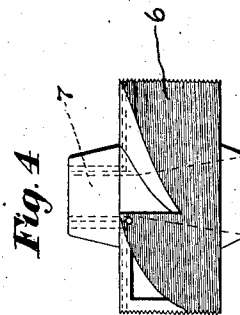
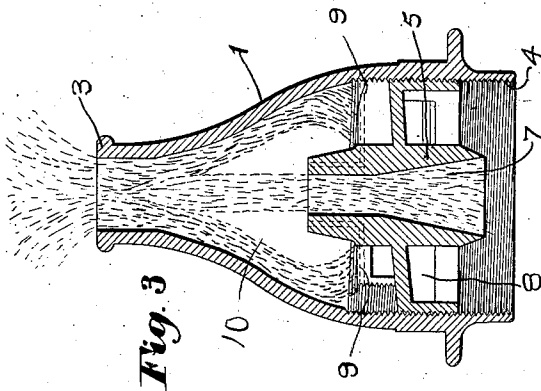
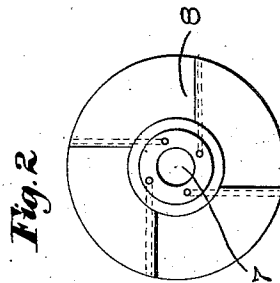
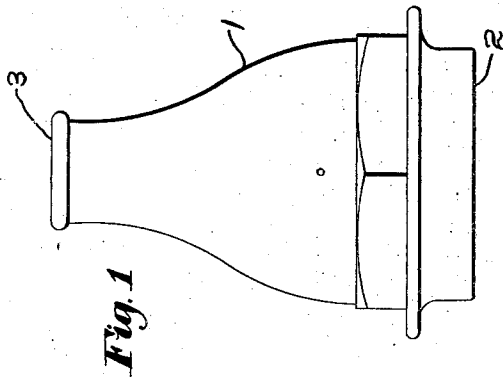


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 SPRAY NOZZLE AND METHOD OF DISTRIBUTING LIQUIDS.
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1,101,264.

Patented June 23, 1914.



Witnesses:

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SPRAY-NOZZLE AND METHOD OF DISTRIBUTING LIQUIDS.

1,101,264.

Specification of Letters Patent.

Patented June 23, 1914.

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To all whom it may concern:

Be it known that I, AUBREY G. ENEAS, a subject of the King of Great Britain, and a resident of Winthrop, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Spray-Nozzles and Methods of Distributing Liquids, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to fluid spray nozzles of general application, and to methods of distributing fluids.

In order that the principle of the invention may readily be understood, I have in the accompanying drawings disclosed a single type of nozzle embodying that part of my invention, and shall proceed to describe the best mode or manner known to me for practising such method.

In said drawings:

Figure 1 is a side elevation of a spray nozzle constructed in accordance with my invention and by which the method of my invention may be practised. Fig. 2 is a plan view of the inner liquid guiding member of the nozzle. Fig. 3 is a central longitudinal section taken through the inner and outer chambers of the nozzle; and Fig. 4 is a side elevation of the inner liquid guide member.

By the nozzle herein disclosed and in accordance with and in carrying out the method of my invention, I form and distribute over preferably an extended area, a spray composed of or comprising water or other liquid or suitable fluid, and which is, in the most effective embodiment thereof, of substantially uniform homogeneity throughout. Such spray is capable of use in many and varied relations. Among other uses, to which I am in no wise limited in the practice of my invention, I may enumerate the following:—For aerating municipal and other water supplies in reservoirs and other places: in connection with cooling ponds to spray the water heated in condensers of turbine or other engines; for spraying effluent in connection with sprinkling filter beds; for precipitating coal dust; for air washing; for condensing vapors; for humidifying air in chemical plants and in cotton mills, for oil burners, fire extinguishers, and in fact for

many other uses not herein necessary to enumerate.

In carrying out my method, I project the fluid, of whatever nature, in a flaring spray, and in practising the method I preferably simultaneously produce both rotary and non-rotary jets, and mix, mingle or blend said jets within a confined space from which I cause the mixed, mingled or blended mass to issue in a spray of substantially uniform homogeneity.

