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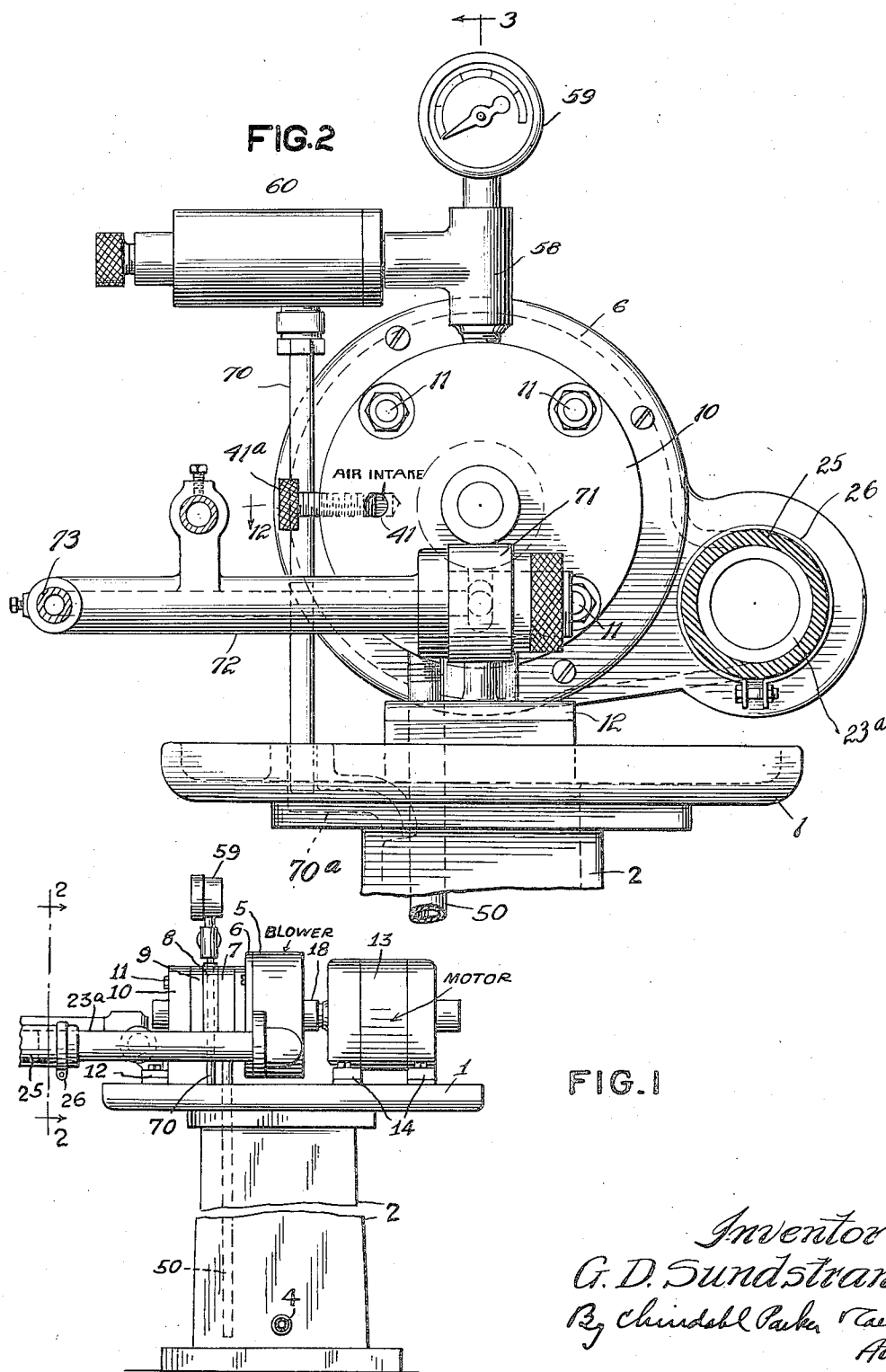
G. D. SUNDSTRAND

1,756,707

OIL BURNING APPARATUS

Filed July 17, 1922

4 Sheets-Sheet 1



April 29, 1930.

