May 3, 1949. J. A. LOGAN 2,469,272

PRESSURE ATOMIZING OIL BURNER

Filed Sept. 6, 1946 4 Sheets-Sheet 1

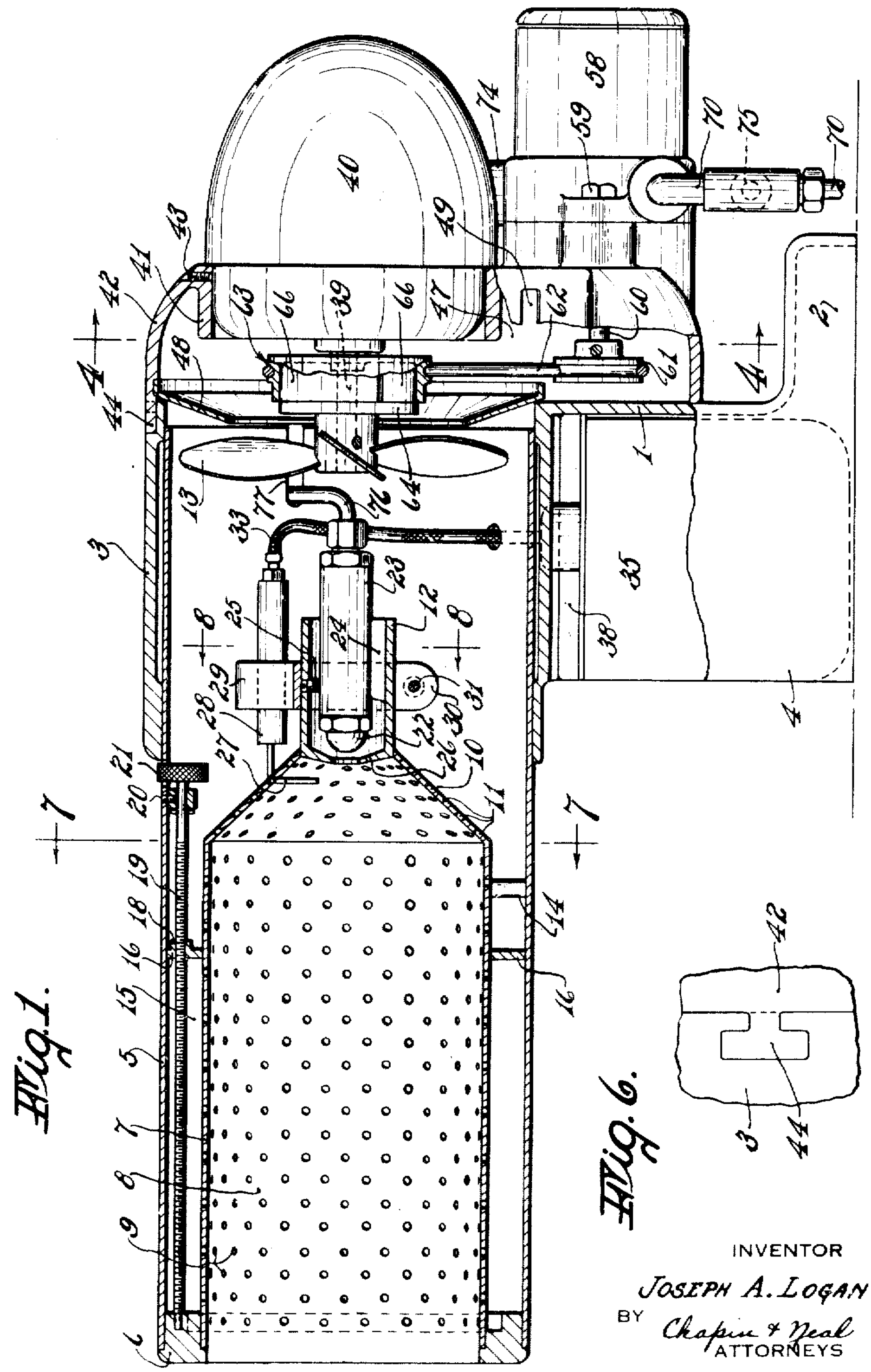

Fig. 1.

Fig. 6.

