

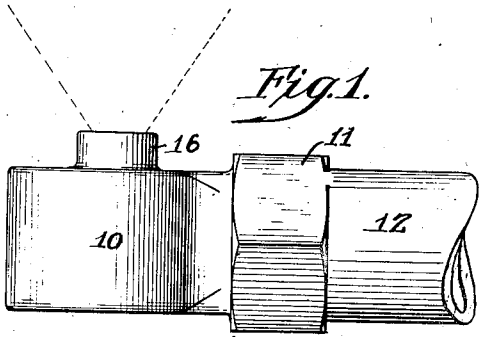
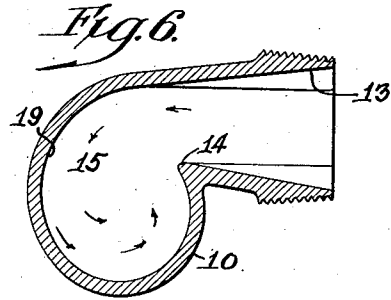
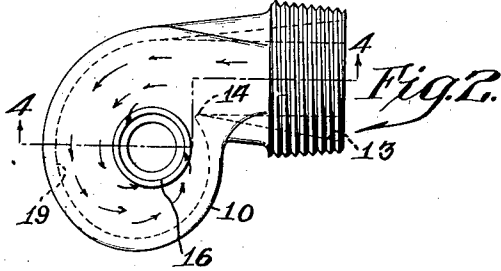
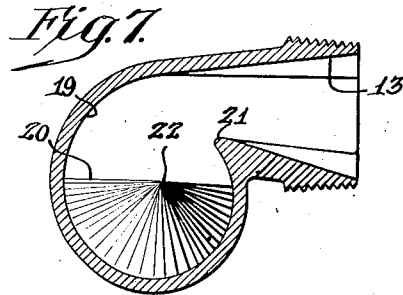
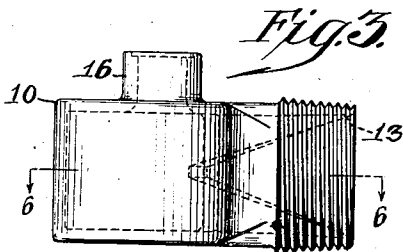
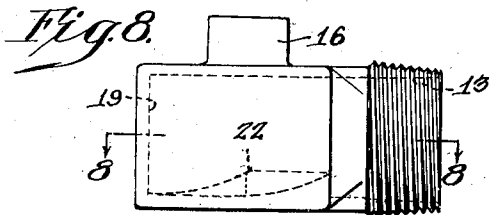
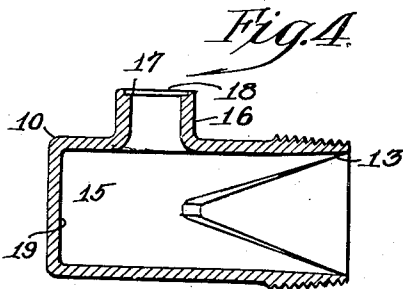
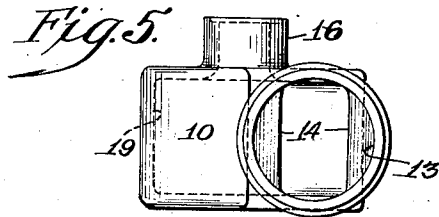
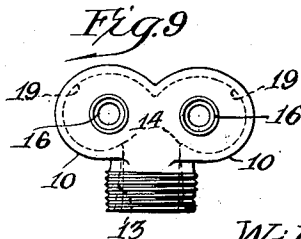
June 4, 1929.

W. H. KLEIN

1,716,174

RIGID SPRAY HEAD

Filed June 9, 1922



Witness:
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UNITED STATES PATENT OFFICE.

WILLIAM H. KLEIN, OF RICHARD CITY, TENNESSEE.

RIGID SPRAY HEAD.

Application filed June 9, 1922. Serial No. 567,001.

My invention relates to spray nozzles for distributing water at low pressure in the form of spray for cooling purposes.

The main purpose of my invention is to provide an improved head or nozzle adapted to easy and inexpensive manufacture and to efficient spraying at very low heads.

A further purpose is to efficiently convert the available pressure into energy of rotation.

A further purpose is to discharge the water at an off-center lateral orifice from a preferably involute chamber in which it is given circular movement, the discharge taking place most desirably from the center of the involute.