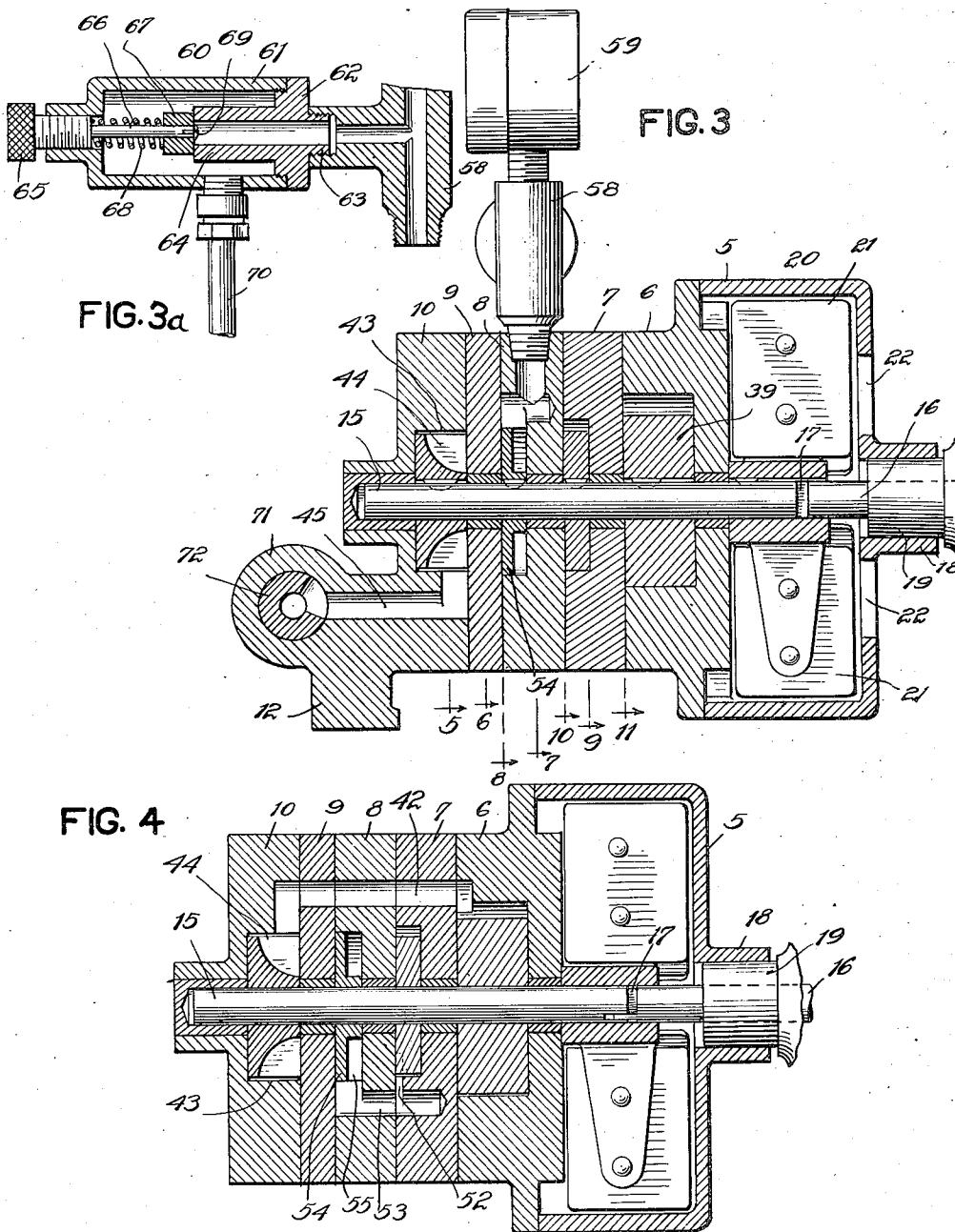
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4 Sheets-Sheet 2



