April 9, 1935. W. E. BAKER 1,996,789

FLUID SUPPLY DEVICE

Filed May 18, 1932 2 Sheets-Sheet 1

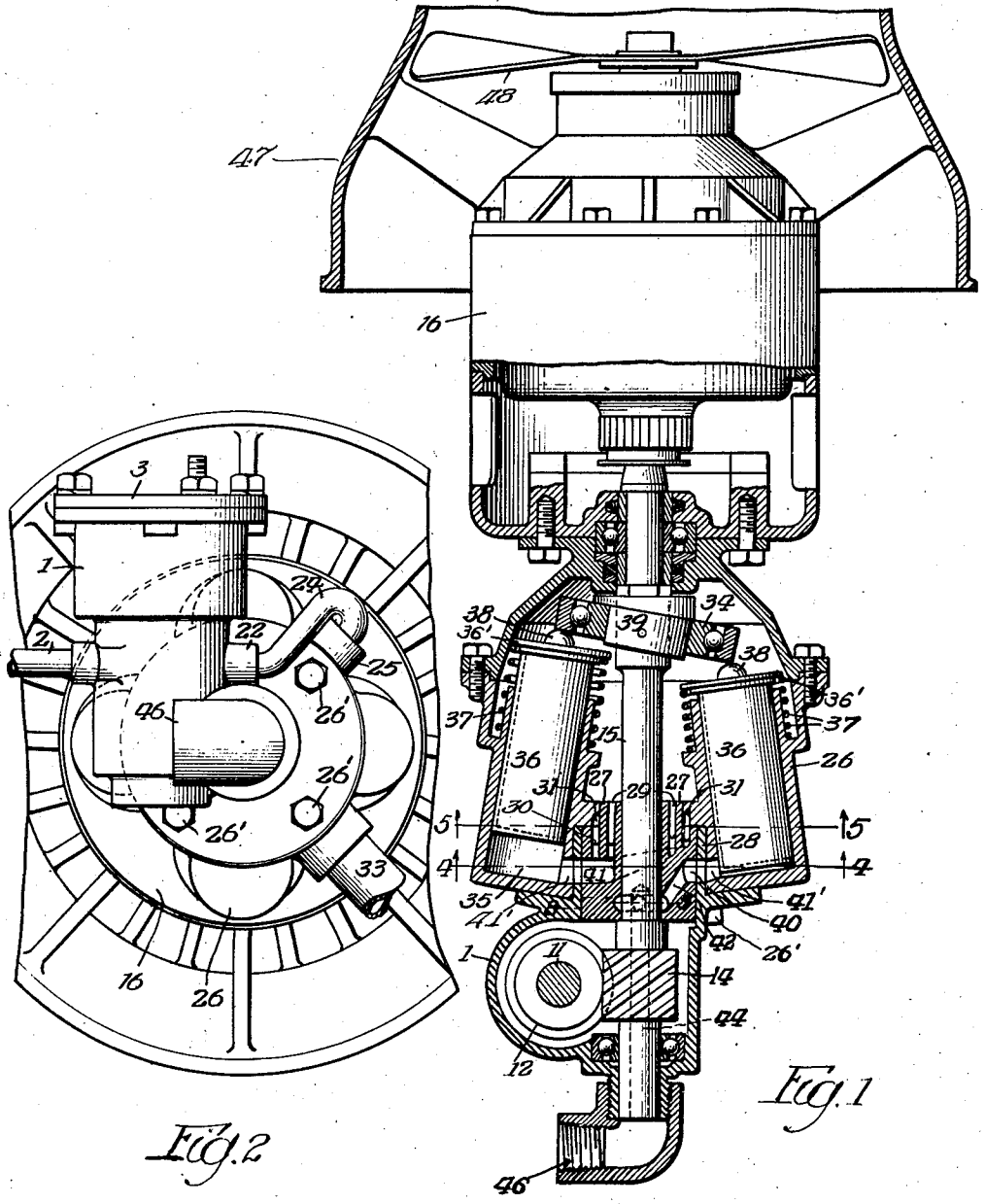


Fig. 2

Fig. 1

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Fig. 7

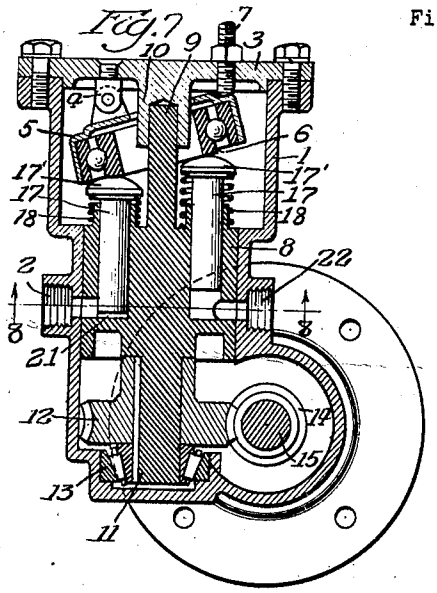


Fig. 3

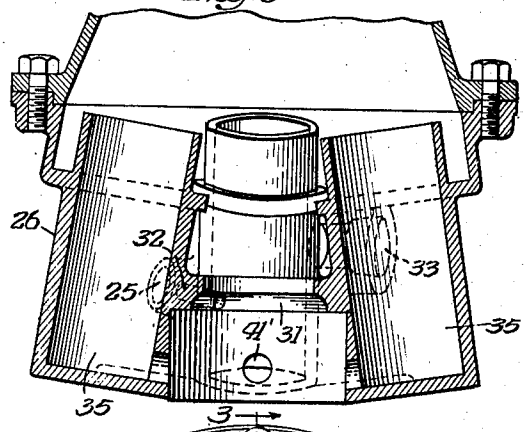


Fig. 4

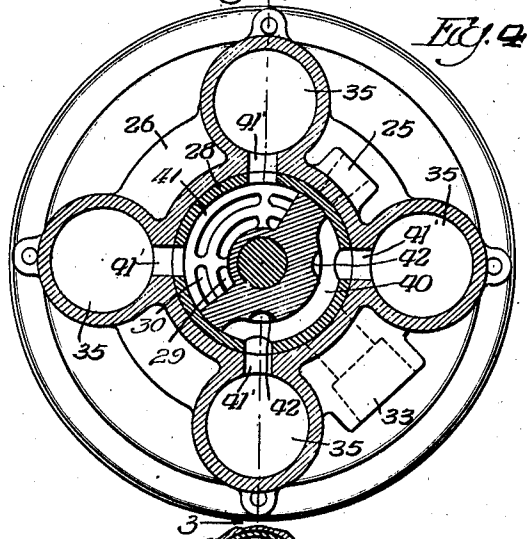


Fig. 8

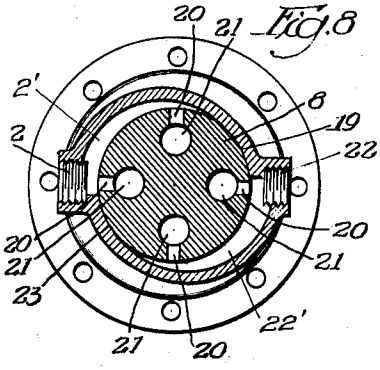


Fig. 9

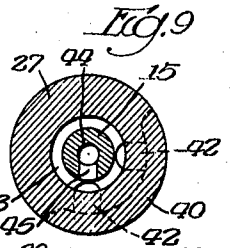


Fig. 6

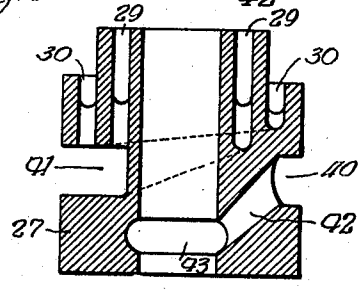
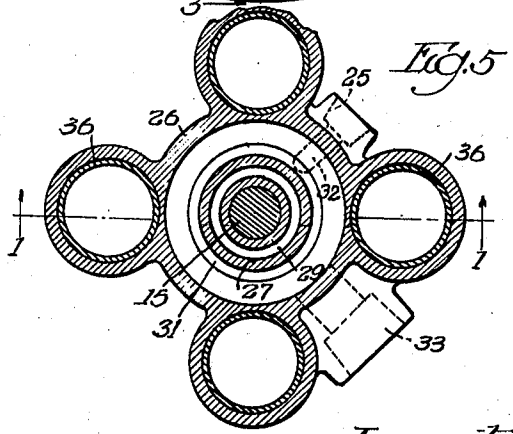


Fig. 5



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UNITED STATES PATENT OFFICE

1,996,789

FLUID SUPPLY DEVICE

William E. Baker, Swanton, Ohio

Application May 18, 1932, Serial No. 611,973

8 Claims. (Cl. 261—28)

My invention relates to a novel and improved means for transforming a liquid fuel into a vapor or mist so that it may be burned with complete combustion.

I have designed my invention primarily for use with fuel oil and shall refer to the fuel as oil for the sake of brevity and clearness but I wish it to be understood that the word "oil" is used as exemplary of any suitable fluid fuel and I do not intend to limit myself to fuel oil but desire to have it understood that the word "oil" includes any fluid fuel.

