

Nov. 7, 1944.

H. F. SIMON

2,362,102

SELF-CLEANING ATOMIZER

Original Filed Feb. 25, 1942

2 Sheets-Sheet 1

Fig. 1.

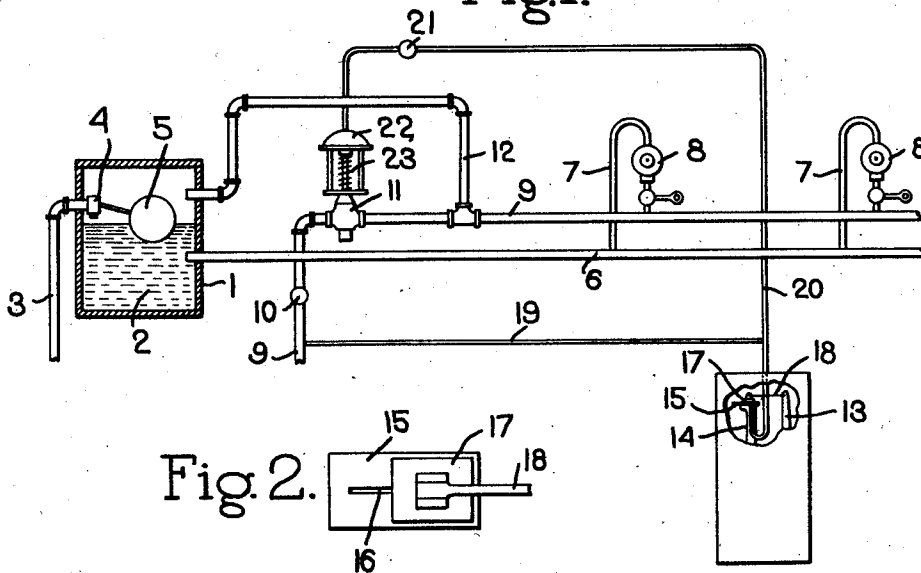


Fig. 2.

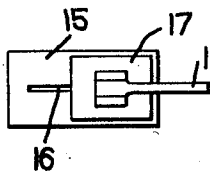
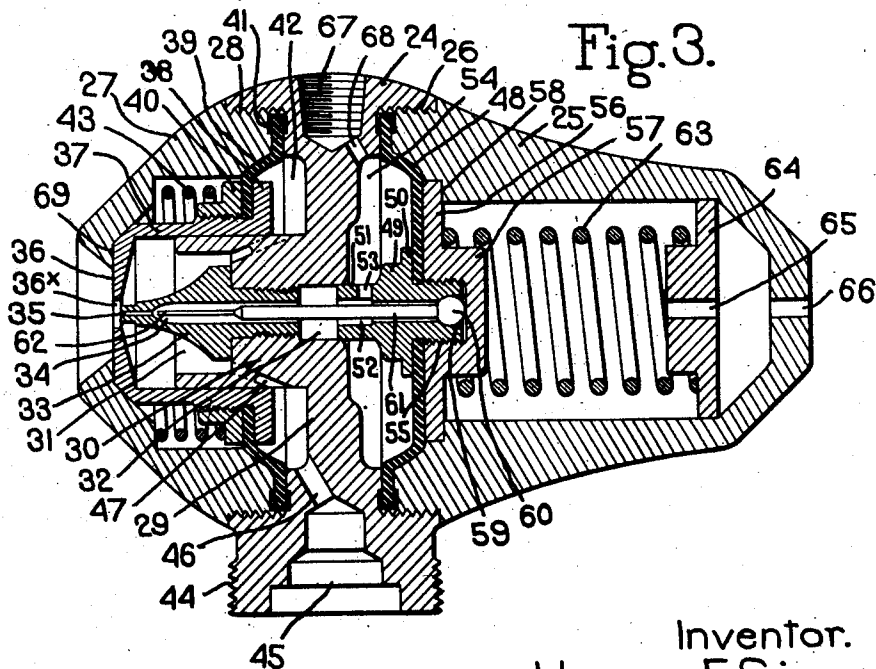


Fig. 3.



Inventor.
Herman F. Simon
by *Heard, Smith & Demant*
Attys.

