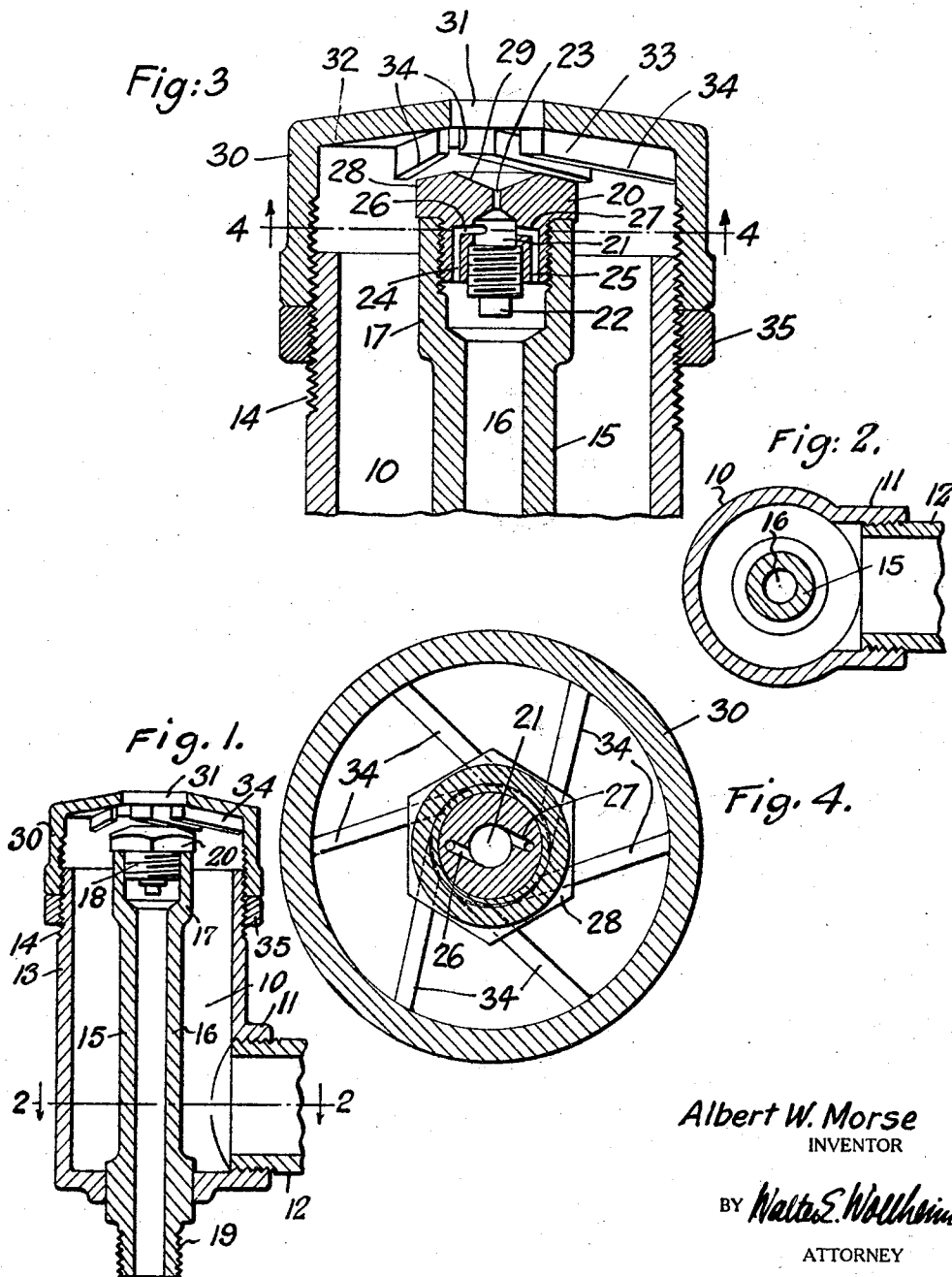


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LIQUID AND GAS MIXER
Filed Aug. 2, 1924



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LIQUID AND GAS MIXER.

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This invention relates to liquid and gas mixers, and particularly to devices in which the liquid is atomized by means of free centrifugal action and not by moving parts or by stationary baffles or impact.

The principal objects of the invention are to provide a liquid and gas mixing device which will thoroughly and almost instantaneously mix the two; to provide a liquid and gas mixing device which will at the same time uniformly mix the two; to accomplish this by means of free centrifugal action of the liquid combined with a swirling motion of the gas; to break the liquid up into a hollow cone of minute particles and to deflect the swirling gas into this cone; and to accomplish this in an extremely simple manner by utilizing the nebulizer disclosed in Patent #876,108, issued January 7, 1908, to Stringham and Elmendorf, in combination with certain novel features of construction set forth hereafter.

Other objects will appear in the following specifications in which a preferred form of my liquid and gas mixer, particularly adapted to the mixing of oil and air for burning purposes, is described.

The invention is illustrated by means of the accompanying drawings, in which

Fig. 1 is a vertical longitudinal sectional view of the mixer;

Fig. 2 is a transverse cross sectional view taken along the plane of line 2—2 in Fig. 1;

Fig. 3 is an enlarged fragmentary sectional view of the outlet end of the mixer, showing more clearly the relation between the nebulizer and gas deflecting cap and their respective details; and

Fig. 4 is a cross sectional view taken along the plane of line 4—4, in Fig. 3.

Like characters of reference denote similar parts throughout the several views and the following specification.

