L. H. PARKER.

METHOD OF DISTRIBUTING LIQUID.

APPLICATION FILED JUNE 24, 1919.

1,311,841.

Patented July 29, 1919.

Fig. 1.

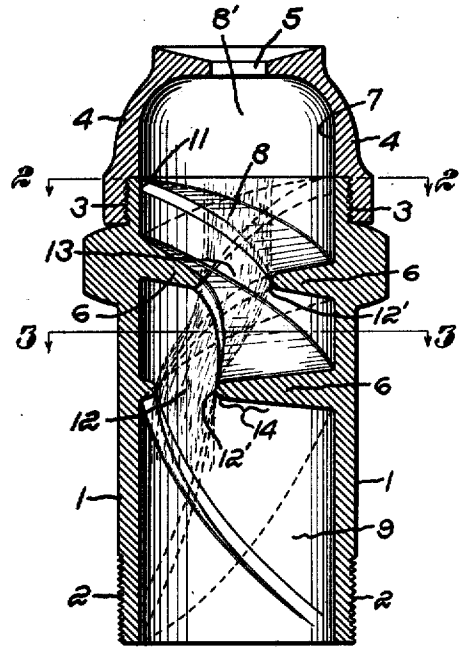


Fig. 2.

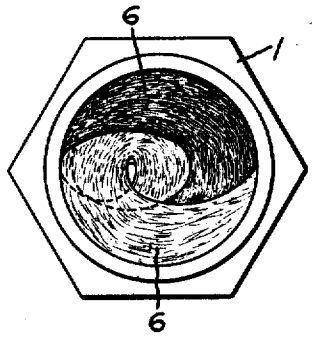
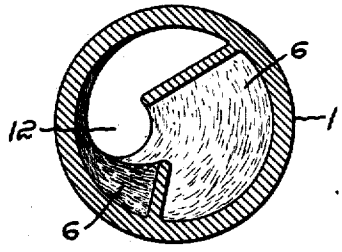


Fig. 3.



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UNITED STATES PATENT OFFICE.

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METHOD OF DISTRIBUTING LIQUID.

1,311,841. Specification of Letters Patent. Patented July 29, 1919.

Original application filed December 17, 1917, Serial No. 207,417. Divided and this application filed June 24, 1919. Serial No. 306,393.

To all whom it may concern:

Be it known that I, LEE H. PARKER, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in 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 application is a division of my copending application Serial No. 207,417, filed December 17, 1917.

This invention relates to methods of distributing liquid and may be used for distributing liquids containing more or less solid matter.

While my invention is not restricted thereto, an important purpose thereof is to provide a method of spraying to provide for cooling water in or in connection with cooling ponds, or for condensers, ice plants, mills or any industry requiring a supply of cooling water or liquid.

By the method herein disclosed, I form and distribute over preferably an extended area a spray composed of or comprising water or other liquid or suitable fluid, and in accordance with the disclosed and preferred way of practising my invention, I discharge the liquid in a spray that is of substantially uniform homogeneity throughout. Such a spray may be used in any of the defined relations or for any other suitable purpose, as, for example, for spraying effluent, for precipitating or for spraying coal dust or other foreign matter, for air washing, for condensing vapors, for humidifying air and for other purposes. In carrying out my invention, I project the fluid in a flaring spray and within the nozzle whereby I may practise my invention, I preferably simultaneously produce an inner jet and one or more surrounding jets which are preferably and for the best results mixed within the mixing chamber, so that there is effective mixture or blending of the jets before they issue in spray form from the mixing chamber, which latter may be and preferably is so shaped or is provided with means whereby to cause impact and mixing of the several jets within the confined space of the mixing chamber of the nozzle.

In order that the principle of the invention may be readily understood, I have in the accompanying drawing disclosed a single type of nozzle whereby my invention may be practised, and wherein—

Figure 1 is a vertical, central section of such nozzle;

Fig. 2 is a view upon the line 2—2 of Fig. 1 looking downward or with the cap portion of the nozzle removed; and

Fig. 3 is a transverse section upon the line 3—3 of Fig. 1.