In order to burn oil satisfactorily and to insure complete combustion thereof it is essential that the oil be vaporized or mistified by mixing the oil with air. The primary object of my invention is to provide novel and improved means for transforming liquid oil to a vapor or mist by mixing a predetermined quantity of oil with air in a novel manner.

Another object is to provide a fuel consisting of a vapor or mist composed of a mixture of oil and air which will burn with complete and perfect combustion and to accomplish this end I provide novel and improved means for mixing the oil and air to create a highly combustible vapor or mist.

A further object is to supply a measured quantity of oil to the means for mixing the oil with air to form the vapor or mist which will be forced through a suitable nozzle in the form of a spray and burn with complete and perfect combustion.

A still further object is to provide a new and novel arrangement of parts to form a compact and efficient structure which may be readily applied to a variety of purposes requiring a complete and perfect combustion of the combustible material. A particular use for which I have designed my invention is to supply an oil vapor or mist to a fire box under a boiler for heating the circulating medium in the boiler for supplying heat to a home or other building, although the invention is by no means limited to this use as it will be readily seen that the invention may be used for power generating or other similar uses.

In the accompanying drawings in which I have shown a selected embodiment of my invention

Fig. 1 is a view partly in section of the line 1—1 of Fig. 5 showing the burner completely assembled.

Fig. 2 is a bottom plan view of the burner.

Fig. 3 is a detail sectional view of the mistifier cylinder housing on the line 3—3 of Fig. 4.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view on the line 5—5 of Fig. 1.

Fig. 6 is an enlarged detail sectional view of the mistifier valve.

Fig. 7 is a sectional view showing the oil pump mechanism.

Fig. 8 is a detail sectional view on the line 8—8 of Fig. 7.

Fig. 9 is a detail sectional view on the line 9—9 of Fig. 1.

