Mar. 13, 1923. 1,448,106.

H. D. BINKS.

ATOMIZING NOZZLE.

FILED APR. 15, 1920.

Fig. 1.

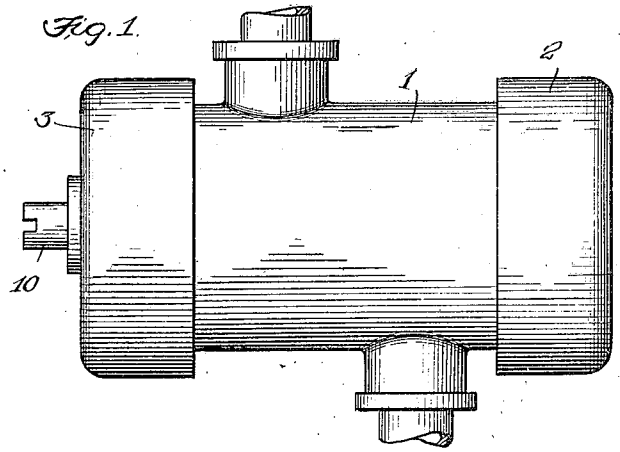


Fig. 3.

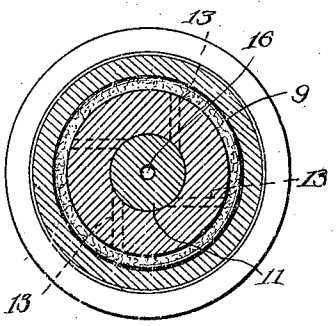


Fig. 2.

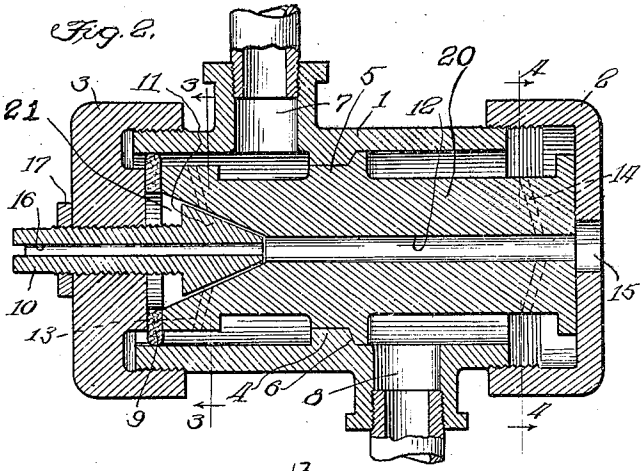


Fig. 4.

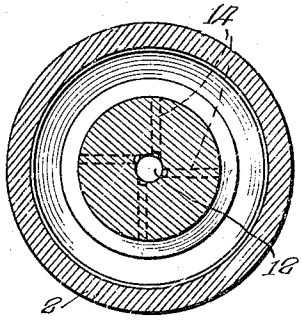
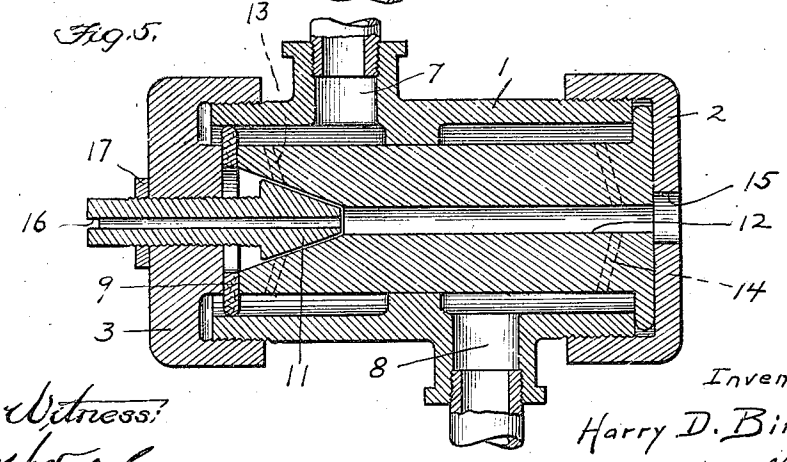


Fig. 5.



