

April 11, 1944.

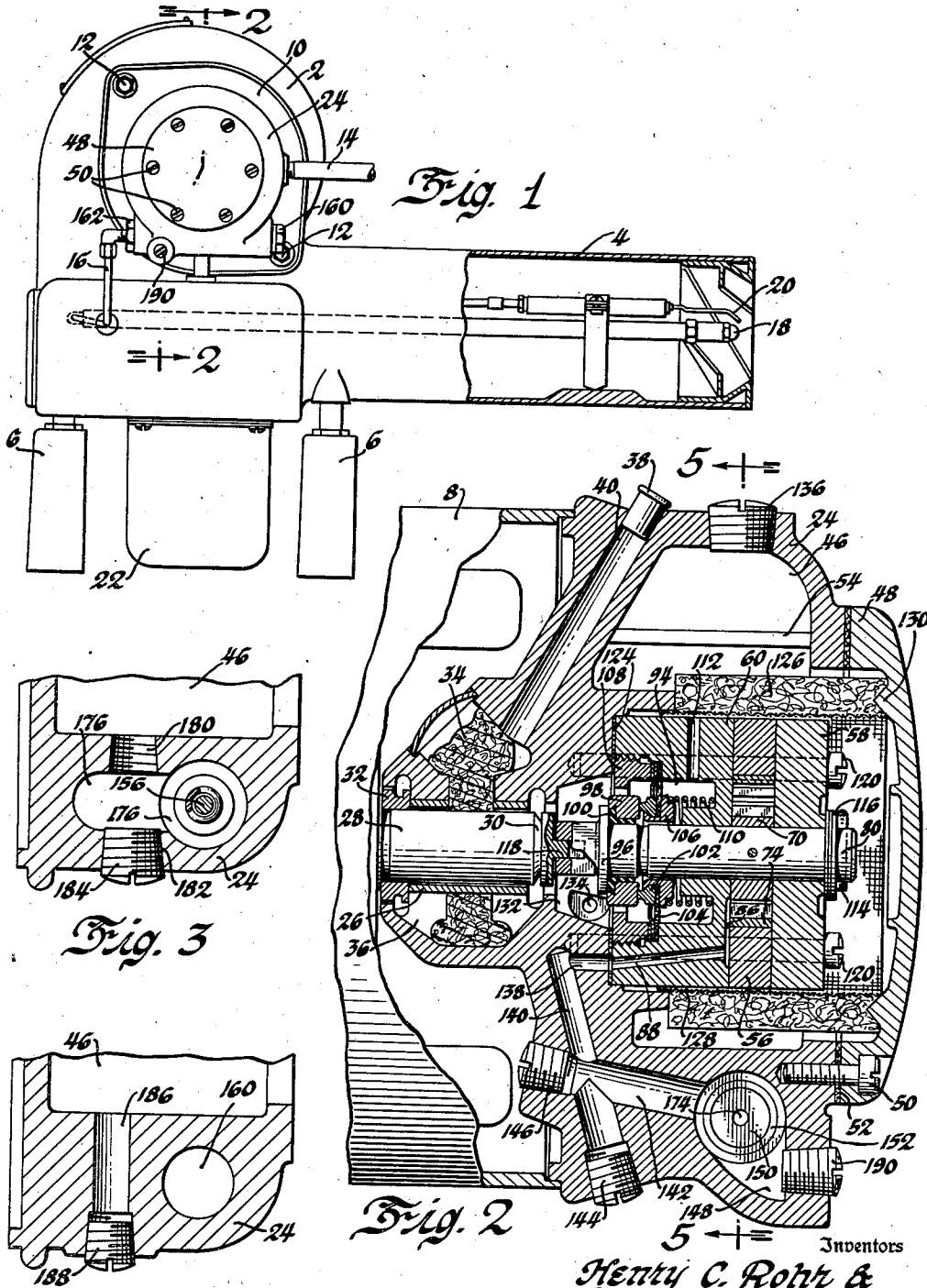
H. C. ROHR ET AL

2,346,398

OIL BURNER

Filed July 17, 1940

2 Sheets-Sheet 1



Inventors
Henry C. Rohr &
Peter R. Contant

Blackwelder, Spencer & Allen
Attorneys

April 11, 1944.