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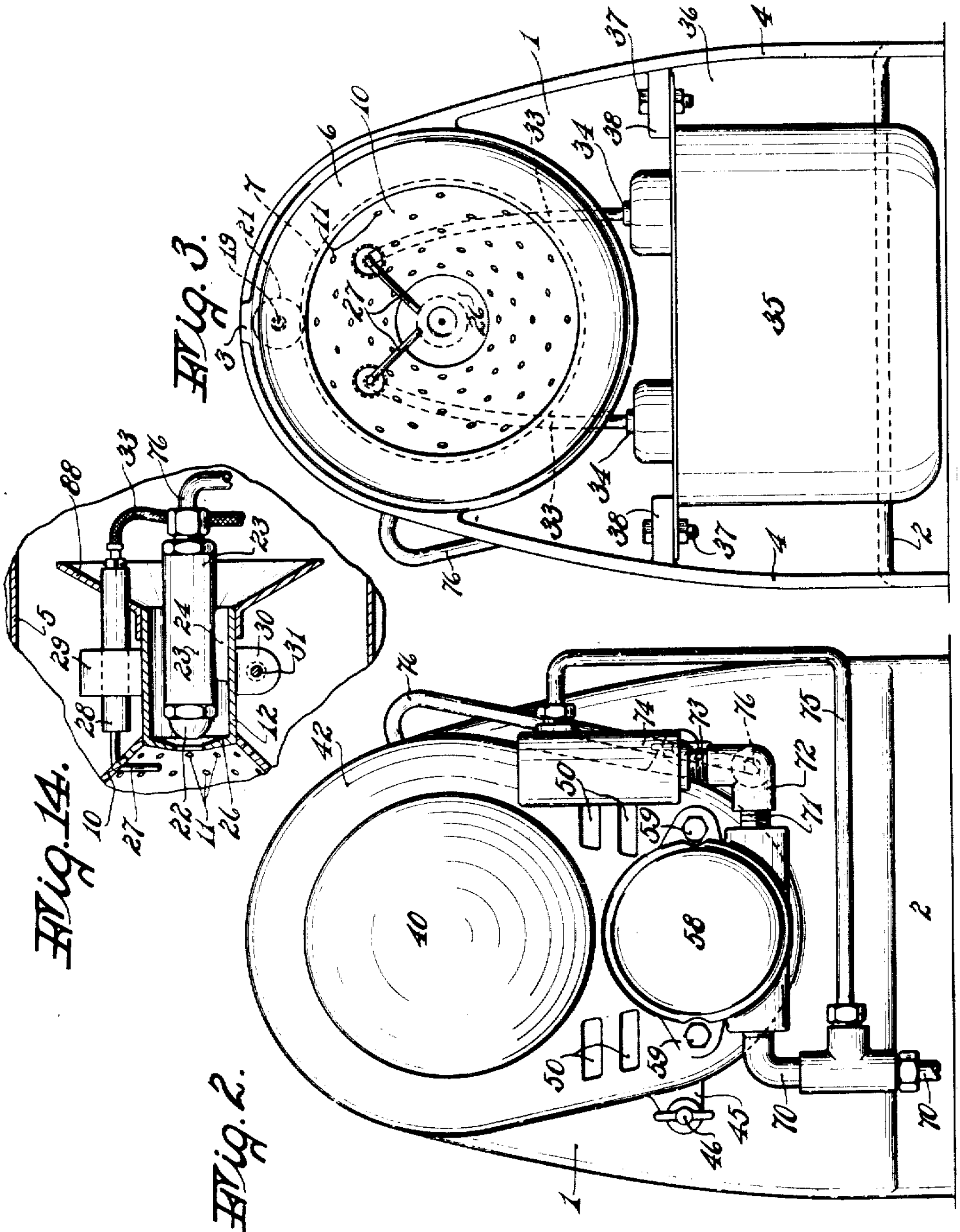

Fig. 2. Fig. 3. Fig. 14.

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PRESSURE ATOMIZING OIL BURNER

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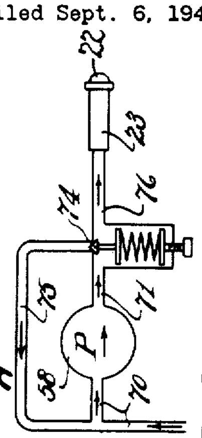

Fig. 15.

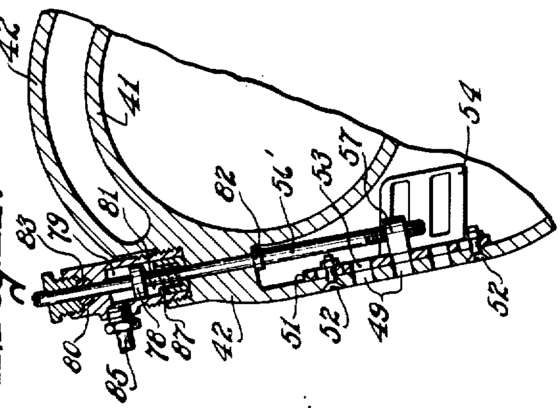

Fig. 11.

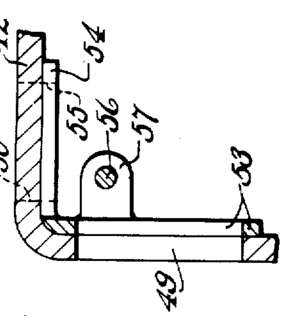

Fig. 5.

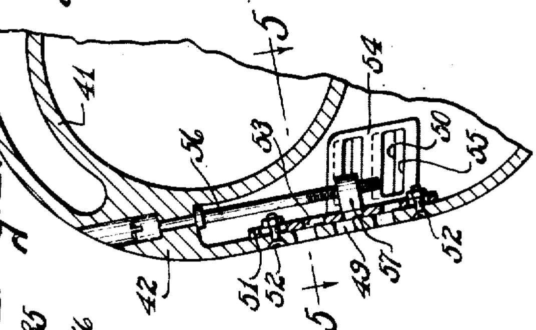

Fig. 4.

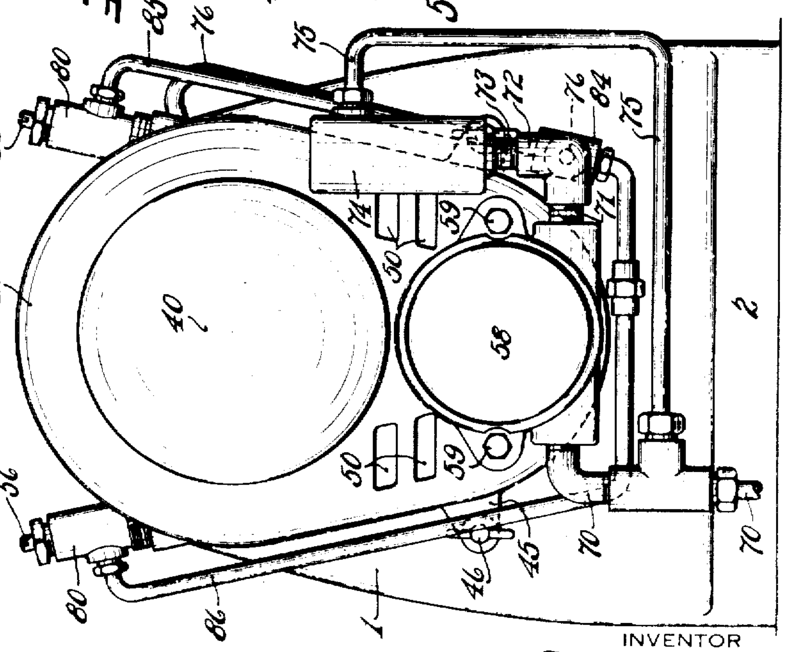

Fig. 10.

