardly toward the axis of rotation through an axial outlet in which is arranged a fuel atomizing nozzle, said vanes having adjustable parts so as to produce an adjustable turbulence of the air currents to obtain currents of relatively low velocity at the center of the outlet adjacent said nozzle and currents of a higher or equal velocity along the walls of said outlet to thereby control the location of the flame with respect to the nozzle; to provide an air pump of the character described constructed so as to cause rotation of the air and vary the velocity of rotation to cause the air currents to be discharged from said outlet under centrifugal action in such a manner as to vary the character of the flame; to provide a rotating high pressure fuel atomizing nozzle whereby the fuel jet is rotated into the spark or flame of the igniting mechanism to ensure ignition of the fuel and avoid possibility of failure of contact of the fuel with the spark from the igniter; and to obtain other advantages and results as will be brought out by the following description.

Referring to the accompanying drawings in which corresponding and like parts are designated by the same reference characters throughout the several views,

Figure 1 is a side elevation of an oil burner system embodying my invention.

Figure 2 is a horizontal sectional view on the line 2—2 of Figure 1.

Figure 3 is a transverse vertical sectional view on the line 3—3 of Figure 2.

Figure 4 is an end elevation of the oil burner.

Figure 5 is a transverse vertical sectional view on the line 5—5 of Figure 2.

Figure 6 is a detached perspective view of one of the movable baffles for the air pump.

Figure 7 is an enlarged fragmentary transverse vertical sectional view on the line 7—7 of Figure 2,

Figure 8 is a sectional view through the oil pump, showing the passage of the oil from the inlet to the hollow shaft to which is connected the fuel atomizing nozzle,

Figure 9 is a view similar to Figure 2 showing a modification of the mounting of the nozzle and the supply of fuel thereto, and

Figure 10 is an enlarged vertical sectional view through the mounting of the nozzle and the oil fuel supply conduit.

Specifically describing the illustrated embodiment of the invention, the oil burner system includes an air pump or centrifugal fan A and an electric motor B which drives both the fan and an oil pump C. The shaft 1 of the motor is tubular and common to the oil pump and the fan, and has secured to one end a fuel atomizing nozzle D.

The air pump A comprises two hollow complementary casing sections 2 and 3. The section 2 is secured as by bolts 4 to a face plate or the like 5 to be attached to the front of a furnace generally indicated by the line 6 which has an opening 7 leading into the fire box. The face plate 5 has an opening 8 corresponding to the opening 7 in the furnace, and the section 2 of the pump casing has a concentric tube 9 which forms the outlet for the air pump. At one side, the section 2 has a hinge lug 10 upon which the section 3 is hingedly mounted by hinge eyes 11 to swing about a vertical axis. Opposite the hinge 10, 11, the sections are connected by a suitable fastening member, such as a swing bolt 12. The motor B may be of any known type of electric motor, and is secured to the casing

section 3 coaxial therewith by cooperating flanges 13 and 14 on the motor and the casing section respectively, through which pass screws 15.

5 Upon the end of the motor shaft 1 which projects into the air pump casing, is a fan comprising a hub 16 upon which are mounted spaced and parallel plates 17 and 170 between which is secured a plurality of approximately
10 radial blades 18. The section 3 is provided with a plurality of air inlet openings 19 which are controlled by a sliding sleeve or band 20. The air enters said openings and passes inwardly toward the center of the fan through an opening 171 in the plate 170. Between the fan and the casing section 2, a plate 21 is arranged within the casing section 3 substantially parallel with the plane of the fan and formed adjacent its periphery with a
20 plurality of openings 22. Upon the side of this plate adjacent the casing section 2 is mounted a plurality of radially disposed baffles each comprising a fixed section 23 and a movable section 24 which is pivotally
25 mounted at 25 upon the plate 21 at the inner end of the fixed section so as to be adjusted into various relations to the fixed section. The ends of said movable baffle sections nearest the center of the plate are returned as at 26, so as to oppose the air currents issuing from the openings 22. These
30 baffles are shown in Figures 2 and 5 of the drawings and while the baffles strictly should not be shown in Figure 2, which is a horizontal sectional view below the upper baffles in Figure 5, the baffles are shown in Figure 2 for clearness in illustration. In operation, as the fan is rotated, the air is drawn into the openings 19 and centrifugally forced by the fan blades 18 into the outer portions of the casing section 3. At the same time the air is caused to rotate within the casing sections. These air currents pass outwardly through the openings 22 in the plate 21 and
40 impinge upon the baffles 23, 24. This causes the air currents to be deflected inwardly toward the center from where the air currents pass outwardly through the outlet tube 9.