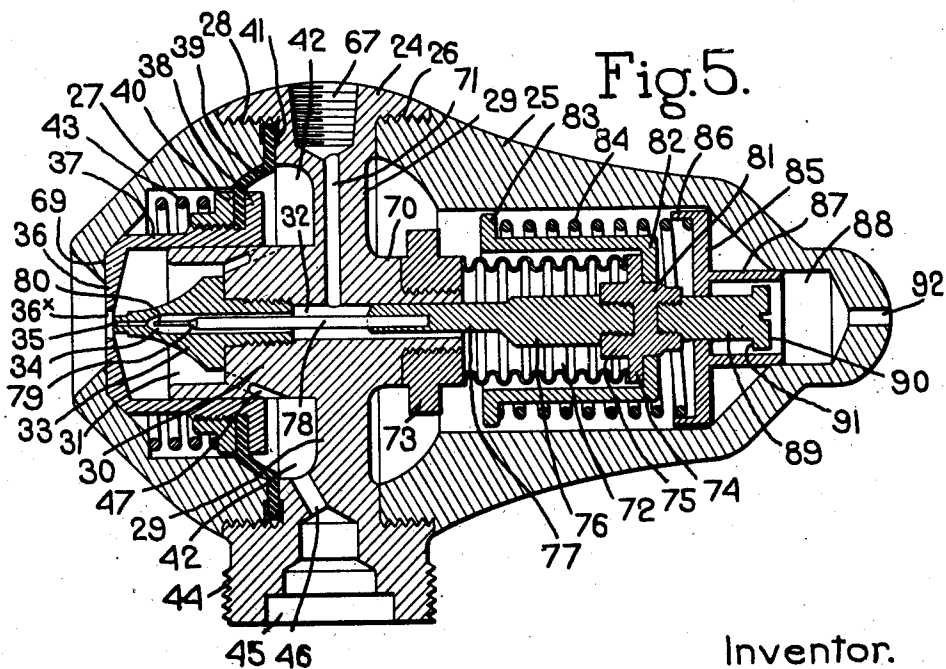
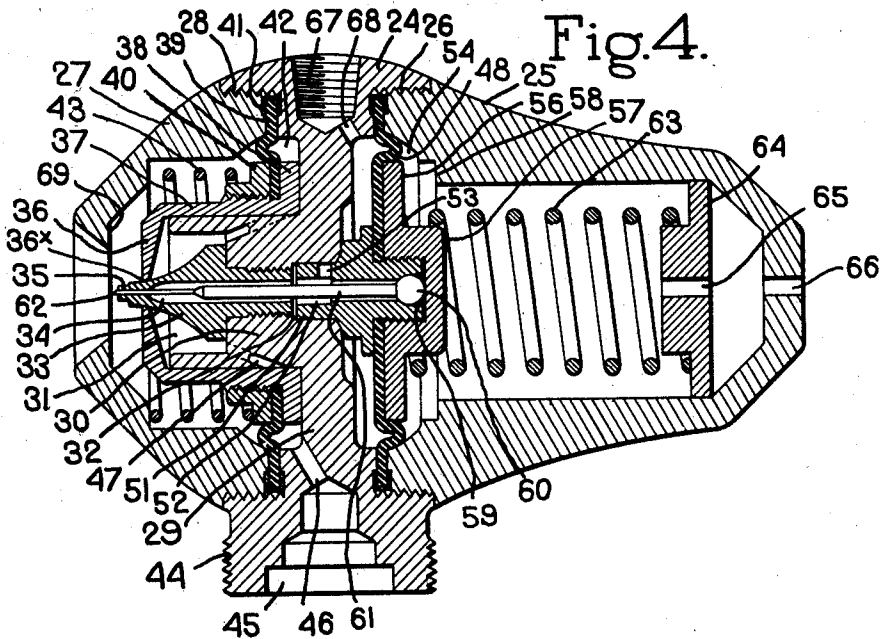
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Inventor.
Herman F. Simon
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Attys.

UNITED STATES PATENT OFFICE

2,362,102

SELF-CLEANING ATOMIZER

Herman F. Simon, Lunenburg, Mass., assignor to
Parks-Cramer Company, Fitchburg, Mass., a
corporation of Massachusetts

Original application February 25, 1942, Serial No.
432,234. Divided and this application June 7,
1943, Serial No. 489,973

18 Claims. (Cl. 299-59)

This invention relates to improvements in self-cleaning liquid atomizers of the type disclosed in my prior Patent No. 2,186,214, granted January 9, 1940, and is a division of my pending application Ser. No. 432,234 filed February 25, 1942, for Air conditioning method and apparatus, which discloses inter alia a method and apparatus for atomizing water in an enclosure to produce and maintain a predetermined standard of humidity by cooperating jets of air and water under automatically controlled correlated superatmospheric pressures.

In usual humidifying methods and apparatus in which moisture is supplied to the atmosphere of the enclosure by atomization and vaporization of water in the enclosure the atomizers are turned on in response to demand for moisture in deficit of the predetermined standard of humidity, and are turned off when the humidity reaches the predetermined standard. In usual forms of humidifying apparatus the water is drawn from a suitable source by inspiration into an atomizing head by a jet of air under pressure which serves to vaporize the water and distribute the vapor into the atmosphere of the room.

The present apparatus differs from prior apparatus in that superatmospheric fluid pressure of the water and the pressure of the air, or other gaseous fluid under pressure such as steam, are maintained in a predetermined correlation, preferably equal pressures, and automatically simultaneously increased or decreased while the same correlation is maintained, thereby varying the volume of water vaporized in response to the demand for moisture to maintain the atmosphere of the enclosure at a predetermined standard of humidity.

The object of the present invention is to provide a self-cleaning atomizer for a gaseous fluid and liquid under equal or other correlated superatmospheric pressures having means operable upon each discontinuance of the supply of humidity to the air of an enclosure to penetrate and clean the outlets for the air and water.

A further object of the invention is to provide a construction in which the delivery of a jet of water through the air nozzle is discontinued in advance of the discontinuance of the jet of air, and conversely resumed only after resumption of the delivery of air under pressure, thereby avoiding imperfect vaporization which would result in projecting unvaporized water into the enclosure.

A further object of the invention is to provide an apparatus for producing a better quality of

spray from the atomizer in response to varying demands of humidity to maintain the predetermined standard of humidity.

Another object of the invention is to provide an apparatus by which a substantial saving in power may be made by the employment of atomizing air at a less average pressure and by more effective automatic regulation.

Another object of the invention is to provide an apparatus comprising self-cleaning atomizers in which a better cleaning of the air and water outlets will be effected because of the actions of the air and water when both are under pressure.

