CHAPTER 12

# Low Pressure Domestic Burners

The principle of vaporizing oil in a low pressure burner is shown in fig. 1. Air and oil are mixed *within the nozzle*, then

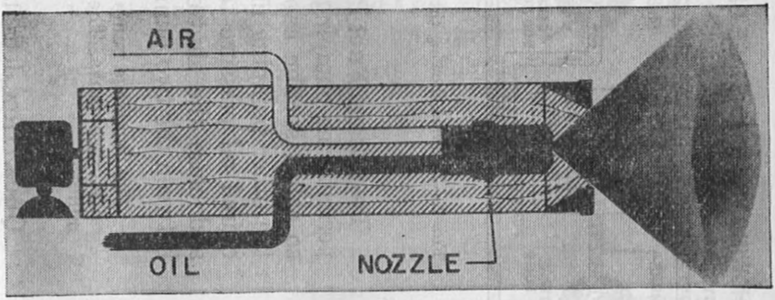
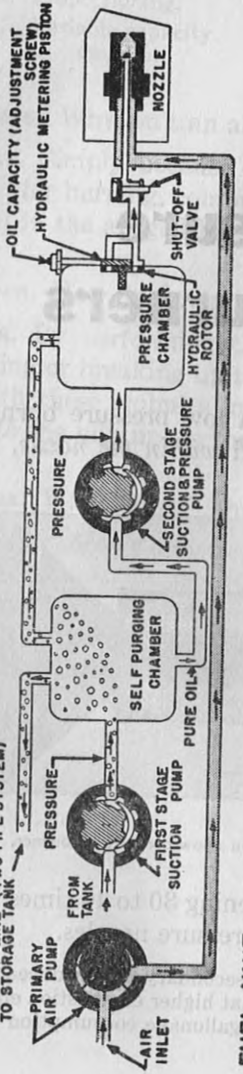



FIG. 1.—Diagram showing principle of vaporizing oil in a low pressure oil burner.

sprayed in vapor form through an opening 30 to 40 times larger than the opening employed in high pressure nozzles.

The air-oil vapor is again mixed with secondary air produced by the fan as it leaves the nozzle. It is claimed that higher combustion efficiency with lower fuel costs and ultimately less gallonage consumption are the result of the mixing of air and oil twice.

DIAGRAMATIC VIEW SHOWING THE TWO-STAGE SELF PURGING PRINCIPLE OF THE




FUEL UNIT • • •

| LEGEND |
| --- |
| AIR-OIL MIXTURE |
| PURE OIL |
| OIL FROM TANK |
| ONE PIPE SYSTEM OIL BY PASS |
| PRIMARY AIR |

FIG. 2.—Diagram showing the two stage self-purging principle of a low pressure fuel unit.

**Two Stage Fuel Principle.**—In operation this arrangement permits one pumping member to perform only in an intake or so called suction capacity—drawing oil from the tank, while the other pumping member performs only to build up the required oil pressure to operate the metering piston and open and close the shut-off valves, with a self-purging reservoir between the two pumping members.

The two stage pump can be connected to either gravity feed or buried oil storage tanks. The capacity is variable from .50 to 3 gallons per minute.

**Ques.** How does it operate?



**Ans.** The primary air pump delivers air to the nozzle at approximately 1¾ lbs. This primary air draws oil (which flows at almost zero pressure) from the nozzle and mixes with this oil in the form of a very fine air-oil vapor spray, which in turn is again mixed with the secondary air to create a fine vapor spray.

The first stage intake pump draws oil from the oil storage tank. The high vacuum created when drawing oil from buried oil storage tank causes air to be separated from the oil so that when it leaves the intake pump into the purging reservoir, it is in a foam form, that is, fine air bubbles and oil. It is here the bubbles go to the top of the reservoir then sent back to the buried oil storage tank while pure oil settles in the lower portion of the reservoir, from which it is pumped into the pressure chamber. This oil under pressure motivates the free floating piston which meters the amount of oil permitted to go to the nozzle when the shut off valve is open. The capacity is varied by the adjustment screw.

**Combustioneer Hydra-vated Low Pressure Fuel Unit.**—This is a low pressure two stage self purging reservoir oil metering pump with capacity from .5 to 3 gallons per hour. The fuel unit is shown in fig. 3.

Before any pump will function it is necessary that oil be brought from the tank to the pump, and it should be easily understood the greater the size and length of piping, the longer it will take for oil to reach the pump.

It should also be easily understood that all air must be bled from the various chambers of a pump after it has received oil from the tank on a one line system.

The hydra-vated pump has an oil pressure chamber, wherein an oil pressure of about 50 lbs. per sq. in. is automatically maintained to open and close the shut off valve on the oil line to and from the nozzle. This oil pressure also motivates the free floating piston through the rotating valve.

In servicing, an air pressure gauge (range 0 to 15 lbs. per sq. in.) may be used and can be attached.