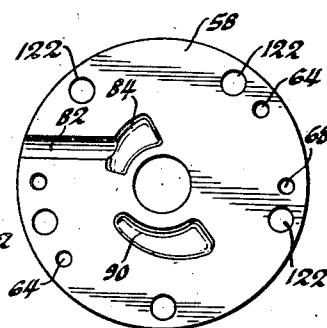
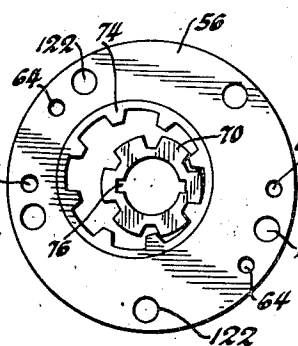
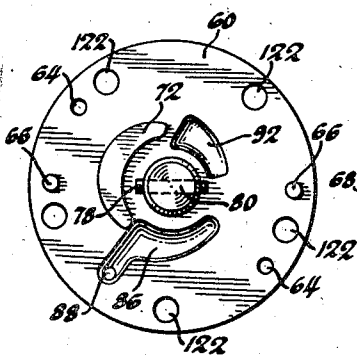
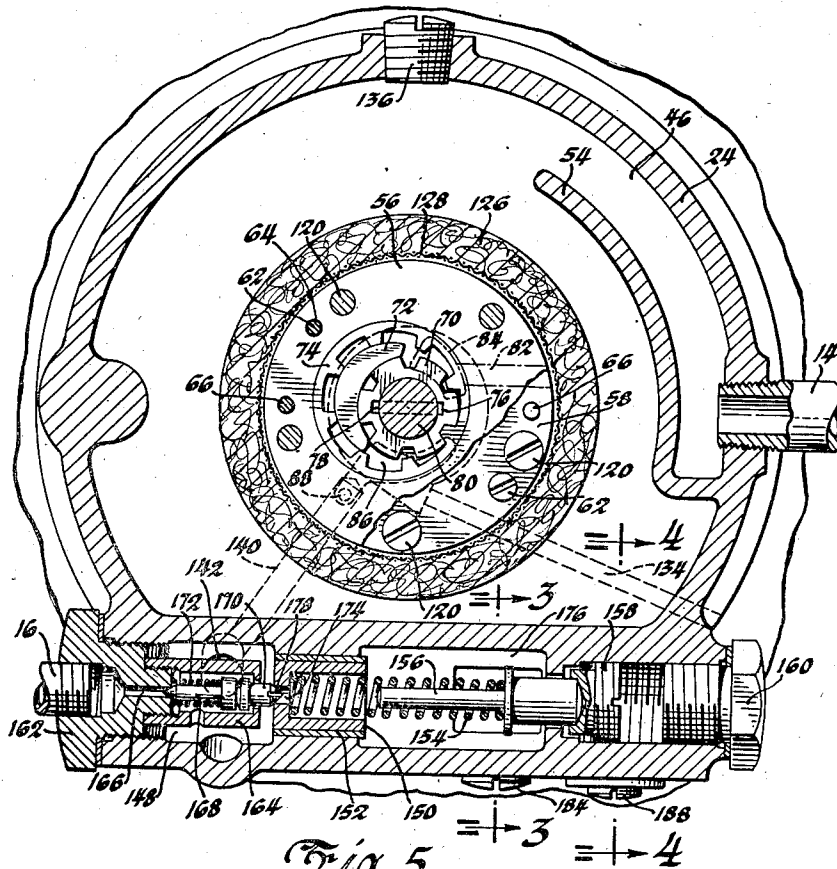
H. C. ROHR ET AL

2,346,398

OIL BURNER

Filed July 17, 1940

2 Sheets-Sheet 2



Inventors
*Henry C. Rohr &
Peter R. Constant*

By *Peter H. Contant*
Blackman, Spruce & Flint
Attorneys

UNITED STATES PATENT OFFICE

2,346,398

OIL BURNER

Henry C. Rohr and Peter R. Contant, Rochester,
N. Y., assignors to General Motors Corporation,
Detroit, Mich., a corporation of Delaware

Application July 17, 1940, Serial No. 346,033

6 Claims. (Cl. 103--42)

This invention relates generally to oil burners and more particularly to improvements in the construction of burners of the gun or pressure atomizing type.