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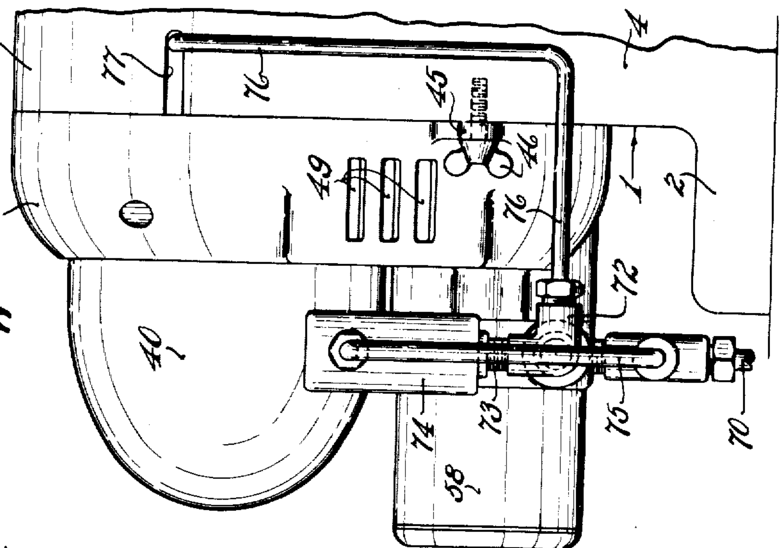

Fig. 9.

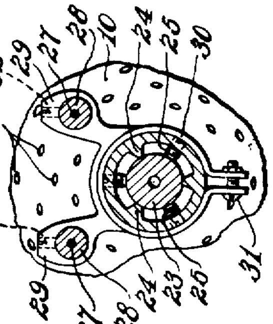

Fig. 8.

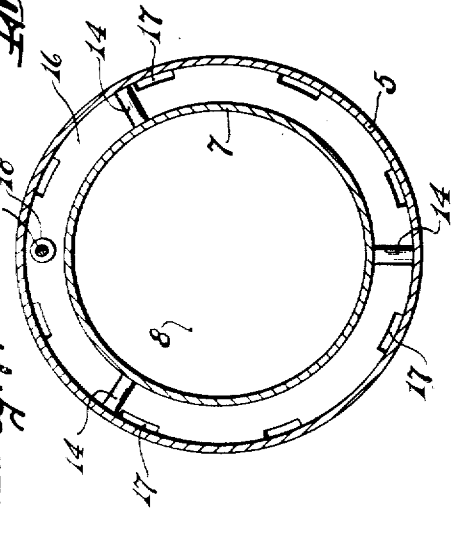

Fig. 7.

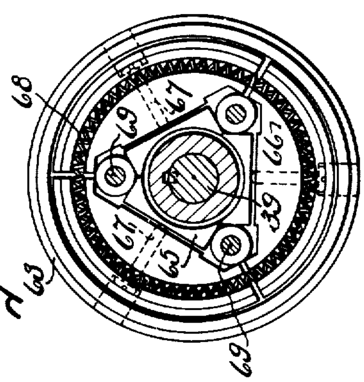

Fig. 13.

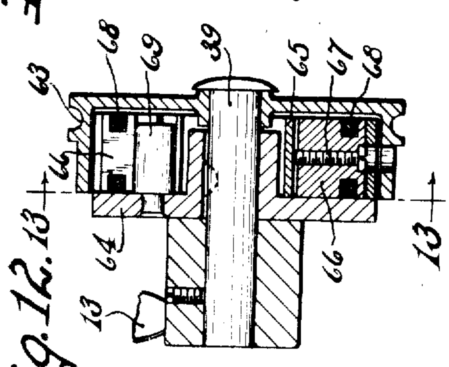

Fig. 12.

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Patented May 3, 1949 2,469,272

UNITED STATES PATENT OFFICE

2,469,272

PRESSURE ATOMIZING OIL BURNER

Joseph A. Logan, Hadley, Mass., assignor to Gilbert & Barker Manufacturing Company, West Springfield, Mass., a corporation of Massachusetts

Application September 6, 1946, Serial No. 695,239

4 Claims. (Cl. 158—28)

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This invention relates to an improved form of oil burner of the oil pressure atomizing type. Its purpose is to burn oil efficiently at a substantially lower rate—for example at a rate of one-half gallon an hour—than the rate at which said type of burner is customarily adapted to operate.

The way the new burner is adapted for its low rate burning will be explained in detail. It involves the idea of using an atomizing nozzle, such as is customarily used in this general type of burner for atomizing efficiency, when fed at an oil pressure of around 100 pounds per square inch to give an oil atomizing rate around one gallon an hour, but feeding it at a much lower pressure in the new burner—for example around 25 pounds per square inch—to give an oil atomizing rate of about one-half gallon an hour, and adapting parts of the new burner to compensate for the lowered atomizing efficiency in a particular way.

In my work leading up to this invention, I have found trouble in getting the low oil burning rate with a desired oil burning efficiency. Efficiency is customarily measured as a percentage of CO_2 in the flue gases, as shown by analysis of such gases. The tendency of the low rate of oil burning per hour is to make the efficiency of such burning low.

