

Jan. 27, 1931.

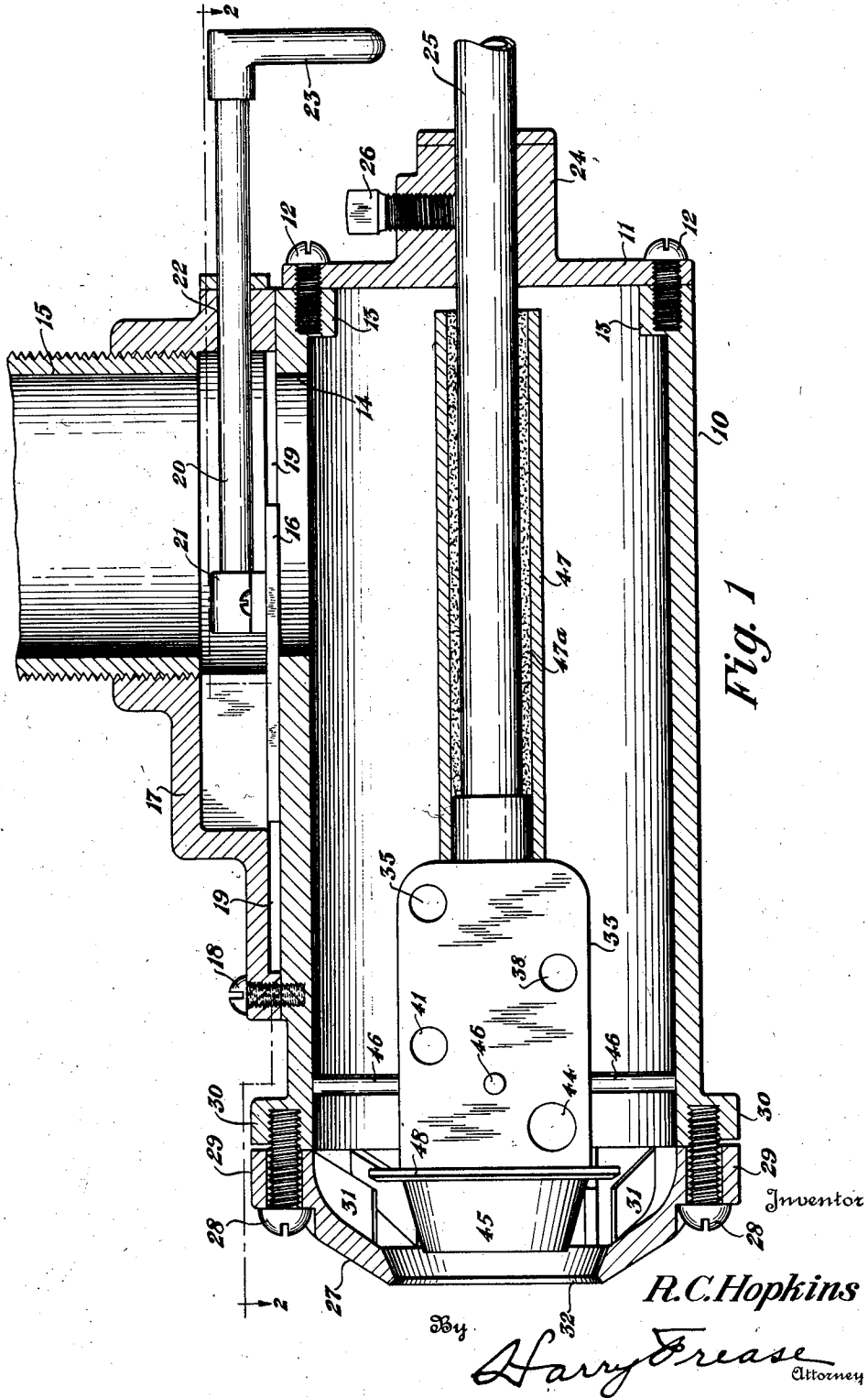
R. C. HOPKINS

1,789,977

OIL BURNER

Filed Oct. 16, 1928

3 Sheets-Sheet 1



Jan. 27, 1931.

