Dec. 3, 1929. W. W. WILLIAMS 1,738,489

PROCESS FOR ATOMIZING LIQUID FUELS

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Fig. 1.

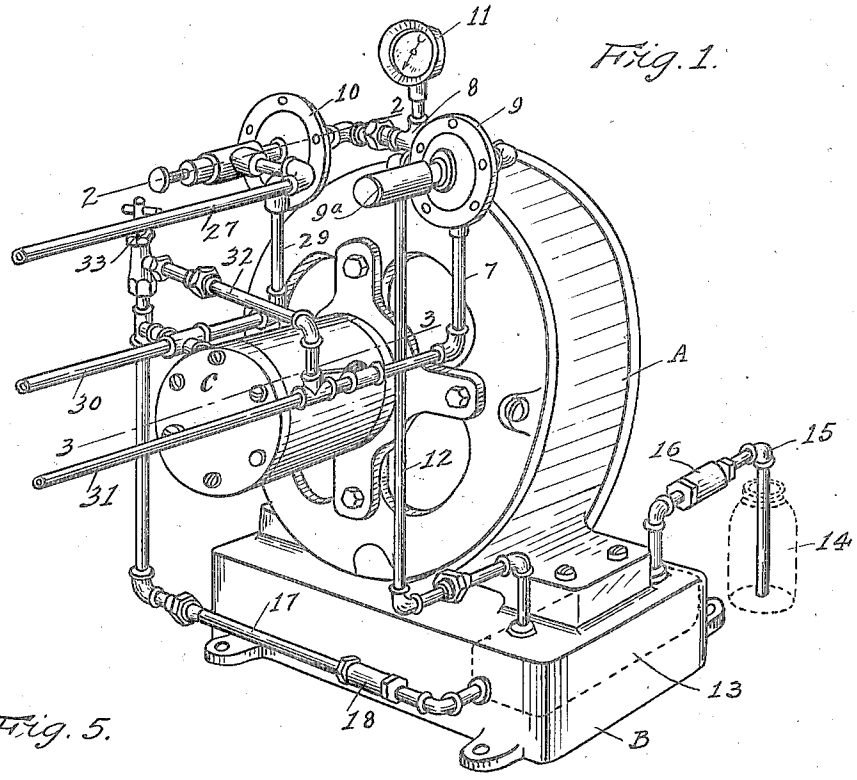


Fig. 5.

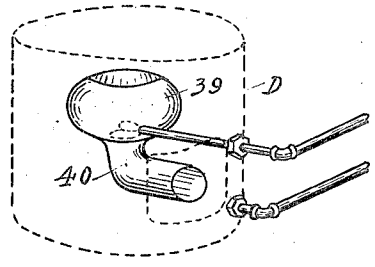
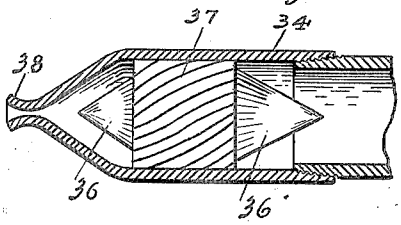


Fig. 6.



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Fig. 2.

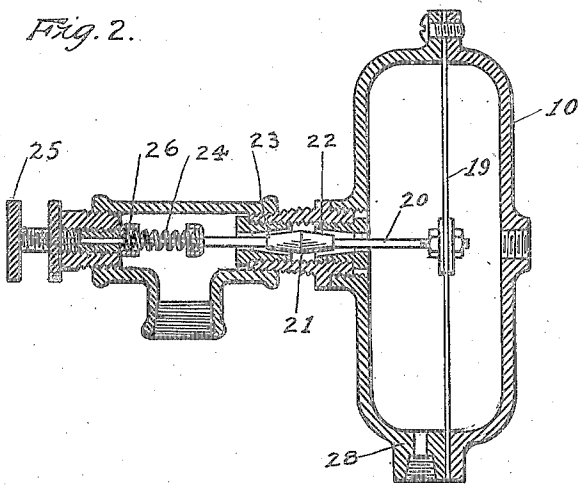


Fig. 4.

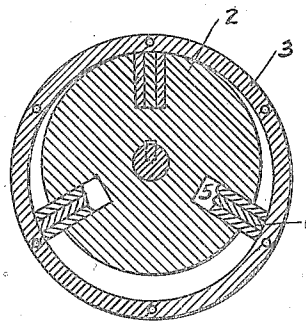
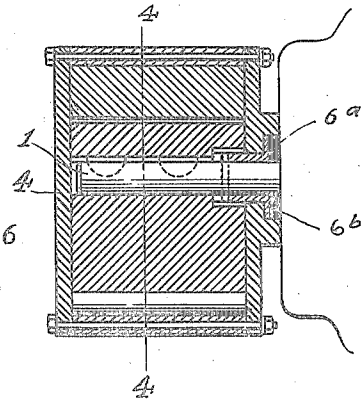


Fig. 3.



