H. D. BINKS.

TWO FLUID SPRAY NOZZLE.

APPLICATION FILED APR. 1, 1920.

1,433,255.

Patented Oct. 24, 1922.

Fig. 1.

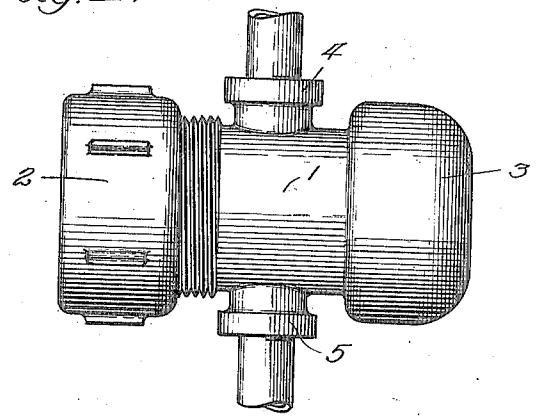


Fig. 2.

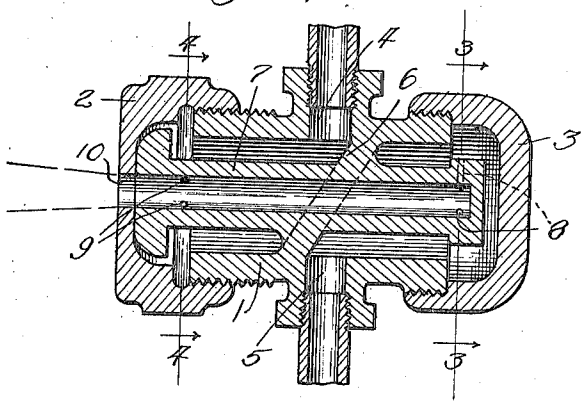


Fig. 3.

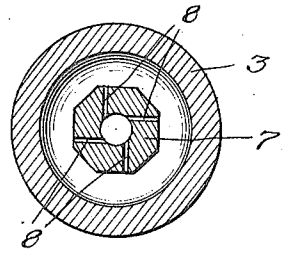


Fig. 4.

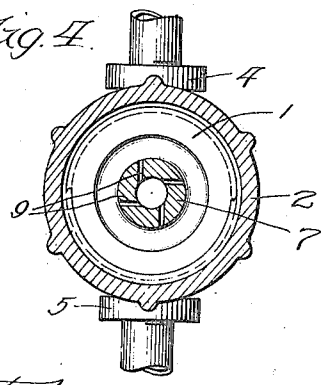
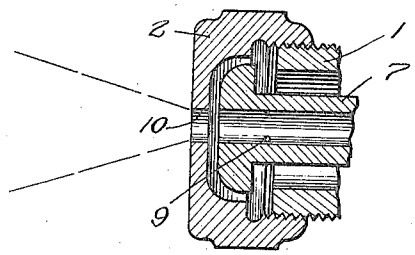


Fig. 5.



Witness:

H. L. Darrington

Inventor:

Harry D. Binks

by Albert Scheible

Attorney

Patented Oct. 24, 1922. 1,433,255

UNITED STATES PATENT OFFICE.

HARRY D. BINKS, OF RIVER FOREST, ILLINOIS.

TWO-FLUID SPRAY NOZZLE.

Application filed April 1, 1920. Serial No. 370,391.

To all whom it may concern:

Be it known that I, HARRY D. BINKS, citizen of the United States, residing at River Forest, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in a Two-Fluid Spray Nozzle; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to nozzles for spraying or atomizing liquids, and its general objects include those of providing a simple and cheaply constructed nozzle for such purposes which can easily be cleaned and which can readily be manipulated to vary both the density of the spray, the angle defined by the spray and the distance to which the spray is projected.

In some of its important commercial aspects, my invention aims to provide a spray nozzle suitable for use with two fluids, one of which fluids may be air or steam, and in this aspect aims to provide a nozzle of simple construction which can readily be adjusted without disconnecting it from the sources of fluid supply, for varying the effect produced by the nozzle. Furthermore, my invention aims to provide a nozzle for the general purposes above named which can readily be taken apart without disconnecting the same from the piping, and which will permit an easy cleaning of its operative parts. Still further and more detailed objects will appear from the following specification and from the accompanying drawings, in which—

Fig. 1 is an elevation of a nozzle embodying my invention.

Fig. 2 is an enlarged and central logitudinal section through the same.

Figs. 3 and 4 are transverse sections taken along the correspondingly numbered lines in Fig. 2.

Fig. 5 is a fragmentary section similar to the forward end of Fig. 2 and showing the nozzle as adjusted for projecting a long and slender spray of liquid, as for example in spraying oil into a furnace.

