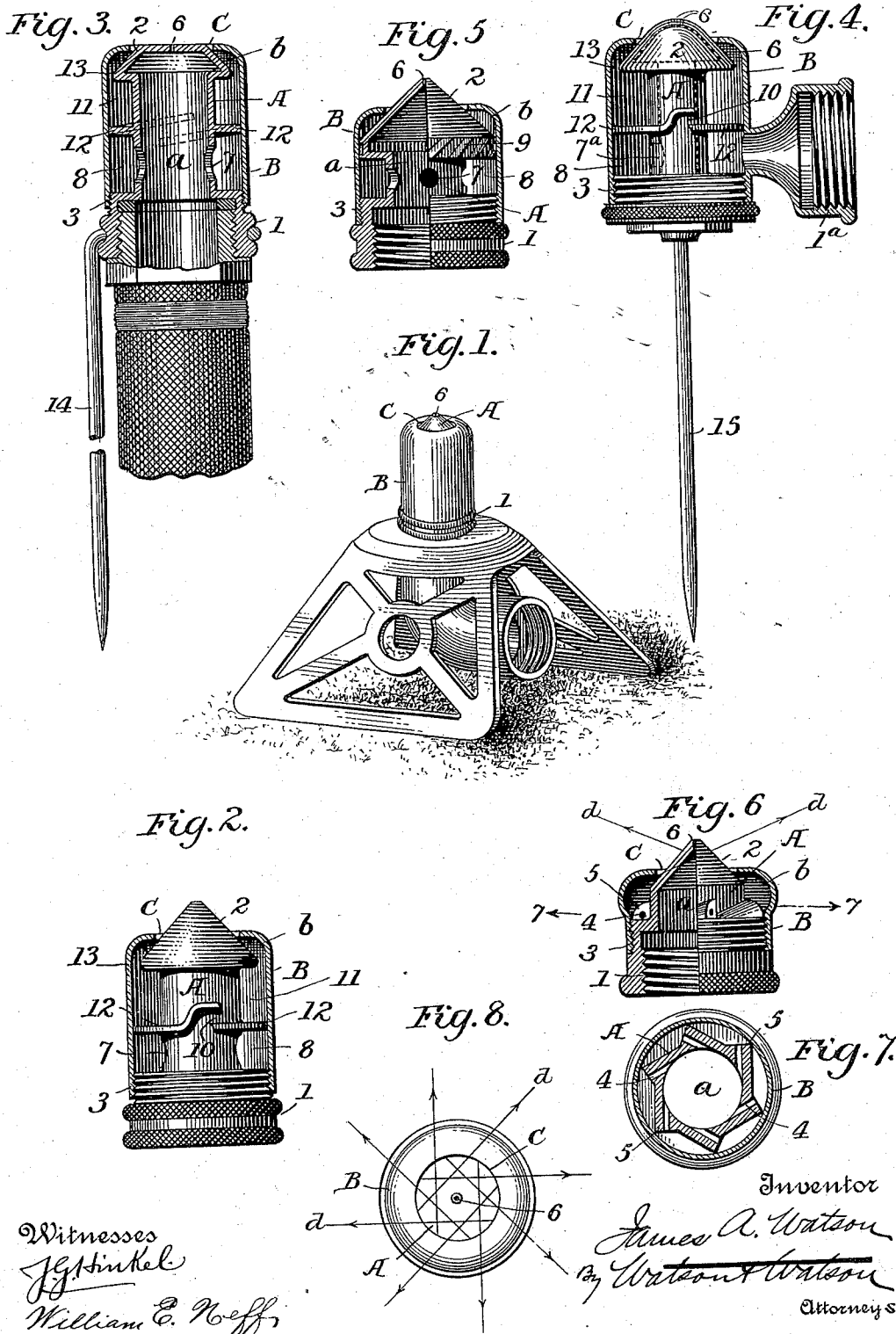


(No Model.)

J. A. WATSON.
SPRAYING NOZZLE.

No. 579,371.

Patented Mar. 23, 1897.



Witnesses
J. H. Hinkel
William C. Neff

Inventor
James A. Watson
By Watson & Watson
Attorneys

UNITED STATES PATENT OFFICE.

JAMES A. WATSON, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
OF ONE-HALF TO RALPH W. LEE, OF SAME PLACE.

SPRAYING-NOZZLE.

SPECIFICATION forming part of Letters Patent No. 579,371, dated March 23, 1897.

