June 17, 1941. F. C. GRISWOLD 2,245,975

ATOMIZING NOZZLE

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Fig. 1.

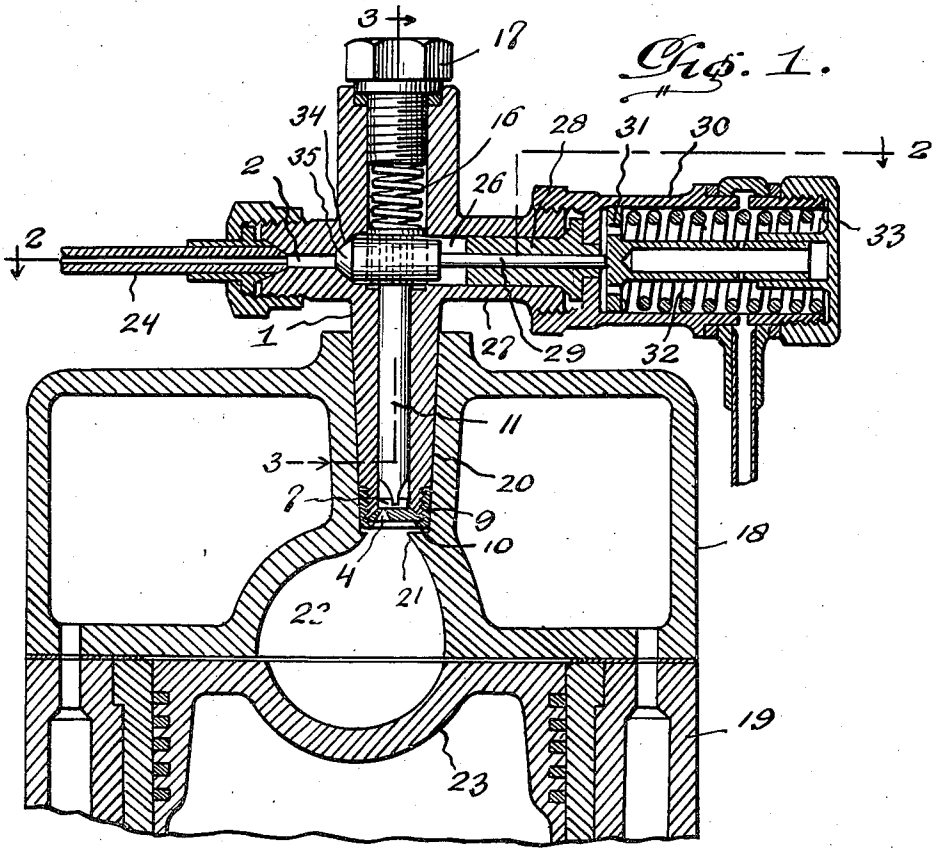
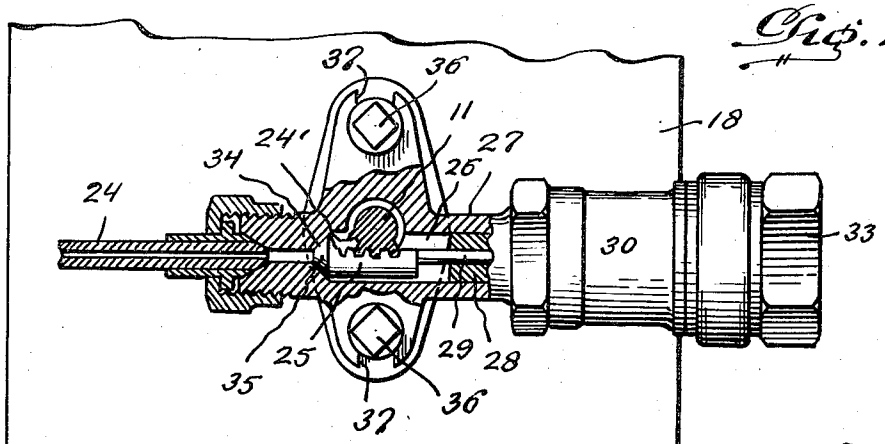


Fig. 2.



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ATOMIZING NOZZLE

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Fig. 3.

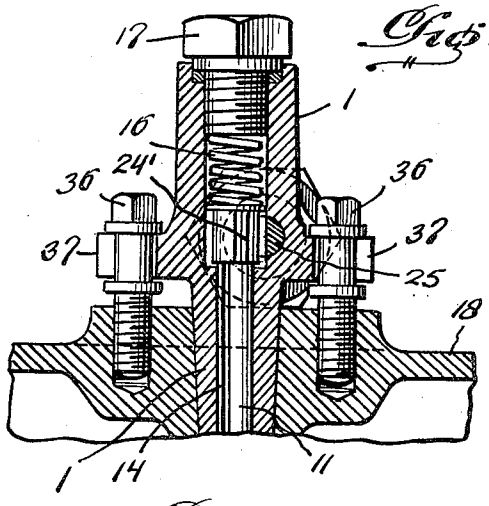


Fig. 4.

