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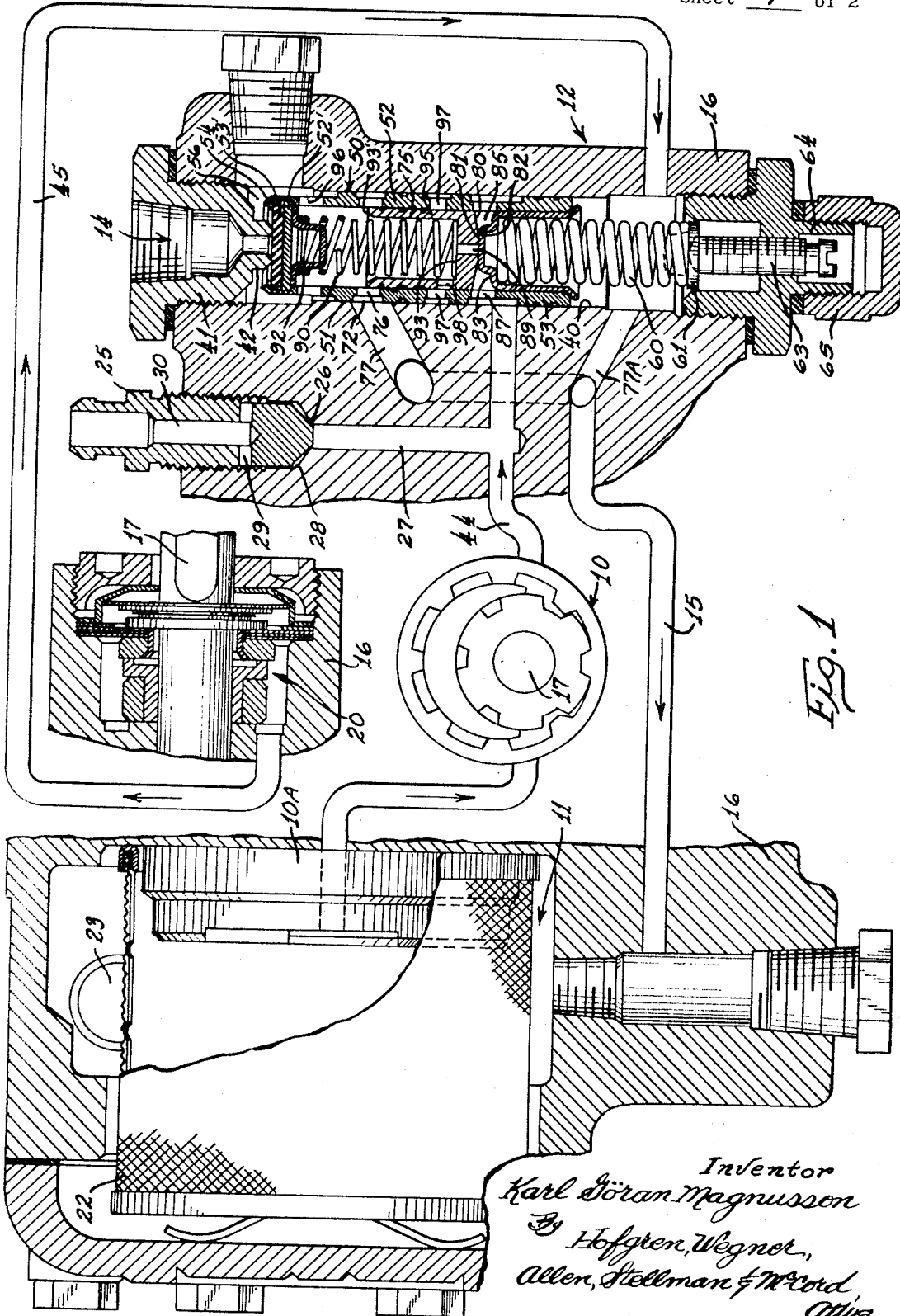
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3,446,231

