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METHOD OF AND APPARATUS FOR ATOMIZING, &c.

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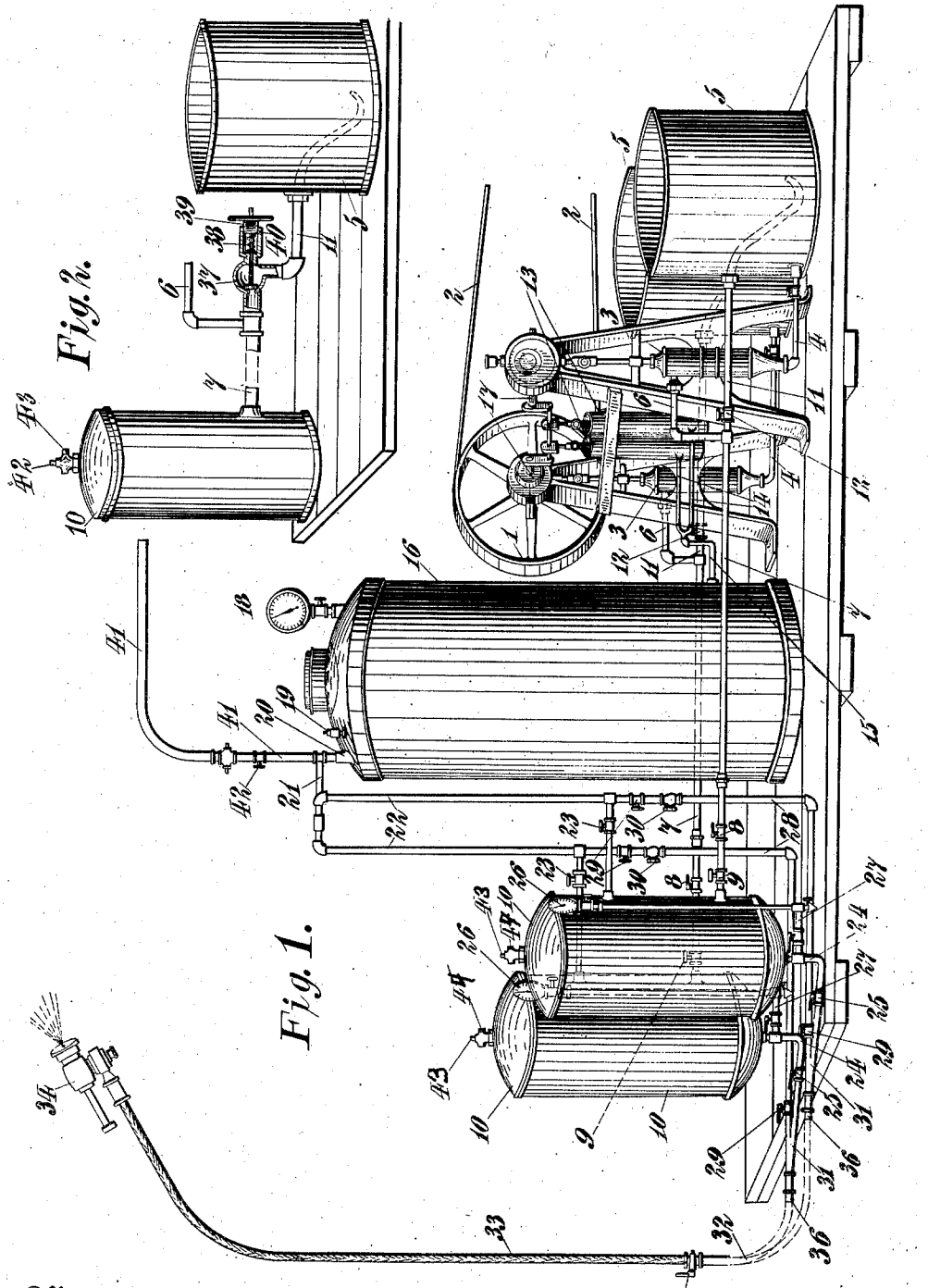

Fig. 1.

Fig. 2.

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METHOD OF AND APPARATUS FOR ATOMIZING, &c.

No. 927,881. Specification of Letters Patent. Patented July 13, 1909.

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To all whom it may concern:

Be it known that I, ANTENOR SALA, a citizen of the Republic of Mexico, residing at the city of Mexico, Republic of Mexico, have invented certain new and useful Improvements in Methods of and Apparatus for Atomizing, &c., of which the following is a specification.