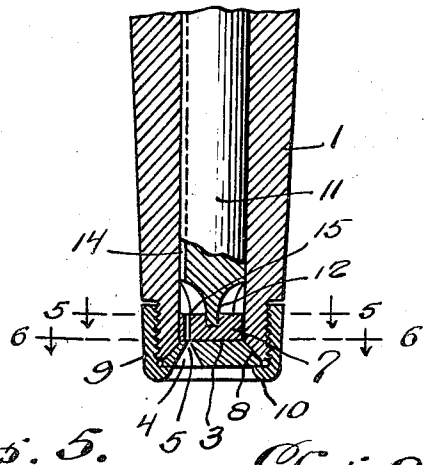


Fig. 7.

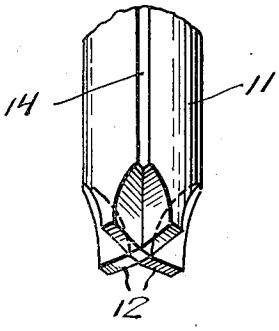


Fig. 5.

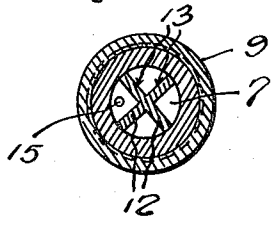


Fig. 9.

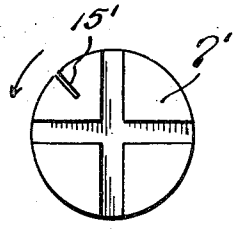


Fig. 8.

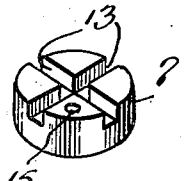


Fig. 6.

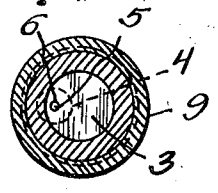


Fig. 10.

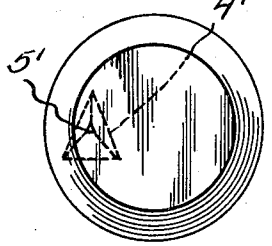
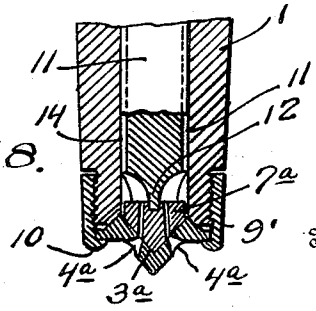


Fig. 18.



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ATOMIZING NOZZLE

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Fig. 11.

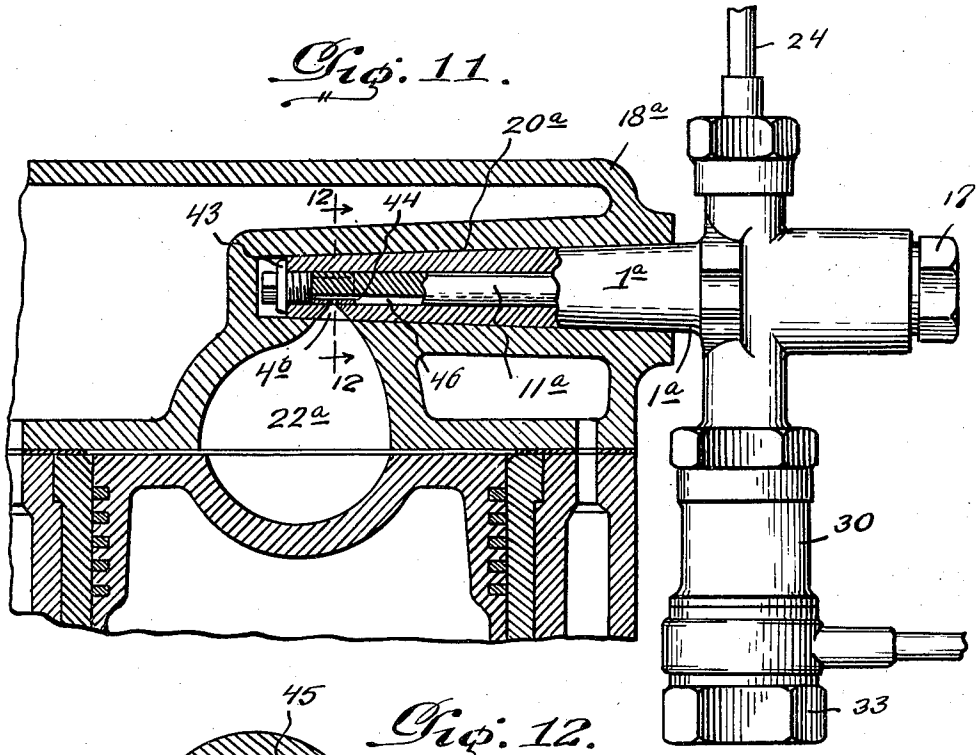


Fig. 12.

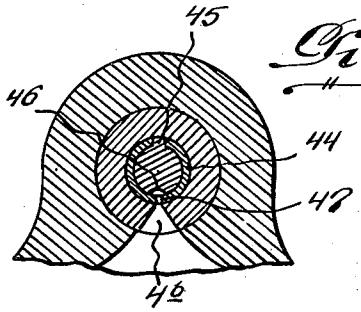


Fig. 13.