The adjusting screw for the air pressure is shown at 5. To reach this air adjusting screw with a screw driver it is necessary to remove its protecting pipe plug. By turning this air adjusting screw clockwise, the air pressure is increased, and by turning the air adjusting screw counter-clockwise the air pressure is decreased.

If pump do not perform satisfactorily, adjust air pressure. This may be determined by an unsatisfactory flame.

**Williams Oil-O-Matic Model 50-10 Low Pressure Oil Burner.**—When the burner starts, the pressure built up on the discharge side of the gear pump E, fig. 4, is transmitted to the lower side of the diaphragm S, in the hydraulic oil valve V.

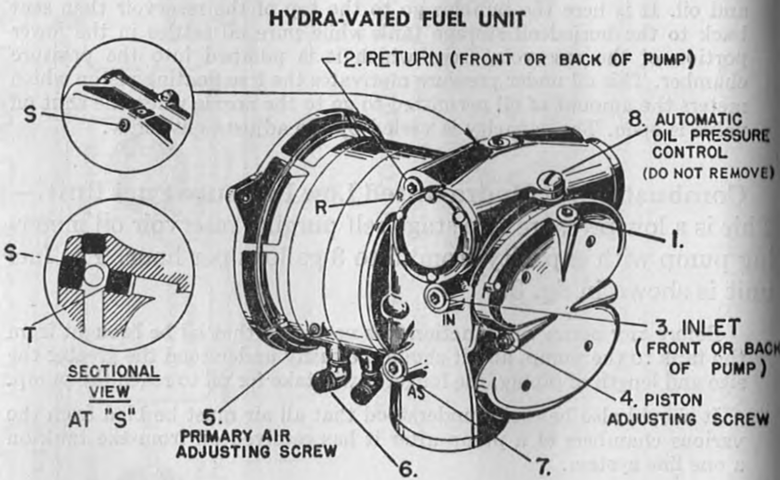



Fig. 3.—Combustioneer Model E2R Hydra-vated two stage self purging reservoir fuel unit. Illustration shows the fuel unit.

When the motor speed reaches approximately 2800 *r.p.m.* sufficient pressure will be attained to overcome the spring tension of spring W, thus raising the piston **PP** off its seat, which permits metered oil from the metering pump to flow through the hollow valve stem T, to the oil tube X.

During the operation, oil is pulled in through the oil inlet port SL, to the strainer housing F. It then passes through a screen A, and over tube B. From the tube, oil is carried through a passage to the inlet side of the

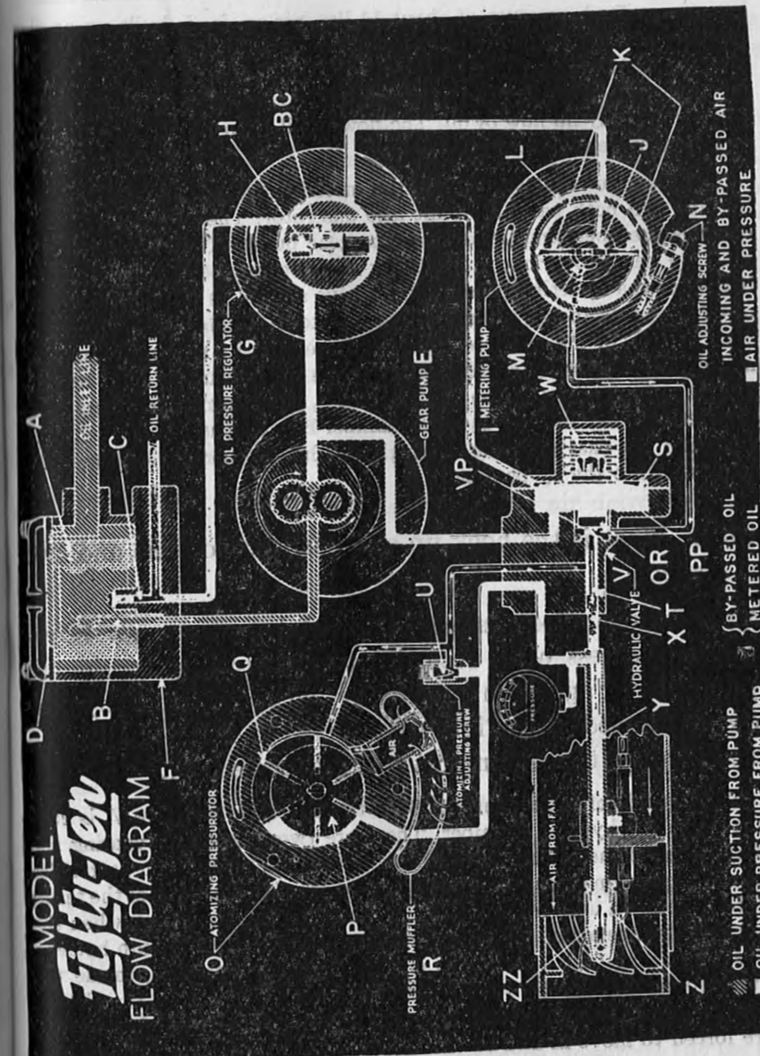



Fig. 4.—Williams Oil-O-Matic model fifty-ten flow diagram.