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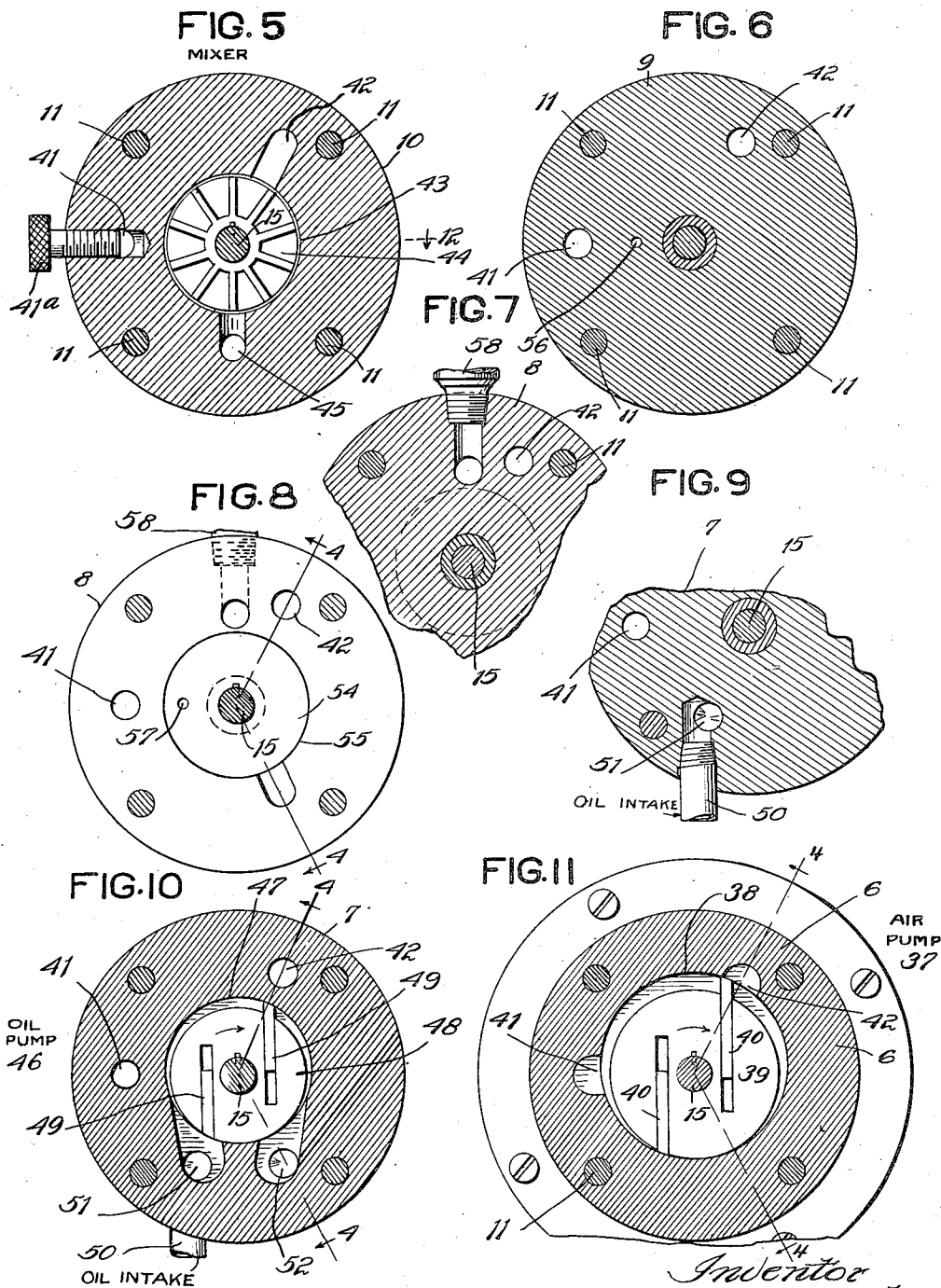
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OIL BURNING APPARATUS