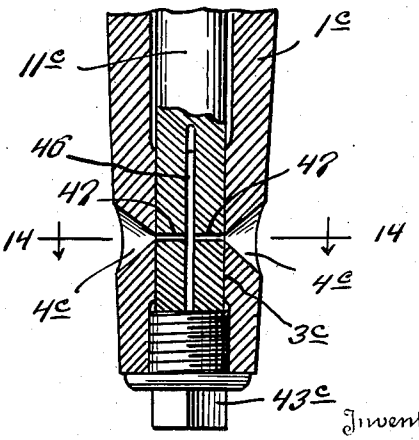
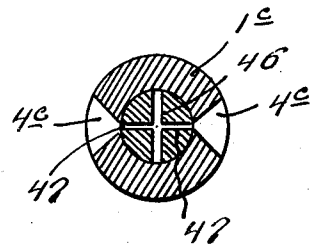


Fig. 14.



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ATOMIZING NOZZLE

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Fig. 15.

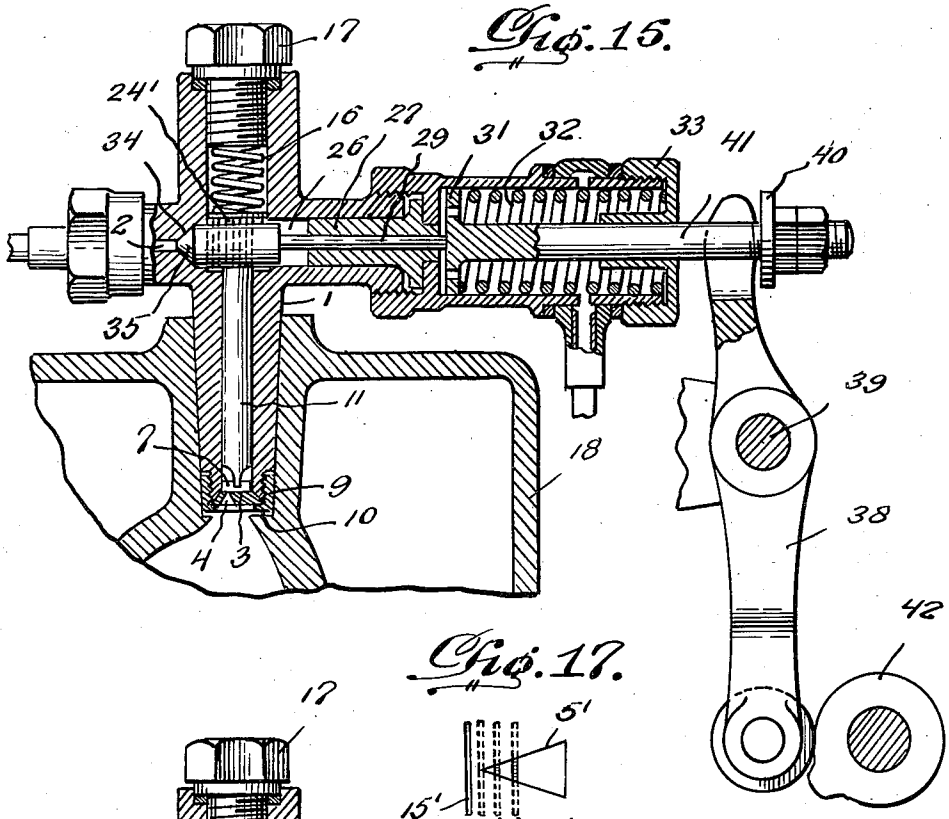


Fig. 17.

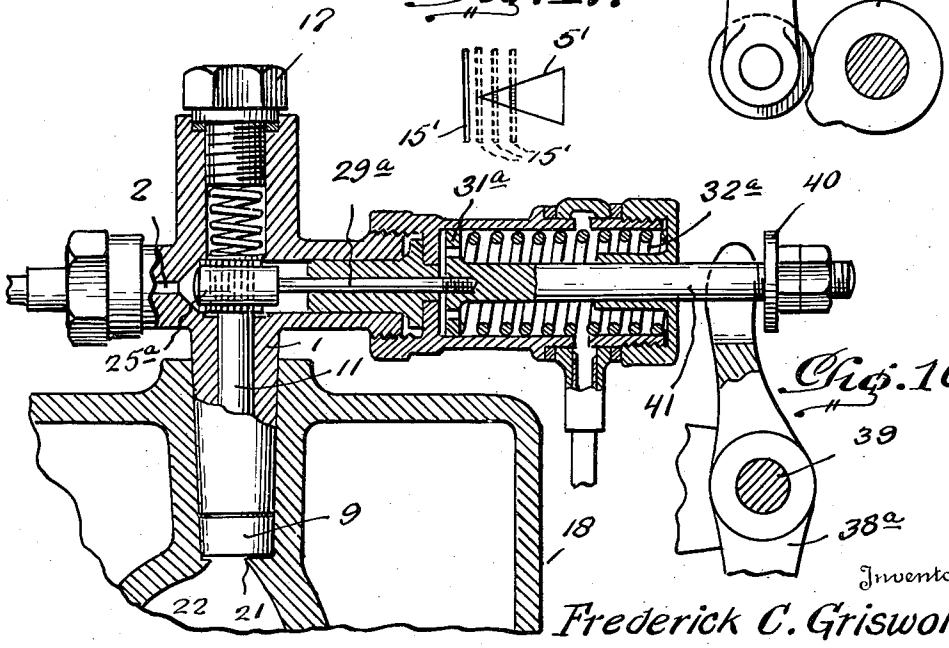


Fig. 16.

