J. GIBBONS.

SPRAYING NOZZLE.

APPLICATION FILED JAN. 4, 1915.

1,202,051. Patented Oct. 24, 1916.

Fig. 1.

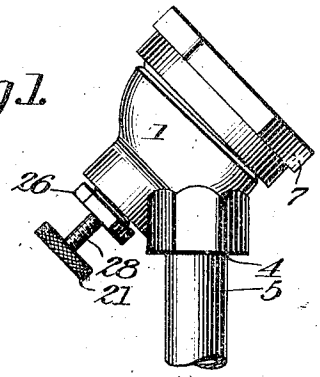


Fig. 2.

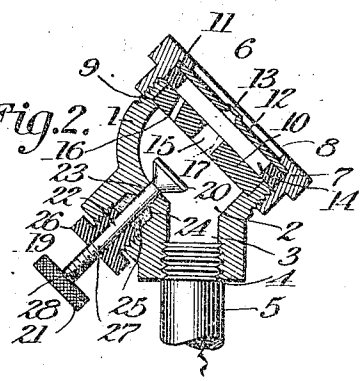


Fig. 5

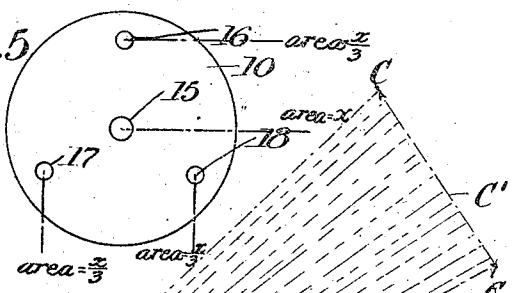


Fig. 6.

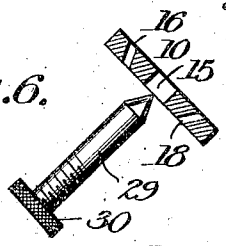
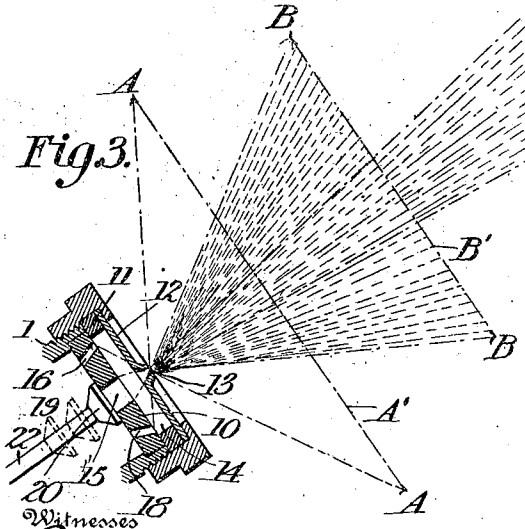


Fig. 3.

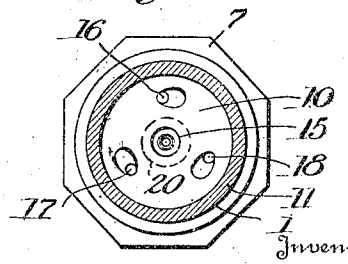


Witnesses

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Fig. 4.



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UNITED STATES PATENT OFFICE.

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SPRAYING-NOZZLE.

1,202,051. Specification of Letters Patent. Patented Oct. 24, 1916.

Application filed January 4, 1915. Serial No. 415.

To all whom it may concern:

Be it known that I, JAMES GIBBONS, a citizen of the United States, residing at West Park, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Spraying-Nozzles, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates broadly to improvements in spraying devices and, specifically, to spray nozzles peculiarly adapted for spraying trees and the like.

One of the primary objects of the invention is to provide a spray nozzle of such construction that the spraying fluid may be discharged therefrom either in the form of a widespread, cone-shaped, hollow mass of relatively short carrying power and of large diametral area, or in the form of a solid body of relatively greater carrying power and of relatively smaller diametral dimensions.

Another object is to provide, in such a construction, means for minutely controlling the flow therethrough of the spraying-fluid whereby the character of the spray discharged therefrom may be accurately varied.

Another object is to provide a structure in which the spraying-fluid may be projected through apertures in a plurality of spaced-apart members, the aperture in one of the members being of relatively different cross-sectional area from the cross-sectional areas of the apertures in a second member but whose aggregate areas equal the area of the aperture in the first member, whereby the flow through the apertures is balanced; means being provided for controlling the flow therethrough for varying its flow-capacity to change the character of the spray as it is discharged from the nozzle.