OIL BURNER VALVE

Filed Nov. 25, 1966

Sheet 1 of 2



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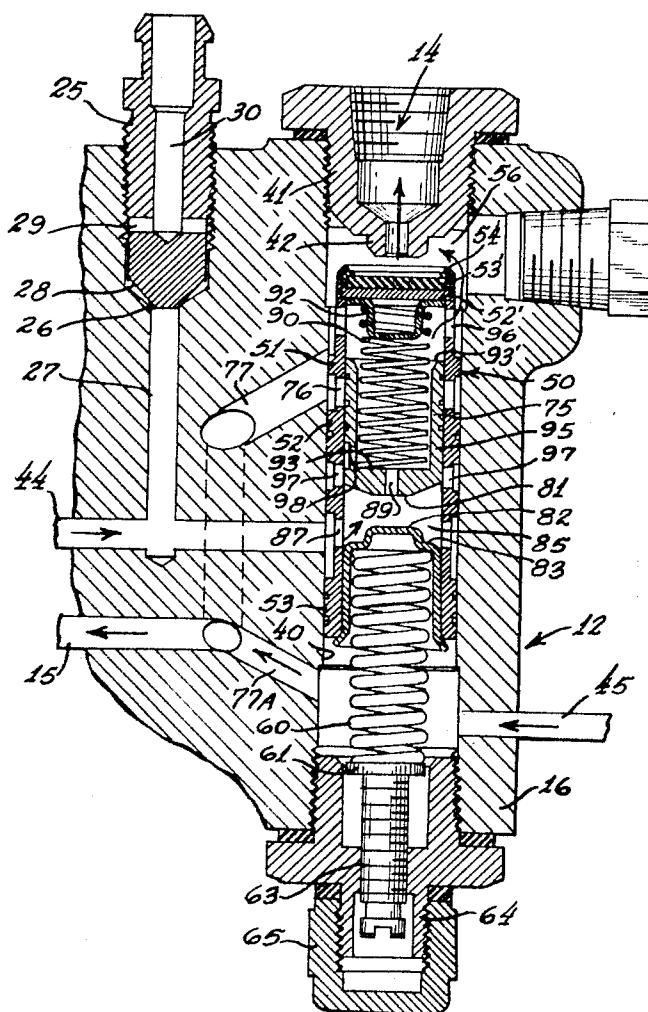
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Fig. 2



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OIL BURNER VALVE

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15 Claims

ABSTRACT OF THE DISCLOSURE

A fuel oil regulating valve between a fuel pump and a burner nozzle including a flow responsive valve upstream of the regulating valve for achieving a high start-up r.p.m. and a high cut-off r.p.m. with an additional valve upstream of the flow responsive valve for limiting the pressure drop thereacross to a predetermined value regardless of pump discharge rate so that an unnecessarily high back pressure is not imposed upon the pump.

This invention relates generally to fuel pumps and more particularly to a regulating valve adapted for use in connection with oil burner pumps.

Oil burner units have in the past been provided with regulating valves between the oil burner nozzles which discharge fuel into the combustion chamber and the fuel pump which supplies fuel to the nozzles. Generally, these regulating valves open upon delivery of a predetermined supply pressure from the pump, regulate constant pressure flow to the burner nozzles, and close to shut off the supply of fuel oil to the nozzles where the pump is turned off on shut-down. In addition to regulating the pressure of fuel oil delivered to the burner nozzles, these valves oftentimes have a bypass function of diverting a large portion of the fuel oil delivered by the pump back to the pump or reservoir instead of delivering it to the burner nozzles so that only a portion of the fuel oil supplied by the pump is delivered to the nozzles.

One of the basic problems in fuel oil regulating valves of this general character is that the transient variations in the fuel oil discharge from the nozzles both at start-up and at shut-down cause highly undesirable smoking in the combustion chamber at these times. Various means have been provided in the past in an attempt to effect rapid valve action and minimize the problem of smoking, but to a large extent the prior solutions have not solved all of the problems of a valve for this purpose, and have had certain characteristics that detract from the performance of the regulating valve.

To minimize this problem of transient variations in the fuel oil discharge both at start-up and at shut-down, it is desirable that the regulating valve open rapidly on start-up at a high pump r.p.m. and close rapidly at shut-down at a high r.p.m. so that the flow variations are minimal from the time when the regulating valve is closed to the time when it is opened and from the time when it is open to the time when it is closed.