Referring more particularly to the drawing, the nozzle herein shown as of a type whereby my invention may be practised comprises a shell or casing 1, the lower end of which is adapted to be attached to a hose or pipe for conveying the water or other liquid. To that end, I have herein represented said shell or casing 1 as threaded at its lower end at 2. Preferably also the upper end of the shell or casing 1 is threaded as represented at 3 for the reception of the head or cap 4 of the nozzle, which is interiorly threaded. Preferably, for convenience in manufacture, the members 1 and 4 are detachable.

The head or cap 4 is provided with a suitable discharge orifice 5 herein represented as circular. The interior of the header cap 4 constitutes a mixing chamber, and it may be and preferably is tapering or more or less dome shaped, so that the streams of liquid are caused to mix and intermingle prior to their discharge from the outlet 5. In the patent to Eneas, No. 1,101,264, dated June 23, 1914, there is disclosed a spray nozzle having a central, axially arranged sleeve or tube through which the central or axial jet passes, surrounding spiral or inclined vanes being provided to convey a plurality of streams of liquid in spiral directions, all of the streams being caused to meet and intermingle within the mixing chamber.

In accordance with my invention I provide for supplying liquid interiorly of the surrounding and preferably spiral or inclined jet or jets, and I have for this purpose herein represented a single inner passage for providing an inner jet, at least a portion of such passage being eccentric to the longitudinal axis of the nozzle. The surrounding jet or jets may be of any suitable character. Preferably the surround-

ing jet or the plurality of surrounding jets, if employed, are formed by reason of the provision of spirals or inclined formations which may be of any suitable character. I do not provide a tube or sleeve for the inner jet but omit the physical tube or sleeve or other element defining the circumferential boundary of the inner jet or stream, which, as above stated, is eccentrically located throughout at least a portion of its extent with respect to the longitudinal axis of the nozzle.

Preferably I obtain the inner jet or stream by positioning or forming the vanes or spirals or other elements by which the surrounding jet or jets are formed in such manner as to permit the passage of the inner jet. In the disclosed embodiment of means for practising my invention, I have accomplished this result by inwardly terminating the vane or vanes at suitable distances radially from the axis of the nozzle, so as to leave an unobstructed non-axial passage through which the liquid passes in a straight stream. I may, however, form or shape or position the vane or vanes in any equivalent way permitting the liquid to pass non-axially between them and non-axially within the convolutions of the vane, if a single vane only be employed. In accomplishing the result in this particular embodiment of means for practising the invention I provide a plurality of spirals or inclined vanes 6 of any suitable pitch and of any suitable radial extent. I have herein represented said spirals as cast or otherwise formed within the shell or casing 1, but they may be separately formed and attached thereto in any suitable manner or positioned frictionally or otherwise within the nozzle. Preferably the said spirals or inclined vanes terminate at or below the upper end of the shell or casing 1; that is, at or below the base of the mixing chamber, so that the liquid is discharged from the upper ends of the spirals or inclined vanes directly against the inner wall 7 of the mixing chamber, and in such a manner that the stream or streams, which are outwardly thrown under centrifugal force, are guided by the inner surface 7 across the discharge opening 5 where or below which they meet the herein disclosed inner jet, indicated at 8, with the result that all the jets are thoroughly mixed or intermingled within the mixing chamber 8', and so that they issue therefrom in a flaring spray of substantially uniform homogeneity in cross section. Preferably each of the spirals or inclined vanes 6 at its lower end merges into the inner surface 9 of the shell or casing 1, as indicated, and at the upper end each of said spirals or vanes again merges into the inner wall of the shell or casing, as indicated at 11, thus presenting as little obstruction as possible to the spiral or inclined streams, particularly at the lower end thereof. In other words, the spiral or spirals or inclined vanes 6 taper toward or are of gradually decreasing width at the points where they merge into the upper surface of the shell 9. They may, however, be of full width at both their upper and their lower ends or of any suitable intermediate widths. I may employ my invention in the spraying of sewage which contains more or less solid matter, and I may and preferably in such case so construct the spiral or spirals that they present the least resistance to the flow of the material while preserving the flow of material in a single stream and herein an inner non-central jet.