10 is a hollow casing of substantially L shape. Its shorter branch 11 is threaded interiorly to receive an air or gas supply pipe 12. 13 is the longer branch of casing 10, its terminal being threaded exteriorly at 14. The other end of branch 13, adjacent to branch 11, is bored out to receive a spindle 15. This spindle is of hollow construction, being provided with a central duct 16. 17 is an enlarged end of spindle 15, projecting slightly over the end of branch 13 of casing 10, and is threaded interiorly at 18. The extreme other end of oil spindle 15 which

projects outside of the casing 10, is threaded exteriorly at 19 to receive a regulating valve (not shown).

20 is a spray nozzle or nebulizer, provided in its center with a hollow core 21, cylindrical in shape, called the swirl chamber. 22 is a plug screwed into the lower part of nebulizer 20 for the purpose of machining chamber 21. At the top of the chamber 21 and in its center is a small circular outlet opening 23. 24 and 25 are small drilled passages extending into the nebulizer 20 at the sides of the chamber 21. 26 and 27 are ducts or inlet orifices joining the innermost ends of passages 24 and 25 with the upper part of chamber 21. These ducts are positioned so as to impinge the circumference of chamber 21 tangentially, as is shown in Fig. 4, and they are further slightly inclined toward the outlet end. 28 is a polygonal projection around the outside of nebulizer 20, slightly larger than end 17 of spindle 15, to facilitate screwing the same into the spindle. The top of the nebulizer 20 is chamfered at 29, so as to make the final outlet passage 23, as short as possible.

30 is a cup shaped cap threaded interiorly to fit end 14 of casing 10. 31 is a circular opening through cap 30 which is concentric with, but of larger diameter than outlet 23 of the nebulizer. Top walls 32 of cap 30, adjacent and surrounding the outlet 31, are in slight angular relation to a perpendicular to the axis of outlet 31. 33 is an angular gas passage formed by the inner side of walls 32 of cap 30 and the top of nebulizer 20. Within this passage 33, and integrally cast with cap 30, are a series of ribs or partitions 34. These ribs 34, in cross section, are so positioned as to be tangential to a circle slightly greater in diameter than outlet 31, as clearly shown in Fig. 4. 35 is a lock nut to hold cap 30 in any desired adjusted position.

The operation of this device is, as follows:

The liquid or oil is admitted into passage 16 under pressure, and is forced through passages 24 and 25 and inlet orifices 26 and 27 into the swirl chamber 21. By means of the tangential direction of inlet orifices 26 and 27 with respect to the wall of the chamber 21, the liquid is given a swirling motion of high velocity which breaks up or atomizes the liquid and expels it through the nebulizer outlet 23 in form of a hollow conical mist or spray.

The gas or air is admitted under pressure into the casing 10 through supply pipe 12, then is forced through passage 33 into the hollow conical spray of liquid issuing from outlet 23. The air is deflected into this spray in a tangential direction, being guided by ribs 34 in cap 30, when the cap is screwed closely to the nebulizer, so that its ribs 34 touch the top of the nebulizer. As the cap 30 is unscrewed, more and more gas is deflected directly into the liquid spray, in addition to the amount directed tangentially into it by guide of the ribs 34, thus producing a mixture of widely varying dispersion and character.

By using this method in an oil burner, for instance, the air is injected not only directly into the center of the cone shaped spray of oil issuing from the nebulizer, but also tangentially to the same, that is towards a circle, the circumference of which is located at a small distance from the spray center and concentrically with the same. In devices in which the air is deflected only directly into the center of the spray, the spray is compressed toward the center and only a partial mixture of the oil particles and the air is obtained, while combining the direct admission of the air to the center of the spray (which is variable according to the nature of the spray by screwing the cap more or less closely to the nebulizer) with the tangential direction of the air to the outside of the conical spray, a better mixture is obtained of high explosive characteristics, resulting in higher temperatures of combustion and corresponding greater efficiency of operation.

While I have shown the ribs 34 integrally with cap 30, the same can also be made integrally with nebulizer 20 instead of the cap, and the air directed against the spray issuing from the nebulizer, not tangentially but directly into it, adjacent and right below outlet 31.

Furthermore, while I have shown and described the application of my invention in

connection with an oil burner, it is understood that the invention may be used in connection with any device in which a mixture of a gas and liquid is desired. It is further understood that various changes in the form, proportion and minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention as defined in the appended claims.

What I claim as new, is:

1. In a liquid and gas mixer having a discharge opening, a nebulizer adapted to discharge a liquid from an outlet in form of a spray by tangential admission into a swirl chamber within it, an adjustable cap defining the said discharge opening, forming a gas passage surrounding the nebulizer adjacent its outlet, the said cap having vanes adjacent its discharge opening tangentially disposed with respect to the said spray for the purpose of directing a gas against the outside of the spray, the said vanes being in spaced adjustable relation to the said nebulizer for the purpose of admitting simultaneously a gas into the center of the spray.

2. In a liquid and gas mixer having a discharge opening, a nebulizer adapted to discharge a liquid from an outlet in form of a spray by tangential admission into a swirl chamber within it, an adjustable cap defining the said discharge opening, forming a gas passage surrounding the nebulizer adjacent its outlet, the said gas passage becoming smaller in size as it approaches the outlet, the said cap having vanes adjacent its discharge opening tangentially disposed with respect to the said spray for the purpose of directing a gas against the outside of the spray, the said vanes being in spaced adjustable relation to the said nebulizer for the purpose of admitting simultaneously a gas into the center of the spray.

In testimony whereof I have hereunto set my hand and seal.

ALBERT W. MORSE. [L. S.]