Various devices have been provided in the past for the general purpose of providing a high pump r.p.m. start-up and shut-down fuel oil regulating valve. One such device includes a flow responsive unloading valve upstream and in series with the regulating valve. This auxiliary valve senses discharge flow from the associated gear pump and serves to bypass flow from the pump so long as it is below a predetermined high level. When this valve senses a predetermined high flow from the pump it pressurizes the main regulating valve causing rapid valve opening at the desired time when pump r.p.m. is high. For sensing the flow in the supply passage from the gear

pump, this secondary valve has an orifice through which flow from the pump passes so that a pressure drop exists across the valve serving to position it against the bias of a spring. At the predetermined high flow rate the secondary valve assumes a position in which it closes a bypass passage and directs all of the flow, at least initially, to the main regulating valve chamber where it opens the valve and discharges to the burner nozzles.

The valve described immediately above and others that have sought to achieve high start-up r.p.m. and high cut-off r.p.m. are designed for optimum performance with a pump having a specific capacity. However, pumps made by one manufacturer, even the same model pump, commonly have variations in flow capacity of as much as fifteen percent from one pump to another. This is due to normal machining inaccuracy and sealing inefficiency which for practical purposes in the industry are fixed. In some high pressure pumps, such as some foreign gear pumps that deliver fluid at 200 p.s.i., the capacity thereof may vary as much as thirty percent from one pump to another. A regulating valve designed for optimum performance with a pump having the minimum capacity (the lowest capacity pump acceptable for a given rated capacity) will suffer a performance penalty when operating with a higher capacity pump, or will at least impose an undesirable load on the pump.

For example, in the specific prior valve described above with a flow responsive orifice in the secondary valve, the orifice would be sized so that the valve closes the bypass passage and ports supply flow to the main regulating valve to open the same at the flow rate achievable by the minimum capacity pump of the manufacturer. If the orifice were larger than required for this, the secondary valve would never close the bypass and the regulating valve would not open. Due to the large range of capacity variations in fuel burner gear pumps, the pumps with a greater capacity than the minimum acceptable, when used with a valve of this type designed for the minimal flow rate, suffer a severe performance penalty. That is, once the secondary valve is opened in response to the predetermined flow rate, the pump continues to increase its delivery due to its excess capacity over the minimal flow pump, and this causes an increase in pressure upstream of the flow sensing orifice in the secondary valve. The result of this is an increase in back pressure on the pump which decreases the efficiency of the pump and causes an unnecessary load on the prime mover driving the gear pump. The pressure downstream of the orifice will, of course, remain constant due to the constant pressure regulating function of the main valve which is in series and downstream of the secondary flow responsive valve.

In accordance with the present invention, the secondary valve opens an additional bypass valve after the predetermined high flow for the pump has been achieved and after the main regulating valve has opened so that any further increase in discharge from the pump will not increase the pressure upstream of the secondary flow responsive valve.

It is, therefore, a primary object of the present invention to provide a new and improved regulating valve assembly for a fuel oil burner.

It is another object of the present invention to provide a new and improved regulating valve assembly of the type described which opens to port fluid to the oil burner nozzles only after the pump has reached a high r.p.m., and which accommodates a certain limited variation from the rated flow capacity of the pump without imposing a high back pressure on the pump or an unnecessarily high load on the prime mover driving the pump.

A further object of the present invention is to provide a new and improved regulating valve assembly of the

type described above which closes at a high pump r.p.m. and high fuel oil pressure to quickly cut off the supply of oil to the nozzles at shut-down even though the actual capacity of the fuel oil pump may vary within certain limits, and to provide such quick cut-off without imposing an unnecessarily high back pressure on the pump.

It is a still further object of the present invention to provide a new and improved regulating valve assembly of the type described above which opens rapidly at a high pump r.p.m. and which closes rapidly at a high r.p.m. with a flow sensitive secondary valve which unloads the main regulating valve until a predetermined high r.p.m. is reached, and which unloads the valve after the pump r.p.m. decreases below the same predetermined high level on shut-down thereby effecting rapid valve opening and rapid valve closure; with means for limiting the pressure upstream of the secondary flow sensitive valve to a predetermined value and limiting the pressure drop across the valve to a predetermined value regardless of pump discharge rate so that an unnecessarily high back pressure is not imposed upon the pump.