A main object of the present invention is to accomplish both a low rate of burning and a desired burning efficiency for the oil. By desired efficiency is meant a percentage of CO_2 in the flue gases comparable with customary commercial operation of burners of the oil pressure atomizing type. If the percentage of CO_2 in the flue gases goes much below eight it is not as high as I desire.

Another object of the invention is to make a burner of low original cost. A number of features in the disclosure are new and useful with relation to this object of low cost of original equipment.

In some respects the present invention is related to the invention of my Patent No. 2,411,048, dated November 12, 1946. A comparison will show some similarities of elements and items of operation. The present invention, however, is not intended to necessarily require the use of the invention of said patent but to stand independently on its own merits regardless of whether or not its use is within the claim of said patent.

The invention will be disclosed with reference to the accompanying drawings, in which:

Fig. 1 is a sectional elevational view of an oil burner embodying the invention;

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Figs. 2 and 3 are end elevational views taken from the right and left, respectively of Fig. 1;

Fig. 4 is a fragmentary cross-sectional view taken on the line 4—4 of Fig. 1 showing a manually-adjustable shutter for controlling the air intake to the fan;

Fig. 5 is a sectional plan view of the shutter taken on the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary plan view showing a detail of the mounting of the housing for the air fan and oil pump;

Figs. 7 and 8 are cross-sectional views taken on the lines 7—7 and 8—8, respectively, of Fig. 1;

Fig. 9 is a fragmentary side elevational view showing the oil piping on the outlet side of the pump;

Fig. 10 is an end view, taken similarly to Fig. 2, but showing the application to the housing of pressure cylinders for automatically operating the air shutters to increase the area of the air intake to the fan during starting and stopping intervals of operation of the burner;

Fig. 11 is a fragmentary cross-sectional view, taken similarly to Fig. 4 and showing the internal construction of the means for automatically operating the air shutters;

Fig. 12 is a sectional elevational view of a speed-responsive clutch on the motor shaft for driving the oil pump;

Fig. 13 is a cross-sectional view taken on the line 13—13 of Fig. 12;

Fig. 14 is a fragmentary sectional elevational view, taken similarly to Fig. 1 and showing a modification; and

Fig. 15 is a diagrammatical view of the oil connections and oil pressure control.

Referring to these drawings, the burner includes a supporting frame having a flat and approximately semi-elliptical wall 1 (Fig. 2) upstanding from a base portion 2 (Figs. 1 and 2) and having projecting horizontally from one face a tubular part 3, which is open at both ends (Fig. 1) and which is connected to the base portion 2 by side webs 4 (Fig. 3).

Suitably fixed at its rear end in the tubular part 3 and projecting forwardly therefrom is a cylindrical tube 5 (Fig. 1) of sheet metal. The projecting portion of this tube, or a substantial part thereof, is adapted to be inserted in the heater, which is to be fired by the burner. Fixed in the forward end of tube 5 is an annular ring 6 having a seat to receive with a sliding fit one end of a perforated tube 7, which affords within it a combustion chamber 8. This tube is provided throughout its periphery with many perforations 9, which are spaced both axially and circumferentially and which are generally distributed over the entire peripheral surface of the tube. One end of the tube 7 is open for the passage of hot gases into the heating apparatus. At its other end the tube has a frusto conical portion 10, also provided throughout with many closely-spaced perforations 11, which are distributed over substantially its entire area. Connected to the smaller end of the portion 10 is one end of a tube 12, the other end of which is open to the interior of tube 5 to receive air from a fan 13, mounted in tube 5 near the rear end thereof, as will be hereinafter described in detail. The perforated cylindrical tube 7 is suitably supported in spaced coaxial relation with tube 5, as by a series of legs 14 on the part 7 which engage the peripheral wall of tube 5, as best shown in Fig. 7. An annular space or packet 15 is thus formed between the tubes 5 and 7. The front end of the jacket 15 is closed (Fig. 1). The rear end of this jacket is in constant communication with the rear part of tube 5 to receive air from fan 13. The only outlets from space 15 are the many perforations 9, through which jets of air issue in directions radially of the combustion chamber and generally at right angles to the axis thereof. Air also passes through the many perforations 11 in the frusto conical portion 10 in directions radially and at right angles to its surface.

A new and important feature of the invention consists in the provision in the air jacket 15 of a baffle in the form of an annular ring 16 (Figs. 1 and 7) having in its outer periphery a circular series of angularly spaced slots 17 (Fig. 7). The inner and outer peripheries of baffle 16 respectively slidably engage the outer periphery of tube 7 and the inner periphery of tube 5. This baffle is adjustable in a direction axially of tubes 5 and 7, as by means of a nut 18 (Fig. 1) fixed to the baffle and a screw 19 threaded into the nut. This screw is disposed lengthwise of jacket 15 and is rotatably supported at one end in ring 6 and near the other end in a bearing 20 fixed to tube 5. A knurled knob 21 is fixed to screw 19 near bearing 20. A portion of the periphery of knob 21 projects through a slot in tube 5, so that it may be turned from outside the tube 5 and, if necessary, while the burner is operating, in order to adjust the position of the baffle 16. This baffle enables one to vary the size of the air jets, issuing from some of the perforations 9, with respect to the air jets issuing from other of such perforations. When the baffle is positioned as shown, the from the perforations 9 to the right of the baffle. (as viewed in Fig. 1), receive air only by way of the slots 17 and, because of this restriction, the air issuing from each such perforation is at a less rate and under a less pressure than the air issuing from the perforation 9 to the right of the baffle. The adjustment also enables the baffle to be rendered inoperative, if desired, by moving it to the extreme left as viewed in Fig. 1 until its abuts ring 6.