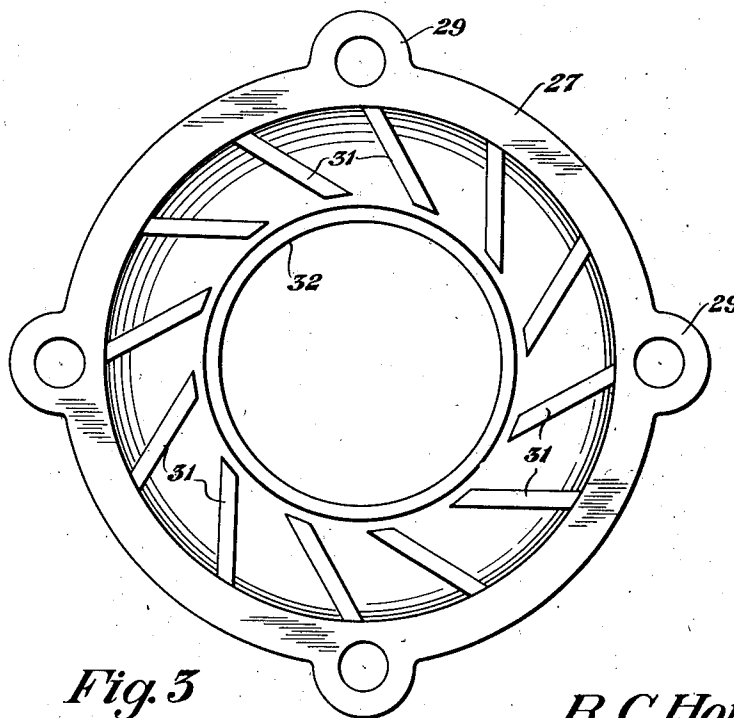
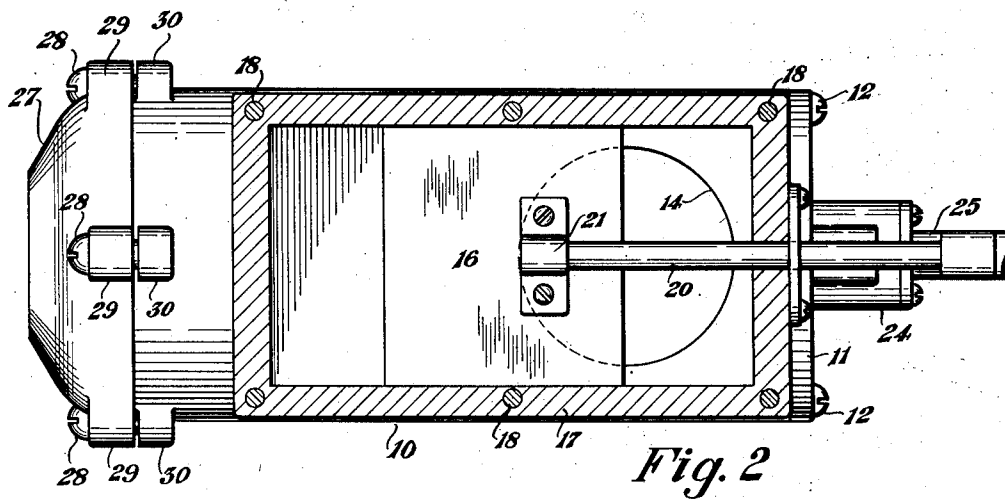
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OIL BURNER

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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