Application filed November 6, 1896. Serial No. 611,289. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. WATSON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Spraying-Nozzles, of which the following is a specification.

My invention relates to spraying-nozzles for sprinkling lawns, and generally for spraying or spreading liquids for any purpose.

The object of the invention is to produce a spraying-nozzle which is simple and cheap in construction, effective in operation, and which is durable, having no parts which are liable to wear or become easily damaged.

To these ends the improved sprayer consists of two parts which are connected by a suitable joint, preferably screw-threaded, and one of which parts may be attached directly to a hose or directly to any fountain or sprayer-stand.

One of the parts of my sprayer is a circular or cylindrical casing having a circular opening in the top. This part is generally made of thin metal drawn or stamped into shape. The other part is preferably a hollow casting, which I will term the "core" of the sprayer, having at its upper end a tapered or cone-shaped tip which projects through the opening in the top of the casing and having at its lower end a coupling-section adapted to be screwed directly on a hose or stand. The tip of the core is preferably conical, having a base larger than the opening in the casing and having its upper portion projecting through and nearly filling said opening. The apex of the cone preferably extends some distance above the casing and is provided with one or more perforations to produce a central jet or jets. An annular chamber is thus formed between the base of the cone and the top of the casing, which I will term a "rotation-chamber," and the water is projected from this chamber through the annular opening. Suitable passages are provided leading from the chamber within the core to the rotation-chamber adapted to admit water to the latter chamber and give it a rapid rotary movement therein.

The details of the construction and operation of the sprayer will now be described in

connection with the accompanying drawings, in which—

Figure 1 is a perspective view of one form of the improved spraying-nozzle mounted upon a suitable stand. Fig. 2 is a side view of the same nozzle, the casing being broken away to show the interior. Figs. 3, 4, 5, and 6 are side views of other forms of the invention, parts being broken away to show the interior construction. Fig. 7 is a section taken on the line 7 7 of Fig. 6, and Fig. 8 is a plan view showing in diagram the direction taken by the water after it is ejected from the nozzle.

My improved sprayer is usually formed of two parts, a core A and a surrounding casing B. In Figs. 6 and 7 it is shown in its simplest form. In these figures the lower end of the core A is in the form of an ordinary hose-coupling 1. Above the coupling is a central chamber a, and at the upper end of the core is a tapering or cone-shaped tip 2. The casing B is circular. Its lower end is connected to the outside of the coupling portion by a threaded joint 3, and there is a circular opening in its upper end, in which the tip 2 is centrally located, thus forming a narrow annular outlet C.

Between the tip and the casing there is an annular rotation-chamber b, and there are a plurality of passages 4 leading from the chamber a to the chamber b and adapted to give the water a rapid rotary movement in said latter chamber. To facilitate the boring of the passages 4, suitable projections 5 are cast upon the core A. The base of the tip 2 is preferably larger than the opening in the casing and situated some distance below the opening. From the base the tip tapers through the opening, nearly filling it, and it preferably extends some distance above, having the sharp point only removed. A small perforation 6 at the apex provides for a central jet, which enhances the effect of the sprayer.

The operation of all of the forms of the sprayer shown in the drawings is practically the same, and it may be readily understood from an inspection of Figs. 6, 7, and 8. The coupling 1 is attached directly to a hose, as shown in Fig. 3, or to any suitable fountain or stand, and water under pressure is ad-

mitted to the chamber *a*. This water issues through the passages 4 and revolves rapidly in the chamber *b*. The passages 4 are in the aggregate larger than the annular outlet C, and hence the water in the annular chamber *b* will be nearly under the same pressure as the water in the chamber *a*. The water therefore issues with great force from the annular outlet C, and it will take the direction shown by the arrow-lines *d* in Figs. 6 and 8. If the water were not rotated in the chamber *b*, it would be propelled from the annular opening directly to the center of the tip and it would there interfere and would not spread properly; but by giving the water sufficient rotation it is thrown off the center, as shown in Fig. 8, and it is free to be projected to a considerable distance horizontally. The water is thrown partly by centrifugal force, but chiefly by the direct pressure in the chamber *b*, and to aid in directing the water properly the cone-shaped tip is larger within the opening of the casing than at the opening, and the walls of the tip and the casing converge toward the annular outlet C.

