At installations for burning liquid fuel with wide range burners of the return flow type (as f. i. U. S. A. Pat. 2,079,430) and where the fuel is supplied to the burners by a high-pressure pump, it is common practice that the return fuel flows back into the suction lead of the high-pressure pump.

In many cases these installations suffer of troubles such as unstable burning, undesirable variations in pressure and, in serious cases, a collapse of the pressure and extinguishing of the flames.

The invention eliminates these troubles completely by supplying the fuel to the high-pressure pump under a positive pressure, while the return fuel flows into the supply lead at a point where said positive pressure prevails.

This may be understood from the results of research about the abovementioned troubles. It has been shown that these troubles were due to vapour-lock phenomena of the fuel which contains often high volatile components, especially where the fuel, as in most cases, is pre-heated.

These volatile components are liberated by the vacuum-shocks in the liquid which are caused by the irregularities in the working of every pump, while these so liberated gases do not resolve or condense afterwards. So these phenomena give rise to gas-accumulation at the suction-side of the high-pressure pump, and so cause irregularities, and under severe circumstances, break-down of the pump-action.

Now it is clear that by supplying the fuel under pressure to the high-pressure pump, these dangerous vacuum shocks cannot arise, and so the formation of gas is eliminated.

Figs. 1, 2 and 3 give schematically some instances of the invention.

In Fig. 1, the high-pressure pump 1 (f. i. 10-20 atm.) supplies a greater quantity of fuel to the burners 2 than is burned. The return (surplus) fuel flows via the non-return valves 3 and leads 4 to the collective return lead 5, which issues into the supply lead 6 and the hot-filter 12 of the high-pressure pump 1. Fresh fuel is supplied under pressure (f. i. 1-6 atm.) by the low-pressure pump 7, which sucks the fuel from the tank 8 via a filter 14. As low-pressure pumps are not so liable to shock action they do not give rise to vapour-locks. Moreover, in cases, where the fuel is pre-heated, as generally occurs, the heater 11 may be inserted between the low-and high-pressure pumps, so that the low-pressure pump does not suck highly heated fuel. This arrangement has also the advantage that this heater, and the necessary hot-filter 12, which in other cases have to be placed in the high-pressure lead due to their flow-resistance, are now much cheaper due to the fact that they need not resist such a high pressure.

The capacity of the burners may be controlled by a valve 13. This may also be done by controlling the capacity of the low-pressure pump 7, f. i. by adjusting the valve 14. The two pumps 1 and 7, may be built together as two stages of a unit.

Another method of applying the invention is explained in Figs. 2 and 3.

Here the return fuel flows through an injector 16. By the energy of the return fuel which enters at considerable pressure through the nozzle 16, the fresh fuel is sucked from the tank 11 through pipe 18, and is pressed from the part 15a of the injector under considerable pressure through pipe 20, heater 19, lead 20 to the high-pressure pump 21. This pump supplies the fuel to the lead 22 and the pipes 23 to the burners 24. The return fuel flows through leads 25 and the collective return lead 26 to the injector.

The capacity of the burners may be controlled in the ordinary way by a valve 27. A far better way is attained by varying the opening of the nozzle 16 f. i. by an adjustable needle 28. By opening the nozzle, more fuel is returned and the capacity of the burners decreases. As with increasing returned fuel quantity the return pressure decreases in about the same proportion, the energy of the injector remains approximately constant over the whole range, and the injector action is always sufficient.

Together with this pressure action and the excellent mixing of the hot return fuel with the relative cold fuel from the tank, the device eliminates the above mentioned troubles in a very efficient and simple way.

With the lead 29 and the valve 30 the fuel may be circulated at the starting.

With control valve 31 the pressure of the high-pressure pump 1 may be regulated.

The surplus fuel of the pump 21 may be returned through the by-passes 32 and 33.

If the return fuel from the pump 21 flows through the lead 33, the back flow assists the action of the injector.

In order to prevent inverse flow from the injector to the tank, a check valve 36 is inserted into lead 18 and an emergency suction lead 34 with check valve 35 provides the possibility of sucking fuel directly from the tank 17.
What I claim is:
1. An installation for supplying fuel to burners of the return flow type, comprising a high pressure pump, a high pressure lead connecting said pump with the supply side of the burners, an injector including a nozzle, a return lead connecting the return side of the burners with said nozzle, a fuel tank, a suction lead connecting the fuel tank with the suction side of the injector, and a supply lead connecting the pressure side of said injector with said pump.

2. An installation, as claimed in claim 1, including means for adjusting the cross-section of said injector nozzle.

3. An installation, as claimed in claim 1, including a by-pass connection between said suction lead and pump and a non-return valve in said by-pass to prevent back flow of fuel to the suction lead.

4. An installation, as claimed in claim 1, including a non-return valve in the suction lead.

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