gear pump **E.** A pressure of about 14 lbs. per sq. in. is built up on the discharge side of the pump. This pressure is transmitted through a passage to the lower side of the diaphragm **S**, in the oil valve. This oil builds up a static head pressure under the diaphragm **S**, because there is actually no flow of oil. The flow of oil from the gear pump **E**, is to the pressure regulator **G.**

The pressure regulator **G**, and the metering pump **I**, are in the same housing and both parts are built into one rotor. The pressure regulator controls the operating pressure of the gear pump. The pressure that is built up has two primary functions: 1, it opens the oil valve, and 2, it assures the metering pump of a positive as well as a uniform volume of oil available to the metering pump pistons. ***During operation,*** the steel ball **H**, in the pressure regulator is held on its seat near the perimeter of the rotor by centrifugal force. As oil pressure is built up, the pressure of the oil forces the ball off its seat, thus permitting excess oil to flow past the ball into the by pass chamber **BC.** By passed oil is delivered from the by pass chamber through the hollow portion of the drive shaft and into the by pass passage.

**Ques.** What is the hook up and operation on one and two pipe systems?

**Ans.** On one pipe systems, internal by pass screw is removed and excess oil is returned to the strainer housing to be pumped over again; on two pipe systems the internal by pass screw is installed in the internal by pass and excess oil is returned through the return port to the storage tank.

The top side of the diaphragm **S**, in the hydraulic oil valve **V**, is connected to the by pass chamber. There are two reasons for venting the diaphragm to the return: 1, to maintain an equal pressure on both sides of the diaphragm during shut down, regardless of the location of the tank; 2, to maintain a uniform pressure differential on the diaphragm when the burner is in operation. Oil under pressure in the metering pump housing fills the intake port **J**, where it is picked up by pistons **K**, inside the pump rotor. As the rotor revolves inside the eccentric ring **L**, the pistons because of the eccentric effect between the eccentric ring and the rotor, are forced to move in and out in their respective cylinders in the rotor.



On the *out* stroke, oil is taken from the inlet port **J**, into the cylinders in the rotor. On the *down* stroke of the pistons, metered oil is discharged into the discharge port **M.**

The mount of oil that is picked up by each stroke of each piston is determined by the length of the piston stroke.

The length of stroke of the piston can be increased or decreased by turning the adjusting screw **N**, thereby changing the relative position of the eccentric ring to the rotor.

**Ques.** How may the firing rate be increased or decreased?

**Ans.** By changing the length of the stroke of the piston.

The metered (measured) oil is delivered through a passage from the discharge port **M**, to the hydraulic oil valve.

**Ques.** In the oil valve, how is internal air delivered?

**Ans.** By the pressurotor P.

The pressurotor operates in approximately the same manner as a centrifugal pump. Rotor vanes **Q**, are held in slots in the rotor **P.** Centrifugal force of the rotor as it turns holds the vanes out against the rotor cylinder. Since the rotor housing and the rotor are off center to each other, the vanes are made to move in and out of their slots. The movement of the rotor causes air to be taken into the housing through the air intake muffler **R.** Pressure is built up on the air in the pressurotor and the air is discharged from the pressurotor on the opposite side from where it was picked up.

**Ques.** How should the operating pressure be adjusted?

**Ans.** It should be adjusted to between 1½ and 2¼ lbs. per sq. in.

This pressure is adjusted by changing the pressure adjusting screw **U**, in the by pass between the pressure side of the pressurotor and the inlet.

The pressurotor is cleaned and lubricated by a small amount of oil (ap proximately 10 drops per minute) fed to it from the cylinder around the hollow stem **T** of the oil valve.

The internal air moves along the air tube to the nozzle. In the nozzle, internal air and metered oil are brought into contact with each other. The air moving down the air tube **Y**, passes around the oil spiral **Z**, and enters the diagonal slots. As the air passes through these three diagonal slots, it passes over the oil ports, picking up the metered oil. The diagonal slots impart a swirling motion to the air and oil. The air and oil mixture set into this swirling motion inside the nozzle tip **ZZ**, is whipped across the knife edge of the nozzle orifice where spraying is accomplished.

**Ques.** What happens when the burner shuts off?

**Ans.** The oil pressure from the gear pump **E**, drops as the motor slows down.

When the motor slows down to approximately 2,100 *r.p.m.* the pressure drop will be sufficient to permit the spring **W** to force the piston **PP**, down on its seat **VP**, thus stopping the flow of metered oil.

The vacuum created in the oil tube **X**, when the piston **PP** closes, causes the metered oil in the tube to be held in the tube during shut down.

Air from the pressurotor that is delivered through the nozzle, after the oil valve is closed, positively purges the oil from the end of the nozzle, thus eliminating the carbonization of the oil in the nozzle by reflected heat from the combustion chamber after shut down.