Referring to the drawings, a casing 1 (Figs. 1, 7) for an oil pump has an oil intake opening 2 to which oil is supplied from any suitable source preferably under atmospheric pressure alone, but if desired the oil may be supplied under a greater pressure depending upon the requirements to which the device is put. A cover plate 3 is bolted over the open end of the casing and a bearing is pivoted at 4 on the inside of the cover plate and comprises a cup 5 carrying a ball bearing 6. The pivot 4 is located at one side of the bearing and an adjusting screw 7 is arranged in the cover plate to engage the opposite side of the bearing to maintain it in an adjusted inclined position in the casing for determining the extent of stroke of the valve plungers 17 as hereinafter described. A metering valve of the rotary type and comprising a body 8 (Fig. 7, 8) is rotatably mounted in the middle part of the casing and it is centralized therein by a stub shaft 9, which is stepped in a bearing 10 in the cover plate, and by an oppositely disposed stub shaft 11 which carries a worm gear 12 and is mounted in a roller bearing 13 at the bottom of the casing. The worm gear meshes with a worm 14 on the main shaft 15 which is rotated by a suitable electric motor 16 (Fig. 1). Rotary motion is imparted to the metering valve from the motor through the main shaft 15, worm 14, and gear 12. Valve plungers 17 (Fig. 7) are mounted to reciprocate in the cylinders 21 formed in the body of the metering valve, and these plungers are provided with enlarged heads 17' which are held in engagement with the bearing 6 by springs 18. The intake 2 (Fig. 8) comprises a clockwise extending tapered arcuate slot 2' and the outlet 22 comprises a similar slot 22' formed in the pump casing and spaced apart at their ends. Ports 20 in the valve body connect the intake and outlet with the plunger cylinders 21 so that oil may flow through the intake to a plunger cylinder on the suction stroke of its plunger and then be forced through the outlet on the exhaust stroke of the plunger. The intake slot 2' and the outlet slot 22' are of sufficient length to insure communication with a cylinder port for a

sufficient period to fill the cylinder with oil on the suction stroke of the plunger, and for fully discharging the oil from the cylinder on the exhaust stroke of the plunger. For all practical purposes the pump provides a continuous discharge of oil at a predetermined and uniform rate determined by adjusting the inclination of the bearing 6 to control the stroke of the plungers.

The pipe 24 (Fig. 2) connects the outlet 22 of the pump and the intake port 25 of the mistifier housing 26 (Fig. 1) to which the pump casing is secured by bolts 26'. A rotary mixing valve is fixedly mounted on the main shaft 15 to control the delivery of air and oil to a mixing chamber in the valve body 27. The pump casing is provided with a cylindrical sleeve 28 (Fig. 1) which fits snugly within the mistifier housing and forms a bearing for the valve body 27. This valve body has an annular air passage 29 (Figs. 1, 4, and 6) and an annular oil passage 30, these passages being concentrically arranged within the valve body 27 about the main shaft and both passages communicate with a mixing chamber 41 in the form of a circular ring sector in the valve body which opens through the periphery of the body. The mixed air and oil are delivered from the mixing chamber 41 through passages 41' extending through the sleeve 28 and housing 26 to the mixing cylinders 35 in the housing. The intake 25 communicates through a short passage 32 (Figs. 3 and 5) with an annular chamber 31 in the mistifier housing and this chamber 31 registers with the oil passage 30 in the mixing valve so that the oil from the pump is delivered through the intakes 25, 32 to the annular chamber 31 and passage 30 to the mixing chamber 41 in the mixing valve. The mistifier housing has an air inlet 33 to the atmosphere through which air is supplied to the annular air passage 29 and the mixing chamber in the mixing valve (Figs. 1, 3). Pistons 36 are arranged to reciprocate in the mixing cylinders 35 and coil springs 37 are arranged between the housing and enlarged heads 36' on the pistons to move the pistons on their suction stroke (Fig. 1). Balls 38 are seated in the enlarged heads of these cylinders and bear against a ball bearing 34 which is mounted on an inclined collar 39 pinned to the main shaft 15 to maintain the bearing in an inclined position relative to said shaft. This bearing wobbles when the shaft is rotated and causes the exhaust stroke of the pistons. The suction stroke of each piston will draw mixed air and oil from the mixing chamber 41 of the mixing valve through the passage 41' into the mixing cylinder where the mixing of air and oil is completed. The air and oil are thoroughly mixed and converted into a mist by reason of the high speed operation of the mixing valve and the pistons. On the exhaust stroke of each piston the mist in the mixing cylinder will be forced by the piston from the cylinder through the passage 41' into an arcuate passage 40 (Fig. 4) in the mixing valve and from this arcuate passage through transverse passages 42 (Figs. 1, 6) into an annular passage 43 (Figs. 6, 9) and through a transverse passage 45 (Fig. 9) into the axial passage 44 in the lower portion of the main shaft 15 to the exhaust outlet 46. Any suitable connection may be made to the exhaust outlet for conducting the mist to the fire box of a furnace.

