

June 13, 1944.

C. M. SNYDER

2,351,372

OIL BURNER

Filed Aug. 22, 1942

3 Sheets-Sheet 1

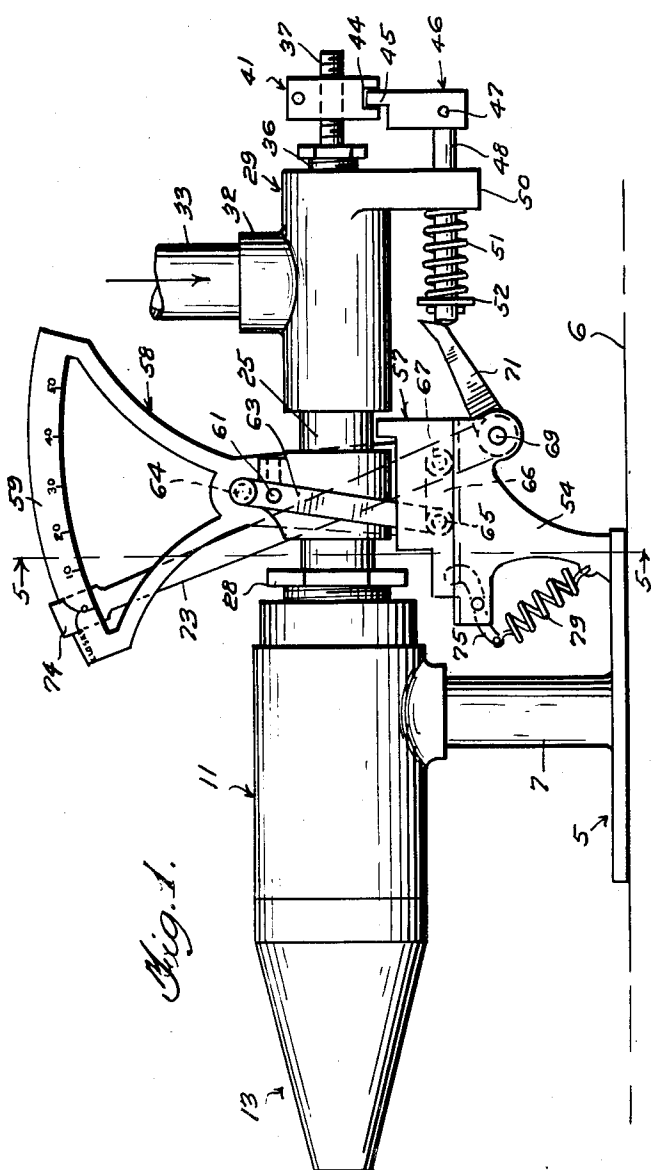


Fig. 1.

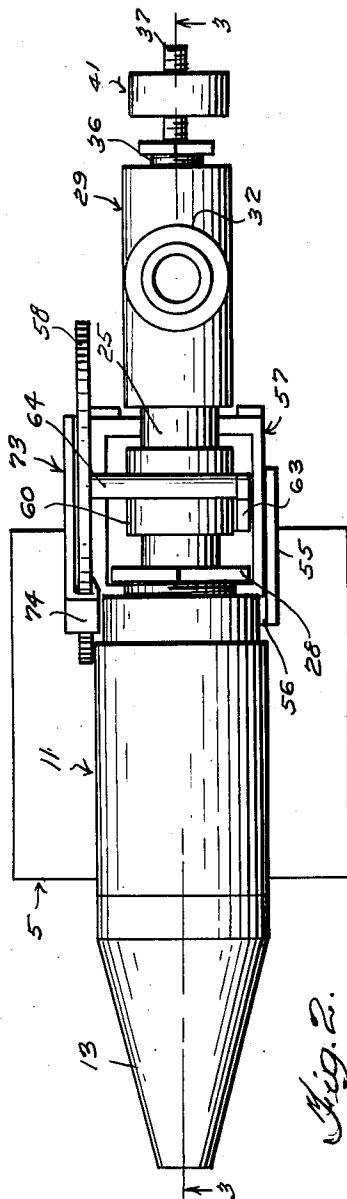


Fig. 2.