An illustrative apparatus including preferred forms of self-cleaning atomizers is illustrated in the accompanying drawings, in which,

Fig. 1 is a diagrammatic view of an apparatus for atomizing water, or other liquid, in which the air and water are maintained under correlated, preferably equal, pressures, with automatic means for simultaneously regulating the pressures of the air and liquid in response to variations of humidity in the atmosphere of the enclosure;

Fig. 2 is an enlarged detail view of the valve mechanism for the regulating means;

Fig. 3 is an enlarged view in vertical longitudinal section of a preferred form of atomizer showing the parts thereof in atomizing position;

Fig. 4 is a similar view in vertical longitudinal section of the atomizer shown in Fig. 3, illustrating the parts in non-atomizing and self-cleaning positions; and,

Fig. 5 is a vertical longitudinal sectional view of a modified form of atomizer with the parts shown in atomizing position.

The preferred form of apparatus illustrated in the drawings comprises an hermetically closed tank 1 which is supplied with water or other suitable liquid 2 through a pipe 3 from any suitable source, a substantially constant level of water being maintained within the tank by a suitable valve 4 controlled by a float 5. A pipe 6 communicating with the tank, well below the level of the liquid therein is provided with suitable branches 7 leading to suitable atomizers 8 hereinafter to be described. Air under suitable pressure is supplied through a pipe 9 which may be provided with a hand operated valve 10 but preferably also with an automatic pressure reducing valve 11. A pipe 12 leads from the pipe 9 to the chamber of the hermetically sealed tank 1 above the level of the liquid therein. By reason of this construction the water is subjected to the same fluid pressure as that of the air.

Other means for maintaining equal or other

correlated fluid pressures on the air and water may however be employed within the scope of the present invention with means for automatically regulating the pressures in correlation in such manner that a sufficiently fine quality of spray may be produced under varying pressures, for example, from a maximum of thirty pounds per square inch to such lower pressure as may be required within the capacity of the atomizers.

Preferably suitable automatic means may be provided for controlling the fluid pressures of the air and the water such as are illustrated and described in the patent to Alfred F. Karlson No. 1,729,074, granted September 24, 1929. In that construction, as illustrated in Fig. 1 of the present drawings, the regulator comprises a lever 13 which is actuated by a bellows which is subject to the psychrometric wet bulb temperature of the air and a lever 14 having on its upper end a valve seat 15 having a port 16 which is controlled by a valve 17 (Fig. 2) connected by a rod 18 to the lever 13. In the present construction, as in that of the Karlson patent, a branch pipe 19 leads from the air supply pipe 9 to a pipe 20 leading to the port 16 in the valve seat 15. The pipe 19 also leads, preferably through a suitable hand operated valve 21, to the chamber 22 of a diaphragm motor adapted when air pressure is supplied through the pipe 19 to close the automatic valve 11 in the air line 9.

A spring 23 normally tends to raise the valve 11 from its seat and permit the flow of air through the air line 9 to the several atomizers 8.

In the normal operation of the regulator when there is a deficit of humidity in the atmosphere of the enclosure the differential expansion of the bellows which actuate the levers 13 and 14 moves the lever 13 in a direction to open the port 16 in the valve seat 15 thereby enabling the spring 22 to open the valve 11 in the air line.

When, however, the humidity of the room increases the differential expansion of the bellows which actuate the levers 13 and 14 causes the levers to approach each other and the valve 17 gradually to move over the port 16 which preferably, as shown in Fig. 2, extends in the axial direction of movement of the valve 17. By thus closing the bleeder port 16 pressure is gradually built up in the pipe 20 which will actuate the diaphragm motor gradually to close the valve 11 in the air line 9.

By reason of this construction the fluid pressure of the air and of the liquid are varied equally in response to the demand for moisture in the atmosphere of the room as detected by the regulator so that a spray of proper fineness is at all times maintained irrespective of the amount of liquid vaporized by reason of the variation in pressures. By reason of such regulation of the gaseous fluid pressure moisture is delivered to the atmosphere continuously and without interruption unless by reason of unusual conditions, such as the admission of highly saturated air in the room, the humidity of the atmosphere of the room exceeds a predetermined standard. In such cases, however, the regulator will cause the valve 17 to close the port 16 gradually and thereafter maintain it in closed position thereby closing the valve in the air line and shutting off the supply of air and liquid until the humidity of the room falls slightly below the predetermined standard.

By reason of the present invention therefore a predetermined standard of humidity may be maintained within a very narrow range under all normal conditions by a continued gradual supply

of humidity responding to the conditions of the atmosphere of the room.

A preferred form of atomizer, which is illustrated in Figs. 3 and 4, is of pear-shaped streamlined construction comprising a body 24 having a hollow rear body portion 25 secured to it by a screw threaded connection 26 and a front cap 27 secured to it by a screw threaded connection 28. The body has a vertical central web 29 provided centrally with a forwardly extending hub 30 having a chambered front portion 31 and an axial bore 32. A nozzle 33, for projecting a jet of water under pressure, which has a steam screwed into the bore 32, is provided with an axial passage 34 leading to a jet-producing outlet 35 of small diameter.

An outer nozzle 36 having an outlet 36x in axial alinement with the water nozzle outlet 35 is provided with a cylindrical portion 37 which slidably fits upon the hub 30. The cylindrical portion 37 of the outer nozzle is provided with a peripheral flange 38 which forms an abutment for an annular diaphragm 39 which is clamped against the abutment 38 by a suitable nut 40 mounted on the cylindrical portion 37 of the outer nozzle. The outer peripheral portion of the diaphragm 38, which preferably is provided with a metal binding 41, is clamped between the cap 27 and the shoulder upon the body portion 24 of the atomizer thereby providing between the diaphragm and the body of the atomizer a chamber 42 for air or other gaseous fluid under pressure. A spring 43, which is interposed between the nut 40 on the outer nozzle and the cap 27, tends to force the outer nozzle rearwardly to the position illustrated in Fig. 4, so that in the absence of air pressure in the air chamber 42 the end portion of the water nozzle 33 will penetrate and clean the orifice 36x of the outer nozzle.