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UNITED STATES PATENT OFFICE

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PROCESS FOR ATOMIZING LIQUID FUELS

Original application filed August 4, 1920, Serial No. 401,146. Divided and this application filed April 23, 1924. Serial No. 709,029.

My invention relates to the process of atomizing liquid fuels.

The object of my invention is to provide a process of atomizing liquid fuels as disclosed in the liquid fuel atomizing device which forms the basis for my prior Patent No. 1,492,186, granted April 29, 1924 upon an application filed August 4, 1920.

My prior patent is directed to the mechanical features utilized in carrying out the present process while this application is directed solely to the specific steps taken prior to the discharge of the fuel mixture into a combustion chamber and is a division of the application of the above mentioned prior patent the application for which was co-pending at the filing of this application. Said prior Patent No. 1,492,186 was granted April 29, 1924, upon an application filed August 4, 1920, and bearing the Serial No. 401,146.

The invention consists of the parts and construction and combination of parts as hereinafter more fully described and claimed, in which:

Fig. 1 is a perspective view of the liquid fuel atomizer;

Fig. 2, is a sectional view on the line 2—2 of Fig. 1;

Fig. 3, is a sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a cross-sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the jet, showing the manner of mounting the jet in the furnace.

Fig. 6 is an enlarged sectional view of the jet.

Referring to the drawings in detail, A indicates an electric motor mounted on a base B, and C a rotary pressure pump, the shaft of the motor furnishing the axis of the pump designated as 1. A rotor 2 is eccentrically mounted on the axis and rotates within a cylinder 3 having airtight ends 4. The rotor has three longitudinal slots, indicated at 5, said slots being parallel to the axis and running the full length of the rotor. In these slots are laminated vanes 6, slidable therein and acting as a seal under the influence of centrifugal force when the pump is operating.

A packing gland is mounted between the motor and pump, said gland consisting of a flange bushing 6^a, mounted upon the pump axis or shaft, and rotating with it. It is so placed that the pressure of the pump presses it outward against a leather or fibre washer 6^b, preventing oil and air from escaping from the pump.

When the motor is started and the pump operated, a pressure is created therein, which is communicated through connections 7 and 8 to the rear of diaphragms within the primer and pressure valve casings 9 and 10 respectively, said pressure being registered on the pressure gauge 11. The pressure against the rear of the diaphragm within the valve casing 9 acts on a valve mechanism, within a valve casing 9^a, similar to that shown in Fig. 2 of the drawings, illustrating the pressure valve mechanism, and pressure is communicated through the piping 12 to a tank 13 containing a priming fluid, said fluid being taken into the tank from a container 14 through a connection 15 having a check valve 16 therein. The pressure exerted in the priming tank forces the priming fluid, kerosene being the usual primer, through the piping 17 and the safety check valve 18 to the rotary pressure pump C.

At the same time that pressure is acting on the primer mechanism, a similar pressure is exerted against the rear of the diaphragm 19 in pressure valve casing 10, pressing inwardly an oil flow adjustment valve 21 on the rod 20, forcing said valve from its seat 22 to a position midway, or approximately so, between valve seats 22 and 23. The position of the oil flow valve is determined both by the pressure exerted on the diaphragm 19 and the tension of the spring 24, regulated by the adjusting nut 25 and connecting means 26. The valve mechanism may be regulated to act when a certain pressure has been created. An oil intake pipe is designated at 27, coming from a fuel oil container, not shown.

When the diaphragm has been forced inwardly by pressure against its rear face, the oil coming in from the intake pipe passes

around the oil adjustment valve and into the pressure valve casing 10, thence past the outlet 28 and through the pipe 29 to the rotary pump C. Just before the entrance of either the priming fluid or the fuel oil into the pump, they are mixed with air from an inlet pipe 30.

The mixture is admitted ahead of one of the laminated vanes when the rotor is in such a position that the vane is extended; hence, the further movements of the rotor due to its eccentric mounting within the cylinder places the fuel mixture under pressure and forces it out of the pump through the pipe 31 to the burner, later described.