This invention seeks in general to provide for definitely controlling a relatively rotative movement of the parts as distinguished from a sliding movement thereof, the sliding action of which is uncertain; so that, from an operative standpoint, my device, as has been found in practical use, possesses a high degree of efficiency and durability and which, structurally considered, is of great simplicity.

Certain other objects will be obvious from the annexed drawings, while others will be pointed out in the following description.

The invention resides broadly in the features of construction, in the relative arrangement of parts, and in the correlative aggroupment thereof, all as exemplified in the construction hereinafter set forth, and the scope of application of which will be indicated in the claims hereto appended.

That the invention may be clearly comprehended, drawings illustrating one of the many possible utilizations of the same are hereto annexed, as a part of this disclosure; it being manifest that other possible utilizations and embodiments (employing the underlying principles of my invention) fall within the spirit thereof and within the objects contemplated thereby.

In these drawings: Figure 1 is a view in elevation of a spray-nozzle constructed in accordance with one embodiment of my invention; Fig. 2 is a view in central section thereof; Fig. 3 is a fragmentary view, somewhat diagrammatic in form, showing the different forms which the spraying-fluid assumes to accord with the position of the controlling-device relative to the primary aperture in the spray-balancing disk-member; Fig. 4 is a view in front elevation, partly in section, of the nozzle; Fig. 5 is a view, somewhat diagrammatic in form, of the spray-balancing disk-member, showing the relative proportions of the two series of spray-guiding apertures therein; and Fig. 6 is a fragmentary view showing a modified form of spray-controlling device.

Referring to these drawings, the reference-character 1 designates a nozzle-body, preferably of the form shown, and hollow to provide a fluid-containing chamber 2. This communicates, by an elongated channel 3, with a port 4 into which is threaded a pipe 5 that connects with a suitable source (not shown) of spraying-fluid. The portion of the nozzle opposite to the port 4 is enlarged, and thereon a cap-device 6 is mounted. In the particular embodiment disclosed, this includes a cap-piece 7 preferably threaded onto the nozzle-body, as shown, and provided with an enlarged opening 8 of approximately the same diametral dimensions as that of the chamber 2. The wall of the outer end of the nozzle-body is cut to form an annular seat 9 for a spray-controlling and balancing disk-member 10. Seated upon the outer end of the nozzle-body and preferably overlapping the outer

edge of the disk-member 10 is a spacing-member 11 which, preferably and as shown, is of resilient material and of somewhat less internal diametral dimension than that of the opening 8 in the cap-member 7.

Retained by the cap-member 7 is a disk 12 provided with a central aperture 13 which is, preferably and as shown, formed with outwardly-flared w lls, for a purpose presently to be explained. The member 11 maintains the disk 12 and the disk-member 10 in spaced relation to provide an eddy-chamber 14 with which said aperture 13 communicates.

The disk-member 10 is, preferably and as shown, provided with two series of flow passages; one comprising a primary-aperture 15 disposed in approximate alinement with the aperture 13 in the disk 12 but of larger diametral dimensions than that aperture, as shown; the other series comprising a plurality—in this instance, there are three—secondary apertures 16, 17 and 18. Preferably and as shown, the wall of the aperture 15 is straight, while those of the secondary-apertures 16, 17 and 18 are cut at an angle to the aperture 15, and these secondary-apertures are concentrically arranged in relation to the primary-aperture 15 in the disk-member 10 and also with the aperture 13 in the disk 12.