The body 24 is provided with a downwardly extending screw threaded extension 44 adapted to be connected by a suitable union to the air line 9 and is provided with a passage 45 having a conduit 46 leading to the pressure chamber 42. One or more ports 47 extend from the pressure chamber 42 through the hub 30 into the chamber 31 of the hub preferably at such angle as to produce a whirling motion of the air within the chamber 31 of the hub 30 and also within the chamber of the outer nozzle.

The cylindrical portion 37 of the outer nozzle, which slidably fits upon the hub 30, serves as a valve gradually to close and open the elliptical entrances to the ports 47 as the nozzle is moved backward or forward in response to the air pressure or to the spring upon diminution of air pressure.

The atomizer comprises means operable not only to automatically clean the outlet of the liquid nozzle but also to shut off the supply of liquid to the nozzle. As illustrated in Figs. 3 and 4 the mechanism for controlling the supply of liquid to the nozzle and for cleaning the nozzle is operated by a diaphragm subject to the pressure of the liquid to move the parts to operative position and by a spring acting in opposition to the fluid pressure to cause a cleaning member to penetrate and clean the outlet of the liquid nozzle and to shut off the supply of liquid thereto. In this construction a diaphragm 48, preferably having a metal bound periphery, is clamped between the rear body portion 25 of the atomizer and a shoulder upon the body portion 24. A valve member 49 having a flat face 50 engages the forward side of the diaphragm and is pro-

vided with a forwardly extending cylindrical hub 51 which is slidably mounted in the axial bore 32 of the body 24. The valve member 49 has an axial passage 52 and a port 53 which communicates with a chamber 54 between the diaphragm and the web 29 of the body 24. The valve member 49 is provided with a screw threaded extension 55 which passes centrally through the diaphragm 48, and a circular plate 56 having an internally screw threaded boss 57 clamps the diaphragm against the flat face 50 of the valve member. The rear body portion 25 of the atomizer is counterbored to provide a shoulder 58 against which the plate 56 is seated when the diaphragm is forced rearwardly by liquid under pressure in the chamber 54 as illustrated in Fig. 3. The extension 55 of the valve member is provided with a spheroidal socket 59 to receive the spherical end 60 of a cleaning rod 61 which extends longitudinally through the axial passage in the valve member and through the axial passages 52 and 34 in the valve member 49 and water nozzle 33. A small cleaning wire 62 is fixedly secured in the cleaning rod 61 and is adapted to penetrate and clean the outlet 35 of the nozzle when the cleaning member is moved forward. The spherical head 60 of the cleaning member is held in place by the inner wall of the boss 57 of the clamping plate in such manner that the cleaning rod 61 and the wire extension thereof may be self-centering as the end of the cleaning wire engages the conoidal end of the passage through the nozzle which leads to the outlet 35.

A spring 63 of substantially greater strength than the spring 43 is interposed between the plate 56 and an abutment plate 64 which is seated against a wall of the rear body of the atomizer. Apertures 65 and 66 in the abutment plate 64 and end of the rear body member permit the passage of air from the hollow rear body portion thereby avoiding compression of air in the rear body portion when the diaphragm is forced rearwardly by fluid pressure in the chamber 54.

Water under pressure is supplied from the pipe 7 (Fig. 1) of the water line through a suitable connection to an inlet 67 and from it through a port 68 into the water chamber 54 and passes from the chamber 54 through the port 53 into the passage 52 and thence through the nozzle and its outlet 35 to project a jet of water into the whirling jet of air which is projected through the outlet 36x of the outer nozzle 36.

In the operation of the atomizer, as above described, air and water under correlated pressures, preferably equal pressures, are simultaneously supplied respectively to the chambers 42 and 54 of the atomizers. In view of the fact that the spring 43 is weaker than the spring 63 the outer nozzle 36 will first be moved toward atomizing position illustrated in Fig. 3 thereby gradually opening the port or ports 47 and as the pressure builds up will project a whirling current of air through the outlet 36x of the outer nozzle until the outer nozzle abuts against the shoulder 69 in the cap 27 where it will be held by air pressure during the maximum operation of the atomizer.

As the pressure upon the water builds up the diaphragm 48 will be forced rearwardly thereby withdrawing the valve member 49 from the position illustrated in Fig. 4 gradually opening the port 53 leading to the passage 32 which communicates with the water nozzle and will simultaneously withdraw the cleaning rod 61 and the wire 62 thereof from the outlet 35 of the liquid nozzle.

When the air or other gaseous fluid pressure is restricted by the operation of the automatic reduction valve in response to the operation of the humidity regulator the greater pressure of the spring 63 upon the diaphragm 48 will gradually force the valve member 49 forwardly thereby closing the port 53 and shutting off the supply of water to the liquid nozzle and simultaneously cause the cleaning wire 62 to penetrate and finally to clean the outlet 35 of the water nozzle, as illustrated in Fig. 4. When the pressure on the gaseous fluid and liquid are reduced sufficiently the spring 43 will force the outer nozzle 36 rearwardly thereby gradually closing the ports 47 and finally causing the end portion of the water nozzle to penetrate and clean the outlet 36x of the outer nozzle as illustrated in Fig. 4. It will therefore be understood that no jet of liquid is projected from the liquid nozzle unless a surrounding jet of air is projected from the outer nozzle and dripping of unvaporized water is therefore completely avoided.