As it has been found that an unrestricted amount of air mixed with fuel and placed under great pressure produces a loud roaring noise when the burner is in action, a by-pass designated at 32 has been constructed to carry the excess mixture back to the original air entrance to the pump. An adjustment valve 33 is used to regulate the amount of air to be taken back.

The fuel mixture under pressure from the pump passes through the pipe 31 and then through a special jet designated at 34. This jet, as shown in Fig. 6 of the drawings, has a helix mounted therein, said helix having radially mounted grooves 37 thereon, and cones 36 projecting from either end; said radial grooves and cones giving the mixture that passes therethrough a whirling action. The nozzle of the jet opens at a slight angle 38 and with the whirling action set up by the helix and cones, the mixture comes out in a fine whirling spray.

The fuel enters the furnace D and the jet is directed into a cylindrical chamber or burner designated as 39, in such a manner that the jet is set at an angle with the inner wall of the burner, the spray from the jet being so directed that it travels approximately parallel to the inner wall thereof, causing the flame to travel about the surface of the chamber. It may be said here that the burner above described is referred to with relation to burners or combustion chambers as used in oil burning outfits as distinguished from the chambers, we will say, in internal combustion engines, wherein a mixture is exploded. A draft means for the burner is shown at 40. A pilot light, not shown, is situated within the furnace and just beneath the nozzle of the jet. This light furnishes the ignition means for the fuel mixture.

For a more complete understanding of the action of the atomizer, its operation is recited.

The electric motor is started either by the action of a thermostat or by the throwing of an ordinary switch in connection therewith. The electric motor operates the pressure pump and the pump produces a pressure that is transmitted to the diaphragms in both primer valve casing and pressure valve casing; the pressure on the primer diaphragm acts on the valve mechanism therein and transmits pressure to the priming tank, whereby a flow of priming fluid is forced to the rotary pump. This special priming mechanism makes possible an immediate ignition of the fuel mixture from the pilot light, by greatly enriching the mixture, the ordinary fuel oils not being readily ignited at low temperatures.

Coincident with the priming valve action is the working of the oil flow adjustment valve. The pressure created by the pump is communicated to the rear of the diaphragm in the pressure valve casing and the oil flow adjustment valve is forced from its seat 22 to an intermediate position, thereby permitting the fuel oil, formerly checked, to flow through the valve and by piping to the rotary pump. The tension of the valve is determined by a screw and spring means and hence the flow may be regulated to produce the fuel mixture that is desirable.

The oil flow is automatically maintained due to the pressure valve mechanism. An increasing amount of oil entering the pump causes an increased pressure therein, therefore, an increased pressure on the diaphragm and a consequent reduction in the oil flow due to the movement of the oil flow adjustment valve between its seats. Also a decrease in the amount of oil entering the pump produces a decrease in pressure, a consequent shifting of the adjustment valve, and an increased oil flow. Should this valve become clogged by heavy fuel or dirt, the pressure in the pump immediately falls, thus allowing the valve to open wider, permitting the obstruction to pass through, not impairing the operation of the device.

Both the priming fluid and the fuel oil are mixed with air just before their entrance into the pump and are almost completely atomized within the pump, also they are placed under great pressure due to the eccentric mounting of said pump. The fuel mixture is taken from the pump under pressure through a single tube to the burner, an excess of air in the mixture being taken off, however, by a by-pass; this relief of the excess air pressure resulting in a comparatively quiet burner. The fuel mixture is expelled from the device through a special jet into a cylindrical chamber or burner in a fine whirling vapor that follows a path approximately parallel to the inner wall of the chamber.

What I claim is:

1. The process of atomizing liquid fuels to be discharged at a predetermined pressure to form a combustible mixture, comprising mixing quantities of air and fuel, placing said mixture under compression, relieving excess pressure from the mixture, and

discharging the mixture in the form of a spray.

2. The process of atomizing liquid fuels to be discharged at a predetermined pressure to form a combustible mixture comprising mixing quantities of air and fuel, discharging said mixture into a chamber, compressing the mixture therein, relieving excess pressure from the mixture as it leaves said compression chamber, and finally accelerating the resultant mixture at the point of discharge.

3. The process of atomizing liquid fuels to be discharged at a predetermined pressure to form a combustible mixture comprising mixing quantities of air and fuel, compressing said mixture, relieving excess pressure from the mixture, and finally accelerating the resultant mixture at the point of discharge.

4. The process of atomizing liquid fuels to be discharged at a predetermined pressure to form a combustible mixture comprising mixing and compressing quantities of air and fuel, relieving excess pressure from the mixture, and discharging the resultant mixture in a spray.

In testimony whereof I affix my signature.

WALTER W. WILLIAMS.