Still another object of the present invention is to provide a new and improved adjustable regulating valve of the type described immediately above with simplified and compact construction which maintains a constant pressure flow to the burner nozzles from the instant the valve opens to the instant it closes.

Other object and advantages will be readily apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIGURE 1 is a diagrammatic view of fuel circuit for an oil burner including a regulating valve assembly shown in its closed position in accordance with the present invention; and

FIGURE 2 is a fragmentary section of the regulating valve assembly shown in FIGURE 1 illustrating the regulating valve in its open position supplying fuel to burner nozzles (not shown).

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail an embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

As shown in FIGURE 1, an internal gear pump 10 of the crescent type is provided for drawing fuel oil from a reservoir 11 and delivering it under pressure to a regulating valve assembly 12 which serves to regulate the flow of fuel to fuel burner nozzles (not shown) through burner nozzle outlet port 14. The valve 12 also serves to bypass a portion of the fuel from the pump 10 back to the reservoir through a return passage 15. The pump 10, the reservoir 11 and the regulating valve 12, in addition to the associated passages, are housed or formed within a single housing assembly 16, although they are shown separately in the drawing for clarity. Pump 10, while shown schematically in FIGURE 1, actually is mounted in a housing member 10a within reservoir 11. The pump 10 is driven by a suitable motor (not shown) through a pump shaft 17 adapted to be connected to a driving electric motor. A suitable shaft seal assembly 20 is provided around the shaft where it projects from the casing or housing assembly 16. Further, a suitable filter 22 is provided in the reservoir 11 for filtering fluid entering the reservoir through the bypass or return passage 15 or through a make-up port 23 which may be used to supply additional fluid to the reservoir as needed.

An air purging valve 25 is provided threaded in the housing 16 for purging fuel (with air entrained) supplied from the pump 10 to the regulating valve 12 after initial installation or extended shut-down. In brief, a conical seating surface 26 on the end of valve 25 engages a complementary seat in the housing 16 preventing the

escape of fluid through passage 27 which continually communicates with the outlet of the pump 10. When opened, however, by unthreading the valve 25, fluid is permitted to pass through passage 27 around a reduced portion 28 on the valve through passages 29 and 30 and out into a suitable receptacle adjacent the unit.

The regulating valve assembly 12 is provided for the purpose of regulating the flow of fuel from the pump 10 through the burner nozzle outlet 14, as described above. It includes a cylindrical valve bore 40 in housing 16 with a burner nozzle outlet fitting 41 threaded in one end thereof having a central projection 42 extending within the bore and defining a stationary valve seat on the end thereof.

An outlet passage 44, formed in the housing 16, connects the outlet of the pump 10 with a central portion of the valve bore 40. The return passage 15 communicates with one end of the bore for conveying fluid therein back to the reservoir 11. Leakage from around the shaft seal assembly 20 along the shaft is also returned to the reservoir through a passage 45 which communicates with the valve bore 40 at the same end as the return passage 15.

Slidable in the bore 40 is a main regulating hollow spool valve member 50 having spaced annular lands 51, 52 and 53 thereon. The upper end of the hollow valve member 50 is closed by a back-up washer 52' contiguous with a resilient washer 53' both retained within the end of the spool member by retaining collar 54. The resilient washer 53' engages the valve seat on the outlet projection 42 and prevents flow, in the position shown, from a chamber 56 (defined by the valve member 50 in the valve bore) through the outlet port 14.

A coil compression spring 60 is provided for biasing the valve member 50 toward its closed position where washer 53' engages the stationary outlet seat 42. The lower end of coil spring 60 reacts against a non-rotatable abutment 61 threadedly carried by an adjustable screw 63 threaded in a fitting 64 which is in turn threaded in the housing 16. A suitable cap 65, provided for the fitting 64, may be removed so that the screw 63 may be rotated to adjust the compressive force of the spring 60 on the valve member 50 to thus vary the regulated pressure of fuel oil through the outlet port 14. The other end of the compression spring 60 reacts against a spring seat 70 fixed within the lower end of valve member 50.