The device may be supported in any suitable manner, preferably in an upright position as shown, and the motor 16 may be supplied with a hood 47 and a cooling fan 48. The oil will enter and leave the pump at a constant rate due to the metering action of the plungers and valve, and the plungers may be adjusted to vary the flow of oil so that a predetermined flow of oil may be furnished to the mistifier in proper proportion to the air supply for obtaining a desired fineness of mist. The air and oil are thoroughly mixed in the proper proportion and this mixture is converted into a mist by the rapid action of the mixing valve and the pistons which draw the air and oil in through the mixing chamber and into the mixing cylinders during which the air and oil are mixed and converted into a mist, and then the plungers force the mist through the exhaust outlet to a suitable burner nozzle in a fire box. The air and oil may be properly proportioned through the regulation by the pump of the oil supply to the mistifier so that a desired degree of fineness of mist will be produced in the mistifier. The plungers of the oil pump are caused to move on their exhaust stroke by the pivoted bearing when the oil valve is revolved from the main shaft and are caused to move on their suction stroke by the springs, and the pistons of the mistifier are caused to move on their down stroke by the inclined bearing fixed on the main shaft and on their suction stroke by the springs, and the pump is synchronized with the mistifier so that a plunger of the oil valve will make its exhaust stroke at the same time the related piston of the mistifier makes its suction stroke thereby forcefully ejecting a metered amount of oil into the mixing cylinders to reduce the potential displacement thereof. If no oil is injected into a mixing cylinder a full charge of air will be drawn into the cylinders on each intake stroke but if oil is injected into the cylinders the magnitude of the charge of air is reduced in each suction operation in an amount equal to the amount of oil injected. Hence, the quantity of air drawn in a mixing cylinder in the suction stroke thereof is inversely proportionate to the amount of oil introduced and variations in the relative quantity of oil and air in the cylinders may be effected by merely varying the quantity of oil injected and therefore, only adjustment of the quantity of oil is necessary to vary the relative proportions of air and oil passed through the exhaust. The burner is compact in construction and operates efficiently to provide a highly combustible vapor or mist for complete combustion.

I am aware that changes in the form, construction and arrangement of parts may be made to provide a burner of different capacity and for different purposes and I reserve the right to make all such changes as fairly fall within the scope of the following claims.

I claim:

1. In a fuel supply device or the like having an exhaust, the combination of a housing having air and oil supply chambers, a rotary valve in said housing interposed between the supply chambers and the exhaust, a plurality of cylinders disposed about said valve, said valve having a mixing chamber therein adapted for communication with said cylinders and having independent discontinuous concentric passages therein respectively leading from said supply chambers to said mixing chamber and having an exhaust passage therein adapted to connect said cylinders and said exhaust, pistons operating in said cylinders to withdraw air and oil from said mixing chamber and to discharge mixed air and oil from said cylinders to the exhaust, and means for rotating said valve to successively establish communica-

tion between said cylinders and said mixing chamber and said cylinders and said exhaust.

2. In a fuel supply device or the like, the combination of a housing having air and oil inlets, a shaft journaled in said housing and having a bore therein providing an exhaust passage, a rotary valve fast on said shaft, a plurality of cylinders in said housing and disposed about said shaft and valve, said valve having independent passages therein for establishing communication between said air and oil inlets and said cylinders and having a passage therein for establishing communication between said cylinders and said exhaust passage, pistons in said cylinders, means including a part on said shaft for reciprocating said pistons in said cylinders to withdraw air and oil from said inlets and to discharge mixed air and oil from said cylinders to said exhaust passages, said valve rotating with said shaft to successively establish communication between said inlets and said cylinders and said cylinders and said exhaust passages.