The pressure fuel atomizing nozzle D is of
50 any suitable construction, and oil is supplied thereto under pressure by the oil pump C which is preferably of the gear type disclosed in my copending application Serial No. 392,287, filed Sept. 13, 1929, and may be
55 mounted upon one end of the motor B as shown. The nozzle D is arranged substantially coaxially with the outlet tube 9, and has an outlet opening 27 through which the fuel is atomized in a whirling jet under a pressure of, for example 150 pounds per
60 square inch. The outlet 27 is shown as formed in a tip 28 within which is arranged a disc 29 having a plurality of spirally arranged slots 30 through which the fuel passes from the interior of the tip to the opening 27.

The tip 28 is shown as secured to a body 31 in which is arranged a ball check valve 32 normally held from its seat 33 by a stud 34 on the inner end of the atomizer disc 29. This check valve closes when the nozzle is removed
70 so as to prevent leakage of fuel.

The body 31 is secured to the casing 35 of a sylphon which has an outlet passage 36 communicating with the interior of the body 31 and controlled by a valve 37 mounted on one
75 end of a closed bellows diaphragm 38 that is secured at its other end to the casing. The casing 35 of the sylphon is secured to the end of the shaft 1 of the motor and has a passage 39 to establish communication between said
80 shaft and the interior of the casing 35 of the sylphon. The sylphon is so constructed as to actuate the valve 37 to close the passage 36 when a predetermined minimum pressure of
85 fuel in the casing 35 obtains, the pressure of the air within the diaphragm causing the diaphragm to expand against the pressure of the fuel. When the fuel reaches a predetermined high pressure, it compresses the air in the diaphragm so as to unseat the valve 37
90 and permit fuel to flow from the casing 35 through the atomizer nozzle D.

A pair of electrodes 40 are arranged adjacent the nozzle D and mounted in the casing section 3 of the air pump. Electric current
95 is supplied to said electrodes from any suitable source through a transformer 41 and wires 42 for producing a spark between the electrodes.

The oil is supplied to the pump C from any
100 suitable source by a supply pipe 43 through a packed swivel 44 in the hinge lug 10 to which is connected a pipe 45 in turn connected to the pump inlet 46. The fuel is forced from the pump inlet to the pump outlet 47 under high
105 pressure, and through the tubular shaft 1 to the nozzle. A pressure relief valve 48 is also connected to the pump outlet 47 for permitting overflow of fuel through a return pipe 49, another packed swivel 50 and a pipe 51
110 to the oil supply tank. If desired a pressure gauge 52 may also be connected to the pump outlet to indicate the pressure of the fuel.

In operation of the oil burner, the atomizer nozzle D is constantly rotated and the fuel
115 is atomized thereby into a substantially conical jet of finely divided liquid. This jet is also rotated into contact with the electrodes 40 between which an electric spark passes for igniting the fuel. This rotation of the fuel
120 jet insures that the fuel will contact with the spark, and thus avoids the possibility of a break in the jet such as might occur from a clogging of the nozzle, occurring adjacent the electrodes so that the spark cannot contact
125 with the fuel. Proper ignition is thus ensured.

The air pump is constantly driven and forces currents of air outwardly through the outlet tube 9 around the fuel nozzle as above
130

described. These air currents are of low pressure but large volume, and they constantly rotate in the same direction as the fan. By adjusting the movable sections 24 of the baffles into various relations with respect to the corresponding fixed sections it is possible to vary the velocity of rotation of the air as well as the turbulence or surging thereof which is caused by impingement upon the baffles. The returned ends 26 of the fixed sections 24 of the baffle direct some of the air currents away from the center of the outlet tube 9 and outwardly through the tube, and normally the currents of air along the walls of the tube move at a greater velocity than the currents of air at the center of the outlet tube adjacent the nozzle. It is possible by means of these baffles to increase or decrease the turbulence and forward rate of motion of the air in the central portion of the outlet tube 9 so as to vary the richness of the mixture of air and fuel close to the nozzle, and determine the distance from the nozzle at which combustion takes place. The turbulence of the air is increased when all three movable sections 24 of the baffles are set as shown, while the turbulence is decreased when the movable sections 24 are alined with the sections 23.