Oil is atomized by nozzle 22 into the interior of the combustion chamber 8, to mix with the air supplied thereto by the tube 12 and the jets 9 and 11. This nozzle is of that type in which oil is atomized by being whirled and forced through a small orifice under substantial pressure. One example of such a nozzle is disclosed in detail in the aforesaid patent. Like the nozzle of that patent, the nozzle 22 is of a size adapted to atomize oil at the rate of one gallon an hour when operated at normal pressure of around 100

pounds per square inch. Here, it is to be operated at less pressure to atomize oil at a lower rate, say one-half gallon an hour. This nozzle is located within tube 12 near the forward end thereof. It is mounted on the front end of a cylindrical member 23, which forms a support for the nozzle and also a part of a conduit for conducting oil under pressure from a pump, to be described, to the nozzle. This support 23 is held in spaced coaxial relation with the internal periphery of tube 12 by means of a series, as three, of circumferentially spaced and longitudinally extending lands 24 (Fig. 8) formed on the tube 12. One or more set screws 25, threaded into the wall of tube 12, engage the support 23 and hold it against axial movement and yet enable its axial position to be adjusted, if and when required.

At the forward end of tube 12, where it joins the small end of the frusto conical part 10 of the tube 7, is an inwardly-extending annular member 26. This member may be an integral part of tube 12 and it is suitably secured, as for example by welding, to the small end of the perforated tube 7. The member 26 has a central opening large enough for the oil spray from the nozzle 22 to pass without interference. The inner surface of member 26 is a frusto conical surface and serves as an air nozzle or director to deflect such air as enters through tube 12 and direct it at substantially right angles to the spray issuing from nozzle 22 and in all radial directions around the circle of such spray. The member 26 also serves as a heat shield for the nozzle to protect it to a substantial extent from the heat of the fire which burns in the combustion chamber 8 within the perforated tube 7.

The oil and air mixture may be ignited by the spark electrodes indicated at 27 (Figs. 1 and 3). These are mounted, one in each of a pair of insulators 28 (Figs. 1 and 8). The insulators are supported one in each of two ears 29, forming part of a split ring frame 30, which encompasses the tube 12 and may be clamped thereto in various positions of axial adjustment by the screw 31. A set screw 32, threaded into each ear 29, serves to fix its insulator 28 therein in various positions of axial adjustment. The electrodes pass through suitable holes (Fig. 3) in the frusto conical part 10 of tube 7 into proper position to ignite the combustible mixture. The electrodes are connected by wires 33 (Figs. 1 and 3) to the high tension terminals 34 of a suitable ignition transformer 35. This transformer may be conveniently located in the pocket 36 formed between the webs 4 and below the tubular part 3 of the frame. The transformer may be supported within this pocket by fixing its base, as by bolts 37, to lugs 38 formed on and projecting inwardly one from each web 4. The ignition wires 33 extend through suitable holes in tube 5, as indicated in Fig. 1.

The air fan 13 is of the propeller type and is fixed directly to the outer end of the shaft 39 of an electric motor 40. This motor and fan constitute a standard production article which may be purchased in quantities at low unit cost. The forward end of the motor casing is cylindrical and fits within a cylindrical sleeve-like part 41 which projects forwardly from a hollow end casing or frame 42 in coaxial relation with the air tube 5. The motor may be fixed in any suitable way to said part 41, as by set screws 43, one of which is shown in Fig. 1. The end casing 42 abuts the flat wall 1 of the first-named and main supporting frame and serves to close the rear end of tube 5. This casing 42 has on its upper portion an outwardly-projecting T-shaped lug 44 (Fig. 6) which fits into a correspondingly shaped groove in the upper peripheral portion of the tubular part 3 of the main frame. On the lower portion of casing 42 are ears 45 (Figs. 2 and 9) which are clamped to wall 1 by thumb screws 46. By removing screws 46, the end casing 42 may be swung outwardly, with the lug 44 acting as a hinge, far enough to carry fan 13 out of tube 5, after which casing 42 can be lifted to disengage lug 44 from its groove and allow removal of the casing with the attached motor, fan and pump. This hollow casing 42 provides a chamber 47 around the part 41 and below the same.

The upper portion of casing 42 is bored to receive the out-turned flange of a baffle 48 (Fig. 1), having a central opening to direct air from chamber 47 to the central portion of fan 13. Air enters this chamber 47 through ports, such as 49 (Figs. 1, 4 and 9), in the lower part of each side wall of casing 42 and through ports 50 (Figs. 2 and 4) in the outer end casing 42. A shutter 51 (Fig. 4) is slidably mounted on each side wall, which shutters are held in place by studs 52 fixed to such wall and passing through slots in the shutter. The shutters has ports 53 therein which may be moved into and out of register with ports 49 to vary the effective intake area and a right angular extension 54 (see also Fig. 5), having ports 55, which may be moved to cover more or less of the ports 50 for a similar purpose. For moving the shutter manually, a screw 56 is provided, having its upper and smooth cylindrical end rotatably mounted in casing 42 and held against axial movement therein, as indicated, and its lower and threaded end engaged in a nut 57 on shutter 51. The screw 56 has a slotted head which is accessible from outside the casing 42 and which may be conveniently turned by a screw driver to adjust the shutter 51.

Oil is supplied to nozzle 22 by means of any suitable pump, shown conventionally at 58 (Figs. 1 and 2). This pump is fixed to casing 42, below the motor 40, by means of cap screws 59. The shaft 60 of the pump extends inside casing 42 (Fig. 1) and has fixed to it a pulley 61 which is suitably driven, as by a belt 62, from a pulley 63, mounted on the motor shaft 39 with freedom to turn thereon. The pump is preferably driven only after the fan has built up considerable speed, approaching as closely as feasible to full speed. This may be accomplished by any suitable form of speed-responsive clutch.