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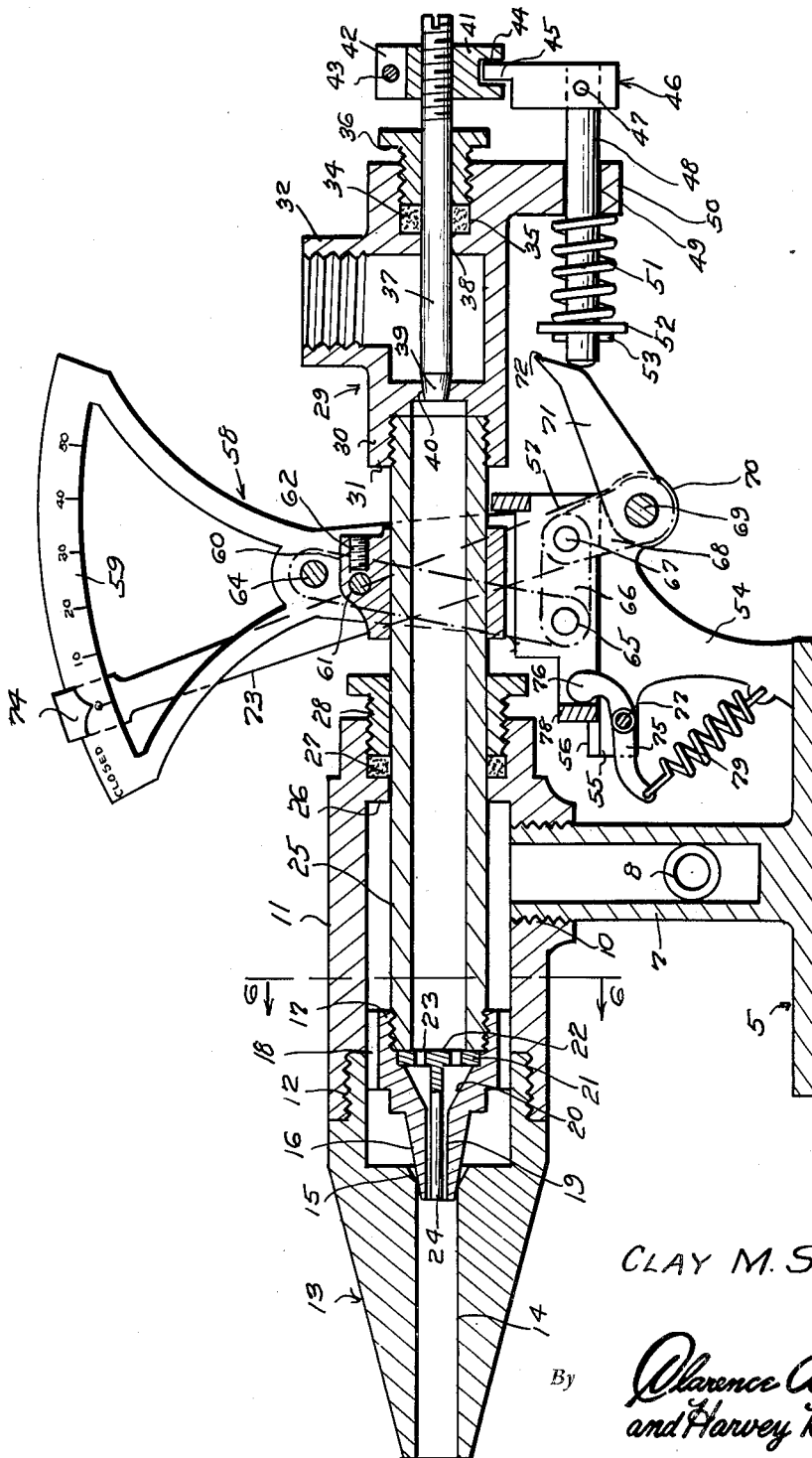
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

