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 FLUID PRESSURE CONTROL MECHANISM
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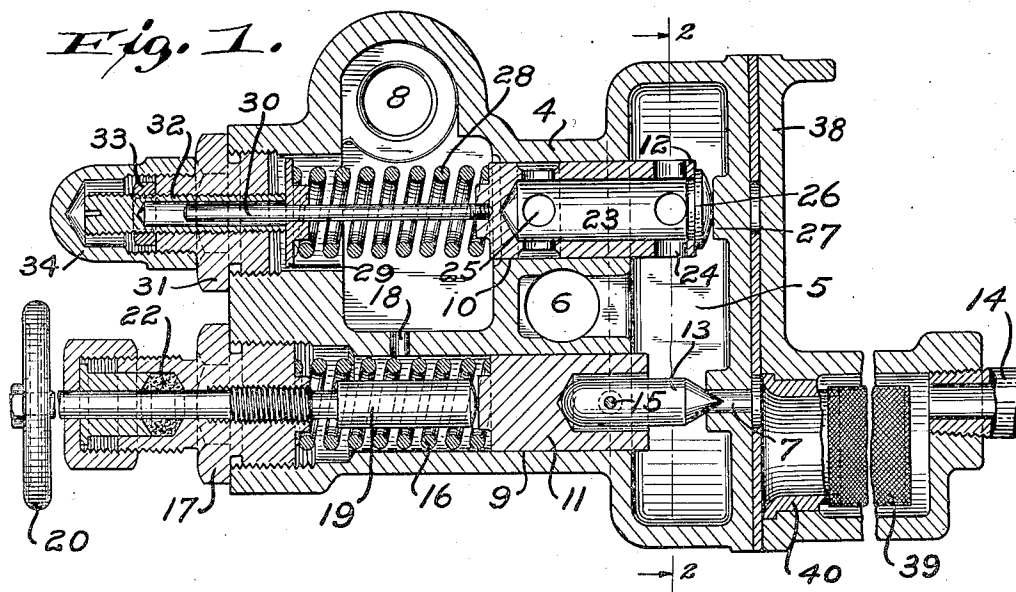
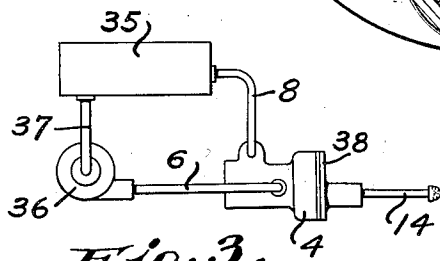
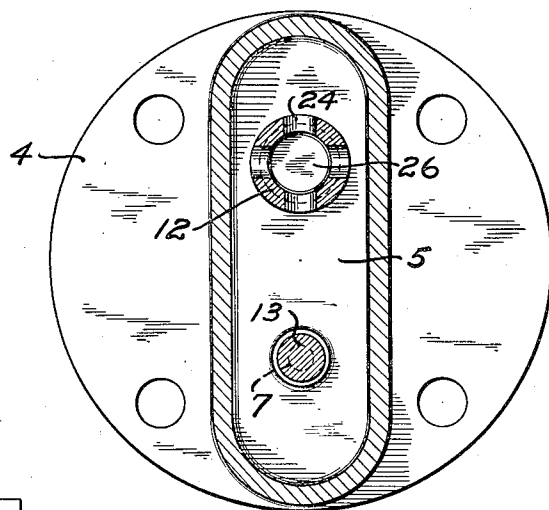


Fig. 2.



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FLUID PRESSURE CONTROL MECHANISM

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3 Claims. (Cl. 137—153)

The present invention relates in general to improvements in the art of fluid distribution, and relates more specifically to improvements in the construction and operation of mechanisms for controlling the delivery of fluid from orifices or the like.

An object of the invention is to provide improved fluid pressure control mechanism which is simple in construction and efficient in operation.