When sufficient fluid pressure occurs in chamber 56 (as shown in FIGURE 2) acting on the upper end of valve member 50, the valve will move downwardly against the force of spring 60 permitting fuel to flow out the outlet port 14 to the burner nozzles. Spring 60 will then regulate a constant pressure flow in the outlet port 14. The land 51 is positioned so that after the valve member 50 moves downwardly to its regulating position, the upper end of the land will be below port 72 permitting excess fuel oil to be bypassed through a bypass passage 77 communicating with the lower end of the bore 40 (through passage 77a) and the return passage 15 so that a portion of the fuel bypasses and returns to the reservoir 11.

Another hollow valve member 75 is provided slidable within the valve member 50 for controlling the flow of fuel from supply passage 44 to the valve chamber 56 and for controlling flow through vent ports 76 in valve member 50 between lands 51 and 52. These vent ports communicate with the bypass passage 77.

The valve member 75 has a frusto-conical surface 80 on one end thereof with a flat valve seat 81 engageable with a complementary flat valve seat 82 formed on the inner end of the spring seat 70. The spring seat 70 also has a surface 83 defining with the surface 80 an annular chamber 85 formed with in the valve member 50 in continuous communication with the supply passage 44 through ports 87 extending through valve member 50 between lands 52 and 53.

An orifice 89 extends centrally through the valve mem-

ber 75 and is adapted when the valve member is open to convey fluid from chamber 85 into the hollow interiors of valve members 75 and 50. Valve member 75 is biased to its closed position shown by a coil compression spring 90 mounted at one end on a spring seat 92 fixed within valve member 50, and reacting at its other end against surface 93 within the valve member 75 pushing it downwardly against the spring seat 70. An upper portion 95 of the valve member 75 closes the vents 76 as the valve member 75 opens preventing the flow of fuel from the interior of the valve members and the valve chamber 56 out the vents to thereby subject the upper end of the valve member to full supply pressure through ports 96 in the upper end of the valve member 50.

The valve member 75 is a differential flow responsive valve, with supply fluid pressure acting on surfaces 80 and 81 urging the valve member 75 upwardly toward its open position, and supply fluid at a pressure determined by the drop across orifice 89 acting on the inner surfaces 93 and 93' urging the valve member 75 downwardly to its closed position with the spring 90. Therefore, there is a net hydraulic force acting on the valve member 75 in a direction with the flow through the orifice 89 depending upon the pressure drop across the orifice. The spring 90 opposes this net hydraulic force acting on valve member 75 and will compress to a length where an equilibrium is attained between the spring force and the net hydraulic force acting on the differential valve 75. Hence, the travel of the valve 75 will be in proportion to the flow through the orifice 89.

At the lower flows, the fluid flow from the orifice 89 will flow through the vent ports 76 and out the bypass passage 77 back to the reservoir 11. This lowers the starting torque requirements on the pump 10. The orifice 89 is sized so that valve member 75 requires a high rate of flow and high pump r.p.m. before it closes vents 76, and until vents 76 are closed, the pressure in the valve chamber 56 is at a low value.

As thus far described, the operation of the valve assembly is as follows: when the pump 10 is initially started after installation or extended shut-down, the purging plug 25 is unseated permitting the fuel and air mixture to flow through passage 27 and out through the central bore 40 of the purging valve. At this time, the spring 90 is of sufficient strength compared with the low hydraulic force of fluid on surface 80 to maintain the valve member 75 closed so that air and oil may not enter the orifice 89 and are blocked from entering either the valve chamber 56 or the return line 77.

On most starts purging is unnecessary and the valve 25 is seated. The discharge from the pump through passage 44 is in proportion to the speed of rotation of shaft 17. The supply fluid from the pump enters chamber 85 and as pressure builds up to a predetermined value, the member 75 will open permitting supply flow through orifice 89. As the flow through orifice 89 increases, the valve member 75 will move upwardly and close the vents 76 at a predetermined flow, and until this time the valve chamber 56 is at low return pressure. When the vents are closed, the pressure within the valve members 75 and 50, as well as in the valve chamber 56, rapidly increases and the force of the fluid acting on the upper end of valve member 50 opposing the main spring 60, rapidly reaches a magnitude where it overcomes the main spring force. The valve member 50 will then move downwardly lifting the valve washer 53' from the outlet nozzle seat and permitting fuel flow through the nozzle outlet 14 to the burner nozzles. The limited delay time from the pump start-up until a sufficient pressure occurs in chamber 56 to open the main valve member 50, lowers the starting torque requirement on the pump and results in a high fuel oil pressure and high pump r.p.m. at the time the valve member 50 opens to eliminate or reduce smoking at start-up.