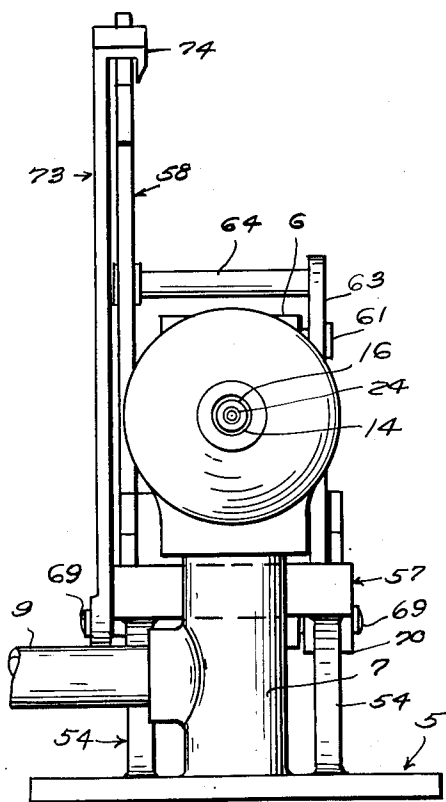


Fig. 4.

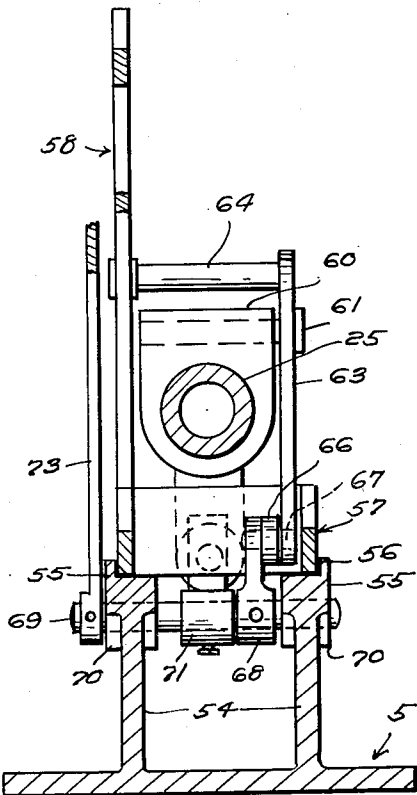


Fig. 5.

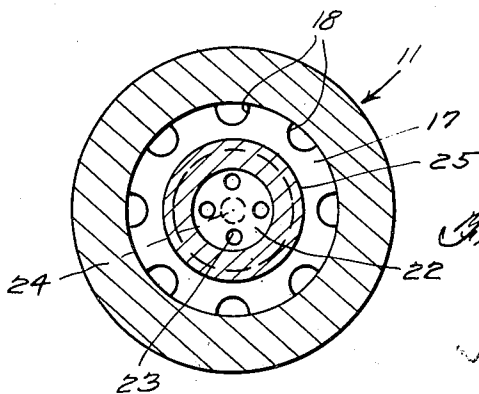


Fig. 6.

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UNITED STATES PATENT OFFICE

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OIL BURNER

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Application August 22, 1942, Serial No. 455,803

5 Claims. (Cl. 299-140)

The invention relates to an improved oil burner, especially although not necessarily of the commercial and industrial type, wherein means are provided to introduce air or steam into the mixing chamber in a hollow tubular stream rather than a solid stream, whereby the volume of air or steam required to thoroughly atomize the oil is substantially reduced, and additional economies in operating costs are secured through increased efficiency and complete combustion of the fuel handled through the burner.

An important object of the invention is to provide an improved oil burner of the character indicated in which a single control operates to coordinately adjust both the entrance of the air or steam under pressure and the ejection of the mixture of oil and air or steam from the mixing chamber, whereby the proportions of air or steam and oil are maintained correct throughout the range of flame adjustment.

Other important objects and advantages of the invention will be apparent from a reading of the following description taken in connection with the appended drawings, wherein for purposes of illustration a preferred embodiment of the invention is shown.

In the drawings—

Figure 1 is a general side elevational view of the embodiment.

Figure 2 is a top plan view of Figure 1.

Figure 3 is a longitudinal vertical sectional view on a somewhat enlarged scale taken along the line 3-3 of Figure 2 and looking upwardly in the direction of the arrows.

Figure 4 is a left hand end elevational view of Figure 1 on a somewhat enlarged scale.

Figure 5 is a transverse vertical sectional view taken through Figure 1 along the line 5-5 and looking toward the right in the direction of the arrows, and on a somewhat enlarged scale.