In the art of utilizing combustible fluid such as oil, for heating purposes, it is not only desirable to be able to accurately control the quantity of oil normally delivered to the combustion chamber from the supply nozzle, but it is furthermore highly desirable to have the oil supply automatically stopped under certain conditions of operation, in order to avoid flooding of the combustion chamber with explosive liquid in case the flame is extinguished. The quantity control should preferably be adjustable to meet various conditions of operation, and the delivery of fluid from the nozzle should be substantially constant for a predetermined position of adjustment of the quantity control means. Regardless of the position of adjustment of the quantity control means, it is desirable to have the fuel supply pump operable at substantially constant speed so that the delivery of fuel therefrom will be substantially constant at all times. It has heretofore been impossible with the prior control mechanisms for oil burners and the like, to accurately control the delivery of fuel from the supply nozzle with the pump operating at substantially constant speed, due to the complexity of the prior control devices and also due to the lack of flexibility in the adjustment thereof.

It is a more specific object of the present invention to provide simple and compact control mechanism which is especially adapted for use in conjunction with oil burner nozzles or the like, for the purpose of accurately regulating the delivery of fuel to the combustion zone.

Another specific object of the invention is to provide an improved control device for oil burners or the like wherein the fuel supply to the discharge nozzle will be automatically stopped when certain abnormal conditions of operation are attained.

A further specific object of the invention is to provide a fuel supply regulator for burners, which is highly flexible and extremely accurate in operation, and which may be maintained in highly effective condition at all times.

Another specific object of the invention is to

provide a fuel flow control which will function effectively without in any manner disturbing the operation of the fuel supply pump, and in which the pump may be maintained in operation at full capacity even when the delivery of fluid to the combustion zone is stopped.

Still another specific object of the invention is to provide a fuel regulator device which may be manufactured and installed at minimum cost.

These and other objects and advantages will be apparent from the following detailed description.

A clear conception of an embodiment of the invention and of the mode of constructing and of operating devices built in accordance therewith, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts in the several views.

Fig. 1 is a central vertical section through a fluid pressure control mechanism especially adapted for oil burner service, showing the various parts in inactive position;

Fig. 2 is a transverse vertical section through the mechanism of Fig. 1, the section having been taken along the line 2—2 of Fig. 1 looking in the direction of the arrows; and

Fig. 3 is a diagram showing the relative disposition of the control mechanism and of the pump for supplying fluid under pressure thereto.

While the invention has been shown and described herein as being specifically adapted for use in connection with, and as actually applied to an oil burner unit, it will be apparent that the improvement is more generally applicable to fluid pressure regulating or control mechanisms. This illustrative disclosure should not therefore be considered as an intentional limitation in the scope of the present invention. It should also be understood that the improved mechanism is capable of operating to control the delivery of fluids other than oil, without departing from the realm of the present invention.

Referring to the drawing, the improved control mechanism comprises in general a main casing 4 forming a chamber 5 having a supply passage 6 communicating therewith. The casing 4 is additionally provided with a fluid discharge orifice 7 and with a by-pass 8, both of which are communicable with the chamber 5 under certain conditions of operation. In addition to the discharge port and by-pass, the casing 4 is also provided with parallel bores 9, 10 in the former of which a plunger 11 is movable and

in the latter of which a second plunger 12 is similarly movable.

The bore 9 is disposed substantially in line with the discharge orifice 7, and the primary plunger 11 carries a needle valve 13 which co-operates with the orifice 7 to control the delivery of fluid from the chamber 5 to the nozzle 14. The needle valve 13 is movably supported in an end socket in the plunger 11, by means of a transverse pin 15 so that the cone point of the valve 13 may find a proper seating upon the casing 4 at the orifice 7, even if the needle valve and orifice are not perfectly alined. The plunger 11 is constantly urged toward the chamber 5, by means of a helical compression spring 16 which reacts against a removable plug 17 secured to the casing 4, and the chamber within which the spring 16 is confined, communicates with the by-pass 8 through a port 18, thereby subjecting the end of the plunger 11 remote from the chamber 5 to by-pass pressure at all times. The range of movement of the primary plunger 11 may be predetermined by an adjustable stop member 19 having screw thread coaction with the plug 17 and extending centrally through the spring 16 in proximity to the end of the plunger 11. The stem of the stop member 19 extends through the plug 17 and is provided with a hand wheel 20 for permitting adjustment of the stop, and a suitable packing 22 serves to prevent escape of oil from within the casing 4 along the stem of the member 19. By manipulating the hand wheel 20, the stop member 19 may be set to establish any desired range of travel of the needle valve 13, and to positively close this valve if so desired.