A further purpose is to accomplish this by giving a spray head an outlet slightly offset abruptly from the center of the casing, using the interior wall of the casing for easy communication between the inlet and outlet.

A further purpose is to cause the water to enter a chamber about which it travels centrifugally while the space for the water is progressively reducing in cross section and the water is crowded out of a lateral opening.

A further purpose is to progressively reduce the cross section of a centrifugally moving column of water and discharge it continuously from an opening lateral to the plane of travel.

A further purpose is to make a low pressure spray head self-cleaning and hence non-clogging.

A further purpose is to provide involute movement of water in a spray head from a point of inlet to a point of lateral discharge.

Further purposes will appear in the specification and in the claims.

My invention relates both to the methods involved and to apparatus by which the methods may be carried out.

I have preferred to illustrate my invention by two variations only, selecting forms that are practical, efficient, reliable and inexpensive and which at the same time well illustrate the principles of my invention.

Figure 1 is a side elevation of a spray head and connection embodying my invention.

Figure 2 is a top plan view of the spray head shown in Figure 1 without the connection.

Figure 3 is a side elevation corresponding to Figure 1 but omitting the connection and dotting interior walls.

Figure 4 is a section of Figure 2 upon line 4—4.

Figure 5 is an end elevation of Figure 3.

Figure 6 is a section of Figure 3 upon line 6—6.

Figures 7 and 8 are sections corresponding with Figure 6 and with Figure 4 respectively show a modified form of my invention.

Figure 9 is a reduced-scale top plan view of a double form.

In the drawings similar numerals indicate like parts.

It is very desirable that spray nozzles for use in cooling water of cooling ponds, condensers, etc., should operate efficiently on low pressure, the power required for spraying being in many constructions prohibitively large. A great variety of constructions will operate well with the pressure usually available for and the capacity usually required from lawn sprinklers, etc., which fail at low pressure and high capacity. In the lawn sprinkler uses, the relatively high pressure of the supply makes up for the deficiency of the sprinklers at the low capacity required.

The difficulty lies in breaking up the water into spray with the small kinetic energy available from low pressure.

I have discovered that the whirling of the water circumferentially at the same time that the cross section available for it is progressively reduced and that side outlet for the water is provided, results in discharge of the water in the form of a conical sheet which breaks into spray about the outer rim of the cone. I find that the best expression of my invention is an involute spiral form in which the water discharge takes place from the inner end of the involute; but recognize that there are other ways of obtaining a part of the benefit of my invention.

Describing the structure in explanation and not in limitation:—

The spray head 10 of Figures 1-6 is shown in Figure 1 as connected up by coupling 11 rigid with or separate from the pipe 12 by which the water supply is furnished.

In the illustration the initial circular cross section of the inlet at 13 is modified, without much varying the cross sectional area, to a rectangular section at the point 14 at which the water is discharged into the chamber 15.

The contour of this chamber in section perpendicular to the outlet axis is preferably that of the flat spiral beneath and about the

outlet. The spiral walls unite opposite walls of the inlet, departing or "offsetting" from opposite vertical walls of the rectangular inlet gradually at one lateral wall and abruptly at the opposite lateral wall.

The outlet is slightly offset both horizontally and vertically from the inlet and is relatively near to the abruptly offsetting side of the chamber, at or near the inner end of the involute curve defined by the water under the combined influences of the curved (involute) walls of the chamber and the whirling of the water where the abrupt offsetting occurs by reason of the loss of head as the water enters the chamber.

The lines of flow are indicated roughly by the arrows of Figures 6 and 2.

The controlling factors in this form are the offset position of the discharge nozzle and the progressively reduced cross section along the path of flow from the inlet to the outlet which results in progressively increasing the velocity of the water along the involute or flat spiral.

It is difficult to exactly follow the path of the water within the chamber, but it would appear that the path of the water is a conical spiral within the interior part of the chamber and a reversed conical spiral outside. The illustration shown in Figures 1-6 is made from a full size working nozzle and gives proportions which I have found to be very effective and in which the stream as discharged corresponds very closely in path and line of breakage to the discharge shown in Figure 1.

The discharge edge 17 of the nozzle 16 is protected against injury by the flange 18.

The flat spiral form for the interior wall 19 of the chamber is the best form for the wall interior known to me. The splendid results which I have attained, spraying successfully on pressures of less than seven pounds through a two-inch pipe have been due to the flat spiral form about the outlet of the offsetting wall and the horizontal and vertical offset of the outlet.