Figure 6 is an enlarged transverse vertical sectional view taken through Figure 3 along the line 6-6 and looking toward the left in the direction of the arrows.

Referring in detail to the drawings, the numeral 5 generally designates a flat plate forming a base for securing to a horizontal support 6, the base including a tubular riser 7 which has an oil supply port 8 at one side to which the supply conduit 9 is connected. The upper end of the riser 7 is threaded as indicated by the numeral 10 into a receiving opening in the bottom of the tubular cylindrical oil chamber 11 into whose forward end is threaded as indicated by the numeral 12 a reduced portion on the burner

nozzle 13. The nozzle 13 has a reduced axial bore or mixing chamber 14 which is flared as indicated by the numeral 15 at its rearward end to cooperate with the tapered valve 16 which projects axially and forwardly from the generally cylindrical annulus 17 whose periphery is indented by circumferentially spaced semi-circular cross section channels 18 forming passages for the movement of oil from the interior of the oil chamber to the entrance of the annular space around the valve 16 and in front of the annulus 17 where the air or steam mixes with the oil. The movement of the tube 25 adjusts the amount the tapered valve 16 projects into the rear end of the passage 14, thereby determining the amount of flow through the passage 14.

The interior of the fitting consisting of the tapered valve 16 and the annulus 17 is formed with a straight bore portion 19 which extends with an enlarged conical orifice 20 terminating with a shoulder 21 against which is seated a perforated disk 22 having the circumferentially and radially spaced openings 23. The disk 22 has an axial stem 24 which is smaller in diameter than the bore 19 and is coaxially arranged therein and extends to the tip of the valve 16, the disk 22 being held in place by the forward end of the air or steam pressure tube 25 which is threaded into the rear end of the annulus 17 and against the back of the disk 22 as clearly shown in Figure 3 of the drawings.

The rearward end of the cylinder 11 has an internal flange 26 closely surrounding the air or steam tube 25 which acts as an abutment for the packing 27 which surrounds the tube 25 and is expanded and sealed in place by a threaded gland 28 which threads into the rear end of the cylinder 11 over the tube 25 and within which the tube 25 is slidable.

On the rear end of the portion of the tube 25 which extends rearwardly from the mixing chamber is threaded a valve body which is generally designated 29 which comprises the forwardly projecting horizontal branch 30 which is threaded as indicated by the numeral 31 on the rear end of the tube 25, and the rising vertical portion 32 which is adapted to be connected to the air supply conduit 33. The rear end of the valve body 29 has a socket 35 in which is arranged a packing 34 which is pressed in place around the valve rod 37 by the gland 36, the valve rod passing slidably through an opening 38 in the body 30 and terminating at its forward end in a tapered terminal 39 which can seat in the con-

formably tapered valve opening 40 which communicates with the air or steam pressure tube 25.

The exposed rear end of the valve rod 37 has threaded thereon a longitudinally adjustable clampable block 41 which has a bifurcated portion 42 traversed by a clamping bolt 43 whereby after adjustment along the valve rod the block 41 may be locked in place. The lower part of the body 41 has a notch 44 into which projects a finger 45 on a block 46 which is locked by a pin 47 on a cam operated rod 48 which is mounted horizontally in a slide opening 49 in a depending portion 50 on the rear part of the body 29. The forward part of the branch 30 of the valve rod 48 has a helical spring 51 circumsposed thereon between the depending portion 50 and a washer or the like stop 52 held in place by a cotter key or the like 53.

Means for coordinately adjusting the position of the valve rod 37 and the position of the valve 16 relative to the valve seats 40 and 15, respectively, comprises a pair of uprights 54 which rise from the rear part of the base plate 5 and have horizontal portions 55 spaced below the tube 25 and the mixing chamber substantially on a line with the valve rod 48. These horizontal portions have inwardly facing slideways 56 in which slide the lower edges of the longitudinal sides of a generally rectangular frame 57, from one side of which rises the indicator segment which is generally designated 58 and which has a scale marked arc 59 at its upper end.