The bore 10 within which the second plunger 12 is movable, may be of the same diameter as the bore 9 in order to facilitate machining of the parts, and the opposite ends of the secondary bore 10 are in open communication with the chamber 5 and by-pass 8, respectively. The second plunger 12 is hollow and the internal space 23 is provided with radial inlet and discharge ports 24, 25 respectively, which under certain conditions of operation are adapted to communicate respectively with the chamber 5 and with the by-pass 8 adjacent the corresponding ends of the bore 10. The end of the plunger 12 within the chamber 5, is provided with a cap 26 which is engageable with an abutment 27 on the casing 4 to limit the movement of the plunger in one direction. The secondary plunger 12 is constantly urged toward the abutment 27, by means of a helical compression spring 28 which reacts against a plate 29. An elongated pin 30, threaded into the member 10, facilitates the withdrawing of the spring 28 and the plunger 12. The outer portion of the casing 4 in line with the bore 10, is provided with a removable closure plug 31 having a central threaded opening the screw threads of which coact with a hollow adjusting screw 32 which loosely embraces the adjacent end of the rod 30 and coacts with the plate 29. The outer end of the screw 32 is provided with a slot for effecting adjustment of the screw and of the plate 29 so as to vary the tension of the spring 28. A clamping nut 33 serves to lock the screw 32 in any desired position of adjustment relative to the plug 31, and a removable cap 34 normally encloses and protects the outer end of the screw 32 and the nut 33 against unauthorized tampering. The spring 28 and the end of the plunger 12 with which this spring coacts, are constantly exposed to the pressure of the by-pass 8, and the reaction pressure on the plunger 12

afforded by the spring 28 may obviously be readily varied as desired, by merely manipulating the screw 32.

The by-pass 8 may be connected directly to a supply tank 35 as shown diagrammatically in Fig. 3, and a pump 36 of any suitable construction may have its suction line 37 connected to this same tank. The pump 36 is preferably operated to produce uniform and substantially constant displacement, and has its discharge connected directly to the supply passage 6 of the casing 4. The casing 4 may be attached to a nozzle support 38 which provides a housing for a strainer 39 so disposed that the oil delivered from the orifice 7 must pass through the strainer before reaching the nozzle 14. The strainer 39 is readily removable from the support 38 for inspection and cleaning, by removal of the strainer retainer 40, and the nozzle 14 is also removable from the support 38 for like purposes.

During normal operation of the improved control device, the pump 36 is operating to deliver fluid under pressure to the chamber 5 at a substantially constant rate. The hand wheel 20 is normally adjusted to permit opening of the needle valve 13 and the hand wheel is turned back as far as possible with the stop portion 19 engaging the inner end of the member 17 and being prevented from withdrawal. The tension of the spring 28 has been adjusted by manipulation of the screw 32 to permit opening of the by-pass only upon attainment of a predetermined pressure within the chamber 5, the by-pass will be thus opened upon attainment of said pressure and the primary plunger 11 will be automatically forced back to open the needle valve 13 thereby causing delivery of fluid under pressure from the chamber 5 to the nozzle 14. By varying the tension of the spring 28 which coacts with the secondary plunger 12, the pressure within the chamber 5 may be adjusted to any desired point and will be maintained substantially constant for the predetermined setting. If the pressure in the chamber 5 tends to drop by virtue of a reduction in the supply of fluid, the by-pass plunger 12 will move toward the chamber 5 and will eventually cut off the ports 24, 25, thereby preventing bypassing of fluid and permitting the valve 13 to close if the pressure in the chamber 5 continues to drop. If the pressure within the chamber 5 tends to increase beyond the desired setting, the secondary plunger 12 will be forced away from the chamber 5 to a greater extent, and the ports 24, 25 will eventually be opened sufficiently to permit by-passing of the excess supply of fluid. It will thus be noted that the plungers 11, 12 will function to automatically maintain a substantially constant pressure within the chamber 5 and will thus maintain a substantially constant rate of delivery of fluid under the predetermined pressure, to the nozzle 14.

The secondary plunger 12 by virtue of its formation, operates with great sensitiveness. The ports 24 are disposed oppositely with respect to each other and thereby prevent the escaping fluid from undesirably tilting the plunger 12 within the bore 10. The end cap 26 provides the pressure surface against which the fluid acts, and the discharge ports 25 likewise prevent tilting of the plunger 12 due to unbalanced lateral pressures on the plunger. Adjustment of the tension of the spring 25 may be readily effected by removal of the closure cap 34 and subsequent manipulation of the adjusting screw 32, and the nut 33 serves to

positively lock the screw 32 in any desired position of adjustment.