It is a feature of my invention, and an important one, that the diametral or cross-sectional areas of the primary-aperture 15 shall be approximately three times that of each of the secondary-apertures; or, otherwise stated, that the aggregate of the diametral dimensions of the secondary-apertures shall be equal to that of the primary-aperture 15, as shown in Fig. 5. By reason of this feature, the flow through the two series of apertures is, under certain conditions, balanced; that is to say, the flow through the primary-aperture 15 is equal to the aggregate-flow through the three secondary-apertures. From this, it will be evident that, by varying the normal flow-capacity of the primary-aperture 15, the equalized flow, or equally-balanced capacity, is in consequence changed. To the end that this variation may be conveniently and accurately accomplished, and to a minute degree, and then maintained, I provide means adapted to control the flow of the fluid through the primary-aperture 15. These means, in my preferred embodiment, include a controlling-member designated, generally, by the reference-character 19 and which, in this instance, is provided with an enlarged head 20 on its inner end; with a knurled piece 21 on its outer end; and with a stem 22 which is movably guided in an opening 23 that opens into the fluid-containing chamber 2. The opening 23 al o communicates with an enlarged recess 24 adapted to receive packing 25 in its lower portion. Threaded into the recess is a stuffing-nut 26 provided with a bore 27 which is threaded to receive a threaded portion 28 of the stem 22. By reason of the fact that the controlling-member 19 is threaded into the stuffing-nut 26, it has a compound rotative and longitudinal movement by which it is accurately positioned in relation to the primary-aperture 15; and, by reason of the fact that the head 20 thereof is of larger diametral dimension than that of the primary-aperture, it is adapted to be seated over and close said primary-aperture when it occupies its innermost position, as shown in full lines in Fig. 3. When the primary-aperture is closed, the flow of fluid is entirely through the angularly-cut apertures 16, 17 and 18, and, by reason of their position and character, they, in conjunction with the walls of the spacing-member 11, produce a whirling or swirling motion of the fluid, which, by reason of the resultant pressure, is caused to discharge through the aperture 13 in the disk 12. The angle of exit of the fluid, then, will be approximately along the oblique lines A—A, with a diameter equal to the laterally-extending line A'. In other words, when the controlling-member 19 closes the primary-aperture 15 in the plate 10, the flow of the solution is through the secondary-apertures 16, 17 and 18 therein and, thence, into the eddy-chamber 14. The liquid which is discharged into this eddy-chamber is then caused to rotate or whirl by reason of its angle of entrance into the chamber. The liquid, then in the chamber 14, is discharged through the aperture 13 in the plate 12 in the form of a hollow cone of a maximum angle represented by the aforementioned lines A—A radiating from the aperture 13. As shown, this position of the controlling-device with reference to the aperture 15 permits the most widespread discharge of the spray of which the nozzle is capable. When, however, the controlling-device 19 is positioned somewhat back and away from the aperture, as indicated in dotted lines in Fig. 3, a portion of the solution is permitted to pass through the aperture 15 as well as through the angularly-cut secondary-apertures 16, 17 and 18. The passage, then, of the solution through the primary-aperture 15 has the effect, first, of reducing the maximum angle of the spray through the aperture 13, which angle is indicated by the lines B—B, also radiating from the aperture 13; secondly, of filling up the center of the cone, so to speak, so that the solution is discharged from the aperture 13 as a solid body, the diametral dimension of which is indicated by the line B'; and, thirdly, of projecting the spray to a greater distance. Thereby, perfect control of the delivery of the spray and a consequent sav-

ing thereof is accomplished. Again, when the controlling-device 19 is moved back to its rearmost position, as indicated in dotted lines in Fig. 3, and is, thus, still farther removed from the aperture 15, a larger quantity of the solution is permitted to pass through the primary-aperture 15 into the eddy-chamber 14. This causes, first, a still further reduction of the angle of the spray, as indicated by the lines C—C; and, secondly, a still further projection of the solid cone of spray, having a diametral dimension indicated by the line C', which effects a still greater definition in the control of the spray, with a consequent greater saving of solution than that where the controlling-device occupies its intermediate position of adjustment. It will, therefore, be obvious that the positioning of the controlling-device 19 in relation to the primary-aperture 15 enables the operator to effect a discharge of the spray through the aperture 13 at any fixed angle between the maximum angle, indicated by the lines A—A, and at any reduced angle, as indicated by the lines B—B, and C—C.

The flared form of the wall of the aperture 13 of the plate 12 is primarily designed to increase the distance between the face of the plate of the disk 10 and the aperture 13 in order that the rotating or whirling motion which is given to the solution that enters the eddy-chamber 14 through the angularly-cut apertures 16, 17 and 18 may be imparted to the solution which passes into the chamber 14 through the primary-aperture 15.

From the foregoing, it will be perceived that I have succeeded in devising a spray-nozzle which is well adapted to achieve the several objects and ends in view.

As many changes can be made in the above-described construction and many widely different embodiments of this invention can be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description and shown in the accompanying drawings shall be interpreted as illustrative and not in any limiting sense. It is also to be understood that the language used in the following claims is intended to cover not only the specific features of the invention but the generic features as well.

What I claim is:

1. A spraying device including in combination, a nozzle-body formed with an internal chamber; a disk-member disposed within the chamber and provided with a primary aperture and with a plurality of secondary, angularly-cut apertures; the nozzle-body being formed with a channel in approximate alinement with the primary aperture and through which fluid is introduced into the chamber and projected in a practically straight line toward and directly through the primary aperture; an eddy-chamber into which said primary and secondary apertures lead and in which a whirling action of the fluid is effected; and means for controlling the primary aperture, whereby the character of the spray passing from the nozzle is varied.