With the valve member 50 open, the spring 60 serves 75

to regulate a constant pressure flow of fuel to the burner nozzles through the port 14. During normal operation, the valve member 50 moves to a point where the upper surface of land 51 moves below the channel 72 permitting excess oil to flow into the bypass passage 77 to the reservoir through the return passage 15.

When the motor is shut off when shut-down is desired, the flow from the pump begins to decrease causing a corresponding decrease in the pressure drop across orifice 89. This reduction in the pressure drop decreases the net hydraulic force acting on the valve member 75 causing the spring to move the valve member toward its closed position. When the flow is decreased to a predetermined, but still high, value, the valve 75 will uncover the vents 76 causing the hydraulic pressure within the valve members and the valve chamber 56 to drop rapidly to a low value on the order of zero p.s.i. The valve land 51 is never wide enough to close off the lower edge of annular chamber 72. The low pressure in chamber 56 upsets the balance between the force of the main spring 60 and the hydraulic force acting on the upper end of valve member 50 so that the valve member 50 will move rapidly to its closed position shown in FIGURE 1, cutting off the supply of fuel to the nozzles. It is this sudden pressure loss in the valve chamber 56 and within the valve members when the vents 76 are uncovered that permits a fast cut-off of the fuel flow to the nozzles at a high pump r.p.m.

Further decrease in the supply flow causes the spring 90 to urge the valve member 75 to its fully closed position engaging the spring seat 70.

Due to the rapid pressure build-up in chamber 56 after the vents 76 are closed and the sudden loss of pressure in this chamber when the vents are open, the valve 50 will maintain a constant pressure flow through the outlet nozzle 14 from the instant the valve opens to the instant it closes.

As thus far described, the valve assembly 12 is designed for optimum use with a specific capacity pump 10. However, as noted above, gear pumps made by the same manufacturer having the same rated capacity in fact have capacities commonly varying as much as fifteen percent from one pump to another, and in certain high pressure pumps, on the order of 200 p.s.i., the variation may be as much as thirty percent. In the absence of the pressure limiting means described below, and if the orifice 89 was sized so that the vents 76 would close at a rate determined by the minimum capacity pump of a particular model, then when a relatively high capacity pump of that model was used with the valve, valve 75 would continue moving upwardly even after the vents 76 were closed and the pressure in chamber 85 would continue to increase as the flow from the pump increased over that necessary to open the valve. Thus the back pressure on the pump 10 would increase reducing the efficiency of the pump and imposing an unnecessary load on the prime mover driving the pump.

To eliminate this problem, vent ports 97 are provided in the valve member 50 for throttling flow from the chamber 86 after the valve member 75 opens (closing ports 76), so that the pressure in passage 44 never significantly exceeds that required at the predetermined valve opening flow rate, or stated differently, the pressure drop across the orifice will remain constant at flow rates above the valve opening flow rate. Toward this end, vent ports 97 continuously communicate with the interior of the valve members 75 and 50 through ports 98 in valve member 75. As shown more clearly in FIGURE 2 ports 97 are positioned so that after the valve member 75 opens at the predetermined high flow rate described above, closing ports 76 causing valve member 50 to assume its regulating position shown, further upward movement of the valve member 75 in response to a further increase in flow from the pump will cause a portion of the fluid in chamber 86 to be bypassed around the orifice 89 through vent ports 97, ports 98, into the interior of the valve members 50 and

75 and into the return line through ports 96 and passage 77. Valve member 75 in cooperation with ports 97 throttles the flow from chamber 85 to maintain a constant pressure in chamber 86 at flow rates above that required to open valve member 75.