This invention relates to methods and means for atomizing or vaporizing liquids, and also to means for spraying liquids and other materials.

The principal object of my invention is to readily and instantly atomize or convert liquids into vapor by physical means, and also to direct and eject the atomized liquid or vapor at any place where desired.

Another object of said invention is to provide an atomizing and spraying apparatus that may be charged and operated so as to atomize or spray continuously, and in which the atomizing or spraying may be maintained practically constant and uniform at any desired working pressure. Also to permit the simultaneous atomizing or spraying of different materials from the same outlet; and also to provide means for stirring the material or materials in its or their receptacles whenever desired.

I have discovered from practical experience, that liquids may be instantly atomized or converted into vapor, by uniting the liquid during its passage in a passage way with an aeriform agent under pressure traveling in the same direction, so that said liquid and agent will unite and be ejected from the outlet of the passage way in the form of vapor or atomized.

In the accompanying drawing, Figure 1 illustrates in perspective one embodiment of an apparatus for carrying out the objects of my invention; and Fig. 2 is a similar view of a modification in detail.

Similar numbers indicate like parts in both figures.

The apparatus may be operated by means of any suitable motor or engine (not shown) from which the power is transmitted to a driving wheel or pulley 1, as for example, by a driving belt 2.

3, 3 represent force pumps, each connected by a pipe 4 with one of the receptacles 5, of the material or materials to be atomized and by pipes 6 with pipes 7, each having a cock 8, and check valve 9, and each of said pipes 7 also being connected with an air tight tank 10. Branches 11 of the pipes 7 enter said receptacles 5 and with their open ends preferably near the bottom of the receptacles, as shown in dotted lines. The passages in these branch pipes 11 are each controlled by a cock 12, which when opened permits the return of the material to said receptacles 5. Air compression pumps 13 communicate by pipes 14, 15 with a compressed air reservoir 16, entering the said reservcir preferably near the bottom. The piston rods of the pumps 3 and 13 are connected with eccentrics or cranks on the shaft 17 of the pulley 1, and the pumps are operated by this means. The air reservoir 16 is provided with a gage 18 and a safety valve or tap valve 19, which may be set for any desired pressure. Said reservoir has also an outlet at 20; the pipe 21 leading from the said outlet divides, and each branch 22 leads to one of the said air tight tanks 10 through the cocks 23. The air tight tanks 10 are provided with outlet pipes 24, each having a cock 25. Pressure gages 26 are connected to a branch 27 of each of said outlet pipes 24.

28 represents a branch of each of the pipes 22, each pipe 28 having cocks 29, 29 and a check valve 30 and uniting at a point 31 with one of said outlet pipes 24, which latter convey the material to be atomized from the tanks 10. The common passageways from the tanks 10 and for compressed air, may unite at 32 and lead from there by means of a pipe or hose 33 (of any desired length) to the outlet nozzle 34. Said pipe is provided with a cock 35. There may be two or more of the outlet nozzles, each connected by a length of hose at a point 36 to one of the passageways 31, in case it is desired to atomize independently two or more materials at the same time.

The operation of the apparatus as an atomizer is as follows: The driving shaft 17 being put in motion, the air compressed by the pumps 13 is forced into the reservoir 16 until the proper pressure is indicated by the gage 18, the outlet from said reservoir being closed up to this time. The pressure above referred to should be considered that above atmospheric pressure. The cocks 23 in the pipes 22 are then opened, and the compressed air from the reservoir 16 will pass into the tanks 10, the cocks 25 in the outlet pipes 24 being closed while the tanks are being charged with the compressed air. When the pressure in the tanks 10 has

reached a point somewhat below the desired working pressure, as will be indicated by gages 26, the cocks 23 are closed, thus shutting off the compressed air from reservoir 16. At the same time the cocks 12 are opened and cocks 8 closed; they have thus far permitted the material pumped by the force pumps to return to the receptacles 5, and thus stir up the materials in said receptacles. The cocks 8 are opened at the same time, the cocks 12 are closed, and the material now forced by the pumps through pipes 7, accumulates in the lower part of the tanks 10, increasing the pressures of the air therein. Meanwhile the pressure in the reservoir 16 has increased to a point determined by the regulation of the valve 19. When the desired working pressure is attained in air tight tanks 10 and air reservoir 16, with the pressure in said tanks 10 greater than that in reservoir 16 the cocks 25 in the outlet pipes 24 from tanks 10, and the cocks 29, 29 in the pipes 22 are all opened, and the material from tanks 10 mixed with air from reservoir 16, and both under the desired working pressure, issue from the nozzle 34 in an extremely, finely, divided or atomized condition, and under the control of the operator by means of cock 35. The air does not issue from the said tanks together with the paint or material to be atomized, but is behind said material or materials forcing them through the pipes 24, 33, to the outlet nozzle. The nozzle may be dispensed with, and the atomizing will still take place.