Fixedly mounted on the tube 25 between the mixing chamber and the valve body 29 is a sleeve 60 which is traversed by a horizontal shaft 61 which is locked in place by a set screw 62. On an extended portion of the shaft 61 is pivoted adjacent its upper end a lever 63, whose upper end is pivoted as indicated by the numeral 64 on a pin on the sector 58 just above the sleeve 60, the lower end of the lever 63 being pivoted on a pin 65 between the side walls of the frame 57. One end of a horizontal link 66 is pivotally mounted on the pin 65 and its opposite end is pivoted as indicated by the numeral 67 to the upper end of an arm or lever 68 which is fixed on a shaft 69 which turns in a pair of depending ears 70 on the rearward part of the horizontal portions 55. Also fixed on the shaft 69 is a cam lever 71 which has an upwardly directed cam terminal 72 which angularly engages the forward end of the cam rod 48. Also fixed on the shaft 69 is the upwardly projecting indicator arm 73 which is located outside of the indicator segment 58 and has a pointer 74 reaching laterally inwardly over the segment 58 to point to the indicia of the scale 59.

Figure 3 of the drawings shows both the valve 16 and the valve rod 37 in fully closed positions and with the pointer 74 on the indicator arm marking zero on the scale 59, in which arrangement of the parts the burner is inoperative. To bring the burner into operation the indicator arm 73 is moved toward the right along the scale 59, which action has the effect of causing the cam arm 71 to cam the rod 48 in a right hand direction and thereby move the valve rod 37 to a certain open position relative to its seat 40. The same movement of the indicator arm 73 operates through the linkage of the lever arm 68, the link 66, the frame 57 and the lever arm 63 to move the air or steam tube 25 rearwardly relative to the mixing chamber 11 and thereby withdraw the valve 16 from the seat 15. With steam or air under pressure coming into the chamber 75

of the valve body 29 and oil under gravity feed entering the port 51 of the riser 7 and flowing up into the oil chamber around the tube 25, and oil from the oil chamber flowing through the passages 18 to a position in the mixing chamber in front of the valve 17, and the air and steam going through the holes 23 in the disk 22 and forming a hollow tubular stream as the air or steam emerges from the bore 19 in the valve 16, the oil will become mixed with the hollow tubular steam or air stream and pass through the bore 14 of the nozzle 13 for ignition. As the arm or lever 73 is moved further toward the right, the valve rod 37 and the valve 16 are opened coordinately to greater degrees, thereby increasing the volume of air or steam admitted to the mixing chamber and simultaneously coordinately increasing the volume of oil admitted to the mixing chamber. This coordination is maintained automatically throughout the range of the burner from minimum to maximum consumption.

It has been demonstrated that combustion takes place efficiently only on the outside of a stream of air, or steam and oil, and that the mixture within these outside areas is inefficiently burned or fails to burn properly and is wasted. However, due to the hollow character of the stream issuing from the nozzle 13 by reason of the presence of the rod 24 in the bore 19 of the valve 16, whereby the hollow stream is created, the resultant hollow stream of air, or steam and oil in atomized condition, exemplifies the most efficient type of arrangement for combustion. Due to the fact that once the burner is in operation the emission of the stream creates a suction in the mixing chamber, the gravity fed oil entering the port 8 is drawn by vacuum into the front of the mixing chamber without the necessity of having the oil under pressure. Further, due to the high efficiency of the annular cross section stream emitted by the nozzle, due to the annular chamber formed by the bore 19 and the rod 24 in the valve 16, a smaller amount of air or steam under lower pressure than usual is required for efficient operation of the burner.

Although there is shown and described herein a preferred embodiment of the invention, it is to be definitely understood that it is not desired to limit the application of the invention thereto except as may be required by the scope of the subjoined claims.

Having described the invention, what is claimed as new is:

1. An oil burner comprising a support, a horizontal tubular oil chamber on said support, a nozzle on the forward end of said oil chamber having a discharge passage axially aligned with, but having a substantially smaller diameter than that of the interior of said oil chamber and communicating therewith, said passage terminating at its rear end in a tapered valve seat, a fluid pressure tube axially slidably mounted through the rear end of said oil chamber with the sides of said tube in spaced relation to the walls of said oil chamber, a valve mounted on the forward end of said tube, said valve comprising a body slidably fitting said oil chamber and having peripheral channel forming conduits connecting the forward and rearward parts of the oil chamber, said body being formed with a bore receiving the forward end of the said tube, said bore tapering forwardly to a reduced cylindrical bore portion opening through the forward end of the body, a perforated plate across the entrance to the tapering part of the bore, a rod projecting forwardly

from said plate in coaxially spaced relation to said reduced cylindrical bore portion whereby to form an annular orifice, the forward part of said body terminating in a tapering valve terminal for seating relative to the valve seat at the rear end of the passage in the nozzle, oil supply means connected with the oil chamber behind said valve body, a conduit for fluid under pressure connected to said fluid pressure tube, and control means comprising mechanism for moving said pressure tube longitudinally to controllably unseat said valve terminal from the valve seat at the rear end of the discharge passage of the nozzle.