It will be obvious that the progressive restriction of the cross section of the water may be accomplished in other ways than by making the wall of the chamber a flat spiral about and toward the outlet and I show Figures 7 and 8 with a view to illustrate this. In these figures the floor of the nozzle has been lifted progressively from 20 around to 21 to assist in the progressive reduction of cross section about the discharge nozzle position 22, with the result that the progressive constriction of the cross section is partially taken care of by this progressive rise and not wholly by the involute spiral. In this arrangement it is still desirable that the discharge nozzle be off-center toward the abruptly offsetting wall, that is that the wall should spiral about and toward the nozzle;

but it is in this case not quite so essential and a part of the benefit of my invention may be obtained in this form with the outlet nearer to the center.

It will be noted that there are no passages to my spray head of smaller cross section than the outlet nozzle and that there is, therefore, no place for anything to clog or stick which will go through the outlet nozzle. Furthermore grass or other matter of stringy nature will be passed through this, the point of smallest cross section along with a spiral stream.

In both forms shown it will be obvious that there are the same features of having the outlet axis perpendicular to the inlet planes and offset from the inlet in two directions and of progressive constriction of the passage. The wall of the chamber affords a guide for the water toward the outlet and starts the water whirling. In both the outlet is located near an abruptly offsetting wall of the chamber to obtain the advantage of the whirl set up by reason of this. In both there is the effect of providing a flat spiral contour to the wall of the chamber with respect to a section perpendicular to the outlet.

It will be observed that the inner end of the involute, and therefore my outlet, is located in that region of low pressure which always exists in an abrupt offset from lines of flow, thus utilizing this fall in pressure, which usually is dissipated in eddy currents, to produce rotary motion and the great efficiency which my nozzle develops in practice is due to the combination thus obtained.

While I much prefer to offset the outlet in two directions, I am aware that the nozzle would work well and probably better than do other nozzles now on the market by having the outlet offset in one direction only, that is by having the outlet extend inward axially into the interior of the chamber. This arrangement still obtains the advantage of locating the outlet at or near the inner end of the involute and in the low pressure region that exists immediately after the abrupt offset, but necessitates the reversal in the rectilinear direction of flow for entry into the outlet and thereby means an unnecessary though perhaps small loss in efficiency.

The form of Figure 9 is intended to be the same as that of Figures 1-6 except that two opposite counterpart spray heads are coupled together to use a common inlet with any degree of spacing between the nozzles that may be desired, continuing the common inlet section into the chambers of the two spray heads (as in the figure) where it is permissible to have the two outlets as close together as this would provide.

In view of my invention and disclosure, modifications and variations will doubtless become evident to others skilled in the art,

to meet the individual whim or particular need, and it is my desire to claim all such modifications and variations in so far as they fall within the reasonable spirit and scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a spray head, an inlet merging in section from round to rectangular, a body at the rectangular end of the inlet and having an interior involute wall tangentially merging with one wall of the inlet and sharply offsetting at the opposite wall of the inlet, and a lateral outlet much smaller than the inlet and having an axis offset from the inlet and near the offsetting wall.

2. In a spray head, an inlet merging in section from round to rectangular, an external thread upon the round end thereof, a body at the rectangular end of the inlet and having an interior involute peripheral wall tangentially merging with one wall of the inlet and sharply offsetting with the opposite wall of the inlet, and a lateral outlet much smaller than the inlet and having an axis offset from the inlet and near the offsetting wall.

3. In a spray head, an intake, a body at

one end thereof having an interior peripheral involute wall merging tangentially with one wall of the intake and sharply offsetting with the opposite wall thereof, a laterally-directed tubular nozzle of much smaller section than the intake from near the offsetting wall offset from the intake, and a raised guard around the discharge rim of the nozzle.

4. The method of spraying water received from a cylindrical supply pipe which consists in flattening the cross section of the water as it approaches the point of spraying discharge, giving the flattened stream of water an involute path while progressively reducing its cross section and discharging the water laterally from along the approximate axis of the involute and at a velocity much higher than that of the intake.

5. The method of spraying water from a cylindrical source of supply which consists in flattening the stream of water, subsequently whirling the stream spirally while progressively reducing its cross section and discharging the water whirled laterally from the center of the spiral and at a velocity much higher than that of the intake.

WILLIAM H. KLEIN.