Oil burners of this type are generally characterized by the provision of a rotary air fan and a fuel oil pump driven by a common electric motor. An oil filter is generally provided between the source of oil and the intake to the oil pump and oil under pressure from the pump outlet is supplied through the intermediary of a pressure regulating valve arrangement to an atomizing nozzle adjacent or within an air duct from the fan.

One object of the present invention is to provide a unit assembly which includes one of the end bearings for the motor shaft, an oil pump assembly, the pressure regulating valves and an oil filter in which all of such parts are readily accessible for examination, repair or replacement.

A further object of the invention is the construction of the oil pump together with a sealing means for the rotating shaft of the pump as a unit assembly which may be readily installed and removed as a unit without disturbing other parts of the burner.

A still further object is the provision of the oil filter in the form of a readily removably cylinder or tube around the oil pump unit whereby all oil to the pump intake passes through the filter which may be readily removed for inspection and replacement when desired.

With reference to the foregoing objects, the construction and arrangement of parts is such as to not only simplify the same and provide for ease of manufacture and accessibility for inspection and service but also to eliminate projecting parts and provide the minimum of external connections to thereby improve the appearance of the complete burner.

Other objects and features of the invention together with the advantages thereof will be apparent from, or specifically pointed out in the following description and accompanying drawings of one embodiment of the invention in which:

Fig. 1 is a side elevation, with parts broken away, of a complete burner.

Fig. 2 is an enlarged vertical section, taken substantially on line 2--2 of Fig. 1, of that portion of the burner embodying the present invention.

Fig. 3 is a fragmentary section to show certain passages taken substantially on line 3--3 of Fig. 5.

Fig. 4 is a fragmentary section taken substantially on line 4--4 of Fig. 5.

Fig. 5 is a transverse section taken substantially on line 5--5 of Fig. 2.

Figs. 6, 7 and 8 are elevations of the several parts of the oil pump to be described hereinafter in detail.

Referring first to Fig. 1 for a general showing of the complete oil burner, the rotary fan or blower housing 2 with the integral burner tube 4 is supported on pedestals 6. The electric motor with a shaft carrying the fan or blower on one end and connected to drive the oil pump at the other end preferably includes a housing or frame 8 with a flange 10 whereby the same may be supported on and secured to the blower housing 2 as by bolts 12. An oil supply pipe 14 from the usual oil storage tank is connected to the fuel pumping unit to be hereinafter described and the oil delivery pipe 16 is connected to the burner nozzle 18 within the burner tube 4 with suitable ignition electrodes 20 and the usual ignition transformer 22.

As will be apparent the general construction described above is more or less conventional and proceeding now to a detailed description of the present invention and referring particularly to Figs. 2 and 5, a casing 24 is adapted to be secured to the motor frame 8 in any desired manner. This casing 24 constitutes an end housing for the motor and is provided with the bearing 26 for one end of the motor shaft 28. The motor shaft 28 is provided with an oil slinger groove 30 and oil slinger ring 32 on opposite sides of the bearing 26 and lubrication is provided by the oil wick 34 in chamber 36 to which oil may be supplied through oil cap 38 and passage 40.

The casing 24 is formed with a relatively large chamber 46 having an end opening adapted to be closed by the cap 48 secured to the casing as by screws 50 with a sealing gasket 52 to form a housing for the oil pump and filter unit. This chamber 46 also constitutes a suction chamber for the pump and communicates at one side with the oil supply pipe 14. An upwardly extending baffle or barrier wall 54 is provided in chamber 46 adjacent the connection to oil pipe 14 to permit the oil inlet to be brought in at the side of the casing and trap a certain amount of oil in the chamber up to the level of the upper edge of the baffle or barrier wall to thereby keep the pump and surrounding filter covered with oil.

The oil pump body comprises the circular plate 56 which is secured between end plates 58 and 60 as a unit by screws 62 in the diametrically opposite holes 64, and to accurately align the plates axially when assembling the unit in the manner to be hereinafter described, dowels 66 are also provided in the diametrically opposite holes 68.

The oil pump per se is of conventional type comprising the pinion 70, crescent 72 and internal gear 74. The internal gear 74 is journaled within the pump body plate 56 and adapted to be rotated by the pinion 70 having diametrically opposite slots 76 to receive the ends of the drive pin 78 passing through the pump shaft 80.