While the liquid or other suitable material that is to be delivered through the nozzle within the surrounding or spiral jet or jets may be caused to flow in any suitable manner, I have herein represented means for providing for the flow of the liquid or other material in a single inner stream, and as shown most clearly in Figs. 1 and 3, I have provided means whereby at least the portion of the flow that is nearest the intake end of the nozzle is located at one side of or eccentrically of the longitudinal axis of the nozzle. To this end, I have in said Figs. 1 and 3, represented the vane or vanes 6 as so formed as to provide an opening or passage 12 whereby liquid entering the nozzle is conducted to one side of the longitudinal axis of the nozzle, and after passing through the opening 12, in this embodiment of my invention, is permitted or caused, before entering the mixing chamber 8', to become substantially axial. This I have accomplished, in this embodiment of means for practising my invention, by providing a substantially axial passage or opening 13 prior to or as herein indicated at the point where the liquid enters the mixing chamber.

Desirably and in the disclosed embodiment of means for practising my invention, the diameter of the inner opening 12 herein shown is at least substantially one third the diameter of the vane or vanes 6, and it is also substantially equal to the full diameter of the outlet 5 from the nozzle. This permits the ready use of the nozzle with a liquid containing solid matter, such as sewage. The dimensions which I have given are illustrative merely, and it is clearly to be understood that my invention is in no sense limited thereto as the dimensions of parts may be such as to provide in any equivalent manner for the onward flow of liquid substantially parallel to but eccentric to the longitudinal axis of the nozzle.

In order further to decrease the obstruction presented by the spirals or vanes 6, the inner edge 12' thereof is made rounding in cross section, as clearly indicated in Fig. 1. Preferably each of the vanes or spirals 6 is

made of a decreasing pitch, so that the surrounding jet or jets are brought gradually from a flow in the direction of the entering stream to a flow in a direction at approximately right angles to the stream flow and approximating tangential thereto. Thus, the surrounding jet or jets are with the least possible obstruction brought into a direction of flow so as thoroughly to mix and intermingle with the inner stream. The inner flow, by which I mean the flow of material otherwise than along and as directly caused by the vanes or spirals 6, is preferably straight, though within the scope and purpose of my invention, it may be rotatory in whole or in part. The cylindrical surface of the inner flow may have more or less of a rotatory motion which may be caused in part by the effect of the surrounding jet or jets which are not separated from the inner flow by a physical wall. The outer or surrounding jet or jets partake of their described paths, particularly through centrifugal action, but the inner flow is not under the influence of centrifugal action and maintains a substantially straight course into the mixing chamber 8.

In the said mixing chamber, the inner flow meets the surrounding jet or jets, and thus the liquid or fluid of the jet is mixed or blended within a confined chamber or space. The mixed mass issues from the chamber in a spray which is of substantially uniform homogeneity throughout. While the several jets or streams are mixed within the mixing chamber 8 substantially as set forth in the said patent to Eneas, No. 1,101,264, I have found in practice that the step of effecting the formation of an inner flow and one or more surrounding jets peculiarly coöperates with the mixing chamber, and particularly in that the liquid from all the jets enters with a minimum of obstruction into the mixing chamber and in streams of such unimpeded force as to result in an even, more effective mixing than before. Moreover I find that in some cases there is or may be a preliminary mixing at the very base of and within the mixing chamber, that is at substantially the point where the several streams enter thereinto. This is owing to the fact that no physical wall is present so as accurately or exactly to define the shape or radial extent of the inner flow. Within the scope and purpose of my invention, I need not provide for a mixing chamber, although it preferably and for the best results is employed.

Referring to the disclosed type only of means for practising my invention, I point out that the inner flow is herein illustrated as a jet that is in the direction of the longitudinal axis of the nozzle and throughout a portion of its length is eccentric to the said longitudinal axis; that is, it is herein shown as non-axial, particularly at a portion thereof between the mixing chamber and the liquid entrance end of the nozzle. In the present embodiment of means for practising my invention, the vane or vanes 6 are so shaped that only throughout a portion of the length of the inner flow does the liquid pass axially, thus forming a central jet. Still referring to the disclosed embodiment of means for practising my invention, the remainder of the length of the passage or space wherethrough passes the liquid forming the inner flow is non-axial. In the disclosed embodiment of means for practising my invention, at the upper portion of the inner flow, the course of the liquid is substantially central or axial of the passage.

Again referring to the disclosed embodiment of means for practising the invention, I have herein so constructed the nozzle that the liquid does not, immediately where it enters the nozzle, partake of a central stream character, but it does do so before the mixing chamber is reached. This depends upon the shape and position and construction of the vane or vanes.