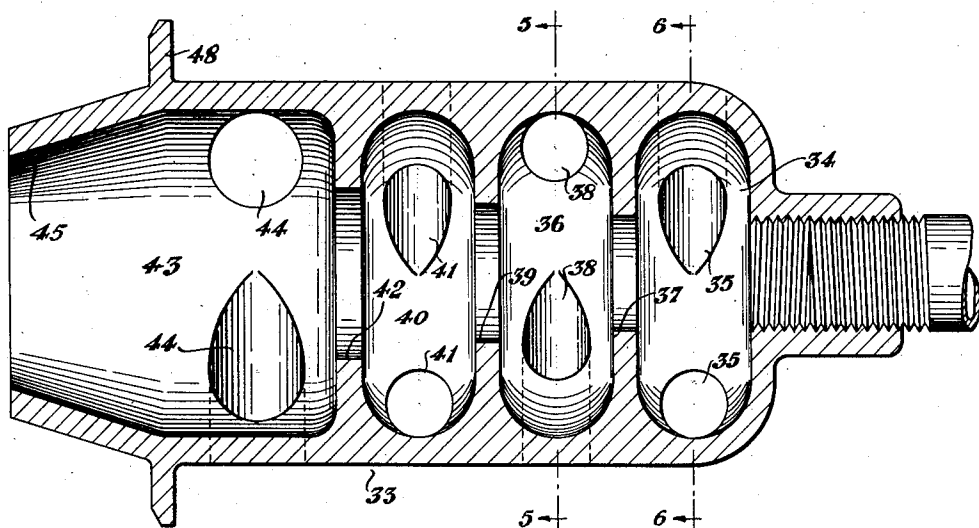


Fig. 4

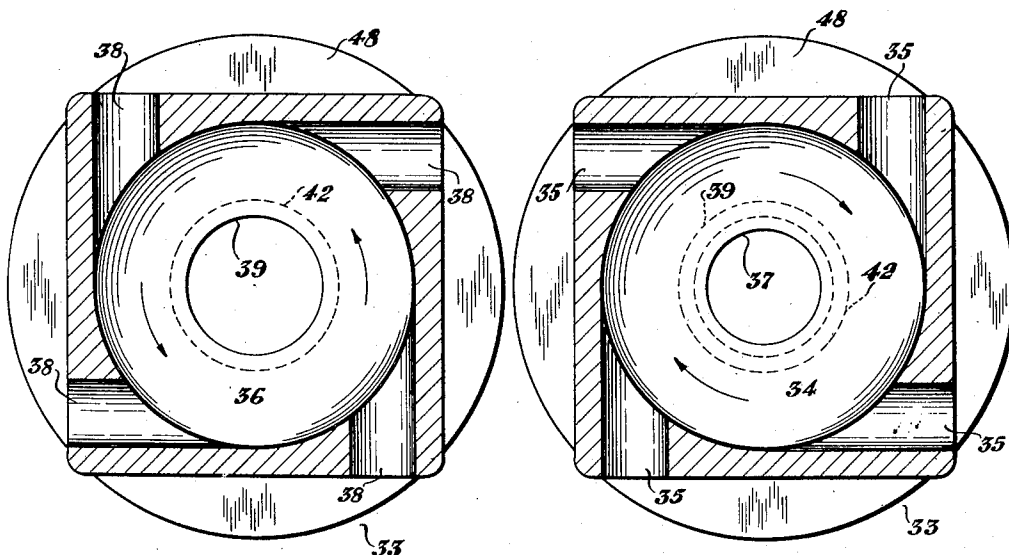


Fig. 5

Fig. 6

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UNITED STATES PATENT OFFICE

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OIL BURNER

Application filed October 16, 1928. Serial No. 312,816.

The invention relates to liquid fuel burners of the type in which the oil or other liquid fuel is atomized within the burner by means of an air blast or other fluid pressure.

5 The object of the invention is to provide a burner including an atomizing barrel through which the liquid fuel is passed, means being provided for atomizing the fuel by means of spiral air blasts engaging the
10 fuel in successive chambers of the atomizing barrel and alternately rotating the same in opposite directions to produce a complete atomization.

15 A further object is to provide a burner of this general type in which an air blast is admitted at one side of the burner casing, a blast gate being mounted within the burner casing to regulate and control the blast of air entering the same.