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Patented June 17, 1941

2,245,975

UNITED STATES PATENT OFFICE

2,245,975

ATOMIZING NOZZLE

Frederick C. Griswold, Port Jefferson, N. Y.

Application January 27, 1940, Serial No. 316,035

10 Claims. (Cl. 299—107.6)

This invention relates to atomizing nozzles particularly useful for atomizing fluid fuel as it is discharged into the combustion chambers of internal combustion engines.

In small oil burning internal combustion engines, where the charge of oil is very small and the oil is injected directly into the combustion chamber hydraulically, it has been difficult to break the oil into atoms small enough to thoroughly mix with the air and thereby provide for good combustion and economical operation. Also, it has been more difficult to produce good atomization of extremely small quantities of fluid fuel than relatively larger quantities thereof.

One of the principal objects of the present invention, therefore, is to provide a novel atomizing nozzle which will break the fluid fuel into extremely small atoms irrespective of the quantity of fuel discharged or the length of time of the atomization period, within reasonable limits.

Another object of the present invention is to provide an atomizing nozzle which will atomize fluid fuel into minute atoms from the beginning to the ending of the atomization period.

Still another object of the present invention is to provide an atomizing nozzle that is not apt to clog or become stopped up because of foreign matter becoming lodged in the restricted areas of the nozzle.

As in my co-pending application for U. S. Letters Patent, Ser. No. 316,034, filed Jan. 27, 1940, the present nozzle includes a body having a discharge port and provided with a bearing surface for a movable valve member, which bearing surface is disposed at right angles to the axis of the discharge port, and which discharge port is tapered from this bearing surface so as to flare outwardly therefrom and produce a knife edge at the bearing surface or at the minute orifice formed by the smaller inner end of the port. In my aforesaid co-pending application, the nozzle has a slide valve which is given a reciprocating rectilinear movement, whereas the movable valve member in the nozzle of the present application is given a reciprocating rotary movement.

Further objects and features of the present invention will become apparent from the following description when considered in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary vertical sectional view through the head end of an engine cylinder equipped with an atomizing nozzle constructed in accordance with the present invention.

Figure 2 is a horizontal section on line 2—2 of Figure 1.

Figure 3 is a fragmentary vertical section taken on the plane of line 3—3 of Figure 1.

Figure 4 is a fragmentary vertical section taken through the discharge end of the nozzle shown in Figure 1 and drawn on an enlarged scale with the movable valve member in open position.

Figure 5 is a horizontal section on line 5—5 of Figure 4.

Figure 6 is a horizontal section on line 6—6 of Figure 4.

Figure 7 is an enlarged fragmentary perspective view of the inner end portion of the valve stem forming part of the nozzle shown in Figure 1.

Figure 8 is an enlarged perspective view of the movable valve member forming part of the nozzle shown in Figure 1.

Figure 9 is a top plan view of a modified form of movable valve member which may be employed in lieu of the valve member shown in Figure 8.

Figure 10 is a top plan view of a wall member for the nozzle body having a modified form of discharge port.

Figure 11 is a view similar to Figure 1 showing a modified form of atomizing nozzle constructed in accordance with the present invention.

Figure 12 is a transverse vertical section on line 12—12 of Figure 11.

Figure 13 is a view similar to Figure 4 showing a further modification of the valve member and discharge port arrangement.

Figure 14 is a transverse section on line 14—14 of Figure 13.

Figure 15 is a view similar to Figure 11 of still another modification of the present atomizing nozzle.

Figure 16 is a view similar to Figure 15 of yet another modification.

Figure 17 is a diagrammatic plan view illustrating the manner in which the elements of Figures 9 and 10 will cooperate, when embodied in the present nozzle, for regulating the volume of fuel discharged; and

Figure 18 is a view similar to Figure 4 of still another modification of the ported wall of the nozzle body and of the movable valve member cooperating therewith.

Referring in detail to the drawings, the present atomizing nozzle includes an elongated body 1 provided with an axial bore and having a fluid inlet 2 intermediate its ends. The body 1

is also provided with a wall affording an inner bearing surface 3 and having an outwardly flared discharge port 4 at said bearing surface 3. The discharge port 4 flares outwardly from the bearing surface 3 to provide a minute orifice 5 and a knife edge 6 at the inner end of said port 4. The purpose of this is clearly explained in my above-mentioned co-pending application. A movable valve member 7 is seated by pressure against the bearing surface 3 and controls the discharge port 4.