Preferably the non-rotary jet is a central or axial one and the rotary jet or jets surround the same and are caused transversely to impinge upon the axial or central jet with the result that said jets are sufficiently mixed to produce a spray of the character described when discharged from the confined space. In carrying out my method, I preferably provide a chamber in advance of the jet producing means, the said chamber being so shaped and of such volume as to permit an effective mixture or blending of the jets before they issue in spray form from said chamber. This result may be effected by so shaping the chamber or so positioning an abutment therein as to cause impact thereon of one or more of the surrounding jets and rebound thereof, with the result of a mixing or blending of these jets within the confined space.

In that embodiment of the nozzle of my invention herein selected for illustration and by which I may practise my invention, the nozzle comprises a shell or casing 1 constituting an outer mixing chamber and having an entrance 2 for the water or other liquid to be sprayed and a discharge orifice 3. The nozzle may be suitably connected to a hose or other means for conveying the fluid or liquid to be sprayed. For the purpose, I have herein represented the nozzle 1 as interiorly threaded at 4. Within the shell 1, I form or position an inner liquid guiding member 6 herein represented as detachable from the shell 1 and as exteriorly threaded at 4, so that it may be screwed into position in the shell 1, forming the mixing chamber 10. The inner member 6 may be constructed in any suitable manner to produce the desired results. In order to effect the spraying referred to, I so construct the inner liquid guiding member that it will

discharge or direct into the mixing chamber 10 a plurality of jets as hereinafter set forth. For this purpose, I may employ a single central jet and one or more exterior jets which, if a plurality thereof be employed, surround the central jet. Preferably at least one of these divergent jets is a whirling one, the jet being given a rotating or whirling character in any suitable manner. Within the scope of my invention, the central jet may be a whirling jet or the surrounding jet or jets may be of that character.

Obviously, the method is not dependent upon the particular form of inner guiding member 6, or the means for positioning or forming the same within the shell or casing.

In that form of nozzle shown in Figs. 1 to 4 inclusive, the central jet is produced by the central passage 7 formed in the liquid guiding member 6 and receiving the water or other liquid or fluid directed thereinto under pressure and from any suitable source. Surrounding the central straight passage 7 are a plurality of divergent curved passages 8 formed between the wall of the central passage 7 and the exterior wall of the member 6. These passages 8 likewise receive liquid or fluid under pressure from the same source and impart a whirling or rotating action to the jets passing therethrough as well as a centrifugal action. The jets passing through the passages 7 and 8 are primarily of equal velocity, but the velocity of the jets passing through the passages 8 is reduced below that of the central jet, owing to the contact of said surrounding jets with the inner wall of the mixing chamber 10. The jets passing through said passages 7 and 8 converge and meet within the mixing chamber 10, the tapering formation of this chamber 10 compelling the mixing of said jets. The impinging of the jets upon each other thoroughly breaks them up and compels a thorough mixing and distribution of the constituent parts thereof, so that as the liquid emerges from the nozzle it spreads into a cone whose apex is the orifice of the nozzle, the spray being substantially uniformly and thoroughly distributed throughout the entire cone.

I have, in the selected form of nozzle, shown the chamber as having vanes shaped to produce rotating or centrifugal jets, said vanes in such selected form of nozzle each extending less than half way about said chamber, and being curved so as gradually to decrease the pitch of the vanes in the direction of flow of the jets and thus gradually to increase the tangential velocity of said jets past the vanes. I have herein shown said vanes as being substantially quadrantal in shape, it being clearly evident that this construction may be widely varied within the scope of my invention.

In other spraying nozzles with which I am familiar the spray is discharged in a cone, but the spray is substantially confined to elements of the cone, so that in reality the spray emerges in a sheet of conical form, it also being common to provide a central jet discharged unmixed with said conical sheet and intended for ornamental effect merely. My nozzle and the method herein disclosed on the contrary produce a spray so uniformly distributed that were sections taken through the cone to which I have referred, they would exhibit a substantially uniform distribution of the spray throughout such section. This uniform distribution is owing to the mixing compelled by the jets 7 and 8 and the distribution in all directions resulting therefrom. I am aware that whirling members have been positioned within nozzles and provided with passages for the liquid to be sprayed, but the result of such construction is to impart merely a centrifugal action to the spray so that in effect merely a shell or conical sheet is formed.