During the atomizing operation of the apparatus, the pressure on the tanks 10 should be enough greater than that in the reservoir 16, so that the liquids from said tanks will not travel at a less rate than the compressed air emerging from the reservoir 16 and so that the said air and liquid will intimately commingle, (the air breaking up and separating the liquid into fine particles) and travel together at about the same rate of speed through the common passageway 32 and 33 and from the nozzle 34. A greater pressure will be required in the tanks 10 than in the reservoir 16, because the compressed air in the tanks has to force the liquid ahead of it from said tanks, while the compressed air from the reservoir to the passageway 32 has nothing to force ahead of it nor to retard its progress. The passageway for the commingled compressed air and liquid from the tanks, consisting of the common passageway 32 and long pipe 33, will cause said commingled air and liquid to assume a concentrated form, and great speed before issuing from the outlet and to be suddenly ejected, so that the material as it issues from the outlet, will be air and finely divided liquid, both under high pressure, and so that said material will be immediately turned into and shot away from the outlet in the form of vapor, and to a considerable distance: and this result will be accomplished whether the ejecting nozzle be used or not. It will be understood that the same charge of air remains, therefore, in the air tight tanks 10, during the entire operation of the apparatus, at any working pressure, and that this pressure is maintained by pumping the material or materials into said tanks 10, and air in reservoir 16 at a rate approximately equal to that at which they leave these tanks and air reservoir, by the pipes 24, 28 and passageways or pipes 33 leading to the outlet nozzle or nozzles. When the desired working pressure is exceeded at any time, by reason of surplus volume of material or materials in tank or tanks 10, then close cocks 8 and open cocks 12, so that the material or materials directly from the pumps return to the receptacle or receptacles 5 without thus discontinuing the atomizing service of the apparatus. The jets entering the receptacles through pipes 11, stir the material therein thoroughly. Each of said receptacles 5 may, of course, be charged with a different material; different materials, therefore, may be atomized at the same time, the operation of the apparatus being the same, excepting that more than one connecting hose are used.

The regulation of the rate of pumping material may be effected by regulating the speed of the force pumps, so that the pressure remains constant, as shown by the gages 18 and 26. This may also be done automatically by substituting a modification as shown in Fig. 2. This modification consists only in the substitution of regulating valves for the cocks 12, or in addition thereto, said cocks being open. We have shown only one of these valves, 37. It is controlled by the spring 38, the stem of the valve passing loosely through the nut 39 screwed into the casing 40, the pressure of the spring against the valve being regulated by screwing the nut in either direction. As soon as the desired working pressure is exceeded, the valve opens and permits the material to flow back through the pipe 11 into the receptacle. The cocks 8 in pipes 7 may remain open continually, and material will flow into the air tight tanks 10 when and only when the pressure therein falls below the desired working pressure. At all other times, that is, whenever the desired working pressure is exceeded, some of the material will flow back into receptacles. When the safety valve 19 in the air reservoir 16 is also set for the said desired working pressure, the apparatus will atomize continuously at this pressure, so long as the pumping speed is equal to or exceeds that necessary to supply the quantity of air and material or materials atomized by the nozzle or nozzles. I have also shown in Fig.

1, a tube 41 connected to the outlet 20, and provided with a cock 42. The compressed air passing from the reservoir 16 through the pipe 41, may be used for an air blast for driving a motor, or operating any mechanism for which compressed air is adapted. Also outlets from the tanks 10 for the compressed air are shown at 43, and provided with ordinary stop cocks 44.

From the above it will be seen that my invention is capable of causing the most effective atomizing of the material and especially by reason of the compressed air, gas, steam or other compressible and expansible aeriform agent commingling with the material discharging from the atomizing outlet or nozzle.

My apparatus as thus described is one that is adapted for atomizing two or more different materials at the same time. It is evident that it may be used for one material only and that all but one set of receptacles, force and air pumps, air tight tanks, communicating pipes, valves, cocks, etc., may be disconnected or even dispensed with, without altering the working principles of my apparatus; and also that there may be more than two sets of the said receptacles, pumps, tanks, etc., and more than two outlet nozzles connected therewith. Two or more materials may also be united in the common passageway leading to the atomizing nozzles, and the compressed air may be mixed with one or more of the materials, either before or after said materials are mixed together.