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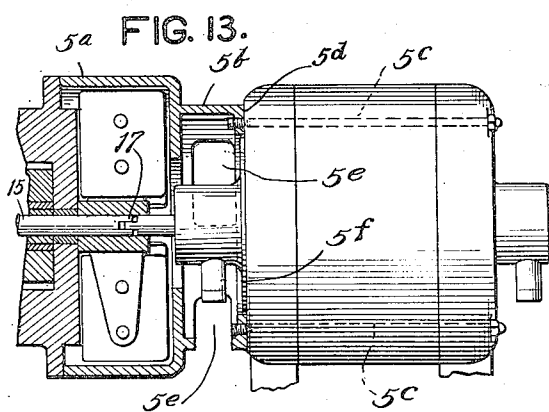
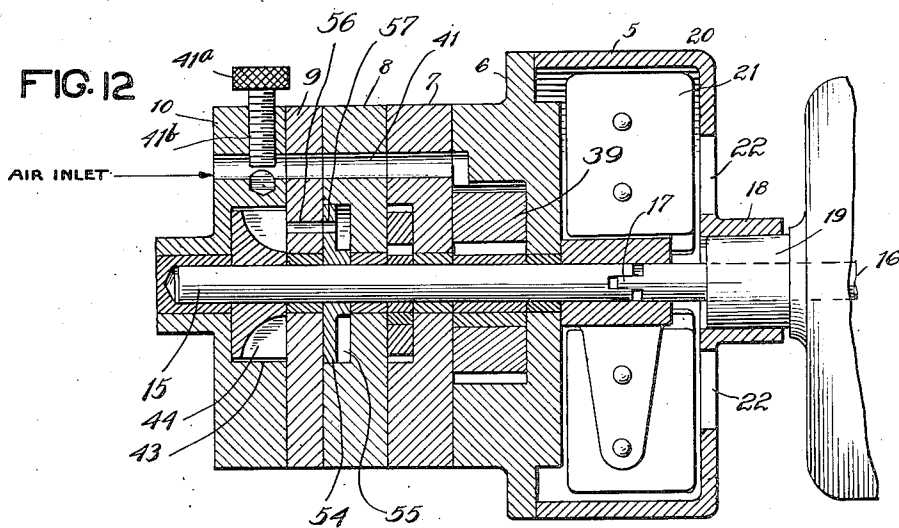
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OIL BURNING APPARATUS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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OIL-BURNING APPARATUS

Application filed July 17, 1922. Serial No. 575,642.

This invention relates particularly to oil-burners adapted for use in conjunction with hot-air furnaces, hot-water heaters, steam boilers and other apparatus for heating dwellings, although the invention is not restricted to such use.

Various forms of apparatus for burning kerosene and applying the heat to house-heating furnaces and boilers have been devised, but, so far as I am aware, none of them is capable of utilizing the grade of oil known as "fuel oil", such oil being much cheaper than kerosene. A particular object of the present invention is to produce an apparatus of the class specified by means of which fuel oil may be successfully burned.

Among the objects of the invention are, to avoid the use of needle valves and other forms of valves susceptible of being rendered inoperative through clogging; to provide for automatic lubrication of the mechanism; and to make an oil burner which can be connected to the sources of supply of fuel oil, electric current and gas and to the furnace by ordinary skilled workmen, and which shall be self-contained, compact and comparatively light and require no troublesome changes in the furnace, thus making it practicable for a tenant to install the burner and to remove it when his lease expires.

In the accompanying drawings, Figure 1 is a side elevation of an oil-burning apparatus embodying the features of my invention, said apparatus being adapted to be positioned in front of a furnace of the common type. Fig. 2 is a sectional view taken in the plane of dotted line 2-2 of Fig. 1. Fig. 3 is a view taken in the plane of line 3 of Fig. 2. Fig. 3^a is a sectional view of the oil bypass valve. Fig. 4 is a view taken in the plane of line 4-4 of Figs. 8, 10 and 11. Fig. 5 is a view taken in the plane of line 5 of Fig. 3. Fig. 6 is a view taken in the plane of line 6 of Fig. 3. Fig. 7 is a view taken in the plane of line 7 of Fig. 3. Fig. 8 is a view taken in the plane of line 8 of Fig. 3. Fig. 9 is a view taken in the plane of line 9 of Fig. 3. Fig. 10 is a view taken in the plane of line 10 of Fig. 3. Fig. 11 is a view taken in the plane of line 11 of Fig. 3. Fig. 12 is a view taken

in the plane indicated by dotted lines 12 of Figs. 2 and 5. Fig. 13 is a fragmental side elevation showing an alternative method of connecting the mechanism to the motor.