In the embodiment of the drawings, the nozzle of my invention consists of three parts, namely a tubular body 1, a forward cap 2 threaded upon one end of the same, and a rear cap 3 threaded upon the other end of this tubular body. The body 1 has a pair of lateral inlets 4 and 5 leading to the two opposite end portions of its bore, which portions are separated by a partition 6 extending across the bore. This partition carries an inner tube 7 which is otherwise freely spaced from the bore of the body and which desirably projects at both ends beyond the latter. This inner tube is closed at its rear end and is equipped near this rear end with lateral ports 8, and near its forward end with a set of lateral ports 9. The ports comprising each of these sets are preferably out of alinement with the axis of the nozzle, and desirably substantially tangential of the bore of the inner tube, after the manner shown in Figs. 3 and 4. The rear cap 2 desirably has a shoulder formation engaging the rear end of the valve body, so that the inlet 5 is connected to the bore of the inner tube only through the rear ports 8. The forward cap 2 is so threaded upon the valve body that it may be adjusted longitudinally of the latter and may therefore either be screwed up tightly against the forward end of the inner tube, as shown in Fig. 2, or may be moved away from the latter as shown in Fig. 5. In this latter position it affords an opening between the inner tube and the cap 2, which cap has a mouth 10 alining with the bore of the inner tube.

If my nozzle is to be used for spraying or atomizing liquids, the supply of liquid is connected to the inlet 5, and this liquid is desirably supplied under a sufficient head to force it through the bore of the inner tube by its own pressure. When thus introduced, the non-axial disposition of the inlet ports 8 will cause the entering liquid to rotate within the bore of the inner tube, so that the liquid will advance spirally and if otherwise unaffected would issue from the mouth 10 of the nozzle in a rather dense and somewhat conical hollow stream undesirable for most purposes. To break up the density of this stream and to increase the distance to which the liquid is projected from the nozzle, I introduce air or steam through the companion inlet 4. This air or steam is de-

sirably supplied at a pressure considerably greater than that of the liquid, and in impacting against the spirally advancing jet of liquid within the inner tube, the air or steam both breaks the liquid up into fine particles and greatly increases the distance for which the liquid is projected from the mouth of the nozzle. Thus, I have found in practice that I can readily atomize various liquids into a very finely divided spray, and by suitably proportioning the length of the outlet portion between the mouth 10 and the extreme forward end of the nozzle in proportion to the bore of the latter, I can obtain a desirable angle for the resulting spray or mist. Consequently, my nozzle readily lends itself to the production of finely divided sprays for use in chemical operations, for applying paints or the like, and for the moistening of various objects.

Moreover, I can readily control both the density of the spray and the angle of projection of the latter to a considerable extent by varying the pressures at which the fluids are supplied to the inlets 4 and 5, and particularly by varying the pressure of the fluid supplied through the high-pressure inlet 4 and the forward ports. If a still narrower angle of spray and greater length of projection is desired, I can readily obtain this by unscrewing the forward cap 2 more or less. By so doing, after the manner of Fig. 5, I permit the fluid entering the inlet 4 not only to enter the inner tube through the ports 9, but also permit the high-pressure fluid to reach the mouth 10 of the nozzle more readily through the gap between the cap 2 and the forward end of the inner tube. With the parts thus adjusted, it will be obvious from Fig. 5 that the liquid entering through the inlet 5 and the ports 8 is spirally advanced within the bore of the inner tube, and that the spirally advancing jet is subjected to the impact and influence of fluid admitted by the inlet 4 and entering a more forward portion of the inner tube through the ports 9. As the resulting jet passes across the gap between the forward end of the inner tube and the cap 2, this jet is surrounded by another but non-rotating portion of the fluid which entered through the inlet 4 and is therefore subjected to a peripherally applied pressure directed radially inward of the jet. This pressure cooperates with the influence to which the particles comprising the jet had previously been subjected, and with the aperture 10 of the cap in producing effects which could not be obtained without such an added and peripherally applied or contractile fluid pressure. For example, I have found that with liquids supplied through the inlet 5 under a head of only one foot, and with a twenty pound air pressure supplied through the inlet 4, I can readily project a fine spray of liquid for a distance of about eight feet; and that I can vary both the angularity of the spray and the distance to which it is projected, by varying the air pressure and the extent to which the cap is unscrewed.

It will be obvious from the above that the nozzle of my invention is exceedingly simple in construction, involving only three parts, and that by removing both of the caps I readily obtain access to the entire interior of the nozzle, so as to clean the same if this should be necessary. Owing to the absence of any vanes or the like, and to the fact that the ports in the inner tube are located beyond the ends of the valve body, such a cleaning is made very easy, so that I reduce delays on this account even when using liquids containing a considerable amount of impurities. Moreover, since I can so easily vary the effects obtained by my nozzle, I can readily employ one and the same nozzle for a larger variety of purposes than has heretofore been possible.

Regardless of the nature of the fluids used, it will also be noted that the adjustment of nozzles embodying my invention can readily be made while the nozzle is in actual use. For example, if my nozzle does not afford just the desired liquid distributing effect, the effective pressure of the fluid supplied through the forward portion of the tubular chamber can be varied by any common method (such as by manipulating a throttling valve associated with the inlet 5) and the spacing between the mouth of the inner tube and the outlet of the nozzle can be varied by rotating the cap 2 in either direction. Both of these adjustments can be made while the nozzle is in actual service, thus avoiding any shutting down or disassembling of the nozzle for such a purpose and making it easy for the user to operate the nozzle at a high degree of effectiveness.