Before proceeding to a further description of the pump unit it is desired to note that certain parts mentioned above have been shown in Fig. 6 as if secured to or forming a part of the plate 60, but it should be understood that the pump shaft 80 extends through and rotates relative to this plate, the crescent 72 may be separately formed and merely positioned on the plate 60 by dowels, and the dowels 66 are adapted to fit within holes in plates 60 similar to the holes 68 in plates 56 and 58. With further reference to the assembly of plates 56, 58 and 60 with the pump parts it has been found desirable to first assemble the plates with a shaft and a set of slightly oversize gears and then drill the dowel holes 68 so that when the oversize gears are removed and the pump unit is assembled with gears of the correct dimensions, the parts will operate smoothly without binding.

The face of the outer or front plate 58 which is adapted to contact with the plate 56 is formed with an oil intake groove or channel 82 extending from the periphery thereof to a recess 84 adjacent the intake area of the pump gears and the inner or rear plate 60 is formed on the face opposed to the plate 56 with a recess 86 adjacent the discharge area of the pump gears which communicate with an oil outlet passage 88 extending through plate 60 to the opposite face thereof. The plate 58 is formed with a further recess 90 which is opposite the recess 86 in plate 60 and the plate 60 is formed with a further recess 92 which is opposite the recess 84 in plate 58, such recesses 90 and 92 serving to equalize the pressure on the side faces of the pump gears and thus prevent undue side pressure on the gears.

The rear face of the plate 60 is provided with a cylindrical recess to form a chamber 94 to house the pump shaft sealing means. The pump shaft 80 is formed with a shoulder 96 and abutting this shoulder is a hardened sealing ring 98 which may be held in position by a ring 100 on the shaft. The ring 100 is preferably made of such material as "Duprene," "neoprene," or similar rubber substitutes or such material as will seal the joint between the shaft 80 and the sealing ring 98. The rings 98 and 100 rotate with shaft 80 and the ring 98 is adapted to be engaged by a sealing ring 102 which is secured to a flexible diaphragm 104 by means of a member 106 which is spun over the inner edge of ring 102. The outer edge of the diaphragm 104 is secured against a shoulder within the recess in plate 60 by a screw-threaded clamp ring 108 with a slightly flared washer and a flat washer interposed between the clamp ring and diaphragm as shown.

The engaging surfaces of the seal rings 98 and 102 are highly finished and the ring 102 is maintained in close contact with the ring 98 by the spring 110 between the member 106 and the base of the recess in plate 60 to minimize leakage of oil from the chamber 94. To prevent the building up of any pressure within the chamber 94, a passage 112 is provided through the plate 60 to connect the chamber 94 to the suction chamber 46.

The oil pump with the several plates and the sealing means is assembled together as a complete unit which may be readily installed or removed. As has been heretofore described the pump parts are assembled with the three plates 56, 58 and 60 secured together by screws 62. As shown in Fig. 2 the outer end of the pump shaft 80 is extended beyond the plate 58 and held from inward movement by the cotter key 114 and washers 116, whereas outward movement of the shaft 80 is resisted by spring 110 and limited by engagement of member 106 with the adjacent portion of plate 60.

The inner end of the pump shaft 80 and the adjacent end of the motor shaft 28 are provided with a suitable coupling 118 such as a cooperating tongue and groove and the unit assembly of the pump and sealing means may be secured to the casing 24 by the spaced screws 120, shown as five in number, extending through aligned holes 122 in plates 56, 58 and 60, with a sealing gasket 124 clamped between casing 24 and plate 60.

A filter 126 is positioned in casing 24 within the chamber 46 and may be made of any suitable material such as cotton yarn wound on a screen wire supporting cylinder 128 which is concentric with the plates 56, 58 and 60. This filter is adapted to be removably clamped against the casing 24 by the end cap 48 which is formed with the circular angular face 130 which embeds itself in one end of the filter 126 as shown in Fig. 2 and compresses the filter against the casing at its opposite end.

The casing 24 is formed with a recess adjacent the inner end of the pump unit to provide a space 132 to receive the inner end of the pump shaft 80 and the coupling 118 to the motor shaft 28 and a passage 134 extends through the casing 24 from this space 132 to drain any oil which may leak into the space 132 to a point outside of casing 24 and indicate that the sealing means is not functioning properly. The upper side of casing 24 is also provided with an opening into the chamber 46 which may be normally closed by a plug 136 to provide for priming the pump or for attaching a vacuum gage to test the pump suction.