One suitable form of clutch is shown by way of illustrative example, in Figs. 12 and 13. The pulley 63 is in the form of a drum, the internal periphery of which is adapted to be engaged at speeds above a predetermined minimum by a plurality of shoes. These shoes are suitably mounted for limited radial movement on a face plate 64, which is fixed to shaft 39. Each shoe is made in inner and outer parts 65 and 66, respectively, which may be moved radially toward or away from each other by means of a radial screw 67, threaded in the outer part and having its inner end bearing on the inner part. The two end faces of each outer part 66 are grooved. The several grooves in the corresponding faces of the several parts 66 form complete annular grooves to receive annular springs 68. These springs 68 tend to draw the several outer parts toward their respective inner parts to the extent permitted by the screws 67. The shoes are supported from, and driven by, a plurality of studs 69, which are fixed to the face plate 64 and project into recesses in the shoes. The tension of springs 68 may be varied by turning screws 67, which may be done by a screw driver through holes in the drum of pulley 63. By changing the tension of the springs, the speed at which the outer parts 66 of the shoes move outwardly by centrifugal force to engage the drum of pulley 63, may be varied.

Referring now to Fig. 2, the intake side of the pump is connected to a suction conduit 70, leading from a suitable supply of fuel. The outlet side of the pump is connected by a nipple 71 to one branch of a three branch fitting 72. Another branch of this fitting is connected by a nipple 73 to a suitable by-pass valve 74, which opens when the oil pressure exceeds a predetermined value and allows some of the oil to flow back through a by-pass conduit 75 to the suction pipe 70. This valve and by-pass may equally well be built into the oil pump, if desired, as is well known to the art. The third branch of the fitting 72 (see also Fig. 9) is connected to a tube 76 which extends through a slot 77 in the frame part 3 and tube 5 (Fig. 1) into the interior of the latter and is connected to the rear end of nozzle-bearing member 23. The slot 77 extends to the rear end of the tube 5 and to the rear end of frame part 3. The arrangement enables the oil tube 76 to be withdrawn, after it has been uncoupled from the fitting 72 and after the casing 42 has been removed. The tube 8, with attached sleeve 12, the nozzle 22, nozzle support 23, electrodes 27 and their insulators 28 and support 29, may be drawn outwardly as one unit through the rear end of tubular frame part 3, when such end has been opened by removal of casing 42.

The fuel feeding system is shown diagrammatically in Fig. 15. It is to be noted that this system has no nozzle cut-off valve, such as is generally used in fuel feeding systems for household burners of the pressure atomizing type to insure the establishment of a predetermined minimum atomizing pressure prior to emission of oil from the nozzle. Due to the use of the speed-responsive clutch in the drive to the oil pump, the latter does not start coincidentally with the fan 13 and driving motor 40, as has been common practice heretofore. Instead the pump starts only after the motor has built up substantial speed, approaching as closely as feasible to full speed. Accordingly, the pump starts quickly and is up to full speed in an instant. Adequate atomizing pressure is built up so quickly that it is not necessary to restrain flow from the nozzle 22 by a cut-off valve as it would be if the pump started with the motor and fan.

A by-pass valve is provided, as has been usual heretofore in oil pumps for burner structure, to limit the maximum pressure of the oil fed to the nozzle 22 and to by-pass any excess oil not needed at the nozzle. The pump 58 pumps at a rate somewhat in excess of the normal rate at which fuel is consumed. However, the pump is not greatly oversize, as has been common heretofore, and its pumping rate is close to the rate at which fuel is consumed. Consequently, a much smaller motor can be used with this burner, which is adapted to burn at a rate of around one-half gallon per hour, than in ordinary household burners which burn oil at anywhere from one to three gallons per hour.

It is desirable to incorporate in the burner the provisions of my copending application Serial No.

672,106, filed May 24, 1946, and provide for increased air intake area during the starting and stopping intervals of operation of the burner. This result may be effected in various ways, as set forth in said application, and I have shown in Fig. 11, as an illustrative example, merely one way that I have found suitable. Two shutter-operating screw-threaded rods are utilized as before described herein, for manually varying the effective area of the air intake ports 49 and 50. One such rod is shown at 56' and its extreme upper end has a screw driver slot to enable it to be manually turned. In addition, there is fixed to this rod a piston 78, which is slidable in a cylinder 79, formed in a casing 80, screw threaded into the casing 42. A spring 81 acts between the lower face of piston 78 and the lower closed end of the cylinder with a tendency to lift the piston and raise rod 56' to the extent permitted by the engagement of a collar 82 with the shoulder on casing 42. The upper end of the cylinder 79 is closed except for an opening to allow rod 56' to pass therethrough and a stuffing box 83 is provided to avoid leakage along this rod. Each cylinder 79 is connected to receive oil from pump 58 as follows—a cross fitting 84 is interposed in oil pipe 76 and its upper and lower branches are connected by pipes 85 and 86, respectively, to the right and left hand cylinders in the casings 79 shown in Fig. 10. When the pump 58 builds up pressure, the pistons 78 are moved downwardly in their cylinders 79 until they abut stops 87 on the closed lower ends of the cylinders. The lowering of the pistons moves the shutters 51 and their extensions 54 in a direction such as to reduce the effective area of each air intake port. While the burner is running and the pistons 78 are engaged with stops 87, the screws 56', either or both, may be manually turned as may be necessary to adjust the total air intake port area with precision to what is required for good efficiency of combustion. The air supply is adjusted to give as high a CO_2 reading as possible for normal operating conditions. However, during the starting and stopping intervals of operation, the total air intake area is increased to provide for a greater proportion of air to oil. This avoids smoky operation during the intervals, short as they may be, when the flame is being started and when it is being extinguished in the burner's operation.

