June 30, 1936. M. G. ANDERSEN 2,046,232

ATOMIZER

Filed Aug. 13, 1934

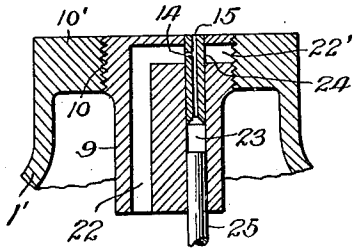


FIG: 2.

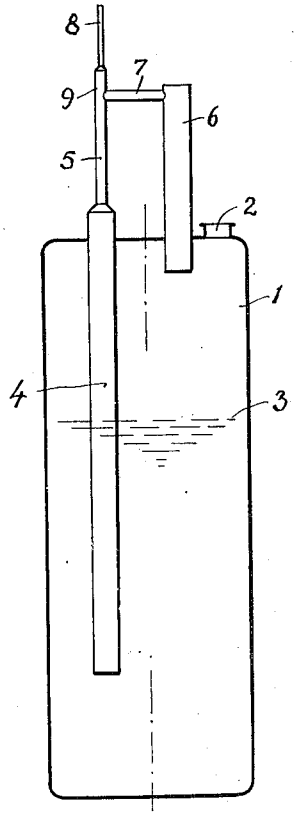


FIG: 1.

Inventor

M. G. Andersen,

By Watson, Coit, Grove & Grindle

Att'ys

Patented June 30, 1936 2,046,232

UNITED STATES PATENT OFFICE

2,046,232

ATOMIZER

Martin Georg Andersen, Frederiksberg, near Copenhagen, Denmark

Application August 13, 1934, Serial No. 739,668
In Denmark January 13, 1934

1 Claim. (Cl. 299—89)

For atomization of a liquid, for instance fuel oil in air, several devices are known which are based upon the ejector principle, that is to say a current of compressed air is directed past an outlet orifice in a liquid-supply pipe, and creates thereby a vacuum having for its consequence that the liquid is sucked into and taken along by the air current as particles kept in suspension therein. Similar devices for atomizing of liquids are known, with the difference, however, that the liquid is not directed to the air current by a suction produced by the latter, but by an air pressure resting on the liquid. Nor has it been possible, by means of such known devices, to attain a uniform atomization of the liquid, i. e. a reduction to a practically uniform size of particles.

By the said known devices it will be necessary to use regulating devices, but even if the latter be adjusted very carefully, a uniform atomization will not be attained. On the contrary, the minute drops of liquid suspended in the flow of compressed air will be of many different sizes.

The present device is an atomizing device of the last mentioned kind, but differs from the known devices by the special manner in which the flows of liquid and air are brought together, and which gives a really uniform atomization, so that the minute drops suspended in the air current will all be of practically one and the same size. The compressed air is in fact introduced into the liquid-discharging pipe by way of a pipe leading sideways into the first mentioned pipe, closely behind the orifice of the pipe discharging liquid into the surrounding air, and the lengths and widths of the pipes are selected in such a manner that the compressed air in the liquid-tank will drive a continuous and suitably strong flow of liquid past the point of entrance of the compressed-air pipe into the liquid-discharging pipe, the effect being that the air in the compressed-air pipe will cut off, in regular succession, equal minute portions of the flow of liquid ascending in the liquid-discharging pipe, and will fling the same into the surrounding air, either directly or by way of an atomizer device for further comminution of the said portions of liquid cut off.

The invention is illustrated on the drawing, on which

Fig. 1 shows a diagrammatic and schematic view of an atomizer embodying the present invention, and

Fig. 2 is a sectional elevation of an atomizer constructed in accordance with a preferred form of the present invention.

Fig. 1 serves mainly to illustrate the working principle underlying the invention. The liquid is contained in a closed liquid-tank 1, into which compressed air is introduced by way of a nipple 2, or in which a suitable air pressure is produced by means of a suitable device disposed in the tank itself, for instance a piston pump discharging air into the tank and being adapted to be operated from the outside. The momentary liquid level is marked 3. From a point near the bottom of the tank, a riser 4 for the liquid extends upward, which pipe is narrowed on the top part so as to form a narrow pipe 5.