Witness:
U. K. Olson

Inventor:
Harry D. Binks
by Albert Scheible Attorney

Patented Mar. 13, 1923. 1,448,106

UNITED STATES PATENT OFFICE.

HARRY D. BINKS, OF RIVER FOREST, ILLINOIS.

ATOMIZING NOZZLE.

Application filed April 15, 1920. Serial No. 374,010.

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 an Atomizing 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 atomizers or spraying nozzles, its general objects being those of providing a nozzle for distributing liquid in the form of a very finely divided spray or mist, for accomplishing this with only a slight head or pressure on the liquid which is to be distributed, and for affording a wide angle of distribution.

In one of its more particular aspects, my invention aims to provide a simple and effective nozzle adapted to operate under a small head of the liquid and to distribute the same in a solid conical spray of an unusually wide angle, as also to provide simple means for varying the density of the spray (or the minuteness of the particles) if desired, and for adjusting the effect of the actuating fluid pressure. In another aspect, my invention aims to provide a nozzle which will not only completely atomize a given liquid, but which will also furnish an additional air supply intermixed with the moisture or spray, thereby affording a nozzle particularly adapted for use in the burning of oils.

In another aspect, my invention aims to provide a two-fluid nozzle which will be unusually effective in operation, which can readily be constructed from easily manufactured parts, and which will be easy to adjust and manipulate. Furthermore, my invention aims to provide a spray or atomizing nozzle adapted to be used with either two or three different fluids. Still further and more detailed objects will appear from the following specification and from the accompanying drawings in which drawings

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

Fig. 2 is a central and longitudinal section through the same.

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

Fig. 5 is a section similar to Fig. 2 but showing a different method of supporting the inner tube.

In some of its aspects, my invention is allied to the two-fluid spray nozzle disclosed in my copending application No. 370,391 on a two-fluid spray nozzle, as filed by me on April 1, 1920. In this nozzle I employed a tubular casing having an inner tube supported by a partition extending across the bore of the casing, with the inner tube, the partition and the tubular part of the casing forming parts of an integral casting. In practice, the coring required for making such a casting represents considerable difficulty and leads to the spoiling of a good many of the castings, thereby increasing the cost. In my present invention I have provided a separable construction in which the coring of the main or body member is greatly simplified, and have also made other changes which may also be desirable in two-fluid nozzles of the general type recited in my said copending application.

In the embodiment here illustrated, the nozzle of my invention includes a tubular casing or body 1 having perforated caps 2 and 3 threaded respectively upon its forward and rear ends. Intermediate of its ends, the body 1 has an inwardly directed collar 4, which slidably fits an enlargement 5 on an inner tube 20 and which also affords an annular shoulder for engaging a collar 6 on the exterior of this inner tube. The shoulder formation within the main member and the collar on the inner tube desirably have their adjacent faces frusto-conical so that one can seat tightly on the other to afford a substantially sealed joint. Consequently, when the inner tube is slipped into position as shown in Fig. 2, the enlarged medial portion 5 of the inner tube will cooperate with the inner collar 4 of the body member 1 in affording a partition across the bore of this body. The said casing or body 1 has lateral inlets 7 and 8 leading to the portions of its bore which are disposed respectively behind and forward of the said transverse partition. After the inner tube has thus been slipped into po-

sition, it is desirably clamped firmly in place by screwing up the forward cap 2 until this engages the forward end of the inner tube and forces the collar 6 against its seat. Then the rear cap 3 is similarly attached, but desirably has a compressible washer 9 interposed between it and the rear end of the inner tube to afford a tight closure at this end of the body member, which usually is the high pressure end.