In operation, the motor 40 will be started automatically under the usual thermostat or any other suitable control and the ignition transformer 35 will be energized at the same time. But the supply of oil is automatically held back until the motor and fan 13 have acquired substantial speed, close to full speed, in order to build up air flow through tube 5, tube 12, jacket 15 and the many perforations 9 and 11. After the fan and motor have reached the desired predetermined speed, the speed-responsive clutch couples the oil pump 58 to the motor. The pump will start up quickly and in a matter of a second or two will be operating at full speed together with the fan. The requisite oil pressure will be quickly built up because of the quick start of the pump at high speed and because the pressure used is much less than is usually used in a burner of the pressure atomizing type. For example, if the nozzle is rated at one gallon per hour and for operation at 100 pounds per square inch pressure, it is in this case operated at a greatly reduced pressure, say around 25 pounds per square inch, determined in this example by the by-pass operation of the pump, so as to obtain a low rate of oil flow, say around one-half gallon per hour. It will be understood that the pump operates at a substantially constant rate tending to give a substantially constant pressure and this pressure can be determined by the spring pressure tending to hold the by-pass valve closed. The less this pressure is the less will be the delivery rate of the pump to the nozzle. Air for combustion is supplied by fan 13 through tube 5 at relatively low pressure, say at a fraction of an ounce.

The air supplied is divided and fed to the oil spray that issues from nozzle 22 in various ways. Some of this air flows through tube 12 and is directed by flange 26 against the oil spray at substantially right angles from all points around the circle of the spray. Such air has considerable velocity and tends to keep the oil spray away from the nozzle and thereby avoid carbon deposits on the latter. If additional air at additional velocity is needed at this location, a funnel 88 may be provided on the intake end of tube 12, as shown in Fig. 14. More of the air will then be forced through tube 12 and, since the area of the opening in air nozzle 26 is the same as before, the velocity of the central air stream will be increased. The air passing around the nozzle support 23 and nozzle 22 tends to cool both these elements and thus tends to reduce the likelihood of carbon deposits on the nozzle. The flange 26 shields the nozzle to a substantial extent from the heat in the combustion chamber 8 and still further reduces the likelihood of carbonization at the nozzle. The air fed through the air nozzle 26, openings 11 and some of openings 9, is effectively mixed with the oil spray from the nozzle and in sufficient volume to form a combustible mixture, which burns with reasonable efficiency when ignited by the electrodes 27. The oil spray is enveloped by the central annular air stream and the mixture is given substantial velocity forwardly in the combustion chamber 8. Additional air is supplied to the flame as it travels through such chamber by the various air jets issuing through the perforations in the wall of the combustion chamber. First, jets of air issue through the perforations 11 in the frusto-conical end 10 of tube 7 and they aid in keeping the flame away from the nozzle by giving it forward velocity and they impinge on the flame at about right angles and hold it away from the cone-shaped inner end of the combustion chamber. The oil spray, that issues at much lower than normal pressure from nozzle 22, tends to fan out and the jets through holes 11 help to counteract this tendency and keep the flame spaced away from the frusto-conical end of the combustion chamber. Air is also received from the jets which issue radially through the perforations 9. Some of these jets (those to the right of baffle 16) will issue at greater velocity than the others and they supply more air to the flame, where it is needed for combustion, and also serve to hold the flame away from the cylindrical wall 7 of the combustion chamber 8. The jets, at lower pressure from the perforations 9 to the left of baffle 16 function more for keeping the flame away from the wall of chamber 8 and less for supplying necessary air for efficient combustion.

Preferably, the air intake port area is increased during the starting and stopping intervals of operation of the burner, as by the means shown in Figs. 10 and 11, or any other suitable means, for the purpose of avoiding a smoky fire during the intervals when oil and air are being supplied to the combustion chamber for a starting or stopping interval in the cycle. The speed-responsive clutch, by holding back oil flow until an air flow near to normal has been built up, cuts to a minimum the intervals when air and oil are both supplied to the combustion chamber to start the fire and insures a good flow of air before any oil can be delivered on starting and stops the oil flow before the air flow diminishes on stopping to stop the fire. The automatic increase of air intake port area during the stopping and starting periods is a desirable refinement co-operating with the speed-responsive clutch in the work of improving combustion conditions during such periods to avoid smoke. With the use of the clutch and the automatic air intake adjustment the rate of air supply during the running periods between the starting and stopping periods, can be reduced to thereby increase the efficiency of combustion.

The baffle 16 is important and novel. It enables control of the air flow through the perforated walls of the combustion chamber. The air flow can be concentrated near the inlet end of the combustion chamber to provide a good combustible mixture at this location. Less air can be fed to the perforations beyond the baffle—for example, just enough to keep the flame from contact with the peripheral wall of the combustion chamber and to prevent such wall from becoming excessively hot. With the use of the baffle, a higher efficiency of combustion can be obtained. Such efficiency is increased by reducing the rate of air supply. The baffle reduces the amount of air fed to the jets 9 which lie beyond it. Hence, since less air is required for the last-named jets, the air intake openings to the fan 13 can be reduced to cut down the air inflow and thereby increase the combustion efficiency as manifested by the percentage of CO_2 in the flue gases while still holding the flame away from the walls of perforated cylinder 8.

Those features disclosed herein and relating to the distribution of the air and including the aforesaid baffle, are claimed in a divisional application Serial No. 58,572, filed November 5, 1948.