2. A spraying device including in combination, a nozzle-body formed with an internal chamber; a disk-member disposed within the chamber and provided with a primary aperture and with a plurality of secondary, angularly-cut apertures; the nozzle-body being formed with a channel in approximate alinement with the primary aperture and through which fluid is introduced into the chamber and projected in a practically straight line toward and directly through the primary aperture; an eddy-chamber into which said primary and secondary apertures lead and in which a whirling action of the fluid is effected; and means for controlling the primary aperture including a positionable device movable in relation to the primary aperture, and means coöperating with the device to maintain it in fixed relation to the primary aperture in any of a plurality of positions.

3. A spraying device including in combination, a nozzle-body formed with an internal chamber; a disk-member disposed within the chamber and provided with a primary aperture and with a plurality of secondary, angularly-cut apertures; the nozzle-body being formed with a channel in approximate alinement with the primary aperture but extending at an angle to the surface of the disk-member and through which channel fluid is introduced into the chamber and projected in a practically straight line toward and directly through the primary aperture; an eddy-chamber into which said primary and secondary apertures lead and in which a whirling action of the fluid is effected; and means for controlling the primary aperture, whereby the character of the spray passing from the nozzle is varied.

4. A spraying device including in combination, a nozzle-body formed with an internal chamber; a disk-member disposed within the chamber and provided with a primary aperture and with a plurality of secondary, angularly-cut apertures; the nozzle-body being formed with a channel in approximate alinement with the primary aperture but extending at an angle to the surface of the disk-member and through which channel fluid is introduced into the chamber and projected in a practically straight line toward and directly through the primary aperture; an eddy-chamber into which said primary and secondary apertures lead and in which a whirling action of the fluid is effected; and means for controlling the pri-

mary aperture including a positionable device movable in relation to the primary aperture, and means coöperating with the device to maintain it in fixed relation to the primary aperture in any of a plurality of positions.

5. A spraying device including in combination, a nozzle-body formed with an internal chamber; a disk-member disposed within the chamber and provided with a primary aperture and with a plurality of secondary, angularly-cut apertures, the aggregate cross-sectional areas of which are not greater than the cross-sectional area of the primary aperture whereby there may be a balance of flow through the apertures; the nozzle-body being formed with a channel in approximate alinement with the primary aperture and through which fluid is introduced into the chamber and projected in a practically straight line toward and directly through the primary aperture; an eddy-chamber into which said primary and secondary apertures lead and in which a whirling action of the fluid is effected; and means for controlling the primary aperture, whereby the character of the spray passing from the nozzle is varied.

6. A spraying device including in combination, a nozzle-body formed with an internal chamber; a cap on the nozzle provided with a discharge-opening formed with flared walls; a disk-member disposed within the chamber and provided with a primary aperture and with a plurality of secondary angularly-cut apertures, the aggregate cross-sectional areas of which are not greater than the cross-sectional area of the primary aperture whereby there may be a balance of flow through the apertures; the nozzle-body being formed with a channel in approximate alinement with the primary aperture but extending at an angle to the surface of the disk-member and through which fluid is introduced into the chamber and projected in a practically straight line toward and directly through the primary aperture; an eddy-chamber into which said primary and secondary apertures lead and in which a whirling action of the fluid is effected; and means for controlling the primary aperture, whereby the character of the spray passing from the nozzle is varied.

7. A spraying device including in combination, a nozzle-body formed with internal receiving and eddy-chambers; a cap-member mounted on the nozzle-body; a primary motion-producing disk-member separating the chambers and provided with a central aperture and with a plurality of angularly-formed channels; a secondary disk-member disposed in spaced-apart relation to the motion-producing disk-member and having a discharge-opening alining with that in said motion-producing disk-member and of a dimension smaller than the opening in the cap-member; the nozzle-body being formed with a channel extending at an angle to the surface of the apertured primary disk-member and through which fluid is introduced into the receiving-chamber and projected in an approximately straight line toward and directly through the central aperture and the secondary apertures; a spacing-member between the disk-members; a stuffing-nut-member mounted leakage-tight in the nozzle-body and threaded internally; and a controlling-member threaded into the nut-member for movement therein in definite and predetermined relation to the central aperture in the motion-producing member to vary the character of spray projected from the nozzle.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES GIBBONS.

Witnesses:

THEODORE M. BRANCH,

ROSA L. GIBBONS.