L. H. PARKER AND C. H. LANDON.

SPRAY NOZZLE AND METHOD OF DISTRIBUTING LIQUID.

APPLICATION FILED JUNE 3, 1920.

1,381,734. Patented June 14, 1921.

Fig. 1.

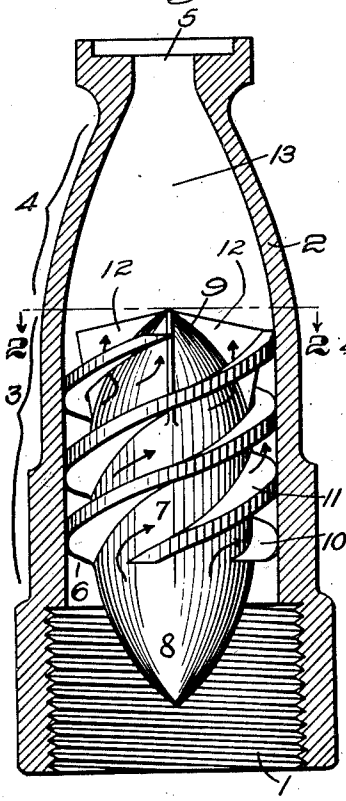


Fig. 3.

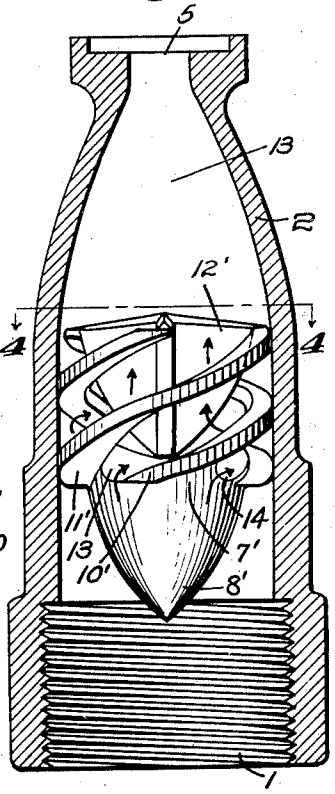


Fig. 5.

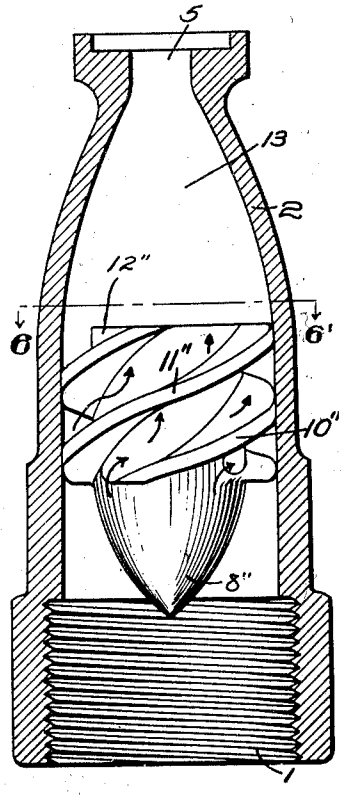


Fig. 2.

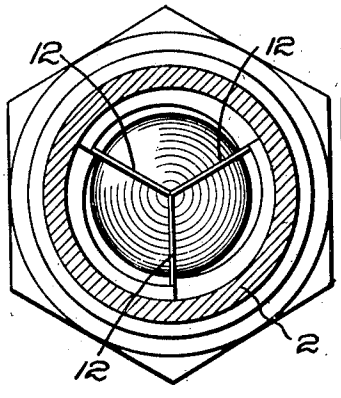


Fig. 4.

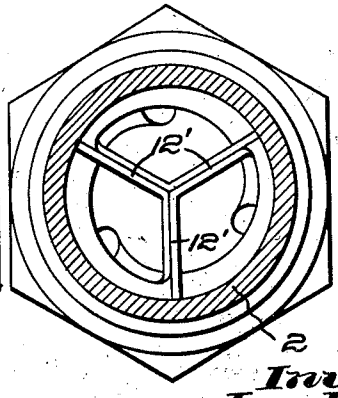
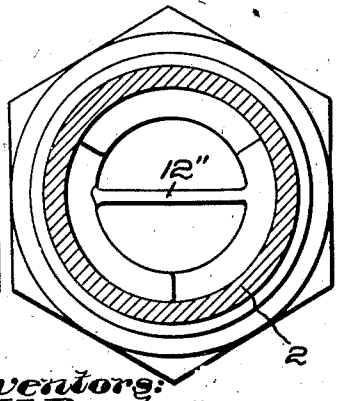


Fig. 6.



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Attys.

UNITED STATES PATENT OFFICE.