Extending through the rear cap 3 and in axial alinement with the bore of the inner tube is a throttling member or valve member which is here shown as comprising a tubular threaded stem 10 projecting rearwardly of the nozzle through the cap 3, and a head 11 disposed within the rear section of the nozzle casing and tapered to match the flaring rear end 21 of the bore 12 of the inner tube. Extending through this rear end portion of the inner tube are ports 13 which lead from the said tapering part of the bore to the annular space between the inner tube and the body 1 back of the transverse partition, or to the portion of the main nozzle bore to which the high pressure fluid inlet 7 is connected. These ports 13 desirably are inclined forwardly of the nozzle, so that they will direct the entering fluid forwardly within the bore 12, and also desirably are substantially tangential of the bore of that part of the inner tube, so that the entering fluid will receive a rotational tendency and will therefore be subjected to spiral advancement within the bore 12. I likewise provide ports 14 in the inner tube near the forward end of the latter, which ports desirably are also inclined forwardly of the nozzle and substantially tangential of the bore 12. These forward ports 14 afford inlets to the bore 12 for the liquid entering through the inlet 8 and owing to their disposition impart a forwardly advancing spiral movement to such liquid. In practice, I desirably arrange both sets of ports so that the rotation imparted through fluid entering the same will be in the same direction. Then I provide the forward cap 2 with a mouth 15 in alinement with the bore 12, desirably larger in diameter and shaped according to the spray distribution desired, so that the spirally advancing mixture of liquid and compressed fluid will be impacted against the bore of this mouth and broken into a spray or mist.

In atomizing a liquid, this is connected to the inlet 8, while the compressed air or steam is connected to the companion inlet 7. Then the stem 10 is unscrewed sufficiently to afford the desired clearance between the tapering head 11 and the flaring rear end part of the bore of the inner tube, thereby permitting the high pressure fluid (such as the compressed air or steam) to enter through the ports 13. When thus admitted, this high pressure fluid will be spirally advanced within the bore of the inner tube, owing to the disposition of the ports 13, and consequently will create a suction which will draw air through the relatively small bore 16 of the stem 10. Consequently, the air or steam admitted through the inlet 7 will be augmented by this supply of air and will be mixed with the liquid entering through the ports 14, after which the resulting mixture is impacted against the mouth 15 of the cap and broken up into a fine spray.

By suitably proportioning the sizes of the ports and of the rear inlet bore 16, I have found that I can produce an unusually fine and uniform spray with only a moderate pressure of the air or steam, and with only a slight head of the liquid supplied through the inlet 8. I have also found that by moving the stem 10, I can adjust the admission of the high pressure fluid so as to compensate for any considerable variations in the pressure of the latter, after which the said stem may be clamped in position by a locknut 17. Moreover, by suitably shaping and proportioning the mouth 15 of the cap I can predetermine the desired angle of distribution and can readily secure a relatively large angle of distribution, as for example a substantially homogeneous conical spray over an angle of 75°. Owing to the high degree of atomization and the wide angle of distribution, my nozzle is particularly effective both for use in humidifying and for any other purposes where unusual diffusing is desired. For example, when atomizing crude oil in this way, I obtain a wide-angle spray or mist of the comparatively short length, such as heretofore has not been obtainable with any fair degree of atomization. Moreover, for such purposes as oil spraying, the supply of air drawn through the bore 16 (which bore is in substance a contraction of the rear end of the effective bore of the nozzle) aids in maintaining the combustion. The amount of the air thus drawn in may obviously be varied by varying the diameter of the contracted bore portion 16, and it will also vary with the pressure of the fluid admitted through the rear ports and thus utilized partly after the manner of an injector. Moreover, it will be obvious that any desired fluid might thus be drawn in through the tubular stem 10, so that I do not wish to be limited to the injecting of air through the rear end of the nozzle. Neither do I wish to be limited to the particular purposes above mentioned, nor to the details of the construction and arrangement as above disclosed, it being obvious that various additions, omissions or changes might be made without departing from the spirit of my invention.

For example, instead of providing the inner tube of my nozzle with a collar adapted to seat on a corresponding inward for-

mation in the tubular body of a casing, I may provide this inner tube with an enlarged head clamped between the forward end of the casing and the forward cap, after the manner shown in Fig. 5. With either embodiment, it will be evident that the hollow stem at the rear of the nozzle, the mouth of the forward cap, and the inner tube cooperate in constituting a tubular member having a contracted rear inlet and an enlarged forward outlet, and that this tubular member is equipped with inlets spaced longitudinally of the same for respectively admitting the compressed fluid and the liquid which is to be sprayed or atomized.