If desired, I may provide means for introducing air into the mixing chamber 10 in order to compel a more thorough intermingling of the jets. While this may be done in any suitable manner, I have herein represented air passages 9 formed in the walls of the member 6 and admitting external air into the interior of the mixing chamber 10. Each air passage 9 is preferably of the general angular character shown so as to introduce the air along radial lines and to discharge the same substantially axially and at points surrounding the central jet issuing through the passage 7.

It will be apparent that within the mixing chamber 10 a partial vacuum is formed between the jets issuing from the passages 7 and 8. Owing to the formation of this partial vacuum, the external air is sucked in through the passages 9, and although entering at atmospheric pressure it has greater pressure imparted thereto by the jets issuing through the passages 7 and 8. It is evident that the external air may be admitted, if at all in any suitable manner and that within the scope of my invention air primarily under greater than atmospheric pressure may be utilized.

It will be apparent that the air when employed in any form of my invention tends further to atomize the fluid at its exit from the nozzle by reason of the expansion of the air after its discharge from the nozzle.

The mixing chamber is relatively large compared to the orifice through which the fluid issues from the nozzle. Said chamber is of sufficient volume and so shaped as to permit and effect blending or mixing of the jets before issuance from the nozzle. In that form of nozzle herein illustrated, the cham-

ber is so shaped as to direct the rotating or centrifugal jet or jets across the path of the axial jet within the chamber, before the jets issue from the nozzle, thereby to cause said rotating jet or jets to be sprayed by said axial jet, so as to increase the spraying angle and form a full spray. In that form of nozzle herein shown, the cross sectional area of the mixing chamber exceeds the combined cross sectional area of the axial and surrounding jets. The chamber is in advance of the means for producing the jets and has its exit spaced sufficiently therefrom to permit a blending of the jets within the nozzle, the chamber being shown as having an impact-receiving formation to compel said blending. The said chamber is shaped to compel transverse impingement upon and ensuing blending of the rotary jet or jets with the non-rotary jet. The rotary jet or jets is or are transversely projected into blending union with the non-rotary jet, before issuance of the jets from the nozzle, it being evident that I provide an impact-receiving and rebound-compelling abutment positioned in advance of the jet-producing means, to cause blending of the jets before issuance from the nozzle.

It will be apparent from the foregoing description that the nozzle herein disclosed is of great simplicity of construction and is of much capacity. By reason of the uniform distribution of the spray, there is a very substantial freedom from all drift. Moreover by reason of the fact that the nozzle contains no moving parts, it is more durable and is of cheaper construction.

It will also be apparent that in accordance with my method, the liquid or fluid of the jets is mixed or blended within a confined chamber or space, and that the mixed mass issues therefrom in a spray which is of substantially uniform homogeneity throughout.

It will furthermore be apparent that the liquid or fluid of the jets is sprayed and atomized and is so thoroughly distributed that all points within the range of the nozzle receive substantially an equal amount of sprayed or atomized liquid or fluid.

Having thus described one illustrative embodiment of the nozzle of my invention and one manner of practising my method, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

I claim—

1. In a nozzle, the combination of means for producing a non-rotating axial jet, means for producing one or more surrounding rotating or centrifugal jets, and a relatively large mixing chamber in advance of

the means for producing the axial jet, having guiding means positioned to direct said centrifugal jet or jets across the path of the axial jet within said mixing chamber before said jets issue from the nozzle, whereby said jets are mixed.

2. A spray nozzle comprising in combination an inner fluid directing member and an outer member inclosing a vacuum and fluid mixing chamber, said members arranged to produce a partial vacuum automatically within the nozzle, and passages for leading the air from the outside of the nozzle to the vacuum chamber, for automatically mixing the air with the fluid under pressure before emission from the nozzle.

3. A fluid spray nozzle comprising in combination a chamber having an emission orifice and wherein a vacuum is automatically formed by the fluid in its passage through the nozzle, means for producing a plurality of jets of different directions of flow through said nozzle, one or more air passages admitting external air to the vacuum chamber, said chamber being so formed as automatically to mix the air and said jets in the nozzle before their emission therefrom.