It should be understood that at a predetermined design flow rate, the valve member 75 will open closing vent 76 thereby permitting the rapid opening of regulating valve member 50 regardless of the capacity of the pump 10 (assuming it has a capacity sufficient to open the valve 75). If the pump 10 has an actual capacity just sufficient to open valve 75 closing ports 76, then valve member 75 will never move upwardly quite to the position shown in FIGURE 2 where ports 97 are open. However, if the pump 10 has a capacity in excess of the flow at which valve member 75 is designed to open, then valve member 75 will move further upwardly to the position shown in FIGURE 2 opening port 97 sufficiently to maintain the pressure in chamber 86 at the predetermined value, and to maintain a constant pressure drop across the orifice 89. Of course, at the same time fluid is bypassed through vent ports 97 a portion of the flow from chamber 85 continues through orifice 89. Thus, the back pressure on the pump 10 will remain constant at a minimum predetermined value regardless of the capacity of the pump.

On valve closure, when pump 10 is shut off, valve member 75 will, in response to a decrease in flow from the pump, first close ports 97 (if the flow from the pump is sufficient to open these ports), then open vent ports 76 causing a rapid pressure drop in chamber 56 permitting regulating valve 50 to close rapidly in the manner described above.

An additional advantage in the provision of the venting port arrangement 97 and 58 is that it permits the size of orifice 89 to be reduced somewhat, increasing the pressure drop across the valve member 75, if desired. This is possible because the pressure drop across the valve 75 is constant regardless of the pump capacity, rather than variable as it would be without the venting arrangement. Of course, an increase in the design pressure drop across the orifice would require a somewhat stronger spring 90 so that the valve 75 would open at the same flow rate.

While reference has been made in the foregoing specification to nozzles supplied through the nozzle port 14, it should be understood that it is within the intent of the invention to supply a single nozzle or a plurality of nozzles.

I claim:

1. A fuel burner valve device for controlling the flow of fuel between a fuel pump and a burner nozzle, comprising: passage means for supplying fluid from said pump, a regulating valve including a valve chamber having a burner nozzle outlet port therein, said passage means being connected to supply fluid to said chamber, a valve member in said chamber movable from a closed position preventing the flow of fluid from said chamber through said burner nozzle port and an open position permitting fluid flow through said nozzle port, means biasing said valve member to its closed position, valve means in series with said chamber and responsive to a predetermined fluid condition in said passage means for porting fluid in said passage means to said chamber to open said valve member, and means for limiting the pressure in said passage means upstream of said valve means to minimize the back pressure on the pump.

2. A fuel burner valve device as defined in claim 1, wherein said valve means is in said passage means, said means for limiting pressure including means for limiting pressure in said passage means upstream of said valve means to a predetermined value so that the back pressure on the pump is the same regardless of pump capacity.

3. A fuel burner valve device as defined in claim 1, wherein said valve means is responsive to a predetermined flow in said passage means to open said valve member upon pump start-up and responsive to a predetermined flow in

said passage means to close said valve member on pump shut-off, restriction means in said passage means for causing a pressure differential across said valve means substantially proportional to flow in said passage means, said means for limiting pressure including means for limiting pressure upstream of said restriction means to a predetermined value.

4. A fuel burner valve device as defined in claim 3, wherein said valve means includes said means for limiting pressure in said passage means.

5. A fuel burner valve device for controlling the flow of fuel between a fuel pump and burner nozzles, comprising: passage means for supplying fluid from said pump, a regulating valve including a valve chamber having a burner nozzle outlet port therein, said passage means being connected to supply fluid to said chamber, a valve member in said chamber movable from a closed position preventing the flow of fluid from said chamber through said burner nozzle port and an open position permitting fluid flow through said nozzle port, means biasing said valve member to its closed position, valve means responsive to a predetermined fluid condition in said passage means for porting fluid in said passage means to said chamber to open said valve member, and means for bypassing fluid upstream of said valve means from said first passage means around said valve means to said chamber upon a flow rate in said first passage means above a predetermined value.