From the upper air-filled part of the tank 1 extends a discharge pipe 6 for compressed air terminating in a narrow pipe 7, which enters from the side into the narrow riser 5 for the liquid. The latter is continued, outside of the point of entrance of the compressed-air pipe 7, by a pipe 8 opening freely into the surrounding air.

Supposing this pipe 8 to be closed, and a suitable excess pressure to be created in the vessel 1, such an excess pressure will of course not produce any rise of the liquid in the pipe 4, but the level of the liquid in this pipe will be the same as outside of the pipe, because no motion is taking place, and the static air pressure will therefore be the same all over the tank 1 and the pipes 4, 5, 6, 7 and 8. If on the contrary the pipe 8 be opened towards the surroundings, the conditions will at once be altered. Compressed air will then flow out through the narrow pipe 8, and thereby a certain part of the excess pressure of the air will be consumed, and at the point 9, where the compressed-air pipe 7 is joined to the liquid-pipe 5, there will therefore be an excess pressure, which is so much lower than the excess pressure in the tank 1 as the amount of pressure consumed by the discharge through the pipe 8. The differential pressure between the air space in the tank and the entrance 9 will cause the liquid to ascend through the pipes 4 and 5, and by a proper selection of the pipe dimensions and the pressure a practically continuous flow of liquid will then be directed up to the inlet 9 and further on past the compressed-air pipe 7.

The effect produced hereby can be explained as follows: When the flow of liquid ascends past the inlet 9 and thereby closes the latter, the pressure in the pipe 7 will increase slightly and, after a certain increase in pressure, the air will penetrate into the flow of liquid opposite the inlet 9, and will thereby separate the short column of liquid above the inlet from the long column of

liquid below, and the separate liquid column will then be flung up through the pipe 8 and into the outer air. As this play will continue pulsatively—always under exactly the same conditions, provided that the pressure in the tank 1 be not altered appreciably—liquid drops of practically equal fineness will constantly and in quick succession be flung out from the inlet 9.

By passing through the pipe 8, or several such pipes or other openings, the minute drops flung out may be further comminuted, always under uniform conditions and, therefore, in a practically perfectly uniform manner.

Evidently, the conditions under which the liquid is thus split into minute drops will depend on the lengths and widths of pipes selected and on the nature of the material and of the pressure used, as the ascent of the liquid through the riser 4 at a suitable speed will require the fulfilment of certain conditions in the said respects, as mentioned above. It is further evident that when all dimensions are selected in a certain manner producing the desired effect on the discharge of a liquid of a certain kind, then the conditions will always remain perfectly uniform, so that no adjusting devices of any kind will be required. Dimensions and material for a given kind of liquid must therefore be selected empirically in such a manner that the desired effect is attained.

Fig. 2 shows how the general principle mentioned above can be carried out in practice. The atomizing device consists here of a cylindrical metal plug 9 with an outside thread 10, by means of which the device can be screwed into a nipple 10^1 formed on the mouth of the tank 1^1. In a diametral plane, two longitudinal bores or channels 22 and 23 are bored in the said plug.

In the same plane, a transverse channel 22^1 is further drilled from the side, i. e. through the thread of the plug, which channel intersects the channel bores 22, 23.

As shown there is inserted in the top of bore 23 a tightly fitting metal cylinder 24 with a longitudinal fine channel 15 and a transverse fine channel 14, which latter connects the bore 22 and the channel 15, into which it enters from the side. This cylinder 24 completely blocks the passage 22^1 so that no air can escape therefrom except through the passage 14. In the bottom end of the bore 23 a pipe 25 is inserted. When the said pipe is connected to the fuel in the fuel tank, and the bore 22 is in connection with the source of compressed air, the apparatus will give exactly the same effect as described.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed I declare that what I claim is:—

An atomizer including, in combination, a tank adapted to contain liquid to be atomized and air under pressure, a plug at the upper end of said tank having a bore extending throughout its length and providing communication from the inside to the outside of the tank, a tube inserted in the lower end of said bore extending below the surface of the liquid in the tank, a second bore open at its lower end to the air in the tank and closed at its top, a transverse bore opening at the side of said plug, crossing said first bore and intersecting and stopping the said second bore, and a second tube in said first bore closing off the transverse bore and having a small axial passage open at its upper end to atmosphere and at its lower end to said first bore, and also having a lateral port affording communication between said passage and transverse bore on the second bore side of the second tube.

MARTIN GEORG ANDERSEN.