As has been heretofore described, the plate 60 is provided with the oil outlet or discharge passage 88 extending to the inner face thereof. An opening through the gasket 124 is adapted to be aligned with this passage and passage 138 in the casing 24 which communicates with intersecting passages 140 and 142 drilled in the casing 24 which are closed at their junction with the outside of the casing by plugs 144 and 146, respectively.

Such passages supply the oil from the pump to a pressure regulator chamber 148 in the casing 24. Communicating with this chamber is a piston 150 slidable within sleeve 152 with a spring 154 interposed between the piston and a shoulder on an adjustable pin 156. The pressure of spring 154 may be readily adjusted by means of the screw 158 engaging pin 156 and the threaded opening for this screw may be normally closed by the removable cap 160.

Axially aligned with the piston 150 is a threaded cap 162 to which is secured a valve guide and cage 164. The cap 162 is provided with a port 166 communicating with a connection to the oil delivery pipe 16 and within the cage 164 are two oppositely directed needle valves 168 and 170 with a relatively light spring 172 urging both valves toward the piston 150 which is provided

with a port 174 communicating with the oil by-pass chamber 176 in casing 24. As will be apparent, the valve 168 is adapted to control port 166 and the valve 170 is adapted to control port 174 with a bleed groove 178 machined in the conical face of valve 170 for a purpose to be hereafter set forth.

Considering now the operation of the pressure regulating valve arranged described above, it will be seen that when the pump is not operating, the spring 154 holds the piston 150 against valve 170 to close port 174 except for the bleed opening provided by groove 178. The spring 154 is much stronger than spring 172 and the valve 168 is therefore held against cap 162 to close the port 166. When oil under pressure from the pump is delivered to chamber 148, the pressure thereof is exerted on piston 150 to move the same and compress spring 154. This movement permits spring 172 to move both valves in the same direction as the piston thereby opening the port 166 to supply oil to the burner nozzle. During a part of the travel of the piston the valve 170 remains seated in port 174, but when movement of this valve is stopped by engagement of a shoulder thereon with the end of the cage 164, the continued movement of the piston opens the port 174 to permit excess oil to flow into the by-pass chamber 176.

The pressure regulating valve arrangement is therefore such that oil is only delivered through port 166 to the burner nozzle when the pressure thereof is of the desired value or range of values and whenever the pressure in chamber 148 exceeds the desired value, the oil will be by-passed through port 174 into the chamber 176. When the pressure drops below the desired value due to stopping the oil pump or for any other reason, the piston 150 will move to first close by-pass port 174 and then move both valves to close the burner port 166. The bleed groove 178 in valve 170 permits oil leakage through the port 174 to reduce the pressure in chamber 148 and permit quick and complete closing of the burner port 166 when the pump is stopped.

It will be apparent that the pressure of the oil to the burner nozzle may be readily adjusted by the spring tension adjusting screw 153 and the extent of opening of port 174 and amount of oil entering the by-pass chamber 176 will be governed by the oil pressure and the setting of the spring 154. The oil which is by-passed to chamber 176 may be either recirculated directly to the pump intake chamber or returned to the supply tank. As shown in Fig. 3, aligned threaded openings are provided in casing 24 from the by-pass chamber 176 to the intake chamber 46 and to the outside of casing 24. The inner opening 180 into the chamber 46 is slightly smaller than the outer opening 182 which is shown as closed by a plug 184 whereby the oil from the by-pass chamber 176 will be returned directly to the pump intake or suction chamber 46. If it is desired in any installation to return the oil to the supply tank, it is merely necessary to remove the plug 184, place a plug in the inner opening 180 and connect an oil return pipe with the outer opening 182.

As shown in Fig. 4 a passage 186 is provided in the lower part of casing 24 and normally closed by a plug 188 to permit the chamber 46 to be drained and cleaned. An opening through the casing into pressure regulator chamber 148 may also be provided as shown in Fig. 2 and normally closed by a plug 190 to permit the connec-

tion of a pressure gage to determine the oil pressure in this chamber or to vent any air from the system.

As will be apparent from the foregoing description, the oil pump and seal assembly is readily detachable as a unit and may be separately tested or quickly removed and a new unit substituted with only a short interruption of burner operation. The filter surrounds the pump unit and is of simple structure and readily removable for cleaning or replacement, and all oil including that recirculated through the pump must pass through the filter to enter the pump intake channel 82. All of the principal parts are contained within the single casing 24 with the advantage that the parts are maintained in their proper relation and the external appearance is improved as will be particularly apparent from the showing in Fig. 1.