However, while I have illustrated and described my invention in a desirable embodiment in which the inner tube is cast integral with the valve body and in which the inlet ports to this inner tube are substantially tangential of this bore, I do not wish to be limited to these or other details of the construction and arrangement thus disclosed. Obviously, various additions, omissions or changes might be made without departing from the spirit of my invention. Neither do I wish to be limited to the use of my nozzle with the particular fluids mentioned by me. The liquid introduced through the rear ports into the inner tube could obviously be varied greatly, while the fluid supplied through high-pressure inlet 4 might also be a liquid, although I have found my nozzle particularly suitable for use with non-liquid fluids introduced through the inlet connected to the forward portion of the tubular chamber within the

nozzle. Furthermore, the liquid might be supplied through the inlet 4 and the high-pressure fluid through the inlet 5, thereby affording still different effects with one and the same nozzle.

I claim as my invention:

1. A spray nozzle comprising a tubular body, a transverse partition dividing the bore of the body into forward and rear portions, an inner tube extending through the partition and projecting at both ends beyond the body, the inner tube having a closed rear end and having lateral ports disposed respectively near its two ends, a closure cap for the rear of the tubular body, a forward cap mounted on the body and having an aperture aligning with the forward end of the inner tube, and fluid inlets disposed at opposite sides of the partition and leading to portions of the space between the inner tube and the bore of the body and respectively connected through the said portions to the said ports.

2. In a spraying or atomizing nozzle, a pair of concentric tubes, a partition dividing the space between the tubes into a pair of tubular chambers, fluid inlets for the two chambers, both the rear chamber and the rear end of the inner tube being closed and the inner tube having non-radial ports connecting it respectively with the two chambers, a perforate closure for the forward chamber having its perforation in alinement with the forward end of the inner tube, and means for varying the spacing between the perforate closure and the end of the inner tube.

3. In a spray nozzle, a tubular body open at its ends and having lateral inlets, means in the body for causing fluid from one inlet to pass rearwardly of the body and for causing fluid from the other inlet to pass forwardly of the body, an inner tube in the body having a closed rear end and having lateral ports adjacent its respective ends, closure means for the rear end of the body spaced from the closed rear end of the tube, and a cap on the forward end of the body and being adjustable with relation to the forward end of the tube to vary the space between the cap and said forward end of the tube.

4. In a spray nozzle, a tubular body, a tube in the body spaced therefrom, a pair of ports leading into the body, said tube having spaced ports, and means in the body for directing fluid from one port of the body to one port of the tube and for directing fluid from the other port of the body to the other port of the tube.

5. In a spray nozzle, a tubular body, a tube in the body spaced therefrom, a pair of ports leading into the body, said tube having spaced ports, and means in the body common to said pair of ports for directing fluid from one port of the body to one port of the tube and for directing fluid from the other port of the body to the other port of the tube.

6. In a spray nozzle, a tubular body, a tube in the body having ports adjacent its ends, a pair of ports leading into the body, and a partition extending across the body and disposed to cause fluid from one body port to be directed towards one of the tube ports, and fluid from the other body port to be directed toward the other tube port.

7. In a spray nozzle, a tubular body having a pair of opposite ports, an inner tube having ports adjacent its ends, and a diagonal partition in the body extending across the respective ports thereof to cause fluid from one body port to be directed towards one of the tube ports, and fluid from the other body port to be directed towards the other tube port.

8. In a spray nozzle, a tubular body having a pair of opposite ports, an inner tube in the body having an inlet for each end, and a diagonal partition in the body extending across the respective ports thereof to cause fluid from one body port to be directed towards one of the tube inlets, and fluid from the other body port to be directed towards the other tube inlet.

9. In a spray nozzle, a tubular body having ports, a tube in the body, and combined means for supporting the tube and for directing the fluid from the respective ports toward opposite ends of the tube.

10. A spray nozzle including a tubular body having a pair of lateral ports, a tube in the body, disposed with its respective ends projecting outwardly from the ends of the body, means to cause the fluid from the respective ports to be directed toward the body ends, and a cap threaded on each end of the body.

11. In a spray nozzle, a tubular body having a pair of lateral ports between its ends, a tube in the body having its ends extending beyond the body ends, means to support the tube and to direct fluid from the respective ports towards opposite ends of the body and a cap threaded on each end of the body.

12. In a spray nozzle, a tubular body having a pair of lateral ports between its ends, a tube in the body having its ends extending beyond the body ends, a cap threaded on each end of the body, and means in the body to direct fluid from the respective ports toward the opposite ends of the body.

13. In a spray nozzle, a body, a tube therein having lateral ports, beyond the adjacent end of the body, said tube having a head extending laterally over and spaced from the said body end, means to direct fluid from the respective ports towards the

opposite ends of the body and a cap adjustable on the body and enclosing said head.

14. In a spray nozzle, a body, a tube therein having lateral ports, beyond the adjacent end of the body, said tube having a head spaced from the said body end, means to direct fluid from the respective ports towards the opposite ends of the body and a cap adjustable on the body and enclosing said head.

Signed at Chicago, Illinois, March 30th, 1920.

HARRY D. BINKS.