Aug. 10, 1926. 1,595,625

P. L. SCOTT

DOUBLE ORIFICE ATOMIZING NOZZLE

Filed June 20, 1924

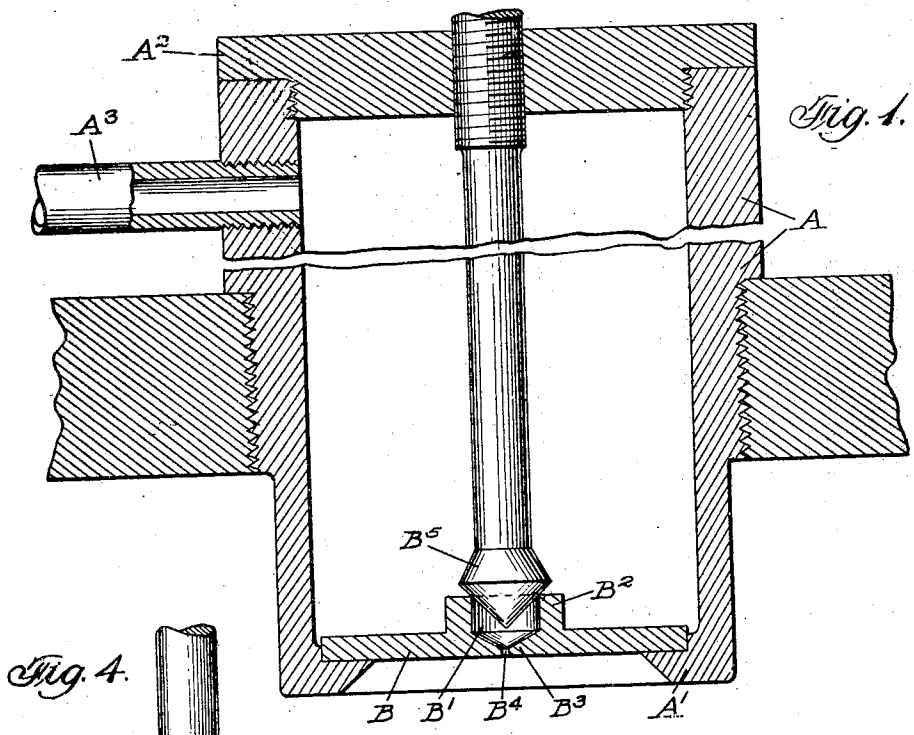


Fig. 1.

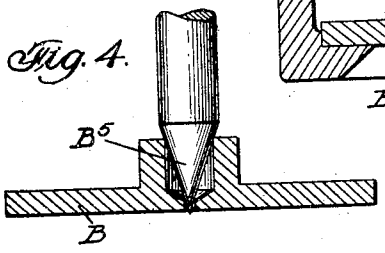


Fig. 4.

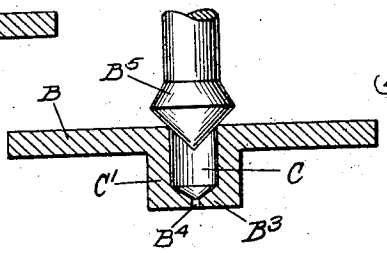


Fig. 2.

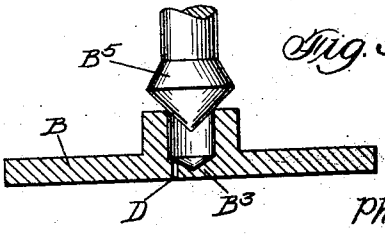


Fig. 3.

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UNITED STATES PATENT OFFICE.

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DOUBLE-ORIFICE ATOMIZING NOZZLE.

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My invention relates to improvements in spray valves such as are adapted for use in connection with spraying the fuel charge in an internal combustion engine, for the fuel spray in a combustion chamber of a boiler or furnace, or spraying any liquid which it is desired to finely atomize and comminute and perhaps to mix with a gas.

I have found out by experiment that if liquid alone, without the addition of air or gas under pressure, is sprayed or forced under pressure through an exceedingly minute passageway, as for instance, through the narrow space between a blunt-ended needle and an aperture in a disk, that if the pressures are sufficiently high, and if the space between the needle and the wall of the aperture is sufficiently small, I will be able to obtain a very fine degree of atomization and that the atomized liquid will be discharged in a jet or spray into a chamber or other receptacle into which the spray nozzle discharges. Experience has, however, shown that the permissible degree of variation of the dimensions and arrangement of the parts and the pressure under which injection takes place is limited, and that sometimes conditions change in operation merely as a result of the injection, so as to change radically the spraying and atomizing operation; so that when the apparatus is set up to produce satisfying atomizing and spraying it frequently will do so for a short time and then, for no very clear reason, suddenly cease satisfactory operation.

I have found that by closing the aperture by a relatively thin membrane removed from the spray aperture, and by piercing that relatively thin membrane with a short discharge passage, I greatly improve the operation of the spray head and greatly increase the permissible limit of variation of pressure, dimensions of parts and width of aperture. I find that when such an arrangement is provided even very rough and crude arrangements of the spray aperture and needle valve or pin will result in a very satisfactory spraying and atomizing.