LEE H. PARKER, OF BOSTON, AND CHARLES H. LANDON, OF WOLLASTON, MASSACHUSETTS, ASSIGNORS TO SPRAY ENGINEERING COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

SPRAY-NOZZLE AND METHOD OF DISTRIBUTING LIQUID.

1,381,734. Specification of Letters Patent. Patented June 14, 1921.

Application filed June 3, 1920. Serial No. 386,245.

To all whom it may concern:

Be it known that we, LEE H. PARKER, and CHARLES H. LANDON, citizens of the United States, and residents, respectively, of Boston, in the county of Suffolk, and Wollaston, in the county of Norfolk, State of Massachusetts, have invented an Improvement in Spray-Nozzles and Methods of Distributing Liquid, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to spray nozzles and to methods of distributing liquid.

In order that the principle of the invention may be readily understood, we have disclosed in the accompanying drawing certain embodiments of the nozzle of our invention and the best mode known to us for practising our method.

In said drawings,—

Figure 1 is a vertical transverse section with the core or inner part in elevation of a spray nozzle constructed in accordance with our invention;

Fig. 2 is a transverse section upon the line 2—2 looking downward in said figure;

Figs. 3 and 4 are views respectively similar to Figs. 1 and 2 of another form of our invention; and

Figs. 5 and 6 are similar views of still another form of our invention.

It has heretofore been proposed, as disclosed in the patent to Eneas, No. 1,239,168, dated September 4, 1917, to distribute liquid over an extended area by mixing a plurality of jets within a fixed surrounding confining wall and in compelling issuance of said mixed jets from said wall in a flaring spray of substantially uniform homogeneity. The method disclosed in said patent was desirably practised by the employment of a central jet and one or more surrounding jets, said jets emanating from a liquid stream introduced into the nozzle from any suitable source.

In accordance with the present invention, liquid, such for example, as water, is introduced from any suitable source at the end 1 of a nozzle casing 2, the latter being of any suitable shape, but the water instead of being divided into an inner jet and a surrounding jet or jets, which jets heretofore were preferably separated by a physical wall, is caused to partake either wholly or in large part of a whirling action whereby it is subjected to centrifugal action. We, however, provide suitable means whereby the stream, thus partaking of the form of a jet or jets in whole or in part, is caused to or does become thoroughly mixed in a mixing chamber in advance of the means whereby the centrifugal or whirling action has been given, the result being that the water issues from the nozzle in a spray of substantially uniform homogeneity. In carrying out the method, therefore, we cause or permit a portion of the stream, which, in the nozzle shown in Fig. 1, is a part of the whirling jets, but which in the construction shown in Figs. 3 and 5, does not partake of such whirling action, to be so directed that it impinges upon the whirling portions of the stream with the result that the whole stream is intimately mixed in the mixing chamber and issues therefrom as a spray of substantially uniform homogeneity.

Referring more particularly to Figs. 1 and 2, the nozzle casing 2 is represented as generally cylindrical throughout the portion 3 and as tapering throughout the portion 4 to an exit or discharge orifice 5. Within the nozzle casing and either structurally separate therefrom or cast or otherwise formed therewith, we provide a core or inner part or member indicated generally at 6 in Fig. 1. Desirably said core or member is provided with an inner portion 7 tapered at both ends as indicated at 8, 9, so as to be accurately stream lined. Such inner portion 7 may be solid or hollow and between its ends may have a cylindrical portion, but desirably it is substantially curved throughout its longitudinal extent when viewed from end to end. Surrounding said inner portion 7 we provide a plurality of suitable spirals or helices 10, 11 extending at any suitable or desired pitch about said inner portion and desirably terminating at about the upper end of said portion. Preferably said spirals or helices have their lower ends at a considerable distance above the lower end 8 of the inner portion 7, so that the stream as it enters the nozzle follows the stream lined lower end of the inner portion 7 and thence enters

with a minimum of obstruction between the spirals or helices 10, 11.

Desirably but not necessarily, said spirals or helices are of decreasing lateral extent toward the exit end of the nozzle, though such decrease need not and preferably does not begin until a point is reached about mid length of the inner portion 7. From the selected point onward to the upper ends of said helices or spirals the latter are spaced from the stream lined upper end of the inner portion 7 so that the liquid may in part flow not along the faces of the helices or spirals 10, 11, but between the same and the stream lined upper end of the inner portion 7.

Desirably we provide one or more obstructions which are encountered by the liquid thus flowing or permitted to flow inwardly and have herein represented said obstruction as partaking of the form of three vertical fins, partitions or vanes 12, 12, 12, the number whereof may be varied as desired, and in order to produce the best results. Desirably said fins extend radially from the stream lined upper end of the inner portion 7 with which they are desirably integral, to the inner edges of the spirals or helices 10, 11 with which also they are desirably integral.