In the embodiment which has been selected to illustrate the invention, the mechanism is mounted upon a support having the form of a shallow basin 1 which is secured to the upper end of a reservoir 2. Said reservoir constitutes a base or pedestal adapted to stand upon the floor beside the furnace of the common type (not shown), the mechanism of the oil-burning apparatus being supported by said pedestal. The lower end of the reservoir 2 is connected to any suitable source of supply of fuel oil by means of a pipe 4.

The mechanism of the oil-burning apparatus comprises a blower, an air pump, an oil pump, an oil valve and a device to mix air and oil. In the present embodiment the blower, pumps, valve and mixer are of the rotary type, have a common axis, and are arranged to form a compact group or unit. The mechanism just mentioned, together with the direct-connected electric motor by which it is driven, is mounted on the basin 1.

In the construction herein illustrated, the moving parts of the blower, pumps, valve and mixer are enclosed within and supported by a structure comprising six transverse sections 5, 6, 7, 8, 9 and 10 secured together by means of screws 11 (Figs. 2 and 5). The section 10 is provided with a base 12 (Figs. 1 and 3) adapted to be secured to the basin 1. The motor 13 is provided with the usual feet 14 for attachment to the basin 1.

The sections 6, 7, 8, 9 and 10 have central bearings for a shaft 15. One end of this shaft is connected to the armature shaft 16 of the motor 13 by a tongue-and-groove joint 17. On the casing-section 5 is a sleeve 18 which fits over the bearing 19 of the armature shaft. The bearing 19 forms a part of the motor structure. It will be seen that the motor may be disconnected from the driven mechanism by merely detaching the motor from the basin 1 and withdrawing the motor from its place.

Fig. 13 illustrates a somewhat better means for connecting the mechanism and the motor than that just described. The casing-section

5^a is provided with an annular flange 5^b which is secured to the motor frame by means of the screw-threaded rods 5^c which serve to unite the sections of the motor frame. An annular surface 5^d is machined on the motor frame to make contact with the end of the flange 5^b. The latter has openings 5^e to allow ingress of air to the blower and to give access to the oil cup 5^f of the motor.

The blower 20 (Fig. 3) comprises the casing section 5 and fan blades 21 fixed upon the shaft 15 within said section. The latter has air-intake openings 22. The blower discharges air through a conduit 23 (Fig. 1) extending into the furnace (not shown) in any desired manner. Preferably said conduit includes a flexible section 25 which may be formed of ordinary rubber hose, the ends of the hose being connected to the other sections of the conduit by means of ordinary clamps 26. The portion of the conduit 23 between the blower and the hose connection 25 is designated 23^a in the drawings.

Referring now to the air pump 37 (Fig. 11): Said pump comprises the casing-section 6 (Figs. 11 and 12), the eccentric chamber 38 therein, and a rotor 39 fixed to the shaft 15, said rotor carrying blades 40. Air is drawn into the chamber 38 through a duct 41 (Fig. 12) formed in the sections 6, 7, 8, 9 and 10. The admission of air may be regulated in any suitable way, as, for example, by means of a screw 41^a seated in an opening 41^b formed in the section 10, said opening intersecting the duct 41. The outer end of the screw 41^a has a knurled head by means of which it may be readily rotated, the inner end of the screw constituting a valve member adapted to change the effective size of the inlet passage.

The air forced from the chamber 38 by the blades 40 passes through a duct 42 (Fig. 4) formed in the sections 6, 7, 8, 9 and 10 and enters a mixing chamber 43 (Fig. 5) formed in the casing-section 10. Fixed to the shaft 15 within the chamber 43 is an impeller 44. The chamber 43 has an outlet 45 (Fig. 3).

The oil pump 46 (Fig. 10) comprises the casing-section 7 the latter having an eccentric chamber 47, and a rotor 48 secured upon the shaft 15 within said chamber, said rotor carrying slidable blades 49. The liquid fuel is drawn from the reservoir 2 through a tube 50 (Figs. 1, 2 and 9) extending downwardly through an opening in the basin 1 to a point near the bottom of the reservoir. The upper end of the oil supply pipe 50 communicates with a port 51 which in turn communicates with the eccentric chamber 47. Said chamber has an outlet port 52 (Fig. 4) which communicates with a passage 53 formed in the casing-sections 7 and 8.