My invention is illustrated more or less diagrammatically in the accompanying drawings, wherein—

Fig. 1 is a diagrammatic section through a spray disk, showing the needle valve;

Fig. 2 is a similar section showing a slightly different arrangement of the disk;

Fig. 3 is a similar section showing a slightly different position of the discharge passage;

Fig. 4 is a similar section showing in detail a modified form of valve.

Like parts are indicated by like characters in the drawings.

A is a spray barrel flanged as at A′ at its lower end and closed at its upper end by a cap A^2. A^3 is a pipe through which the liquid to be sprayed is fed under pressure to the barrel.

B is a spray disk in the bottom of the barrel resting upon the flange A′, seated either by gravity, by the pressure of the liquid, or by any other suitable mechanical means not here illustrated. This disk is provided with a central aperture B′ which, in one instance, is surrounded by an upwardly projecting annular wall B^2. The bottom of the aperture is closed by a diaphragm B^3 through which is a comparatively small and comparatively short aperture B^4. The aperture B′ is closed by the needle valve B^5 and in this present form I rely upon the pressure of the liquid to force the diaphragm B slightly away from the end of the needle valve so as to make a sufficient aperture to permit the liquid to be sprayed through. Of course, obviously the needle valve and diaphragm might be made rigid and set at some predetermined position with a predetermined aperture between the face of the needle valve and the wall of the aperture through the disk.

In the modified form shown in Fig. 2, the aperture C is of lesser diameter and greater depth than the aperture B′ and the diaphragm, instead of being flush with the bottom of the disk, is flush with the bottom of a projection C′ which extends downwardly from the under face of the disk.

In the modified form shown in Fig. 3, the perforation D through the diaphragm B^3, instead of being central, is disposed eccentrically.

In all three cases the operation is exactly the same.

In the modified form shown in Fig. 4 the needle projects clear through both of the apertures that is to say the large sealing aperture is such that the needle may seat

to close the aperture. It also projects through another distribution or secondary aperture, and the needle may or may not close that aperture also when in its seated position, but it always projects through it so that the spray or stream is discharged about the needle. X indicates the point at which the member B^5 closes the discharge aperture or guiding orifice as shown in Figure 4.

I claim:

1. A spray valve comprising a flexible apertured plate, a needle valve closing the aperture at one side of the plate, and a perforated wall extending across the aperture in the plate on the other side thereof, the plate being adapted to be deflected.

2. In a spray nozzle a seat, a perforated member carrying said seat and a needle normally seated in said seat closing the same, a short passage leading from such seat and a perforated closure extending across said passage, said seat carrying member adapted to yield to open a passage between the seat and the needle when the pressure of liquid exceeds a predetermined point.

3. A spray nozzle comprising a liquid receptacle having an apertured plate, a needle valve adapted normally to close said aperture, the plate being adapted to be deflected by pressure on the liquid contained within the receptacle to unseat the valve and permit discharge of liquid between the needle valve and the wall of the aperture, and a perforated wall extending across said aperture at a point removed from the needle valve.

4. A spray nozzle comprising a liquid receptacle having an apertured plate forming a part thereof, a perforated wall extending across said aperture on the discharge side thereof, a needle valve in opposition to said perforation just clearing the wall thereof, the needle valve and the aperture being normally in engagement, the plate being adapted to be deflected by pressure of the liquid in the receptacle to unseat the valve.

5. In an atomizing nozzle, a valve member adapted to move to form a minute narrow atomizing opening, a short relatively large passage leading therefrom, and a closure for said passage having a directing discharge opening therethrough larger than the atomizing opening, the up stream atomizing opening being normally closed and adapted to open in response to the pressure of the liquid passing therethru.

6. A spray nozzle comprising a needle valve and a member associated therewith and forming a valve seat, such member being movable in response to the pressures of the fluid acting thereon, the nozzle having two openings in series, with a short connecting passage between them, the first opening being narrow and located between the needle valve and its seat and operating to break up and atomize the liquid spray, and the second opening operating to direct and guide the atomized spray, the upstream atomizing opening being normally closed by the needle valve and adapted to open in response to the pressure of the liquid acting on the said movable member.

7. In an atomizer nozzle, a valve adapted to move to form two openings in series, a short connecting passage between them, the first one being adapted to break up and atomize the spray, the second to direct and guide it, the first opening being exceedingly narrow and longer than its width, the up stream atomizing opening being normally closed and adapted to open in response to the pressure of the liquid passing therethru.

8. In an atomizing nozzle, a valve member adapted to move to form two openings in series, a short connecting passage between them, the first one being adapted to break up and atomize the spray, the second to direct and guide it, the first opening being exceedingly narrow and longer than its width, the passage between the two openings being unobstructed and many times larger in cross section than either of said openings, the up stream atomizing opening being normally closed and adapted to open in response to the pressure of the liquid passing therethru.

9. In an atomizing nozzle a valve member adapted to move to form a primary minute atomizing orifice, a secondary guiding orifice through which the atomized material passing through the first is discharged, the up stream opening being normally closed and adapted to open in response to the pressure of the liquid passing therethru.

Signed at Philadelphia, Pennsylvania, this 18th day of June, 1924.

PHILIP LANE SCOTT.