By reason of the gradual control of the diaphragm actuated mechanisms which are operated respectively by correlated air and water pressure moisture is supplied gradually to the atmosphere of the enclosure in response to variations of humidity of the atmosphere of the enclosure and the humidity of the atmosphere maintained within an exceedingly narrow range from a predetermined standard of humidity without abrupt changes in the supply of humidity to the atmosphere of the enclosure inherent in previous constructions and without emptying the air in the line leading to the atomizer. It is found by the present invention that the atomizers can be operated on a lower average pressure, that less air is required per pound of water evaporated, that the same quality of spray is maintained throughout the concurrent variations in pressure of air and water, that a more uniform humidity is maintained, and that fogging up from full capacity where there is only a slight demand for moisture is avoided. It is also found that by the present invention the number of sizes of nozzles required in usual systems of different capacities may be largely reduced.

While the embodiment of the invention illustrated in Figs. 1, 3 and 4 are the preferred forms of the invention it is obvious that other specific constructions may be made an example of which is illustrated in Fig. 5. In the construction there illustrated the main body of the atomizer is quite similar to that disclosed in Figs. 3 and 4. The construction and relation of the inner water nozzle and the outer nozzle through which gaseous fluid under pressure is projected and the mechanism for actuating the same may be and are the same as in the construction shown in Figs. 3 and 4. The construction illustrated in Fig. 5, however, differs in the manner in which water is supplied to the inner or liquid nozzle and in the cleaner for the inner nozzle and the mechanism for actuating the same.

In the construction disclosed in Fig. 5 the web 29 of the main body is provided with a rear extension or hub 70 in axial alinement with the hub 30 and the liquid is supplied from the inlet 67 directly through a conduit 71 to the passage 32 which leads to the inner water nozzle. In the construction disclosed in Fig. 5 the passage 32 leads through the rear hub 70 into a Sylphon bellows 72 which has at its forward end a nut 73 which is screwed upon a reduced extension of the hub 70 and forms a liquid-tight joint therewith.

The opposite end of the Sylphon bellows is provided with a head 74 having a forwardly extending internally threaded boss 75 which is connected to a reduced screw threaded end of a plunger 76 having a reduced extension 77 of preferably triangular cross section which is slidably mounted in the passage 32 through the hubs 30 and 70. By reason of this construction passage for the liquid is provided from the conduit 71 to the Sylphon bellows 72. A rod 78 is mounted in the end of the triangular portion 77 of the plunger and extends axially therefrom and is provided with a conical end portion 79 adapted to fit and form a valve for a valve seat in the tapered end of the bore 34 of the atomizer nozzle. A cleaning wire 80, which is mounted in and extends axially from the end of the rod 78, is adapted to penetrate and clean the outlet 35 of the inner nozzle.

When water under sufficient pressure is supplied to the Sylphon bellows 72 the cleaner will be retained in withdrawn position illustrated in Fig. 5.

Suitable means are provided for forcing the cleaning member forward upon reduction of liquid pressure to cause the cleaning wire 80 to penetrate and clean the outlet 35 of the liquid nozzle. In the particular construction illustrated the head 74 is provided with a rearwardly extending hub 81 upon which is mounted the end 82 of a cylindrical cup-shaped sleeve having at its opposite end an outwardly extending peripheral flange 83. A spiral spring 84 of considerably greater strength than the flange 83 and an abutment 85 which is seated against the convergingly tapered wall of the rear end of the rear body portion. The abutment desirably is provided with a forwardly extending peripheral flange 86 which surrounds the end of the spring 84 and is also provided with a cylindrical tubular extension 87 which is slidably mounted in a complementary cylindrical extension 88 of the rear body portion. A screw 89, which extends through a central aperture in the abutment 85, is seated in the rearwardly extending hub 81 of the head 74 of the Sylphon bellows. The screw 89 is provided with a head 90 presenting a shoulder 91 adapted to engage the abutment 85 when the cleaner is moved forward by the spring 84 and thereby to limit the forward movement of the plunger rod 78 when the conical valve-shaped end thereof is seated and the outlet 35 in the nozzle 33 penetrated by the cleaning member 80.

A suitable outlet 92 is provided in the rear extension of the rear body portion to avoid compression of air in the body portion which would interfere with the proper operation of the atomizer.

In the operation of the construction disclosed in Fig. 5, as in that disclosed in Fig. 4, air and liquid under correlated preferably the same pressures are simultaneously introduced in the manner above described. The outer nozzle is first forced forwardly to atomizing position and air supplied to it to project a jet of air through the outlet 36x. When the air and water pressures have built up sufficiently the water pressure will expand the Sylphon bellows thereby withdrawing the cleaning member and the cleaning wire from the inner liquid nozzle until the parts are in atomizing position. Upon reduction of the correlated pressures of the air and liquid the outer nozzle will be forced rearwardly by the spring 43 until the end portion of the inner liquid nozzle penetrates and cleans the outlet of

the outer nozzle. Thereafter the spring 84 will force the cleaning member forward until the valve 79 at the end of the rod 78 closes the water nozzle and the wire 80 of the cleaning member penetrates and cleans the outlet of the inner liquid nozzle.