The means for admitting oil to the mixing chamber 43 comprises, in the present embodiment, a disk 54 (Figs. 4, 8 and 12) keyed upon the shaft 15 within a chamber 55 formed

in the casing-section 8. The oil discharge passage 53 communicates with the chamber 55 as shown in Fig. 4. The casing-section 9 has a port 56 (Fig. 12) adapted to connect the valve chamber 55 with the mixing chamber 43. The disk 54 rotates in contact with the casing-section 9 and has a single port 57 arranged to register with the port 56 in each revolution of the disk 54. The ports 56 and 57 are preferably of relatively large diameter, as, for example, five thirty-seconds of an inch, thus obviating any danger of clogging.

The upper portion of the valve chamber 55 communicates with a pressure gauge and a by-pass valve, both connected to a fitting 58 (Figs. 2, 3 and 7). The pressure gauge is indicated at 59. While the by-pass valve may be of any suitable character, the by-pass valve 60 herein shown comprises a casing 61 (Fig. 3^a) having a head 62 which is provided with a nipple 63 that is screwed into the fitting 58. The head 62 has an inwardly-extending tube 64 which communicates with the interior of the fitting 58. A screw 65 is seated in an axial opening in the opposite end of the casing 61 and has a stem 66 which extends to a point adjacent to the inner end of the tube 64. On the inner portion of the stem 66 is slidably mounted a valve member 67 arranged to be pressed toward the end of the tube 64 by a helically-coiled expansive spring 68 surrounding the stem 66. The inner end of the tube 64 constitutes a seat for the spring-pressed valve member 67. In the inner end of the stem 66 is screw 69, the head of which forms an annular shoulder to retain the valve member 67 upon the stem 66.

The oil pump 46 delivers more oil than is supplied to the mixing chamber, the surplus oil being discharged through the by-pass valve 60 and flowing thence through a tube 70 to a passage 70^a (Fig. 2) in the basin 1, which passage returns the oil to the reservoir 2. Preferably the oil is discharged into the mixing chamber under relatively low pressure.

The impeller 44 mixes the oil and air delivered to the mixing chamber 43, the mixture being discharged through the passage 45 (Fig. 3). This passage extends into a bearing 71 in which is pivotally mounted a tubular bracket 72 (Fig. 2) which extends transversely of the axis of the mechanism. The bracket 72 communicates with the passage 45 as shown in Fig. 3. To the outer end of the bracket 72 is secured a feed pipe 73 (Fig. 2). This pipe extends through an opening in the furnace (not shown) and is arranged to discharge the mixture of oil and air downwardly into the furnace in any desired manner.

In the operation of the device, every time the port 57 in the valve disk 54 registers with the port 56, a small quantity of oil is forced into the mixing chamber 43. The rotation of

the impeller 44 causes atomization of the oil entering the chamber and thoroughly mixes the oil with the air. Proper proportioning of the air and the oil is effected by means of the adjusting screw 41^a (Fig. 12) and the oil by-pass adjusting screw 65 (Fig. 3^a).

If desired, connections may be made with a thermostatic circuit-closer arranged to supply current to the motor 13 in accordance with the temperature to be maintained in the rooms heated by the furnace.

The embodiment herein shown of the invention is very compact and requires but little floor space. Since the apparatus need not be attached to the furnace, and is easily transportable, it can be installed by a tenant and removed upon expiration of the lease. The valve for controlling the oil feed is of such character that it cannot be clogged. The key which prevents relative rotation between the shaft 15 and the valve disk 54 does not prevent the disk from moving longitudinally of the shaft, consequently the pressure of the oil keeps the disk pressed against the section 9 with sufficient force to prevent leakage, and causes wear of the disk and its seat to be automatically taken up.

The construction herein disclosed is especially adapted for automatic lubrication through seepage of fuel oil along the shafts. It will be understood, however, that special provision for lubrication may readily be made in a construction intended for burning kerosene and other relatively light oils.

While I have herein illustrated and described rotary pumps for moving the air and the fuel, and a rotary oil valve, it will be apparent that other types of pumps and valves may be used, and that various other changes in the size, construction and relative location of the different elements may be made without departing from the spirit of the invention defined in the appended claims.