In the embodiment illustrated in Figure 1, the wall having the bearing surface 3 consists of a disk member having a beveled edge adapted to engage the beveled end edge of the nozzle body proper as at 8 and securely held in place by means of a screw ring 9 having an inwardly directed annular end flange 10 arranged to engage the margin of the disk as shown clearly in Figure 4, the ring 9 being threaded on the lower or inner end of the nozzle body proper as shown. This construction and assembly provides for economical manufacture and at the same time avoids leakage where the beveled joint is provided between the ported disk and the nozzle body proper. These edges may be effectively ground and likewise with respect to the contiguous faces of the disk and the movable valve member 7.

Means is provided for imparting a reciprocating rotary motion to the valve member 7 which is also in the form of a disk. For this purpose, a valve stem 11 is rotatably fitted in the bore of the body 1 and has its inner or lower end formed to provide crossed bits 12 which are beveled upwardly and outwardly and are arranged to engage in crossed grooves 13 provided in the upper surface of the valve member 7. Due to the beveling of the bits 12, the valve member 7 is capable of limited lateral tilting relative to the stem 11 so as to always flatly contact the bearing surface 3. Obviously, the engagement of the bits 12 in the grooves 13 afford the necessary driving connection between the stem 11 and the valve member 7. A longitudinal groove or other passage 14 in the stem 11 provides for the necessary flow of fluid from the inlet 2 to the space immediately above the valve member 7 and said valve member 7 has a suitable outlet port or passage 15 therethrough which is normally out of registry with the discharge port 4 but situated so that limited turning of the valve member 7 will result in bringing the port 15 in registry with the port 4. The valve member 7 is not only seated by the pressure of the fluid against the bearing surface 3, but also by the pressure of a helical compression spring 16 interposed between the upper end of the stem 11 and a plug 17 threaded into the upper end of the body 1. As shown, the head 18 of the engine cylinder 19 is provided with a chamber 20 in which the lower end portion of the body 1 is snugly fitted, the body 1 and the chamber 20 being correspondingly tapered. At the bottom of the chamber 20, there is provided an inlet 21 communicating with the top of a combustion chamber 22 which has been illustrated as partly formed in the head 18 and partly formed in the piston head 23 of cylinder 19. The inlet 2 is suitably coupled to a pipe 24 leading from a suitable source of supply of fluid fuel under pressure.

The means for imparting reciprocating rotary motion to the stem 11 and valve member 7 may take any one of many different mechanical forms. As illustrated, the upper end of the stem 11 may be formed to provide a segment gear 24' meshing with a horizontal rack bar 25 slidable in an intermediate chamber 26 of the nozzle body 1. The chamber 26 is in line with the inlet 2 and a nipple 27 extending laterally from the opposite side of the body 1. Fitted and secured in the nipple 27 is a tubular guide 28 having an axial bore receiving a stem 29 rigid with one end of the rack bar 25. This stem 29 projects into the adjacent end of a cylinder 30 which is screwed onto the nipple 27 and which has a plunger 31 slidably fitted therein. The plunger 31 is urged in contact with the stem 29 by means of a helical compression spring 32 arranged in the cylinder or housing 30 between the plunger 31 and a cap 33 threaded on the outer end of the cylinder or housing 30. Spring 32 urges the plunger 31 to the left of Figure 1 and thereby moves the stem 29 and rack bar 25 so as to rotate the stem 11 and the valve member 7 to a position wherein said valve member 7 is in closed position. The plunger 31 is suitably vented and guided so as to insure free movement of the plunger 31 at all times, as described in connection with a similar arrangement in my above-mentioned co-pending application. In this form or embodiment, a valve seat 34 is provided where the fluid inlet 2 meets the bore of the body 1, and an end of the rack bar 25 is formed to provide a valve member 35 arranged to engage said seat and normally cut off communication between the intlet 2 and the interior of the nozzle body. When the pressure of the fluid exceeds the strength of the spring 32, the rack bar 25 will be moved so as to unseat the valve part 35 and permit fluid to flow under pressure into the space directly above the valve member 7. As this takes place, the stem 11 is turned so as to similarly turn the valve member 7 and bring the port 15 in registry with the discharge port 4. The fluid fuel is then discharged in a spray into the combustion chamber 22, the volume of fluid discharged depending upon the degree of opening movement of the valve member 7 as controlled by the pressure of the fluid supplied to the nozzle. As soon as the pressure of the fluid is lowered below the strength of the spring 32, said spring will act to reversely move the rack bar 25 and thereby reversely turn the stem 11 and valve member 7 until the latter is closed. The nozzle is suitably secured in place within the chamber 20, such as by means of bolts 36 threaded into the cylinder head 18 and having swivelled engagement in as well as being laterally removable from slotted lateral flanges 37 rigid with and extending from opposite sides of the nozzle body 1, as shown more clearly in Figure 3.