It will be observed that the air from the air pump is primarily intended to sustain combustion and control the character and location of the flame, and that the fuel is supplied under high pressure and atomized by the nozzle D which projects a jet into the turbulent or agitated air around the nozzle so that a thorough mixture of air and fuel is obtained.

Upon loosening the swing bolt 12, the apparatus can be swung on the hinge 10, 11 so as to move the nozzle and fan away from the opening 7 in the furnace, whereby easy and quick access to the parts can be had for inspection or repair.

In the modification of the invention shown in Figures 9 and 10 the fuel atomizing nozzle is fixedly mounted instead of rotatably, and the fuel is supplied to the nozzle from an additional pipe instead of through the shaft of the motor. Specifically the modified construction includes the sylphon casing 55 which is attached to the plate 21 by means of screws 56 passing through ears 57 on the sylphon casing. The sylphon casing may have formed therein a fuel conduit 58 which is connected to a pipe 59 passing outwardly and horizontally through the casing section 3 where it is connected to another pipe 60 which is in turn connected to the fuel supply pump C at the point where the gauge 52 is shown connected in Figure 4. The operation of this modified form of the invention is substantially identical with that shown in Figures 1 to 8 inclusive except that the fuel atomizing nozzle does not rotate.

While I have shown and described the apparatus as embodied in certain details of construction, it should be understood that this is primarily for the purpose of illustrating the principles of the invention, and that many modifications and changes can be made in the details of construction without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim is:

1. Oil burning apparatus comprising a low pressure and large volume air pump including a casing having an outlet opening, a pressure fuel atomizing nozzle arranged substantially coaxially within said outlet opening of the air pump casing, a fuel pump for supplying fuel to said nozzle under pressure, means for driving said air pump and said fuel pump, whereby a jet of fuel under pressure is projected into the air currents passing through said outlet opening, and adjustable means for regulating the turbulence of the air currents in said outlet opening.

2. The apparatus set forth in claim 1 said nozzle being mounted for rotation about its axis.

3. The apparatus set forth in claim 1 with the addition of an igniter, said nozzle being mounted for movement to cause the jet of fuel therefrom to pass into igniting relation to said igniter.

4. The apparatus set forth in claim 1 said nozzle being mounted for rotation about its axis, and an igniter so arranged relatively to said nozzle that the jet of fuel constantly rotates in igniting relation to said igniter.

5. Oil burning apparatus comprising a low pressure large volume centrifugal fan pump including a casing having a wall dividing it into a fan chamber and an outlet chamber having a coaxial outlet opening, a fan rotatable in said fan chamber coaxially with said outlet opening, said wall having openings for passage of air from said fan chamber to said outlet chamber, a pressure fuel atomizing nozzle within said outlet opening, means for supplying fuel to said nozzle under pressure, and a plurality of baffles within said outlet chamber between said openings in said wall and said outlet opening each including a plurality of relatively adjustable sections to vary the turbulence of the air currents at different portions of said outlet opening.

6. Oil burning apparatus comprising a low pressure large volume centrifugal fan pump including a casing having a wall dividing it into a fan chamber and an outlet chamber having a coaxial outlet opening, a fan rotatable in said fan chamber coaxially with said outlet opening, said wall having openings adjacent its outer periphery for passage of air from said fan chamber to said outlet chamber, a pressure fuel atomizing nozzle within said outlet opening, means for sup-

plying fuel to said nozzle under pressure, and a plurality of baffles within said outlet chamber between said openings in said wall and said outlet opening, said baffles being
 5 constructed to deflect a portion of the air currents away from the center of said outlet opening and outwardly therethrough.

7. Oil burning apparatus comprising a low pressure large volume centrifugal fan
 10 pump including a casing having a wall dividing it into a fan chamber and an outlet chamber having a coaxial outlet opening, a fan rotatable in said fan chamber coaxially with said outlet opening,
 15 said wall having openings adjacent its outer periphery for passage of air from said fan chamber to said outlet chamber, a pressure fuel atomizing nozzle within said outlet opening, means for supplying fuel to said
 20 nozzle under pressure, and a plurality of baffles radially disposed within said outlet chamber said baffles having their inner ends returned to deflect a portion of the air currents away from the center of said outlet
 25 opening and outwardly therethrough.