Referring to that portion of the nozzle where the eccentrically located opening 12 is provided, it will be apparent that the portion 14 of the vane 6 adjacent thereto constitutes in effect a central plug or obstruction of restricted length, and at a suitable point whereabove the liquid partakes of the central stream character, to which feature, however, my invention is not limited.

In other words, I have at 14 indicated a central or axial obstruction, and the opening 12 is at one side thereof. Such opening is preferably of the same diameter as the exit passage 5.

While my invention is in no sense whatever limited to such proportioning of the parts, it is pointed out that for the best results and particularly where the nozzle is used in the spraying of sewage or in the spraying of liquid containing more or less solid matter, the inner formation providing for the inner flow is approximately one third of the diameter of the entire passage through the nozzle.

The surrounding or outer jet or jets may be of any suitable character. While I preferably use a spiral vane or vanes, such as indicated at 6, it is clear that the vane or vanes need not be of spiral character, so long as it or they are substantially a surrounding or outer vane or vanes, so as to produce an outer or surrounding jet or jets.

The formation or structure of the nozzle interiorly of the shell 1 constitutes a core mainly made up of vanes or spirals 6 and also including the prolongation or lateral formation of one of the vanes 6 indicated at 14 in Fig. 1, and which constitutes an obstructing formation shielding the outlet of

the nozzle from the direct projection or travel of an axial portion of the initial stream of liquid through the nozzle. The construction is such that there is permitted an onward projection or travel laterally of the axis of the nozzle of liquid admitted at the inlet of the nozzle axially of said nozzle.

It will be noted that the core includes the formation of a vane or vanes, a central obstructing formation, and also a formation permitting the forward projection or travel of a portion of the liquid stream as clearly shown at 12 in Fig. 3.

The formation 14 is positioned across the axis of the nozzle, and at 12 is the liquid passage or opening, which, as clearly shown in Fig. 3, is the result of a vane-edge shape or formation of the vane or vanes, such passage or opening being laterally offset from the axis of the nozzle. This opening or passage resulting from said vane-edge formation permits forward projection or travel of a portion of the liquid stream. This passage or opening resulting from the vane-edge formation modifies the flow of liquid along the vane wherein it is formed. That is to say, it modifies the rate of spiral advancement imparted to a portion of the liquid along said vane. The said passage or opening resulting from said vane-edge formation causes a part of the initial liquid stream to exert liquid pressure directly longitudinally of the nozzle, and thereby accelerates the rate of spiral advancement of a portion of such initial stream. The core construction is such as to impart a plurality of different movements to different portions of the initial stream. The core formation is such as to cause different portions of a single and imperforate stream of liquid to impact upon each other and upon the interior of the housing of the nozzle, so as to convert the liquid stream into a spray of substantially uniform consistency. The said core formation includes a spiral or helical passage and an opening laterally offset from the axis of the nozzle.

I have heretofore pointed out that the spirals 6 are represented as cast or otherwise formed within the shell or casing 1, but that they may be separately formed and attached thereto in any suitable manner or positioned frictionally or otherwise within the nozzle. Such removability permits the cleaning upon removal of the core.

It will be observed that the vane-edge shaped formation resulting in the opening 12 affords the equivalent of a bore extending through the nozzle core in a direction substantially parallel with the axis of the nozzle.

Having thus described one illustrative embodiment of means for practising my invention, 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, since the method of my invention may be practised otherwise than by the type of nozzle herein illustrated, the scope of the invention being set forth in the following claims.

Claims—

1. That method of producing a spray of substantially uniform homogeneity which comprises directing a portion of a stream of liquid into one or more paths substantially spiral but onward with respect to the direction of flow of said stream, and directing another portion of said stream in an onward direction that is, throughout at least a portion of its length, at one side of the longitudinal axis of said stream, while permitting the surface contact of said portions of said stream, in causing said several portions of the stream to meet within a confined space, whereby the flow of the first mentioned portion of the stream is modified by that of the second portion, and whereby all portions of the stream issue from said confined space in a spray of substantially uniform homogeneity.

2. That method of producing a spray which comprises directing a portion of a stream of liquid into one or more paths substantially spiral but onward with respect to the direction of flow of said stream, and directing another portion of said stream in an onward direction that is, throughout at least a portion of its length, at one side of the longitudinal axis of said stream, while permitting surface contact of said portions of said stream, in causing said several portions of the stream to meet within a confined space, whereby the flow of the first mentioned portion of the stream is modified by that of the second portion, and whereby all portions of the stream issue from said confined space in a spray.