The discharge port 4 and outlet port 15 of a fuel atomizing nozzle of the present type must be designed for the type and size of combustion chamber with which it is to be used. For instance, where the combustion chamber is of spheroidal design and no provision made for turbulence therein, the atomized fuel should be ejected in cone shape, in which case the discharge port 4 is of cone shape as shown in all forms except Figures 9 and 10. Also, a round port is provided at 15 in the movable valve member 7 so as to cooperate with the round minute orifice at the inner end of the conical discharge port 4 and provide a spray of elliptical form in cross section as the movable valve member opens, when deep penetration of the spray into the combustion chamber is desired. In cases where the

combustion chamber is shallow but very broad and no provision is made for turbulence within the combustion chamber, the fuel should be ejected in a somewhat fan shape spray. This can thus be secured by providing a wall member of the form shown in Figure 10 in lieu of that shown in Figures 1 and 4, wherein the discharge port 4' is of pyramidal form and provides a minute orifice at its inner or smaller end which is of triangular form as at 5'. When this is done, a valve member 7' of the form shown in Figure 9 is substituted for the valve member 7, wherein the outlet port 15' is in the nature of a radial narrow slot in the edge portion of the valve member 7'. Such a slot-like port cooperates with the triangular orifice 5' as illustrated by the diagram in Figure 17. In this way, a gradual increase in the volume of fluid sprayed from the nozzle is effected as the valve member opens, but the thickness of the flared spray will not be increased and will be kept in fan shape.

In other instances, particularly in connection with large engines, it will be desirable to have several discharge ports in both the movable valve member and the wall with which it cooperates. Examples of how this can be accomplished are found in Figures 13 and 18, and it will be apparent that the embodiment of Figure 13 is such that the lower end of the nozzle must project into the combustion chamber. Referring to Figure 18, the wall member is held by the screw ring 9' against the lower end of the body proper 1 and is in the form of a hollow cone having the flared ports 4a at a plurality of points through the tapered wall thereof, the inner surface of this tapered wall constituting the bearing surface 3a for the valve member 7a. The valve member 7a has a conical lower surface corresponding to the bearing surface 3a and is snugly seated against said bearing surface by pressure as noted in connection with Figure 1. The valve stem 11 is identical with that of Figure 1 and may be operated in the same way.

In some cases, the pressure of the fluid may not be sufficient to overcome the action of the spring 32. When such is the case, mechanical means may be provided for periodically retracting the plunger 31 and compressing the spring 32 so as to permit the fluid under pressure to actuate the rack bar 25 and cause opening movement of the valve member 7. Such an arrangement is illustrated generally in Figure 15, wherein the lever 38 is pivoted intermediate its ends as at 39 and has a forked end engaging an abutment 40 carried by the projecting end of a stem 41 carried by the plunger 31, the other end of lever 38 being operatively associated with a rotary cam 42 suitably power driven. Each time the lever 38 is actuated by cam 42, the retraction of plunger 31 and compression of spring 32 is effected to permit the fluid under pressure to actuate the combined valve and piston member formed on an end of rack bar 25, thereby opening communication between the inlet 2 and the interior of the nozzle body and at the same time actuating the valve member 7 so as to open the same. As soon as the cam 42 releases lever 38, the spring 32 will promptly return the parts to the position of Figure 15 wherein the combined valve and piston member 35 is seated to cut off communication between the inlet 2 and the interior of the nozzle body and the valve member 7 is rotated to closed position. Otherwise, the device of Figure 15 corresponds with that of Figure 1, and it will be seen that the coacting faces of the movable valve member and the wall provided with the bearing surface 3 may be machined to insure against leakage therebetween.

As illustrated in Figure 16, the pressure of the fluid may not be relied upon for effecting opening of the valve. In other words, the stem 29a of the rack bar 25a may be connected with the plunger 31a so that when the lever 38a is actuated as in Figure 15 to compress the spring 32a, it will also act to shift the rack bar 25a so as to turn the movable valve member to open position. In this arrangement, the spring 32a is simply relied upon to return the movable valve member to closed position and mechanical means is provided for opening the movable valve member. As is also illustrated in this embodiment, the rack bar 25a may not necessarily have a combined valve and piston portion for cutting off communication between the inlet 2 and the interior of the nozzle body.

In some instances, it is preferable to utilize an atomizing nozzle of the present kind within a horizontal chamber 20a provided in and opening through one side of the cylinder head 18a as shown in Figure 11, the body 1a of the nozzle being horizontally disposed and having the discharge port 4b extending laterally through the wall thereof in communication with the top inlet of the combustion chamber 22a. In such an arrangement, the only difference between the construction of Figure 11 and that of Figure 1 will be that the port 4b is a lateral one and the movable valve member will control the flow through this discharge port 4b instead of through a port at the inner end of the nozzle body. To bring this about, the inner end of the nozzle body may be closed by a plug 43, and the inner end portion of the valve stem 11a may be reduced to receive a split resilient valve sleeve 44 and to provide a rib 45 arranged to engage between the ends of this split valve sleeve so that rotation of stem 11a will be imparted to the valve sleeve 44. The stem 11a will have a groove 46 behind the central portion of valve sleeve 44 so as to admit the fluid between the stem 11a and said valve sleeve 44 for ultimate passage through an outlet opening 47 provided in said valve sleeve 44. The outlet opening 47 will be arranged so that it will normally be out of registry with the discharge port 4b but will be moved in registry therewith when the stem 11a is actuated by the pressure of the fluid as in Figure 1. By tensioning the split valve sleeve 44 to normally expand into contact with the bearing surface afforded by the adjacent portion of the wall of the bore in nozzle body 1a, said valve sleeve 44 will at all times be snugly seated against such bearing surface to avoid leakage. Otherwise, the operation will be exactly the same as above described in connection with Figure 1, namely, a spring in the housing 30 will actuate a rack bar to rotate the stem 11a and valve member 44 to closed position, the pressure of the fluid overcoming the action of this spring to rotate stem 11a and valve member 44 in the opposite direction to a position wherein such valve member 44 is opened as illustrated in Figure 12.