The mounting of the needle valve 13 obviously permits tight closing of the valve with respect to the orifice 7, and the range of movement of the valve 13 may be conveniently adjusted by means of the hand wheel 20. If the range of movement of the valve 13 is great, then the spring 16 will be placed under greater tension as the valve 13 opens farther. The tension of the spring 16, may also be varied by inserting shims of different thickness between the plug 17 and the casing 4, if so desired, and the valve 13 may be positively closed with the aid of the hand wheel 20 and stop member 19, if so desired. Such closing of the needle valve 13 does not affect the operation of the supply pump 36, since the by-pass plunger 12 will then permit by-passing of the entire quantity of fluid which is delivered to the chamber 5 from the pump.

If for any reason the pressure within the chamber 5 should fail, the plunger 11 will be forced forwardly by its spring 16 to close the needle valve 13, and the plunger 12 will likewise be forced forwardly against the abutment 27 by means of its spring 28. The bores 9, 10 may be of equal diameter as shown, or these bores may be of different diameters. The equal diameter bores may be more readily machined, and so far as possible, all parts of the mechanism are made interchangeable thereby reducing to a minimum the cost of construction.

From the foregoing description it will be apparent that the invention provides a simple and compact control mechanism adapted to accurately regulate the delivery of liquid from a chamber. The device has been found especially effective when used in conjunction with oil burner nozzles, since the supply of fluid to the nozzle is automatically and quickly stopped when abnormal conditions of operation are attained. The desired adjustments may be quickly and accurately accomplished and the operation of the fuel supply pump need not be disturbed when a new adjustment is made.

It should be understood that it is not desired to limit the invention to the exact details of construction and to the precise mode of operation herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination, a casing forming a chamber having a pair of bores of uniform cross-section communicating therewith throughout the full cross-section of both bores, a plunger slidable along each of said bores, a fluid intake communicating with said chamber to subject said plungers to pressure over the entire cross-sectional areas thereof, resilient means for urging said plungers toward said chamber in op-

position to the fluid pressure therein, a fluid outlet communicating with said chamber, a valve carried by one of said plungers for controlling the delivery of fluid through said outlet, and a fluid pressure relief passage communicating directly with both of said bores remote from said chamber, the other of said plungers having an end portion movable into said chamber and provided with lateral ports exposed to said passage and to said chamber respectively only when said portion enters said chamber for permitting escape of fluid from said chamber through said other plunger to said relief passage.

2. In combination, a casing forming a chamber having a pair of bores of uniform cross-section communicating therewith throughout the full cross-section of both bores, a plunger slidable along each of said bores, a fluid intake communicating with said chamber between said bores to subject said plungers to pressure over the entire cross-sectional areas thereof, resilient means for urging said plungers toward said chamber in opposition to the fluid pressure therein, a fluid outlet communicating with said chamber in line with one of said bores, a valve carried by one of said plungers for controlling the delivery of fluid through said outlet, and a fluid pressure relief passage communicating directly with both of said bores remote from said chamber, the other of said plungers being formed hollow and having an end portion movable into said chamber and provided with lateral ports exposed to said passage and to said chamber respectively only when said portion enters said chamber for permitting escape of fluid from said chamber through said other plunger to said relief passage.

3. In combination, a casing forming a chamber having parallel bores communicating therewith and extending to the exterior of the casing, a plunger slidable within each of said bores adjacent said chamber, a fluid intake communicating directly with said chamber, a fluid outlet communicating with said chamber in line with one of said plungers, a valve carried by said plunger for controlling the delivery of fluid from said chamber through said outlet, a spring for urging said plunger and said valve toward said outlet, a stop adjustable from the exterior of said casing and coacting directly with said plunger within said spring for controlling the degree of opening of said valve, a fluid pressure relief passage communicating directly with both of said bores remote from said chamber, a spring for urging the other of said plungers toward said chamber and away from said relief passage, and means for varying the tension of said last-mentioned spring from the exterior of said casing, said other plunger having ports for controlling the flow of fluid from said chamber through said plunger to said relief passage.

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