4. A fluid spray nozzle comprising in combination a chamber having an emission orifice and wherein a vacuum is automatically formed by the fluid in its passage through the nozzle, means to produce a whirling jet within the nozzle, one or more air passages for admitting external air to said vacuum chamber, said chamber being so formed as automatically to mix the admitted air with said whirling jet before its emission from the nozzle.

5. In a nozzle, the combination of means for producing a non-rotating axial jet, means for producing one or more surrounding rotating or centrifugal jets, and a chamber in advance of the means for producing said jets and having converging walls, shaped to direct said rotating jet or jets across the path of the axial jet within the said chamber before the jets issue from the nozzle.

6. In a nozzle, the combination of means for producing a non-rotating axial jet, means for producing one or more surrounding rotating or centrifugal jets, and a chamber in advance of the means for producing said jets, and having guiding means shaped to direct said rotating jet or jets across the path of the axial jet within said chamber before the jets issue from the nozzle, thereby to cause said rotating jet or jets to be spread by said axial jet, so as to increase the spraying angle and form a full spray.

7. A spray nozzle comprising in combination, means for producing an axial, non-rotating jet and one or more centrifugal surrounding jets, and a surrounding mixing chamber beyond the jet orifices, in which all

the jets are mixed before emission from the nozzle, the cross sectional area of said mixing chamber exceeding the combined cross sectional area of said axial and surrounding jets.

8. A spraying nozzle comprising in combination, a chamber having vanes shaped to produce rotating or centrifugal jets, said vanes each extending less than half-way about said chamber, and being curved so as gradually to decrease the pitch of the vanes in the direction of flow of the jets and thus gradually to increase the tangential velocity of said jets past the vanes.

9. A spraying nozzle comprising in combination a chamber, having vanes shaped to produce rotating or centrifugal jets, said vanes each being substantially quadrantal in shape and being curved so as gradually to decrease the pitch of the vanes in the direction of flow of the jets and thus gradually to increase the tangential velocity of said jets past the vanes.

10. In a nozzle, means for simultaneously producing both rotary and non-rotary jets and means for mingling said jets before issuance from the nozzle.

11. In a nozzle, means for simultaneously producing both a rotary and a non-rotary jet and means transversely to project said rotary jet into blending union with said non-rotary jet, before issuance of said jets from the nozzle.

12. In a nozzle, in combination, means for producing a non-rotary axial jet, means for producing one or more surrounding rotary jets, and a chamber in advance of said means, shaped to compel transverse impingement upon and ensuing blending of said rotary jet or jets with said non-rotary jet.

13. In a nozzle, in combination, means for producing a non-rotary jet and one or more rotary jets, and an impact-receiving and re-

bound compelling abutment positioned in advance of said means to cause blending of said jets before issuance from the nozzle.

14. In a nozzle, in combination, means for producing a non-rotary jet and one or more rotary jets, and a chamber in advance of said means and having its exit spaced sufficiently therefrom to permit a blending of said jets within the nozzle, said chamber having an impact receiving formation to compel said blending.

15. In a nozzle, in combination, means for producing a non-rotary jet and one or more rotary jets, and a chamber in advance of said means and of sufficient volume and shaped to permit and effect blending of said jets before issuance from the nozzle.

16. That method of distributing liquid over an extended area which consists in simultaneously producing both rotary and non-rotary jets and in causing a mixture of said jets within a confined space.

17. That method of distributing liquid over an extended area which consists in simultaneously producing both rotary and non-rotary jets and in causing the mixture of said jets within a confined space and the issuance thereof from said space in a spray of uniform homogeneity.

18. That method of distributing liquid over an extended area which consists in simultaneously producing both a rotary and a non-rotary jet, and in transversely projecting the rotary jet in a confined space into blending union with said non-rotary jet and in thereafter effecting issuance of said blended jets from said space as a spray.

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

AUBREY G. ENEAS.

Witnesses:

IRVING U. TOWNSEND,
F. IRENE CHANDLER.