I claim as my invention:

1. A compact oil-burning apparatus having, in combination, a supporting structure, a shaft journaled in said structure, said structure containing a blower chamber, an air pump chamber, an oil pump chamber, a valve chamber and a mixing chamber, an impeller mounted on said shaft in the mixing chamber, a valve disk mounted on said shaft in the valve chamber, a rotor mounted on said shaft in the oil pump chamber, a rotor mounted on said shaft in the air pump chamber, and fan blades on said shaft in the blower chamber, said structure having therein an air inlet passage establishing communication between the atmosphere and the air pump chamber, a passage connecting the air pump chamber to the mixing chamber, and a passage connecting the oil pump chamber to the valve chamber, the valve chamber being connected to the mixing chamber by a port controlled by said valve disk.

2. A compact oil-burning apparatus having, in combination, a supporting structure, a shaft journaled in said structure, said structure containing an air pump chamber, an oil pump chamber, a valve chamber and a mixing chamber, an impeller mounted on said shaft in the mixing chamber, a valve disk mounted on said shaft in the valve chamber, a rotor mounted on said shaft in the oil pump chamber, and a rotor mounted on said shaft in the air pump chamber, the air pump chamber being connected to the mixing chamber, the oil pump chamber being connected to the valve chamber, and the valve chamber being connected to the mixing chamber by a port controlled by said valve disk.

3. An oil-burning apparatus having, in combination, a mixer, means to supply air to the mixer, a valve chamber having a port in one of its side walls communicating with the mixer, means to supply oil to the valve chamber, a driving shaft, and a valve disk mounted on said shaft in said valve chamber, said disk being slidable longitudinally of said shaft, one side of said valve disk being held against said side wall of the valve chamber by the pressure of the oil, said disk having a port arranged to register with the first-mentioned port.

4. An oil-burning apparatus having, in combination, a mixer, means to supply air to the mixer, a valve chamber having a port in one of its walls communicating with the mixer, means to supply oil to the valve chamber, and a rotary valve in said valve chamber, said valve being held against said wall by the pressure of the oil, said valve having a port arranged to register with the first-mentioned port.

5. An oil-burning apparatus having, in combination, a mixer, an air pump arranged to deliver air under pressure to the mixer, a valve chamber, an oil pump arranged to deliver oil to the valve chamber, and a repeating cut off valve in said chamber arranged to control the flow of oil from the valve chamber to the mixer in a rapid succession of small quantities of oil.

6. A compact oil-burning apparatus comprising a blower, an air pump, an oil pump, an oil valve, and a mixer, all of said devices being of the rotary type, each of said devices being contained in a casing, all of said casings being aligned in abutting relation to form a unitary structure, and an electric motor axially aligned with and having a direct driving connection with said devices.

7. A compact oil-burning apparatus having, in combination a reservoir constituting a pedestal, a basin mounted on the reservoir, an air pump, an oil pump and a mixer mounted on the basin, said oil pump drawing oil from the reservoir, and a motor mounted on the basin for driving the pumps and mixer.

8. An oil-burning apparatus having, in

combination, a mixing chamber, an impeller in said chamber, means to supply air under pressure to said chamber, a valve chamber connected to the mixing chamber by a port, means to supply fuel oil under pressure to said valve chamber, a rotary valve in said valve chamber controlling said port, and means for synchronously rotating said impeller and said valve.

9. An oil burning apparatus having, in combination, a mixer, an air pump arranged to deliver air to the mixer, a valve chamber, an oil pump arranged to deliver oil to the valve chamber, and a repeating cut-off valve in said chamber arranged to cause a flow from the valve chamber to the mixer of a succession of small quantities of oil.

10. A compact oil burner apparatus, comprising a blower, an air pump, an oil pump, an oil valve and a mixer, all of said devices being of the rotary type and being axially alined, an electric motor axially alined with and having a direct driving connection with said device, and conduit connections from said pumps to the mixer, said connections being contained within the casing comprising said devices.

In testimony whereof, I have hereunto affixed my signature.

GUSTAF DAVID SUNDSTRAND.

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