The main feature of this invention, namely, that of atomizing or reducing to the form of vapor, paints and other liquids, is based upon the principle that thorough or actual atomization is accomplished by uniting said liquid with an aeriform agent both under pressure and both traveling in the same direction, and then ejecting them together from the same outlet. Any aeriform agent under pressure may be used, as for example, compressed air, gas or steam, but I prefer to use compressed air especially on account of its accessibility and economy.

If it be desired to utilize the apparatus for ejecting the liquid or other material either in the form of a spray or otherwise, but not to atomize it, this can be accomplished by shutting off all communication between the main passage or passages 31 and the supply pipes 28, by means of the cocks 29. The aeriform agent will then be prevented from uniting with the liquid in its passage way to the outlet, said agent being used to eject the material from behind, and the material will thus be forced from the outlet either in the form of a stream or jet, or in the form of spray.

I do not limit myself to the precise method and construction herein described and shown, as many changes may be made therein without departing from the spirit of my invention or sacrificing its principal advantages.

What I claim as new and desire to secure by Letters Patent, is:—

1. The improved method of atomizing or vaporizing liquids, consisting in causing a liquid and an aeriform agent each to travel under a pressure greater than gravity or atmospheric through separate passages by means of separate and independent sources of pressure for said liquid and agent respectively, and then causing said liquid and agent to unite and continue to travel under said pressures through a laterally confining passageway having a length many times its width, whereby the said liquid and agent are intimately commingled, and causing them to be ejected from said passageway.

2. The improved method of atomizing or vaporizing liquids, consisting in causing a liquid and an aeriform agent each to travel under a pressure greater than gravity or atmospheric through separate passages by means of separate and independent sources of pressure for said liquid and agent respectively, and the pressure on the liquid being greater than that on said agent, and then causing said liquid and agent to unite and continue to travel under said pressures through a laterally confining passageway having a length many times its width, whereby the said liquid and agent are intimately commingled, and causing them to be ejected from said passageway.

3. The improved method of atomizing or vaporizing liquids, consisting in forcing a column of liquid through a passageway by the expansion behind it of a compressed aeriform agent, causing a column of an aeriform agent to travel under pressure greater than atmospheric through another passageway, and by a separate source of pressure from that for the liquid, uniting said two columns and causing them to travel together under said pressures through a laterally confining passageway having a length many times its width, whereby the said liquid and agent are intimately commingled, and causing them to be ejected from said passageway.

4. The improved method of atomizing or vaporizing liquids, consisting in forcing a column of liquid through a passageway by the expansion behind it of a compressed aeriform agent, causing a column of an aeriform agent to travel under pressure greater than atmospheric through another passageway by a separate source of, and less pressure than that on the liquid, uniting said two columns and causing them to travel together under said pressures through a laterally confining passageway having a length many times its width, whereby the said liquid and agent are intimately commingled, and causing them to be ejected from said passageway.

5. An apparatus for atomizing or vaporizing paint and other liquids, comprising a main laterally confining passageway having a length many times its width, and an outlet at one end, separate passages uniting in said main passage at its other end, means for forcing by pressure an aeriform agent through one of said separate passages and the main passageway, and separate and independent means for forcing a liquid by pressure greater than atmospheric or gravity through another separate passage and the main passageway, whereby said agent and liquid will unite, travel together under pressure, and be intimately commingled in said main passageway, and be ejected therefrom in the form of vapor.

6. An apparatus for atomizing or vaporizing paint and other liquids comprising a main laterally confining passageway having a length many times its width, and an outlet at one end, separate passages uniting in said main passage at its other end, means for forcing by pressure an aeriform agent through one of said separate passages and the main passageway, and separate and independent means for forcing a liquid by pressure greater than atmospheric or gravity through another separate passage and the main passageway, and the pressure on the liquid being greater than that on said agent, whereby said agent and liquid will unite to travel under pressure and be intimately commingled in said main passageway and be ejected therefrom in the form of vapor.

7. In an apparatus for applying paint and similar materials, the combination of a flexible tube of considerable length and relatively small cross-section and having an ejecting outlet, separate passageways uniting in said tube at a material distance from said outlet, means for forcing a liquid by pressure greater than atmospheric or gravity through one of said passageways and tube, and separate and independent means for forcing by pressure an aeriform agent through the other of said passageways and tube.

8. In an apparatus for applying paint and similar materials, the combination of an air tight tank, a receptacle for said material, a passageway for the material from said receptacle to said tank, means in said passageway for forcing the material therethrough, and a conduit leading to the lower portion of said receptacle and in operative relation with said forcing means for stirring the material in said receptacle.