6. A fuel burner valve device as defined in claim 5, wherein said valve member bypasses fluid from said chamber after a predetermined opening movement, return passage means for receiving bypassed fluid, said valve means being responsive to flow in said passage means below a predetermined value for communicating said passage means with said return passage means and to flow in said passage means at said predetermined value for blocking communication between said passage means and said return passage means so that said valve chamber becomes rapidly pressurized, said valve means bypassing fluid from said passage means to said return passage means at flow rates in said passage means above said predetermined value to limit the pressure in said passage means.

7. A fuel burner valve device for controlling the flow of fuel between a fuel pump and a burner nozzle, comprising: passage means for supplying fluid from said pump, a regulating valve including a valve chamber having a burner nozzle outlet port therein, a valve member slidable in said chamber movable from a closed position blocking flow through said outlet port to an open position permitting flow through said outlet port, means biasing said valve member to its closed position, said biasing means opposing the force of fluid pressure in said chamber tending to open said valve member, a second valve member slidable in said first valve member for controlling the pressure in said chamber, said second valve member having an orifice therein for receiving fluid flow from said passage means and causing a pressure drop across said second valve member, said pressure drop positioning said second valve member so that at a predetermined flow through said orifice said second valve member will place said passage means in full communication with said chamber, return passage means, said second valve member porting fluid from said first passage means to said return passage means upon a predetermined flow through said orifice.

8. A fuel burner valve device as defined in claim 7, wherein said second valve member ports fluid from said first passage means to said return passage means to limit the pressure in said passage means to a predetermined value.

9. A fuel burner valve device as defined in claim 7, wherein said second valve member communicates said passage means with said return passage means at flow rates below said predetermined flow rate and blocks communication between said passage means and said return passage

until the valve member has opened a predetermined amount.

10. A fuel burner valve device as defined in claim 7, including means for biasing said second valve member to a closed position blocking communication between said passage means and said chamber.

11. A fuel burner valve device as defined in claim 7, including an air purging valve in said supply pump means.

12. The combination as defined in claim 7, including a valve housing having a bore therein, said outlet port being in one end of said bore, said first valve member being generally cylindrical and having a valve surface on one end thereof defining said chamber at said one end of said bore, said valve surface being cooperable with said burner nozzle outlet port to control the flow therethrough, said first and second valve members being hollow, separate spring means engaging and biasing said valve members toward their respective closed positions, return passage means in said housing communicating with said bore, and means on said valve member blocking communication between the chamber and the return passage means around the valve member in its closed position and permitting a portion of the fluid in said chamber to be bypassed through said return passage means upon a predetermined movement of said valve member from its closed position.

13. A fuel burner valve device as defined in claim 12, including a valve seat for said second valve member fixed within the end of said first valve member opposite said first member valve surface, first passage means including a passage in said housing communicating with said bore and an inlet port in said first valve member communicating said first passage means with the interior of said first valve member adjacent said seating surface, said second valve member having means urging the same against its valve seat, first vent port means in said first valve member in communication with said return passage means, said second valve member adapted to close said first vent port means upon a predetermined opening movement thereof, second vent port means in said first valve member communicating with said return passage means, said second valve member opening said second vent port means after a predetermined opening movement after closing said first port means.

14. A regulating valve assembly for an oil burner fuel

pump, comprising: supply passage means for conveying fluid from the pump, return passage means adapted to be connected to return fluid to the pump, first valve means including a housing having a nozzle outlet port adapted to be connected to burner nozzles, a movable valve member slidable in said housing for controlling flow through said outlet port from said supply passage means and defining a valve chamber in said housing, said valve member also controlling flow from said supply passage means to said return passage means, a purging valve in said supply passage means for conveying the fluid and air mixture therefrom during start-up, second valve means for blocking flow from said supply passage means to said return passage means during purging, and said second valve means being movable from a closed position blocking flow from said supply passage means to said return passage means and to said chamber to a first open position permitting communication between said supply passage means and said return passage means, and to a second open position blocking flow from said supply passage means to said return passage means but permitting communication between said supply passage means and said chamber for rapid opening of said first valve member, and means for bypassing fluid from said supply passage means to said return passage means when said second valve member moves from said second open position.

15. A fuel burner valve device as defined in claim 1, wherein said valve member includes bypass valve means for bypassing fluid in said chamber when the pressure on said valve member exceeds a predetermined value.

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