It will be understood that the particular self-cleaning atomizer constructions herein shown and described are of an illustrative character and that various changes in construction and arrangement of parts may be made within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A self-cleaning atomizer comprising a head having chambers respectively for a liquid under superatmospheric pressure and for a gaseous fluid under a pre-determined correlated superatmospheric pressure provided respectively with outlets normally so positioned during the operation of the atomizer as to cause the liquid to be vaporized by the current of gaseous fluid, and cleaning means for the respective outlets operable respectively by interruption of the fluid pressures of the gaseous fluid and of the liquid to penetrate and clean the respective outlets.

2. A self-cleaning atomizer comprising a head having a nozzle for projecting liquid under superatmospheric pressure, a nozzle for projecting gaseous fluid under superatmospheric pressure yieldably and telescopically mounted upon and having an outlet effectively fitting said liquid nozzle and normally movable by the gaseous fluid under pressure beyond the end of said liquid nozzle to atomizing position, cleaning means yieldably and telescopically mounted in and substantially fitting the outlet of said liquid projecting nozzle and normally retracted from the outlet thereof by the pressure of said liquid, and means operable by discontinuance and resumption of the respective pressures to cause relative movements of said air projecting nozzle and said liquid nozzle cleaning means effectively to clean both of said nozzles.

3. A self-cleaning atomizer comprising telescopically movable and relatively yieldable inner and outer nozzles for projecting respectively a jet of liquid under superatmospheric pressure and an atomizing jet of gaseous fluid under superatmospheric pressure and a cleaning member for said inner nozzle movable relatively thereto all normally maintained in atomizing position by the pressures of the gaseous fluid and of the liquid, and means operable upon interruption of the supplies of the gaseous fluid and of the liquid to cause penetration and cleaning of the inner nozzle by the cleaning member and thereafter to cause the inner nozzle to penetrate and clean the outer nozzle.

4. A self-cleaning atomizer comprising an inner nozzle for projecting a jet of liquid under superatmospheric pressure and an outer nozzle for projecting an atomizing jet of gaseous fluid under superatmospheric pressure telescopically mounted upon said inner nozzle, a cleaning member within the outlet of said inner nozzle and movable relatively thereto all normally maintained in atomizing position by the respective pressures of the gaseous fluid and of the liquid, and resilient means operable respectively upon interruption of said respective pressures to cause penetration and cleaning of the inner nozzle by the cleaning member and thereafter to cause

the inner nozzle to penetrate and clean the outer nozzle.

5. A self-cleaning atomizer comprising an inner nozzle for projecting a jet of liquid under superatmospheric pressure and an outer nozzle for projecting an atomizing jet of gaseous fluid under the same superatmospheric pressure telescopically mounted upon and fitting said inner nozzle, a cleaning member within and fitting the outlet of said inner nozzle and movable relatively thereto, all normally maintained in atomizing position by the respective pressures of the gaseous fluid and of the liquid, a spring acting upon said outer nozzle to cause penetration, cleaning and closing of the outlet thereof by said inner nozzle upon discontinuance of the supply of gaseous fluid under pressure, and a spring acting upon said cleaning member to cause it to penetrate, clean and close the outlet of said inner nozzle upon discontinuance of the supply of liquid under pressure.

6. A self-cleaning atomizer comprising an inner nozzle for projecting a jet of liquid under superatmospheric pressure and an outer nozzle for projecting an atomizing jet of gaseous fluid under the same superatmospheric pressure telescopically mounted upon and fitting said inner nozzle, a cleaning member within and fitting the outlet of said inner nozzle and movable relatively thereto, all normally maintained in atomizing position by the respective pressures of the gaseous fluid and of the liquid, a spring acting upon said outer nozzle to cause penetration, cleaning and closing of the outlet thereof by said inner nozzle upon discontinuance of the supply of gaseous fluid under pressure, and a spring acting upon said cleaning member to cause it to penetrate, clean and close the outlet of said inner nozzle upon discontinuance of the supply of liquid under pressure, the spring acting on the nozzle of the cleaning member being of sufficiently greater strength than that of the spring acting upon the outer nozzle to permit completion of the movement of the cleaning member of the inner nozzle before completion of movement of the outer nozzle when pressures are discontinued, but to permit completion of the movement of the outer nozzle before completion of the movement of the inner nozzle when pressures are resumed, thereby to prevent imperfect atomization of the liquid.

7. An atomizer comprising a head having a chamber for liquid under superatmospheric pressure, a nozzle communicating therewith for projecting a jet of said liquid and a chamber for gaseous fluid under superatmospheric pressure having a nozzle telescopically mounted upon and yieldable relatively to said liquid projecting nozzle with the outlet thereof in axial alinement with that of said liquid nozzle, and means for varying the volume of liquid and the volume of gaseous fluid delivered by the respective nozzles in correlation to corresponding variations in fluid pressures of the liquid and gaseous fluids.

8. An atomizer comprising a head having a chamber for liquid under superatmospheric pressure, a nozzle communicating therewith for projecting a jet of said liquid and a chamber for gaseous fluid under the same superatmospheric pressure having a nozzle telescopically mounted upon and yieldable relatively to said liquid projecting nozzle with the outlet thereof in axial alinement with that of said liquid nozzle, and means for varying the volume of liquid and the volume of gaseous fluid delivered by the respec-

tive nozzles in correlation to simultaneous increase or decrease of said equal pressures.

9. An atomizer having a head provided with a pressure chamber for liquid under superatmospheric pressure, a nozzle communicating therewith for delivering a jet of liquid, a pressure chamber for gaseous fluid under correlated superatmospheric pressure, a chambered nozzle valve telescopically and yieldably mounted upon said liquid nozzle, and movable to atomizing position by the pressure of said gaseous fluid, a conduit establishing communication between the pressure chamber for said gaseous fluid and the chamber of said nozzle valve, and means respectively operable upon discontinuance of the pressure of the liquid and said gaseous fluid to cut off the supply of liquid and to cause said nozzle valve to close said conduit.