3. That method of producing a spray which comprises imposing a spirally advancing motion upon part of a liquid stream, and imposing upon another part of said stream a motion in an onward direction that is, throughout at least a portion of its length, at one side of the longitudinal axis of the entire stream, while permitting surface contact of said several portions of the stream, in causing the several portions of the stream to meet within a confined space, whereby the flow of the first mentioned portion of the stream is modified by that of the second portion, and in causing all portions of the stream to issue from said confined space in a spray.

4. That method of producing a spray which comprises imposing a spirally advancing motion upon a part of a liquid stream, modifying the flow of such portion of the stream by subjecting it to the action of another portion of said stream caused to flow

in an onward direction that is, throughout at least a portion of its length, at one side of the longitudinal axis of the entire stream, and in causing the several portions of the stream to meet within a confined space from which they are discharged as a spray.

5. That method of producing a spray which comprises imposing a spirally advancing motion upon part of a liquid stream, modifying the rate of spiral advancement imparted to such part of the liquid stream by subjecting it to the action of another part of said stream, which other part of said stream, throughout at least a portion of its length, flows in an onward direction at one side of the longitudinal axis of the entire stream, while permitting surface contact of both portions of said stream, in causing said several portions of the stream to meet within a confined space, and in causing all portions of the stream to issue from such space in a spray.

6. That method of producing a spray of substantially uniform homogeneity which comprises imposing a spirally advancing motion upon part of a liquid stream, in causing a part of the stream laterally offset from the longitudinal axis of the entire stream to exert liquid pressure directed longitudinally of the entire stream, and thereby accelerating the rate of spiral advancement of the first mentioned portion of the stream, while permitting surface contact of all portions of said stream.

7. That method of producing a spray of substantially uniform homogeneity which comprises imposing a spirally advancing motion upon part of a liquid stream, in causing a part of the stream laterally offset from the longitudinal axis of the entire stream to exert liquid pressure directed longitudinally of the entire stream, and thereby accelerating the rate of spiral advancement of the first mentioned portion of the stream, while permitting surface contact of all portions of said stream, in causing said several portions of the stream to meet within a confined space, and in causing all portions of the stream to issue from the confined space in a spray of substantially uniform homogeneity.

8. That method of producing a spray which comprises directing a portion of a stream of liquid into one or more paths substantially spiral but onward with respect to the direction of flow of the stream, in imparting a different movement to another portion of said stream in an onward direction at one side of the axis of the stream while permitting surface contact of all portions of said stream, in causing all portions of the stream to meet within a confined space, and in effecting the issuance thereof from said confined space in a spray.

9. That method of producing a spray of substantially uniform homogeneity which comprises causing different portions of a single and imperforate stream of liquid to impact upon each other after respectively flowing along spiral paths and a path that is laterally offset from the axis of the stream, while permitting surface contact of all portions of the stream, and thereafter causing all portions of the stream after such impact upon each other to issue as a spray of substantially uniform homogeneity.

10. That method of producing a spray of substantially uniform homogeneity comprising imposing a spirally advancing motion upon a part of the stream, modifying the flow of said part of the stream by another part of the stream laterally offset from the axis of the entire stream, but permitting surface contact of all portions of the stream, causing said several portions of the stream to meet within a confined space, and causing all portions of the stream to issue from said confined space in a spray of substantially uniform homogeneity.

11. That method of producing a spray of substantially uniform homogeneity which comprises imposing a spirally advancing motion upon a part of the stream, modifying the flow of said part of the stream by another part of the stream flowing along a path laterally offset from the axis of the entire stream, permitting surface contact of said several portions of the stream prior to their mixing, in causing said several portions of the stream to meet and mix within a confined space, and in permitting issuance thereof from said confined space in a spray of substantially uniform homogeneity.

12. That method of producing a spray which comprises imparting spirally advancing motion to parts of a liquid stream, in altering the motion of said parts of the stream by means of another part flowing along a path that is, for at least a portion of its length, at one side of the longitudinal axis of the entire stream, thereby causing said several parts of the entire stream to blend in an imperforate stream subjected to a variety of different strains, while permitting surface contact of the several parts of the stream.

In testimony whereof I have signed my name to this specification.

LEE H. PARKER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."