The invention provides a burner which can be operated at a relatively low oil rate, such as one-half gallon per hour, with reasonable efficiency, say around 8% CO_2, and which provides its own combustion chamber, thereby avoiding the necessity of building a refractory combustion chamber in the heating apparatus. The air jets, issuing through the perforated wall of the combustion chamber, keep the temperature of such wall within reasonable limits. The baffle enables better efficiency of combustion by cutting down air flow to certain of the jets to reduce to some extent the excess air supplied, without effecting the utility of the jets for their intended purpose.

The invention disclosed will be briefly summarized in some of its general aspects. The form of the burner is simpler, less expensive, and more convenient than customary oil pressure atomizing burners. The parts are related so that this form is particularly adapted for an oil consumption rate of around one-half gallon an hour with the advantage of burning the oil with an efficiency in the efficiency range of customary burners when operating at one gallon or more an hour. Such customary burners operate on a much higher oil pressure feeding to the atomizing nozzle to give atomizing efficiency, which is required in their constructions for their degree of oil burning efficiency. The new burner will operate at about one-quarter the usual atomizing pressure which will give about one-half the oil burning rate with the same size atomizing nozzle, it being desirable in this way to use one large enough to avoid frequent plugging. This arrangement for a low oil burning rate is made feasible by compensating for the low atomizing efficiency from nozzle 22 in the way described with relation to controlling the air. And this way is particularly useful for getting the low rate of oil burning with a desired degree of oil burning efficiency.

I claim:

1. A fuel and air supply unit for oil burners, comprising, a supporting frame having a straight cylindrical air passage therethrough open at opposite ends, a hollow frame closing one end of said passage and having its interior communicating with the last-named end of said passage, said hollow frame being supported by said supporting frame and connected thereto for quick and convenient movement to open said end when required and to subsequently close it, a motor fixed to the hollow frame and located outside the same and outside said passage, said motor having a shaft extending into the rear end of said passage and coaxially thereof, a propeller type fan fixed to said shaft, said hollow frame having openings therein for admission of air to the space between the fan and motor, an oil pump fixed to the hollow frame and located below the motor and outside said passage, said pump having a shaft extending into the interior of the hollow frame parallel with and below the motor shaft, and driving connections between said shafts and located entirely within the hollow frame.

2. A fuel and air supply unit for oil burners, comprising, a supporting frame having a straight cylindrical air passage therethrough open at opposite ends, a hollow frame closing one end of said passage and having its interior communicating with the last-named end of said passage, said hollow frame being connected to said supporting frame for quick and convenient movement to open said end when required and to subsequently close it, a motor fixed to the hollow frame and located outside said passage, said motor having a shaft extending into the rear end of said passage and coaxially thereof, a propeller type fan fixed to said shaft, said hollow frame having openings therein for admission of air to the space between the fan and motor, an oil pump fixed to the hollow frame and located below the motor and outside said passage, said pump having a shaft extending into the interior of the hollow frame parallel with and below the motor shaft, a speed-responsive clutch carried by the motor shaft and having a driving element fixed to the motor shaft, a driven element in the form of a drum loose on the motor shaft, a spring-retracted weight mounted on the driving element and movable by centrifugal force to engage the inner periphery of the drum and drive the latter when the driving member attains a predetermined speed, a driving connection between said drum and pump shaft, a shutter for varying the effective area of said inlet openings and mounted on the hollow frame for movement between two predetermined positions in one of which the shutter provides for a greater effective air inlet area than in the other, yieldable means for moving the shutter to and holding it in the position for greater air inlet area, and means controlled by the driving engagement of the clutch elements

for moving the shutter to its position for lesser air inlet area.

3. A fuel and air supply assembly for oil burners, comprising, a supporting frame having a vertical end wall and a straight horizontal tubular portion projecting from the front face thereof, said portion and said end wall having a cylindrical passage extending from the rear face of the end wall to the front end of the tubular portion, a hollow frame having a vertical end wall and a marginal wall projecting from the front face thereof, said marginal wall engaging the rear face of the end wall of the supporting frame and surrounding the rear end of said passage, a motor fixed to the end wall of the hollow frame and projecting rearwardly from its rear face, said motor having a shaft extending into the rear end of said passage coaxially thereof, a propeller type fan fixed to said shaft and located within said passage, said hollow frame having air inlet openings communicating with the rear end of said passage at a location between the fan and the end wall of the hollow frame, the latter being connected to the supporting frame for quick and convenient removal and replacement, an oil pump mounted on the end wall of the hollow frame beneath the motor, said oil pump having a shaft extending into the interior of the hollow frame and parallel with the motor shaft, and a driving connection between said shafts.

4. A fuel and air supply unit for oil burners, comprising, a main frame including a top part in the form of a short horizontally disposed tube adapted at its front end to telescope with and support the air tube of the burner, and a bottom supporting part, a rear side part in the form of a removable cap having an upper side opening coaxial with said tube and a lower side opening parallel with the upper side opening, a motor removably secured in the upper side opening with its shaft extending into the cap coaxially of said tube, an oil pump removably secured in the lower side opening with its shaft extending into the cap parallel with the motor shaft, a fan fixed to the motor shaft, said frame having therein air inlet openings for said fan, a centrifugal clutch having a driving element fixed to the motor shaft and a driven element in the form of a pulley loose on the motor shaft, a pulley on the pump shaft, and a belt connection between the pulleys.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,618,808	Burg	Feb. 22, 1927
1,858,837	Messer	May 17, 1932
1,985,934	Logan	Jan. 1, 1935
2,057,783	Lattner	Oct. 20, 1936
2,156,405	Smoot	May 2, 1939
2,159,414	Wilcox et al.	May 23, 1939
2,311,404	Macchi	Feb. 16, 1943
2,360,924	Wolfert et al.	Oct. 24, 1944
2,405,196	Elliot et al.	Aug. 6, 1946

FOREIGN PATENTS

Number	Country	Date
406,422	Great Britain	Mar. 1, 1934