10. An atomizer having a head provided with a pressure chamber for a liquid under superatmospheric pressure, a nozzle communicating therewith, means operable by variations in the pressure of the liquid for controlling the volume of liquid supplied to said nozzle, a pressure chamber for a gaseous fluid under the same superatmospheric pressure, a chambered nozzle valve telescopically and yieldably mounted upon said liquid nozzle having an outlet cooperating with that of said nozzle to vaporize the liquid and movable to atomizing position by the pressure of said gaseous fluid, a conduit leading from said gaseous fluid pressure chamber to the chamber of said gaseous fluid nozzle having an outlet controlled by the movements of said nozzle valve to regulate the volume of fluid supplied to said gaseous fluid nozzle in correlation to the volume of liquid supplied to the liquid nozzle.

11. A self-cleaning atomizer comprising a head having an inner nozzle, a relatively movable tubular outer nozzle telescopically mounted on said inner nozzle and having an outlet adapted to fit the end portion of said inner nozzle, yieldable means normally causing said inner nozzle to penetrate, and clean the outlet of said outer nozzle, a cleaning member reciprocally mounted in said inner nozzle, yieldable means normally causing the cleaning member to penetrate, clean and close the outlet of the inner nozzle, means for supplying liquid under pressure to the inner nozzle, means for supplying gaseous fluid under pressure to the outer nozzle, means operable by the pressure of the gaseous fluid to move the outer nozzle to atomizing position, and means operable by the pressure of the liquid to withdraw the cleaning member from the outlet of the inner nozzle and to project a jet of water therefrom into the gaseous fluid projected through the outlet of the outer nozzle.

12. A self-cleaning atomizer comprising a head having a chamber for a liquid under pressure and a chamber for a gaseous fluid under pressure, an inner nozzle, means for supplying liquid under pressure to said inner nozzle and to said liquid pressure chamber, a chambered outer nozzle telescopically mounted on said inner nozzle and having an outlet in axial alinement with the outlet of the inner nozzle adapted to fit the end portion of said inner nozzle, means for conducting gaseous fluid under pressure to said gaseous fluid chamber and to the chamber of said outer nozzle, a cleaning member slidably mounted in said inner nozzle having means to penetrate, clean and close the outlet thereof, resilient means acting respectively on said cleaning means and on said outer nozzle, in the absence of pressure in said chambers, to cause penetration,

cleaning and closing of the inner nozzle by the cleaning member and thereafter to cause the inner nozzle to penetrate, clean and close the outer nozzle, and yieldable means respectively connected to said outer nozzle and to said cleaning member operable respectively by the pressures of the gaseous fluid and of the liquid to move the outer nozzle to atomizing position and to withdraw the cleaning member from the outlet of the inner nozzle.

13. A self-cleaning atomizer comprising a main body having a central hub provided with an axial passage therethrough, an inner nozzle mounted on said hub communicating with said passage, a chambered outer nozzle slidably fitting said hub having a peripheral flange and having a central outlet in axial alinement with said inner nozzle adapted telescopically to fit the end portion of the inner nozzle, a cap mounted on said body having an outlet in axial alinement with said nozzles, an annular diaphragm having its periphery clamped between said cap and body and fixedly clamped to the peripheral flange of said outer nozzle providing a front pressure chamber between the diaphragm and body, resilient means normally forcing said outer nozzle toward said body to cause the inner nozzle to penetrate and clean the outlet of said outer nozzle, a cleaning member slidably mounted in the inner nozzle and axial passage of said hub having means to penetrate the outlet of the inner nozzle, and means to shut off the passage of liquid through the inner nozzle, a hollow rear body portion connected to said main body, resilient means in said rear body portion engaging said cleaning member and normally causing it to penetrate, clean and close the passage of said inner nozzle, yieldable pressure operated means in said hollow rear body portion connected to the cleaning member, means for supplying air under pressure to the front pressure chamber to move the outer nozzle to atomizing position and to supply air under pressure to the chamber of said outer nozzle, and means for supplying water under pressure to the pressure operated means in the hollow rear body portion and to said inner nozzle, thereby to withdraw said cleaning member from penetration of the outlet of the inner nozzle and cause a jet of water to be projected by said inner nozzle into the air under pressure issuing from said outer nozzle.

14. A self-cleaning atomizer comprising a main body having a central hub provided with an axial passage therethrough, an inner nozzle mounted on said hub communicating with said passage, a chambered outer nozzle slidably fitting said hub having a peripheral flange and having a central outlet in axial alinement with said inner nozzle adapted telescopically to fit the end portion of the inner nozzle, a cap mounted on said body having an outlet in axial alinement with said nozzles, an annular diaphragm having its periphery clamped between said cap and body and fixedly clamped to the peripheral flange of said outer nozzle providing a front pressure chamber between the diaphragm and body, a front spring normally forcing said outer nozzle toward said body to cause the inner nozzle to penetrate and clean the outlet of said outer nozzle, a cleaning member slidably mounted in the inner nozzle and axial passage of said hub having means to penetrate the outlet of the inner nozzle, and means to shut off the passage of liquid through the inner nozzle, a hollow rear body portion connected to said main body, a diaphragm

connected to said cleaning member and having its periphery clamped between said rear body portion and said body providing a rear pressure chamber between said diaphragm and body, a spring intermediate of said diaphragm and the end of said rear body portion for causing the cleaning member to penetrate, clean and close the passage of the inner nozzle, means for supplying air under pressure to the front pressure chamber to move said outer nozzle to atomizing position, and means for supplying water under pressure to said rear pressure chamber and to the inner nozzle thereby to withdraw the nozzle cleaning member and cause a jet of water to be projected by said inner nozzle into the air under pressure issuing from said outer nozzle.