Thus the liquid is caused or permitted to flow inwardly into the mixing chamber 13. A portion of such inwardly flowing liquid strikes against the faces of the fins or vanes 12 and then enters the mixing chamber 13. Still another part of the liquid that has entered the nozzle follows the faces of the spirals or helices 10, 11, and therefore continues its whirling movement under centrifugal action and in such whirling condition enters the mixing chamber 13. Here all the described portions of the liquid become thoroughly mixed and in such mixed condition are discharged through the exit 5 in a spray which is of substantially uniform homogeneity in transverse section.

In Figs. 3 and 4, we have shown a slightly modified form of our invention. Therein the inner portion 7′ does not extend throughout the length of the inner or core like member, but only to a point which is preferably about in the same transverse plane as the lower ends of the spirals or helices 10′, 11′. The lower end of said inner portion 7′ is preferably stream lined as indicated at 8′, and the said spirals or helices 10′, 11′ are desirably of decreasing lateral extent as in that form of our invention shown in Fig. 1 but not necessarily so. As indicated most clearly at 13, 14 in said Fig. 3 a portion of the liquid entering between the spirals or helices 10′, 11′ does not or is not compelled to partake of the centrifugal or whirling action, but passes immediately and substantially directly inward, the remaining portion of the liquid following the faces of said spirals or helices. Preferably radially inside of said spirals or helices we provide a suitable obstruction which, as shown in Fig. 3, partakes of the form of three vertical fins, partitions or vanes 12′, here shown as similar to the corresponding part in Fig. 1, but of greater radial extent in that they meet at the central or axial line of the core or of the nozzle.

The action of the nozzle shown in Figs. 3 and 4 is similar to that shown in Figs. 1 and 2, excepting in that in the modified form of nozzle a portion of the liquid passes or is permitted to pass as stated directly inward, so that it is radially inside of the spirals or helices 10′, 11′, and does not partake or at least does not partake substantially or is not compelled to partake, of the whirling action that is imparted to the remaining portion of the liquid. The part of the liquid passing directly inward encounters at least in part the faces of the fins or vanes 12′, and all the parts of the liquid become thoroughly mixed in the mixing chamber 13, and issue through the outlet 5 in a spray of substantially uniform homogeneity.

In that form of the invention shown in Figs. 5 and 6, the construction shown is similar to that shown in Figs. 3 and 4, with the exceptions that the spirals or helices 10″, 11″ are here shown as of full lateral depth or extent throughout and the obstruction 12″ is here represented as a single web extending transversely of the inner or core member, as clearly indicated in Fig. 6.

In this form of our invention, all portions of the liquid enter the mixing chamber 13 and are discharged therefrom in a spray of substantially uniform homogeneity throughout. In this form of our invention, as in that form shown in Fig. 3, some part of the liquid passes or is permitted to pass directly inward between the spirals or helices 10″, 11″ and does not partake of the whirling action of the rest of the liquid.

Desirably the liquid that passes radially inward of the spirals or helices is a part of the original stream entering through the nozzle inlet 1, but within the scope of our invention the liquid that passes inward without partaking of the centrifugal or whirling action or partaking thereof in part may be received from sources other than that from which the remaining portion of the liquid is received. In other words, we may introduce liquid from two or more sources, but the construction shown is that preferably employed.

Having thus described certain embodiments of our invention and the best mode known to us for practising the method of our invention, we 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:

1. A spray nozzle comprising a shell or casing for an inlet and an outlet, means within the shell or casing to direct entering liquid outward toward the inner face of said shell or casing, means to subject at least a large part of such liquid to a whirling or rotary movement, means whereby a portion of the entire stream of liquid is permitted to flow inward, an obstruction to which such portion of the entire stream is subjected, and a mixing chamber in advance of said obstruction and of said means for effecting a whirling or rotary movement.

2. A spray nozzle comprising a shell or casing having an inlet and an outlet, means within the shell or casing to prevent the flow of liquid along the axis of the nozzle, means to subject at least a large part of the liquid to a whirling or rotary movement about a contained area, means whereby a portion of the entire stream of liquid is permitted to flow inward to a point within said contained area, and a mixing chamber beyond said means to impart a whirling or rotary movement.

3. A spray nozzle comprising a shell or casing having an inlet and an outlet, means within the shell or casing to prevent the flow of liquid along the axis of the nozzle, means to subject at least a large part of the liquid to a whirling or rotary movement, means whereby a portion of the entire stream of liquid is permitted to flow inward to a point within a whirling or rotary portion of the liquid, an abutment or obstruction interposed in the path of the inwardly flowing liquid, and a mixing chamber beyond the said means to impart a whirling or rotary movement.

4. A spray nozzle comprising a shell or casing having an inlet and an outlet, a central core within the shell or casing provided with a spiral, means to prevent the liquid from passing axially of the shell or casing, and whereby a portion at least of the liquid is subjected to the action of the spiral, a mixing chamber in advance of the spiral, and means to permit a portion of the liquid to pass inwardly within the spiral, and an obstruction interposed in the path of such liquid.

5. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core having a stream lined inner end, a spiral extending to the inner part of said core, and an obstruction at the inner end of said core to the path of a portion of the stream of liquid.

6. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core having a stream lined inner end, a spiral extending to the inner part of said core, an obstruction at the inner end of said core to the path of a portion of the stream of liquid, and a mixing chamber in advance of said core.

7. A spray nozzle comprising a shell or casing having an inlet and an outlet, and a core having a spiral of progressively decreasing lateral extent and means whereby a part of the stream is permitted to flow inwardly away from said spiral.

8. A spray nozzle comprising a shell or casing having an inlet and an outlet and having a spiral, the spires whereof are of decreasing lateral extent, means whereby a part of the stream is permitted to flow inwardly away from said spiral, and an obstruction to the liquid between the spiral and the axis thereof.

9. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within said casing having a spiral whereby all the liquid is subjected to a whirling or rotary movement, and means whereby a portion of the liquid is permitted to flow inward from the said spiral.

10. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within the casing having a spiral to the action of which all the liquid is subjected, and means whereby a portion of the liquid is permitted to flow inwardly from said spiral.

11. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within the casing having a spiral to the action of which all the liquid is subjected, means whereby a portion of the liquid is permitted to flow inwardly from said spiral, and a mixing chamber in advance of said core wherein all the constituent parts of the stream are intimately mixed.

12. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within said casing having a spiral to which all the liquid of the stream is subjected, means to permit a portion of the liquid to flow inwardly away from the spiral, an obstruction interposed in the path of flow of said inwardly flowing part of the liquid, and a mixing chamber wherein all the parts of the stream are intimately mixed.

13. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within said casing having a spiral to the action of which a portion of the stream is subjected, means whereby a portion of the stream is permitted to pass directly inwardly without being subjected to the action of said spiral, an obstruction interposed in the path of such inwardly flowing portion of the liquid, and a mixing chamber in advance of said core.

14. A spray nozzle comprising a shell or casing having an inlet and an outlet, means to impart a rotary or whirling action to liquid introduced into the nozzle, and means

whereby a part of that liquid may escape from the whirling liquid, and an obstruction interposed in the path of said escaped liquid.

15. A spray nozzle comprising a shell or casing having an inlet and an outlet, means to impart a rotary or whirling action to liquid introduced into the nozzle, means to permit a part of that liquid to withdraw from the whirling liquid, an obstruction interposed in the path of said withdrawn liquid, and a mixing chamber in advance of said core.

16. That method of spraying liquid comprising introducing a liquid into a confined space, causing at least a portion of said liquid to partake of a whirling or rotary motion, permit the separation of a portion of the liquid partaking of said whirling or rotary motion, and permitting it to flow inwardly of said whirling or rotary portion, and finally causing all the parts of the liquid to mix and thereafter to issue from said confined space.

17. That method of spraying liquid comprising introducing a liquid into a confined space, causing a portion of said liquid to partake of a whirling or rotary motion about a contained area, permitting the remainder of the liquid to flow inwardly along a non-axial path into said contained area, mixing all portions of the stream within a confined space, and permitting the issuance thereof in a spray of substantially uniform homogeneity.

18. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within the casing having means to prevent the axial flow of the liquid, means to impart a whirling or rotary motion to a part at least of the liquid about a contained area, and means to permit a portion of the liquid to flow into said contained area or rotary portion of the liquid without separation therefrom by a physical wall.

19. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within the casing having means to prevent the axial flow of the liquid, and means to impart a whirling or rotary motion to a part at least of the liquid, there being a space between the axis of the shell or casing and the inner part of said whirling or rotary motion means whereinto liquid may enter in its passage toward the nozzle outlet.

20. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within the casing having means to prevent the axial flow of the liquid, and means to impart a whirling or rotary motion to a part at least of the liquid, there being a space between the axis of the shell or casing and the inner part of said whirling or rotary motion means whereinto liquid may enter in its passage toward the nozzle outlet, and an obstruction interposed in the path of the liquid entering said space.

21. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within said casing having means to prevent the axial flow of the liquid and having a spiral to impart a whirling or rotary motion to a part at least of the liquid, there being a space between the inner edge of said spiral and the axis of the core into which space liquid may enter in its passage toward the nozzle outlet.

22. A spray nozzle comprising a shell or casing having an inlet and an outlet, a core within the casing having tapered ends and formed to prevent the axial flow of the liquid, said core having a spiral surrounding it throughout the major part of its length, the upper part of the spiral being out of contact with the surface of the core, whereby liquid may flow inwardly from the spiral in its passage toward the outlet of the nozzle.

In testimony whereof, we have signed our names to this specification.

LEE H. PARKER.
CHARLES H. LANDON.