2. An oil burner according to claim 1 wherein said control means further comprises a hollow valve body mounted on the rear end of said pressure tube and having a valve seat in communication with said pressure tube, said hollow valve body being provided with means for supplying a fluid under pressure thereto, a longitudinally movable valve rod for seating and unseating with respect to the last mentioned valve seat to control said supply to said pressure tube, said mechanism further comprising means for simultaneously opening or closing said valves to deliver a predetermined volume of fluid in an annular jet to the rearward end of the passage through the nozzle in predetermined proportion to the amount of oil simultaneously drawn into said passage, said fluid and oil being thereby thoroughly mixed and ejected from the forward end of said passage in atomized form.

3. An oil burner according to claim 1 wherein said control means further comprises a hollow valve body mounted on the rear end of said pressure tube and having a valve seat in communication with said pressure tube, said hollow valve body being provided with means for supplying fluid under pressure thereto, a longitudinally movable valve rod for seating and unseating with respect to the last mentioned valve seat to control said supply to said pressure tube, said mechanism further comprising means for simultaneously opening or closing said valve and said valve rod to coordinately determine the proportionate amounts of oil and fluid to be mixed in and discharged from the discharge passage of the nozzle, the last-mentioned means comprising link and lever means mounted on said support and comprising a cam arm for operative engagement with said valve rod and a connecting rod pivotally connected to said pressure tube, and a single lever for imparting motion thereto.

4. An oil burner according to claim 1 wherein said control means further comprises a hollow valve body mounted on the rear end of said pressure tube and having a valve seat in communication with said pressure tube, said hollow valve body being provided with means for supplying

fluid under pressure thereto, a longitudinally movable valve rod adapted for seating on the valve seat to control the air or steam supply to said pressure tube, said mechanism further comprising means for simultaneously operating said valve and valve rod to coordinately determine the proportionate amounts of a mixture of oil and fluid to be discharged in a hollow stream from the discharge passage of the nozzle, the valve operating means comprising a link and lever mounted on said support and a cam arm engaging with said valve rod, a connecting rod pivotally connected to said pressure tube, a single lever for imparting motion thereto, and an indicator arm, a segment having a scale relative to which said indicator is movable to predetermine the coordinate amount of opening of the valve rod and the valve.

5. An oil burner comprising a support, a horizontal tubular oil chamber on said support, a nozzle on the forward end of said oil chamber, having a rearward chambered section, and a discharge passage axially aligned with, but having a substantially smaller diameter than that of the interior of said oil chamber and communicating therewith, said passage terminating at its rearward end in a tapered valve seat, a fluid pressure tube slidably mounted through the rear end of the said oil chamber, in alignment with the longitudinal axis of, and spaced in relation to the peripheral wall of said oil chamber, a head mounted on the forward end of the said pressure tube, said head comprising a body slidably fitting the chambered rearward section of the nozzle, and said body having longitudinally disposed channels around the periphery thereof to permit the passage of oil around said body and a bore terminating in a chambered recess at the rearward end of said body to receive an insert held in place in said chambered recess by the forward end of the pressure tube, an axial stem on the insert extending forward through said bore in spaced relation with the bore to form therewith an annular passageway in the forward part of the body, said forward part of the body being tapered externally for seating in the tapered valve seat of the nozzle to secure an operative closure for the valve seat, oil supply means connected with the oil chamber behind said valve body, a conduit for fluid under pressure connected to said fluid pressure tube, and control means comprising mechanism for moving said pressure tube longitudinally of the oil chamber to controllably coordinate the position of the tapered forward part of the body with the rearward end of the discharge passage through the nozzle.

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