8. Oil burning apparatus comprising a low pressure large volume centrifugal fan pump including a casing having a wall dividing it into a fan chamber and an outlet chamber
 30 having a coaxial outlet opening, a fan rotatable in said fan chamber coaxially with said outlet opening, said wall having openings adjacent its outer periphery for passage of air from said fan chamber to said outlet chamber,
 35 a pressure fuel atomizing nozzle within said outlet opening, means for supplying fuel to said nozzle under pressure, and a plurality of baffles radially disposed within said outlet chamber and each comprising a plurality of
 40 sections relatively movably mounted so as to be arranged in alinement with each other or at various angles, so as to cause the air currents from said openings in said wall to flow at different velocities at different portions of
 45 said outlet opening.

9. Oil burning apparatus comprising a low pressure large volume centrifugal fan pump including a casing having a wall dividing it into a fan chamber and an outlet chamber
 50 having a coaxial outlet opening, a fan rotatable in said fan chamber coaxially with said outlet opening, said wall having openings adjacent its outer periphery for passage of air from said fan chamber to said outlet chamber,
 55 a pressure fuel atomizing nozzle substantially axially within said outlet opening, means for supplying fuel to said nozzle under pressure, and a plurality of baffles in said outlet chamber for controlling the flow of air
 60 currents through said outlet opening, each baffle including a fixed section approximately radially disposed in said chamber adjacent the outer periphery thereof, and a section at
 65 the inner end of said fixed section movable

either into alinement with said fixed section or at an angle thereto.

10. Oil burning apparatus comprising a low pressure large volume centrifugal fan pump including a casing having a wall dividing it into a fan chamber and an outlet chamber having an elongated coaxial outlet tube, a fan rotatable in said fan chamber coaxial with said outlet opening, a pressure fuel atomizing nozzle arranged substantially coaxially within said outlet tube, a fuel pump for supplying fuel to said nozzle under pressure, means for driving said fan pump and said fuel pump, and adjustable means for regulating the turbulence of the air currents
 70 in said outlet tube.

11. Oil burning apparatus comprising a low pressure large volume centrifugal fan pump including a casing having a wall dividing it into a fan chamber and an outlet chamber, an elongated outlet tube for said outlet chamber, a fan rotatable in said fan chamber coaxially with said outlet tube, said wall having openings adjacent its outer periphery for passage of air from said fan chamber to said outlet chamber, a fuel atomizer arranged substantially axially within said outlet tube, means for supplying fuel to said atomizer, means for driving said fan pump, and a plurality of baffles in said outlet chamber for controlling the flow of air currents through said outlet tube, each baffle including a fixed section approximately radially disposed in said chamber adjacent the outer periphery thereof and a section at the inner end of said fixed section extending inwardly of the outlet chamber beyond the walls of said outlet tube and movable into alinement with said fixed section or at an angle thereto.
 90 95 100 105

12. The oil burning apparatus set forth in claim 11, wherein the inner ends of the movable sections of the baffles are returned to direct a portion of the air away from the central portion of the outlet tube and outwardly therethrough.
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13. In an oil burning apparatus the combination of an air pump having an outlet chamber into which air is delivered with a centrifugal action, said chamber having an axial outlet opening, a plurality of baffles in said chamber for retarding rotation of the air therein and directing the air through said outlet opening, said baffles having portions extending inwardly beyond the walls of said opening and adjustable into and out of radial positions to regulate the relative velocities of flow of air currents through said outlet opening at different portions thereof.
 115 120

14. In an oil burning apparatus the combination of an air pump having an outlet chamber into which air is delivered with a centrifugal action, said chamber having an axial outlet opening, a plurality of baffles in said chamber for retarding rotation of the air
 125 130

therein and directing the air through said outlet opening, said baffles having portions extending inwardly beyond the walls of said opening and returned to deflect a portion of the air currents away from the center of said outlet opening and outwardly therethrough.

15. In an oil burning apparatus, the combination of an air pump having an outlet chamber into which air is delivered with a centrifugal action, said chamber having an outlet tube, a pressure fuel atomizing nozzle coaxially arranged in said outlet tube, means for supplying fuel to said nozzle under pressure, and a plurality of baffles in said chamber for retarding rotation of the air therein and directing the air through said outlet tube, said baffles having portions extending inwardly beyond the walls of said opening and adjustable into and out of radial positions to regulate the relative velocity of flow of air currents through said outlet tube at different portions thereof.

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