The tip is preferably made in the form of a cone, as shown in Fig. 6, in which case the water will separate before reaching the apex of the cone and the apex will be dry. I prefer to form one or more small openings 6 in the apex to enhance the effect of the spray and for the purpose of effectually wetting the ground immediately surrounding the sprayer. If the apex of the cone be removed, as shown in Fig. 3, the result will not be very seriously affected; but I have found that a portion of the cone extending above the casing will increase the angle of elevation of the stream and assist in breaking up the water, so that it will fall quite uniformly at all points within the radius of operation. As above stated, a perfect cone is the most desirable shape for the tip, but it may be flattened or rounded somewhat without materially affecting the operation.

Next to the simplest form is that shown in Fig. 5, in which the water passes from the central chamber *a* through openings 7 to a chamber 8, and from the latter chamber it passes to the rotation-chamber *b* through spiral passages 9, cut in the edge of the tip 2. The operation of this form of sprayer is the same as that of the form shown in Fig. 6.

In the forms shown in Figs. 1, 2, and 3 the water passes from the central chamber *a* through openings 7 to an annular chamber 8, and from the chamber 8 it passes through passages 10 to an equalizing-chamber 11. The passages 10 are formed by the overlapping ends of flanges 12, and they are arranged to rotate the water in the chamber 11. There is a contracted throat or passage 13 between the chamber 11 and the rotation-chamber *b*. It is found that unless the pressure of the water is equal all around the rotation-chamber the spray will not issue uniformly from the outlet, and it is found, further, that with

but one or two tangential inlets the spray will not be uniform unless means be provided to equalize the pressure about the annular outlet. By directing the water first into the equalizing-chamber 11 and then through the annular throat 13 I effectually equalize the pressure and obtain a uniform spray. In Figs. 2 and 3 the outer edges of the flanges 12 fit closely to the casing, and water is only permitted to pass through the passages 10 between the overlapping ends. In these forms the coupling portion is the same as in Figs. 5 and 6. In Fig. 3 the tip is a truncated cone, but the rotation-chamber *b* is the same as in the other figures, *i. e.*, formed between the top of the casing and the base of the cone-shaped tip. The sprayer shown in Fig. 3 is provided with a supporting pin or rod 14.

In Fig. 4 there is a coupling 1^a, cast integral with the casing B, and the water is admitted directly from the coupling to the annular chamber 8. The core and cone may be cast hollow, as shown in dotted lines, and water admitted through an opening 7^a to supply the central jet or jets 6. A pin 15, suitably connected to the core, is provided to hold the nozzle in an upright position.

In the various forms of the invention the casings are adjustable upon the cores. When the nozzle is used purely as a lawn-sprayer, it will be found to work very well under all pressures with a uniform opening and no adjustment will be necessary; but when used as a nozzle to hold in the hand it is convenient to make the spray fine or coarse, as desired, or to shut the water off completely. This can be accomplished, as shown in Figs. 2 and 3, simply by turning the casing to the right or left, thus varying the annular opening C or closing it completely. When the opening is very small, the spray will be very fine and when it is larger the spray will be coarser.

In some instances the form shown in Fig. 6 is preferable and in other instances the forms shown in the other figures are preferable. In the forms shown in Figs. 2 and 3 the passages 7 and 10 can be formed in the casting without drilling, while in that shown in Fig. 6 it is generally necessary to drill the passages 4.

The passages 4, 9, and 10 are all adapted to impart a rotary movement to the water in the chamber surrounding the cone, and I shall designate them broadly as "tangential" passages, although the term may not be strictly correct in all instances.

The various forms may be used as nozzles to be held in the hand for sprinkling purposes, but when designed for such use the cone-shaped tips should be elongated and the angle of the cone correspondingly reduced, so as to throw the water away from the operator. In general, the angle of elevation at which the water is discharged depends on the angle of the cone and the speed of rotation. It will increase as the sides of the cone be-

come steeper and decrease as the speed of rotation increases. By properly proportioning the various parts any desired angle of elevation may be secured. I have found that when the angle at the apex of the cone is ninety degrees the best result is obtained for ordinary lawn-spraying purposes. As shown in Fig. 8, the water leaves the cone before reaching the apex thereof, and hence the cone may be truncated more or less, if desired. As hereinbefore stated, I prefer to use a perfect cone, as shown in Figs. 2, 5, and 6. The water from the annular opening will cling to the cone for some distance above the opening and will then be thrown off in spray, leaving the tip of the cone free from water. The spray from the annular opening will not therefore interfere with the jet-openings in the top of the cone.