The type of construction shown in Figure 11, provision may be made for use in a vertical position as in Figure 1, but with the lower end of the nozzle projecting into the combustion chamber. Also, this type of construction may have a plurality of outlet ports 4c extending laterally through opposite sides of the nozzle body 1c as shown in Figure 13. With this arrangement, the

lower or inner end of the valve body 1c will be closed by a plug 43c, and the movable valve member may be provided by specially constructing the inner or lower end of the valve stem 11c. As shown, this stem may have its inner or lower end provided with a central longitudinal slot 46 and transverse outlet ports 47 leading outwardly from the slot 46 to the exterior of the stem in the same horizontal plane as the discharge ports 4c. The valve stem 11c will of course be normally turned to a position wherein the ports 47 are out of registry with the ports 4c, the stem 11c being rotatable in a direction to bring the ports 47 into registry with the ports 4c. With this arrangement, two cone-like sprays may be simultaneously ejected into the combustion chamber, the movable valve member being normally closed by spring means and opened by fluid pressure operated or mechanical means as respectively shown in Figures 1 and 17. The bifurcations formed by providing the slot 46 are preferably tensioned to spring apart and thereby have a snug seating engagement with the bearing surface 3c afforded by the reduced bore portion of the nozzle body 1c.

From the foregoing description, the construction and operation, as well as the advantages of the present invention, will be readily understood and appreciated by those skilled in the art. It will be apparent that the invention is capable of finding embodiment in many different forms, and it is obvious that various changes may be made in the specific details of construction illustrated and described without departing from the spirit and scope of the invention as claimed.

What I claim as new is:

1. In a nozzle for atomizing fluid fuel and injecting the atomized fuel into the combustion chamber of an internal combustion engine, and wherein the fluid fuel is forced through a minute orifice under high pressure, a hollow body having a fuel inlet and provided with a wall affording an inner bearing surface, said wall having a tapered discharge port at said bearing surface, said discharge port gradually flaring outwardly from said bearing surface to the outer surface of said wall to provide a minute orifice and a knife edge at the inner end of said port and to present no ledge and no wall surfaces parallel with the axis of said port on which atoms of fuel may accumulate, a valve member rotatably fitted in said body and constantly engaged with and seated by pressure against said bearing surface, said valve member having an outlet port movable into and out of registry with said discharge port of the body and adapted to cooperate with the latter to form a fine spray of the fuel discharged through said discharge port into the combustion chamber, and means to periodically impart reciprocating rotary movement to said valve member for moving the outlet port of the latter into and out of registry with said discharge port.

2. In a nozzle for atomizing fluid fuel and injecting the atomized fuel into the combustion chamber of an internal combustion engine, and wherein the fluid fuel is forced through a minute orifice under high pressure, a hollow body having a fuel inlet and provided with a wall affording an inner bearing surface, said wall having a tapered discharge port at said bearing surface, said discharge port gradually flaring outwardly from said bearing surface to the outer surface of said wall to provide a minute orifice and a knife edge at the inner end of said port and to present no ledge and no wall surfaces parallel with the axis of said port on which atoms of fuel may accumulate, a valve member rotatably fitted in said body and constantly engaged with and seated by pressure against said bearing surface, said valve member having an outlet port movable into and out of registry with said discharge port of the body and adapted to cooperate with the latter to form a fine spray of the fuel discharged through said discharge port into the combustion chamber, and means to periodically impart reciprocating rotary movement to said valve member for moving the outlet port of the latter into and out of registry with said discharge port, said movement imparting means including spring means acting to turn the valve member in one direction to a position wherein its port is out of registry with said discharge port of the body, and piston means operable by the pressure of the fuel thereon when said pressure exceeds the strength of said spring means for turning the valve member in the opposite direction so as to bring its outlet port in registry with said discharge port of the body.

3. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with a wall affording an inner bearing surface, said wall having a tapered discharge port at said bearing surface, said discharge port gradually flaring outwardly from said bearing surface to the outer surface of said wall to provide a minute orifice and a knife edge at the inner end of said port, a valve member rotatably fitted in said body and constantly engaged with and seated by pressure against said bearing surface, said valve member having an outlet port movable into and out of registry with said discharge port of the body by imparting reciprocating rotary movement to said valve member, spring means acting to turn the valve member in one direction to a position wherein its port is out of registry with said discharge port of the body, and means operable by the pressure of the fluid thereon when said pressure exceeds the strength of said spring means for turning the valve member in the opposite direction so as to bring its outlet port in registry with said discharge port of the body, said last-named means including a valve member acting to normally cut off communication between said fluid inlet and the interior of the body.

4. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with a wall affording an inner bearing surface, said wall having a tapered discharge port at said bearing surface, said discharge port gradually flaring outwardly from said bearing surface to the outer surface of said wall to provide a minute orifice and a knife edge at the inner end of said port, a valve member rotatably fitted in said body and constantly engaged with and seated by pressure against said bearing surface, an operating stem for said valve member rotatably fitted in said body, means to periodically impart reciprocating rotary movement to said stem and said valve member for intermittently opening and closing said discharge port, said wall comprising a disk removably fastened to an end of the body proper, said valve member comprising a ported disk having crossed grooves in the inner surface thereof, and said stem having an end formed to provide crossed bits engaging in said grooves and beveled to centrally engage

and permit limited lateral tilting movement of the valve member relative to the stem and thereby insure constant flat engagement of the valve member with said wall.

5. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with a wall affording an inner bearing surface, said wall having a tapered discharge port at said bearing surface, said discharge port gradually flaring outwardly from said bearing surface to the outer surface of said wall to provide a minute orifice and a knife edge at the inner end of said port, a valve member rotatably fitted in said body and constantly engaged with and seated by pressure against said bearing surface, an operating stem for said valve member rotatably fitted in said body, means to periodically impart reciprocating rotary movement to said stem and said valve member for intermittently opening and closing said discharge port, said wall comprising a disk removably fastened to an end of the body proper, said valve member comprising a ported disk having crossed grooves in the inner surface thereof, and said stem having an end formed to provide crossed bits engaging in said grooves and beveled to centrally engage and permit limited lateral tilting movement of the valve member relative to the stem and thereby insure constant flat engagement of the valve member with said wall, and a spring acting on said valve stem to force the latter and the valve member toward said wall and thereby cause pressure engagement of the valve member with said wall.

6. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with a lateral outwardly flared tapered discharge port, the bore of said body forming a bearing surface at said discharge port, a valve stem rotatably fitted in said hollow body and having a ported valve member at one end seated by pressure against said bearing surface, spring means to rotate the valve stem so as to normally position the valve member in closed position, power-operated means for rotating the valve stem in the opposite direction to bring the valve member in open position with respect to said discharge port, an end of said valve stem being reduced and provided at said reduced end with a longitudinal rib, a split spring sleeve fitted on the reduced end of said stem and constituting said valve member, said rib being interposed between the ends of said sleeve to provide a driving connection between the sleeve and the stem, and a port in said sleeve movable into and out of registry with the discharge port as the stem is turned in opposite directions.

7. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with a lateral outwardly flared tapered discharge port, the bore of said body forming a bearing surface at said discharge port, a valve stem rotatably fitted in said hollow body and having a ported valve member at one end seated by pressure against said bearing surface, spring means to rotate the valve stem so as to normally position the valve member in closed position, power-operated means for rotating the valve stem in the opposite direction to bring the valve member in open position with respect to said discharge port, an end of said valve stem being reduced and provided at said reduced end with a longitudinal rib, a split spring sleeve fitted on the reduced end of said stem and constituting said valve member, said rib being interposed between the ends of said sleeve to provide a driving connection between the sleeve and the stem, a port in said sleeve movable into and out of registry with the discharge port as the stem is turned in opposite directions, said sleeve being tensioned to normally expand into snug engagement with the bearing surface.

8. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with a wall affording an inner bearing surface, said wall having a tapered discharge port at said bearing surface, said discharge port gradually flaring outwardly from said bearing surface to the outer surface of said wall to provide a minute orifice and a knife edge at the inner end of said port, a valve member rotatably fitted in said body and constantly engaged with and seated by pressure against said bearing surface, an operating stem for said valve member rotatably fitted in said body, a segment gear on the outer end of said stem, a rack bar movable transversely of the stem and meshing with said segment gear, spring means acting on the rack bar to rotate the stem in a direction to turn the valve member to closed position, power-operated means for actuating the rack bar in the opposite direction to rotate the stem and valve member in such opposite direction and thereby bring the valve member in open position, and a combined piston and valve carried by the rack bar normally seated to close communication between the inlet and the interior of the valve body and operable by the pressure of the fluid when such pressure exceeds the strength of said spring means to turn the valve member to open position.

9. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with an end wall affording a conical inner bearing surface, said wall having a plurality of outwardly flared tapered discharge ports therethrough at said bearing surface, a valve disk member rotatably fitted in said body and having a conical lower surface constantly engaged with said bearing surface, and a valve stem rotatably fitted in the body and having driving engagement with said valve disk member, said valve disk member having outlet ports therethrough movable into and out of registry with said flared discharge ports.

10. In a fluid atomizing nozzle wherein the fluid is forced through a minute orifice under high pressure, a hollow body having a fluid inlet and provided with an end wall affording a conical inner bearing surface, said wall having a plurality of outwardly flared tapered discharge ports therethrough at said bearing surface, a valve disk member rotatably fitted in said body and having a conical lower surface constantly engaged with said bearing surface, and a valve stem rotatably fitted in the body and having driving engagement with said valve disk member, said valve disk member having outlet ports therethrough movable into and out of registry with said flared discharge ports, and spring means acting on said valve stem to force the latter and the valve disk member toward said wall and thereby maintain the valve disk member pressed against said bearing surface.

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