I claim as my invention:

1. In a nozzle, a body, a tube therein having a bore the latter flared at its rear end, one of said elements having an intermediate projecting portion engaging the other to afford a partition and to provide spaces between the body and tube, inlets leading into said spaces from opposite sides of the partition, a cap on one end of the body abutting the adjacent tube end and having an aperture in register with the tube bore, a cap on the opposite end of the body for pressing against the opposite tube end, and a stem carried by the last named cap and having a head tapered to correspond to the flared end of the bore, the tube having ports leading respectively from one of the spaces between the same and body and into the flared end of the bore and between the opposite end of the bore and the other of said spaces.

2. A liquid distributing nozzle including tubular means having ends each in communication with the air and having longitudinally spaced lateral inlets for a liquid and a compressed fluid, one of said ends of the tubular means being contracted in diameter.

3. A liquid distributing nozzle including tubular means having ends each in communication with the air and having longitudinally spaced lateral inlets for a liquid and a compressed fluid, the rear one of said ends being contracted in diameter and the forward one of said ends enlarged in diameter.

4. In a nozzle, a body, tubular means therein open to the air at both ends, and spaced inlets for a liquid and for a compressed fluid each extending through the means and into the interior thereof.

5. In a nozzle, a body, tubular means therein having ends each open to the air, and spaced inlets for a liquid and for a compressed fluid each extending through the means and into the interior thereof and being each disposed to lie substantially tangential to the interior.

6. In a nozzle, tubular means having ends each open to the air, an adjustable compressed fluid inlet leading into the interior of said means adjacent one end thereof to draw air into the latter, and a liquid inlet leading into the interior of said means adjacent the opposite end thereof.

7. In a spraying or atomizing nozzle, a tube open at both ends, and means contracting the rear opening of the tube, the tube having fluid inlet ports non-radial thereof and sloping forwardly, and having non-radial liquid inlet ports disposed in advance of the aforesaid ports.

8. A nozzle as per claim 7, in combination with means for controlling the admission of fluid through the first named ports.

9. In a liquid distributing nozzle, a tubular member open at both ends and having lateral ports for admitting a compressed fluid and a liquid, and a second tubular member open at each end and operatively forming an extension of the aforesaid member and controlling the fluid-admitting ports.

10. In a liquid distributing nozzle, a tubular member open at both ends and having its bore flared at its rear end, and having a fluid-admitting port in its said flared portion and a liquid-admitting port forwardly thereof, and a second tubular member open at each end and alined with the aforesaid member and having a tapering part entering the flaring rear end of the bore of the first named member and movable with respect to the latter to control the fluid-admitting port.

11. In a liquid distributing nozzle, a casing having alined apertures at its front and rear ends, a tube within the casing in alinement with the said apertures and having inlets respectively arranged for admitting a compressed fluid and a liquid, and an auxiliary tubular member open at each end and movably mounted on the rear end of the casing and controlling the said fluid inlet.

12. In a nozzle, a member open at each end to the air and formed in two spaced parts, means to supply a compressed fluid to the space between said parts to draw air into the means at one end, and means to supply liquid to the first means in advance of said space and rearwardly of the opposite end of the first means.

13. In a nozzle, tubular means open at each end to the air, means to admit fluid to the interior of said means between the ends thereof and to simultaneously draw air into one end of the means to effect spiral movement of the fluid and air, and means to admit liquid to the interior of said means in advance of the second means and rearwardly of the opposite end of the tubular means to effect spiral movement thereof.

14. In a nozzle, a tube having a bore with tangential inlets leading thereinto at points spaced longitudinally of the bore, and a controlling member for one of the inlets disposed so that the latter impacts fluid admitted thereto against the periphery of the

controlling member and having a bore open at each end and with one end communicating with the tube bore.

15. In a nozzle, tubular means having ends each open to the air, means to admit fluid to the interior of said means so as to draw air therewith into the means and to effect spiral movement of the two, and means to admit liquid to the tubular means at points in advance of the second means and spaced therefrom to effect spiral movement thereof.

Signed at Chicago, Illinois, April 12th, 1920.

HARRY D. BINKS.