9. In an apparatus for applying paint and similar materials, the combination of a main passage having a length many times its width, two passageways connecting with said passage approximately at its other end, an air tight tank for said material connected to one of said passageways, a source of compressed aeriform agent connected to the other of said passageways, means for regulating the pressure in said tank and independent means for regulating the pressure on said aeriform agent.

10. In an apparatus of the class described, the combination of an air tight tank, means for supplying an expansible aeriform agent to said tank, an inlet to said tank, means for forcing liquid material through said inlet and into said tank, an outlet passage from said tank having an ejecting outlet at one end, and a passageway for conveying said agent from a different source of supply than said tank to said outlet passage at a material distance from its outlet.

11. In an apparatus of the class described, the combination of an air tight tank, means for supplying an expansible aeriform agent to said tank, an inlet to said tank, means for forcing liquid material through said inlet and into said tank, an outlet passage from said tank having an ejecting nozzle at its end, and a passageway for conveying said agent from a different source of supply than said tank to said outlet passage at a material distance from its outlet.

12. An apparatus of the class described, consisting of a plurality of air or gas tight tanks, means for supplying an expansible aeriform agent to said tanks, an inlet to each of said tanks, means for forcing liquid or other material through said inlets into said tanks, an outlet passage of considerable length and small cross section between said tanks and the ejecting outlet, and a passageway for conveying said agent from a different source of supply than said tanks to said outlet passage at a material distance from its outlet.

13. An apparatus of the class described, consisting of an air or gas tight tank, means for supplying an expansible aeriform agent to said tank, an inlet to said tank, means for forcing liquid or other material through said inlet and into said tank, an outlet passage between said tank and the ejecting outlet, means for indicating the pressure on said material, and means for regulating said pressure, and a passageway for conveying said agent from a different source of supply than said tank to said outlet passage, at a material distance from its outlet.

14. In an apparatus of the class described, the combination of an ejecting outlet, a plurality of passages for the material to be ejected, a common passageway uniting said passages and the ejecting outlet, means for forcing the material through said passages, passageways and outlet and means for automatically regulating the pressure on said material.

15. An apparatus of the class described, consisting of an air or gas tight tank, means for supplying an expansible aeriform agent to said tank, an inlet to said tank, means for

forcing liquid or other material through said inlet and into said tank, an outlet passage of considerable length and small cross-section between said tank and the ejecting outlet, means for automatically regulating the pressure on said liquid or other material, and a passageway for conveying said agent from a different source of supply than said tank to said outlet passage at a material distance from its outlet.

16. An apparatus of the class described consisting of a plurality of passages for the material to be ejected, a common passageway of considerable length and small cross-section, uniting said passages and the ejecting outlet, means for forcing the material through said passages, passageway and outlet, and means for automatically regulating the pressure or force on said material.

17. An apparatus of the class described consisting of an air tight tank, means for supplying compressed air to said tank, a receptacle for liquid or other material, a passageway leading from said receptacle into said tank, a controlling valve in said passageway, an outlet passage of considerable length and small cross-section between said tank and the ejecting outlet, and means for regulating the pressure on said material in said tank, and also for regulating said valve, all as and for the purposes set forth.

18. An apparatus of the class described consisting of an air tight tank, a compressed air reservoir, a passage way from said reservoir to said tank through which compressed air is supplied to said tank, an outlet passage between said tank and the ejecting outlet, an outlet passage from said reservoir communicating with the outlet passage from the tank all as and for the purposes set forth.

19. In an apparatus of the class described, an air pump for supplying compressed air to the passage way to the ejecting outlet, a force pump for supplying the material to be ejected to said passage way, and the pistons of both the air pump and the force pump operated by cranks on the same shaft.

20. An apparatus of the class described consisting of a plurality of air tight tanks, a compressed air reservoir and passage ways between said reservoir and tanks for conducting the compressed air in said tanks, outlet passages from said tanks, passage ways from said reservoir communicating with said outlet passages, said outlet passages uniting in a common passage way leading to the ejecting outlet, air pumps for forcing compressed air into said reservoir, a plurality of receptacles for the material to be ejected, a plurality of force pumps communicating respectively with the receptacles and with said tanks for forcing the materials in said tanks, and means for regulating the pressure on the material in said tanks all as and for the purposes set forth.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ANTENOR SALA.

Witnesses:

HERMAN J. TEUFER,

EDWIN SEGER.