20 The above and other objects may be attained by constructing the burner in the manner illustrated in the accompanying drawings, in which

25 Figure 1 is a longitudinal sectional view through the improved burner;

Fig. 2, a section on the line 2—2, Fig. 1, showing the improved sliding blast gate located within the burner housing or casing;

30 Fig. 3, an interior elevation of the nozzle plate;

Fig. 4, a longitudinal sectional view through the atomizing barrel, taken upon an enlarged scale;

35 Fig. 5, a transverse section through the atomizing barrel taken substantially on the line 5—5, Fig. 4; and

Fig. 6, a similar view on the line 6—6, Fig. 4.

40 Similar numerals refer to similar parts throughout the drawings.

45 The burner casing indicated generally at 10 may be substantially cylindrical and provided at its rear end with the end plate 11, connected thereto as by screws 12 engaging the internally threaded bosses 13 formed in the casing.

50 One side wall of the casing may be provided, near the rear end thereof, with the air inlet opening 14 for receiving an air blast from the air line 15. A blast gate may be

provided at this air inlet to control and regulate the air blast entering the casing.

This blast gate may be in the form of a slidable plate 16 mounted in a suitable housing 17 connected to the casing 10 as by screws 18. The blast gate is adapted to be slidably moved within the groove 19 provided therefor in the housing 17.

60 For the purpose of operating this blast gate, a rod 20 may be fixed thereto as by the bracket 21 and slidably located through a suitable bore 22 in the housing 17, the outer end thereof being provided with a handle as shown at 23.

65 The end plate 11 may be provided with a boss 24 through which is slidably located the oil tube 25, communicating with any suitable source of liquid fuel supply. A set screw 26 may be radially located through this boss for holding the oil tube in adjusted position.

70 A conical nozzle plate 27 is fixed to the forward end of the burner as by screws 28 located through the lugs 29 and 30 on the nozzle plate and casing respectively.

This nozzle plate is provided upon its interior with tangential vanes 31 for the purpose of swirling the air blast in a spiral as it issues from the nozzle opening 32.

80 The atomizing barrel indicated generally at 33 is carried upon the forward end of the oil pipe 25 and is so constructed as to provide for a multiple stage counterswirling of air therethrough for mixing the oil and air and thoroughly atomizing the oil as it passes through the several stages.

85 The rear chamber 34 communicates axially with the oil pipe 25 and is provided with the tangential openings 35 for permitting the air blast to enter and whirl clockwise therein, mixing with the oil and breaking up the particles thereof by throwing the same centrifugally against the walls of this chamber.

90 The chamber 34 communicates with a similar chamber 36 through the axial opening 37 which is preferably of greater diameter than the opening from the oil pipe leading into the chamber 34. The chamber 36 is provided with tangential openings 38 oppositely disposed to the openings 35 whereby the air
100

blast entering the same will be whirled counter-clockwise.

The air and oil mixture will issue from the chamber 34 in a spiral and be engaged by the countermoving whirl of air in the chamber 36, further atomizing and mixing the oil with the air.

An axial opening 39, preferably of larger diameter than the opening 37, forms communication between the chamber 36 and a similar chamber 40 having the tangential openings 41 located in the same position as the openings 35, thus causing the air blast entering the same to be whirled clockwise within the chamber.

The anticlockwise whirl of air and oil from the chamber 36 will engage this counter-current and again be further broken up. This mixture will then pass through the axial opening 42, of larger diameter than the opening 39, into the last stage chamber 43 which is of considerably greater size than the other chambers and which is provided with tangential openings 44, preferably of larger diameter than those above described and positioned to cause a counter-clockwise whirl of air within the chamber.

The counter-currents of air will again engage in this chamber, still further atomizing the oil and causing the mixture of air and completely atomized oil to issue from the tapered nozzle 45 of the atomizing barrel in a rapidly whirling spiral.

For the purpose of guiding the atomizing barrel axially within the casing, radial pins 46 may be carried by the barrel and slidably engaged with the interior of the casing.

In order to limit the longitudinal movement of the barrel and oil tube within the casing, a larger tube 47 may surround the oil tube for contact with the back plate 11, and a peripheral flange 48 may be provided upon the atomizing barrel for contact with the vanes 31 or the nozzle plate 27. Heat resisting or insulating material indicated at 47a may be filled in the space between the tube 25 and the outer tube 47, protecting the oil line in case of highly superheated air.