It will be apparent that many changes and modifications may be made in the detailed construction and arrangement of parts within the scope of the present invention and that many advantages of the several novel features thereof in addition to those specifically mentioned herein will be obvious to those skilled in the art.

We claim:

1. In an oil burner, a fuel supply unit including an electric motor having a motor frame and a motor shaft, a unitary housing secured to said motor frame and provided with a portion forming a closure for an end of said motor and a bearing for one end of said motor shaft, a pump chamber in said housing, a fuel pump unit in said chamber including pumping elements, a pump shaft, and sealing means for said pump shaft, a coupling between said motor shaft and pump shaft, a recess in said housing between said motor shaft bearing and said pump unit to receive said coupling, and a drain passage extending from said recess through said housing to the outer side of said housing whereby said drain will serve to indicate any leakage of oil past said sealing means into said coupling recess.

2. In an oil burner, a housing provided with a pump chamber having inlet and outlet passages, a fuel pump unit including intermediate and end plates, pumping elements in said intermediate plate, an intake passage formed between said intermediate plate and one of said end plates, an outlet passage extending through said other end plate adapted to communicate with said pump chamber outlet passage, a pump shaft journaled in said end plates, a sealing means for said pump shaft connected to one of said end plates, means to secure said plates together whereby said pump unit comprises a self-contained unit incorporating the said pumping elements, pump shaft and pump shaft sealing means, and means for detachably securing said pump unit to said housing within said pump chamber.

3. In an oil burner, a housing provided with a pump chamber having inlet and outlet passages, a fuel pump unit including intermediate and end plates, pumping elements in said intermediate plate, an intake passage formed between said intermediate plate and one of said end plates, an outlet passage extending through said other end plate adapted to communicate with said pump chamber outlet passage, a pump shaft journaled in said end plates, a sealing means for said pump shaft including a rotatable sealing ring secured to said pump shaft and a relatively stationary sealing ring secured to one of said end plates with means forcing the same into engagement

with said rotatable sealing ring, means to secure said plates together whereby said pump unit comprises a self-contained unit incorporating the said pumping elements, pump shaft and pump shaft sealing means, and means for detachably securing said pump unit to said housing within said pump chamber.

4. In an oil burner, a fuel supply unit including a housing formed with a pump chamber having an end wall adapted to receive the end of a motor shaft, a fuel pump unit adapted to be removably mounted in said chamber, said unit including a pump shaft, pumping elements and a sealing means for said pump shaft, means to detachably secure said shaft, pumping elements and shaft sealing means together as a self-contained unit, and means to detachably secure said unit to the said end wall within the pump chamber.

5. In an oil burner, a fuel supply unit including a housing formed with a pump chamber having an end wall and a detachable cover for said chamber, a drive shaft extending through said end wall, a pump unit including a pump shaft, pumping elements and a sealing means for said pump shaft adjacent one end thereof, means to detachably secure said shaft, pumping elements and shaft sealing means together, and means to detachably secure said pump unit to said end wall with said pump shaft in disconnectible engagement with said drive shaft so that said pump shaft, pumping elements and shaft sealing means may be installed or removed as a self-contained

unit when said cover is removed from said housing.

6. In an oil burner, a housing provided with a pump chamber having an inlet opening and an end wall having an outlet passage, a drive shaft extending through said end wall into said chamber, a fuel pump unit adapted to be removably mounted within said chamber, said unit including a plurality of plates, pumping elements and a pump shaft, said plates housing said pumping elements and provided with an intake passage to said elements from said chamber and an outlet passage adapted to communicate with said outlet passage in said end wall, detachable means for securing said plates and pumping elements together, means for detachably mounting said pump shaft in said plates including a sealing means for said pump shaft adjacent one end thereof adapted to limit movement of said shaft in one direction and means adjacent the other end of said shaft adapted to limit movement thereof in the opposite direction, and means for detachably securing said pump unit to said end wall with said pump shaft in disconnectible engagement with said drive shaft so that said pump unit together with said pump shaft sealing means may be installed or removed without disturbing the drive shaft or the inlet and outlet of said pump chamber.

HENRY C. ROHR.
PETER R. CONTANT.