15. A self-cleaning atomizer comprising a main body having a central hub provided with an axial passage therethrough, an inner nozzle mounted on said hub communicating with said passage, a chambered outer nozzle having a valve portion slidably fitting said hub and also having a peripheral flange and a central outlet in axial alinement with said inner nozzle adapted telescopically to fit the end portion of the inner nozzle, a cap mounted on said body having an outlet in axial alinement with said nozzles, an annular diaphragm having its periphery clamped between said cap and body and fixedly clamped to the peripheral flange of said outer nozzle providing a front pressure chamber between the diaphragm and body, one or more ports leading from said front pressure chamber to the chamber of the outer nozzle, a front spring normally forcing said outer nozzle toward said body to cause the inner nozzle to penetrate and clean the outlet of said outer nozzle, and also to cause the valve of the outer nozzle to close the port or ports in said hub, a cleaning member slidably mounted in the inner nozzle and axial passage of said hub having means to penetrate the outlet of the inner nozzle, and means to shut off the passage of liquid through the inner nozzle, a hollow rear body portion connected to said main body, a diaphragm connected to said cleaning member and having its periphery clamped between said rear body portion and said body providing a rear pressure chamber between said diaphragm and body, a spring intermediate of said diaphragm and the end of said rear body portion of greater strength than said front spring, for causing the cleaning member to penetrate, clean and close the passage of the inner nozzle, means for supplying air under pressure to the front pressure chamber to move said outer nozzle to atomizing position, and by opening the port or ports in said hub gradually to supply air under pressure to said outer nozzle, and means for supplying water under pressure to said rear pressure chamber and to the inner nozzle thereby to withdraw the nozzle cleaning member and cause a jet of water to be projected by said inner nozzle into the air under pressure issuing from said outer nozzle, the construction being such that by reason of the greater strength of the rear spring the outer nozzle will be forced to atomizing position before the cleaning member is withdrawn from the outlet of the inner nozzle.

16. A self-cleaning atomizer comprising a main body having a central hub provided with an axial passage therethrough, an inner nozzle mounted on said hub communicating with said passage, a chambered outer nozzle having a valve portion slidably fitting said hub and also having a peripheral flange and a central outlet

in axial alinement with said inner nozzle adapted telescopically to fit the end portion of the inner nozzle, a cap mounted on said body having an outlet in axial alinement with said nozzles, an annular diaphragm having its periphery clamped between said cap and body and fixedly clamped to the peripheral flange of said outer nozzle providing a front pressure chamber between the diaphragm and body, one or more parts leading from said front pressure chamber to the chamber of the outer nozzle, a front spring normally forcing said outer nozzle toward said body to cause the inner nozzle to penetrate and clean the outlet of said outer nozzle and also to cause the valve of the outer nozzle to close the port or ports in said hub, a cleaning member slidably mounted in the inner nozzle and axial passage of said hub having means to penetrate the outlet of the inner nozzle and means to shut off the passage of liquid through the inner nozzle, a hollow rear body portion connected to said main body, a Sylphon bellows connected at one end to said body and at its opposite end to said cleaning member and communicating with the axial passage in said body forming a rear pressure chamber, a spring in said hollow body portion normally causing said cleaning member to penetrate, clean and close the passage of said inner nozzle, means for supplying air under pressure to said front pressure chamber to move the outer nozzle to atomizing position and by opening the ports in said hub to supply air under pressure to the chamber of said outer nozzle, means for supplying water under pressure to said rear pressure chamber and to said inner nozzle thereby to withdraw said cleaning member from the outlet of the inner nozzle and to cause a jet of water to be projected by said inner nozzle into the air under pressure issuing from said outer nozzle, and a spring acting upon the Sylphon bellows having sufficiently greater strength than the spring acting upon the outer

nozzle to delay withdrawal of the cleaning member until the outer nozzle is in atomizing position.

17. An atomizer comprising a head having an air chamber and a water chamber each having a diaphragm wall, relatively longitudinally movable air and water nozzles communicating respectively with the air and water chambers, means for supplying air and water to said chambers under correlated superatmospheric pressures, means operable by the pressures applied to the respective diaphragms to place said air and water nozzles in operative atomizing position, and means operable by the movement of said diaphragm of the water chamber upon predetermined reduction of said water pressure to prevent delivery of water to the water nozzle and thereby avoid dripping of water from said head.

18. An atomizer comprising a head having an air chamber and a water chamber each having a diaphragm wall, relatively longitudinally movable outer air and inner water nozzles, means for supplying air under superatmospheric pressure to said air chamber, means for supplying water under superatmospheric pressure to said water chamber, means for conducting air under pressure from said air chamber to the outer nozzle, a conduit connecting said water chamber to said water nozzle, valve mechanism for said water conduit connected to the diaphragm of said water chamber, means operable by the pressures applied to the respective diaphragms for causing relative movement between said air and water nozzles to place them in operative atomizing position, and means operable upon predetermined reduction of said pressures to cause said valve mechanism to shut off the supply of water through the water conduit to the water nozzle thereby to avoid dripping of water from said head.

HERMAN F. SIMON.