3. In a fuel supply device or the like having an exhaust, the combination of a housing having air and oil inlets, a rotary valve interposed between said inlets and the exhaust, a plurality of cylinders in said housing and disposed about said valve, pistons operating in said cylinders to withdraw air and oil from said inlets and to discharge mixed air and oil from said cylinders to the exhaust, means for rotating said valve to successively establish communication between said inlets and said cylinders and said cylinders and said exhaust, and means for supplying a predetermined quantity of oil to the oil inlet to thereby regulate the admixture of air and oil in the cylinders.

4. In a fuel supply device or the like having an exhaust, the combination of a housing having air and oil inlets, a shaft journaled in the housing, a rotary valve fast on the shaft and interposed between the inlets and the exhaust, a plurality of cylinders in said housing disposed about said shaft and valve, pistons in said cylinders, means for reciprocating said pistons and including a part on said shaft whereby said pistons are reciprocated upon rotation of said shaft to withdraw air and oil from said inlets and to discharge mixed air and oil from said cylinders to the exhaust, said valve rotating with said shaft to successively establish communication between said inlets and said cylinders, means for supplying a predetermined quantity of oil to the oil inlet, and means for operating the oil supplying means from said shaft and in timed relation with the operation of said pistons and said valve.

5. In a fuel supply device or the like having an exhaust, the combination of a housing having air and oil inlets, a rotary valve interposed between the inlets and the exhaust, a plurality of cylinders in said housing and disposed about said valve, pistons operating in said cylinders to withdraw air and oil from said inlets and to discharge mixed air and oil from said cylinders to the exhaust, means for rotating said valve to successively establish communication between said inlets and said cylinders and said cylinders and said exhaust, said rotary valve having independent air and oil passages, and metering means for injecting a predetermined quantity of oil into said cylinders through the oil passage in said valve whereby the amount of air drawn into the cylinders through the air passage in said valve is determined by the amount of oil injected thereinto.

6. In a fuel supply device or the like, the combination of a rotary valve, a plurality of cylinders disposed about said valve, means providing passages between said cylinders and said valve and between said cylinders and an exhaust, pistons operating in said cylinders, said rotary valve having independent air and oil passages, metering means for injecting a predetermined quantity of oil into said cylinders through the oil passage in said valve whereby the amount of air drawn into the cylinders through the air passage in said valve is determined by the amount of oil injected thereinto, and means for rotating said valve to successively establish communication between the air and oil passages in said valve and said cylinders and said cylinders and said exhaust.

7. In a fuel supply device or the like having an exhaust, the combination of a housing having air and oil supply chambers, a rotary valve in said housing interposed between the supply chambers and the exhaust, a plurality of cylinders disposed about said valve, said valve having independent air and oil passages for connecting the cylinders with the supply chambers and an independent passage for connecting the cylinders with the exhaust, pistons operating in said cylinders to withdraw air and oil from the supply chambers into the cylinders and to discharge mixed air and oil from the cylinders to the exhaust, means for rotating said valve to successively establish communication through said independent air and oil passages between said supply chambers and said cylinders and said cylinders and said exhaust, and metering means for injecting a predetermined quantity of oil into said cylinders through the oil passage in said valve whereby the amount of air drawn into the cylinders through the air passage in said valve is determined by the amount of oil injected thereinto.

8. In a fuel supply device or the like having an exhaust, the combination of a housing having air and oil supply chambers, a rotary valve in said housing interposed between the supply chambers and the exhaust, a plurality of cylinders disposed about said valve, said valve having a mixing chamber therein adapted for communication with said cylinders, said valve also having independent air and oil passages therein leading from said supply chambers to said mixing chamber and having another passage therein for connecting the cylinders to the exhaust, pistons operating in said cylinders to withdraw air and oil from said mixing chamber and to discharge mixed air and oil from said cylinder to the exhaust, means for rotating said valve to successively establish communication between said cylinders and said mixing chamber and said cylinders and said exhaust, and metering means for injecting a predetermined quantity of oil into said mixing chamber through the oil passage in said valve whereby the amount of air drawn into the mixing chamber is determined by the amount of oil injected thereinto.

WILLIAM E. BAKER.