In the operation of the burner the air blast is admitted from the pipe 15 through the opening 14 to the interior of the burner casing and may be controlled and regulated by means of the blast gate. Oil enters the burner through the oil tube 25 and flows into the first chamber of the atomizing barrel, meeting the tangential inflow of air, causing a rapid rotation of the oil and a mixture of the same with the air.

A pressure is set up in this chamber by means of the inflowing air, sufficient to drive the oil and air thus mixed into the next compartment where the mixture thus formed is met by a counterflow of air, the mixture of oil and air passing from one chamber to the other and being reversely rotated and further

mixed until the oil is completely atomized. Thus, by the counterflow or opposition of air and oil currents, the atomization and thorough mixing are accomplished.

It will be seen that the centrifugal force of the air currents within the several chambers of the atomizing barrel throws the oil out against the walls of the chambers, tending to break up the particles of the oil.

The spinning motion of the air and oil is continued as the mixture passes from each chamber through the reduced opening into the next chamber. This spinning motion reduced from a relatively large diameter to a smaller diameter has the effect of milling or grinding the oil and causing a more intimate mixture of the oil and air.

Assuming that friction were negligible, there would be a certain velocity from the tangential inflow of air to any one of the chambers. There would thus be an increase of the number of revolutions of the spinning air and oil as it passes from the chamber through the axial outlet orifice.

The admission of air and oil from one chamber to the other would then meet with an expansion due to pressure relief, and also centrifugal force, and the motion would here be reduced, that is the number of revolutions would be reduced and the effect would be a grinding and milling at this point, and so on through the several stages of the atomizing barrel.

This successive increase and decrease of revolutions sets up a friction between the particles of oil and the whirling currents of air so that there is a tendency to pulverize or grind and mix the oil particles with the air until a complete atomization and mixture is accomplished.

As the mixture of air and oil issues in a spiral from the conical end of the atomizing barrel it is met by the main air blast which is whirling in counterdirection due to the vanes 31. The final stage of mixing and atomization is accomplished as these counterwhirling currents issue from the burner.

I claim:

1. A liquid fuel burner including a casing, an air blast pipe communicating with the casing, an oil tube extending into the casing, and an atomizing barrel in said casing communicating with the oil tube, said barrel having annular walls therewithin forming a plurality of chambers circular in cross section and arranged in series, each chamber having the same diameter, and there being tangential openings in the chamber walls, the openings into adjacent chambers being oppositely disposed.

2. A liquid fuel burner including a casing, an air blast pipe communicating with the casing, an oil tube extending into the casing, and an atomizing barrel in said casing com-

communicating with the oil tube, said barrel having annular walls therewithin forming a plurality of chambers circular in cross section and arranged in series, each chamber having the same diameter, said annular walls defining ports between chambers, and there being tangential openings in the chamber walls, the openings into adjacent chambers being oppositely disposed.

3. A liquid fuel burner including a casing, an air blast pipe communicating with the casing, an oil tube extending into the casing, and an atomizing barrel in said casing communicating with the oil tube, said barrel having annular walls forming a plurality of communicating chambers circular in cross section and arranged in series, said annular walls forming axial orifices having cross sectional areas less than the cross sectional area of the chambers, and there being tangential openings in the chamber walls, the openings into adjacent chambers being oppositely disposed.

4. A liquid fuel burner including a casing, an air blast pipe communicating with the casing, an oil tube extending into the casing, and an atomizing barrel in said casing communicating with the oil tube, said barrel having walls forming a plurality of chambers circular in cross section and arranged in series, there being orifices in said walls having cross sectional areas successively increasing but less than the cross sectional area of the chambers for communicating the chambers with each other, and there being tangential openings in the chamber walls, the openings into adjacent chambers being oppositely disposed.

In testimony that I claim the above, I have hereunto subscribed my name.

ROBERT C. HOPKINS.