What I claim, and desire to secure by Letters Patent, is—

1. A sprayer comprising a core having a central chamber and a tapering or cone-shaped tip, a cylindrical casing surrounding the core and having a circular opening in its upper end, an annular chamber included between the tip and the casing, an annular outlet to said chamber formed by the tip centrally arranged in the opening of the casing, and tangential passages through which the water from the central chamber passes to the annular chamber, said passages imparting a rotary movement to the water in said latter chamber, substantially as described.

2. A sprayer comprising a core having a central chamber, a coupling portion and a cone-shaped or tapering tip at its upper end, a circular casing surrounding the core and connected to it by a suitable joint, a circular opening in the top of the casing, an annular rotation-chamber between the core and the casing, an annular outlet to said chamber formed by the tip centrally located in and nearly filling the opening in the casing, and tangential passages through which the water from the central chamber passes to the annular chamber, said passages imparting a rotary movement to the water in said latter chamber, substantially as described.

3. A sprayer comprising a core having a central chamber, a coupling portion and a cone-shaped or tapering tip at its upper end, a jet opening in the top of the tip leading from the central chamber, a circular casing surrounding the core and connected to it by a suitable joint, a circular opening in the top of the casing, an annular rotation-chamber between the core and the casing, an annular outlet to said chamber formed by the tip centrally located in and nearly filling the opening in the casing, and tangential passages through which the water from the central chamber passes to the annular chamber, said passages imparting a rotary movement to the water in said latter chamber, substantially as described.

4. A sprayer comprising a core having a

central chamber, a coupling portion and a cone-shaped or tapering tip at its upper end, a circular casing surrounding the core and connected to it by a suitable joint, a circular opening in the top of the casing, an annular rotation-chamber between the core and the casing, an annular outlet to said chamber formed by the tip centrally located in and nearly filling the opening in the casing, and tangential passages through which the water from the central chamber passes to the annular chamber, said passages imparting a rotary movement to the water in said latter chamber, and said casing being adjustable on said core to vary or close the annular outlet, substantially as described.

5. A two-part sprayer comprising a hollow core having a coupling 1, a tip 2, and a central chamber *a* above the coupling, in combination with a circular casing having its lower end attached to the outer side of the coupling and its upper end provided with a circular opening smaller than the base of the tip, said tip projecting through and nearly filling said opening, and tangential passages through which the water from the central chamber *a* passes to the annular chamber surrounding the tip, said passages imparting a rotary movement to the water in said latter chamber, substantially as described.

6. A sprayer comprising a core having a cone-shaped tip and a central chamber, a casing surrounding the core and having a central opening in its top into which the tip enters to form an annular outlet, a rotation-chamber between the casing and tip, an annular chamber 8 below the rotation-chamber, passages leading from the central chamber to the chamber 8, and tangential passages leading from the chamber 8 to the rotation-chamber, said passages imparting a rotary movement to the water in said latter chamber, substantially as described.

7. A sprayer comprising a core having a tapering or cone-shaped tip, a casing surrounding the core and having a circular opening in its upper end through which the tip of the core projects to form an annular outlet, and flanges 12 surrounding the core below the tip, said flanges fitting the casing and having overlapping ends, the passages between said ends being adapted to impart a rotary movement to the water as it passes upward to the annular outlet, substantially as described.

8. In a sprayer the core having the coupling 1, surrounding overlapping flanges 12, a cone-shaped tip 2, a central chamber *a* and an outlet-opening 6, in combination with a circular casing fitting said flanges 12 and provided with a circular opening in its top into which the tip projects to form an annular outlet, said casing being adjustably connected to said core by a screw-threaded joint, substantially as described.

9. In a sprayer, the combination of the core having overlapping flanges and a cone-shaped tip, with a cylindrical casing fitting the outer

edge of said flanges and having a circular
opening in its top through which the tip pro-
jects to form an annular outlet, said casing
inclosing the chamber 8 below the flanges into
5 which the water is first admitted, passages 10
between the overlapping ends of the flanges,
an equalizing-chamber 11 into which the wa-
ter is admitted through the passages 10, an
annular throat 13 at the base of the tip and
10 a rotation-chamber *b* above said throat, the

water being ejected from the rotation-cham-
ber through the annular outlet, substantially
as described.

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

JAMES A. WATSON.

Witnesses:

RALPH W. LEE,
WILLIAM E. NEFF.