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H. H. DUTTON

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MIXING NOZZLE

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2 Sheets-Sheet 1

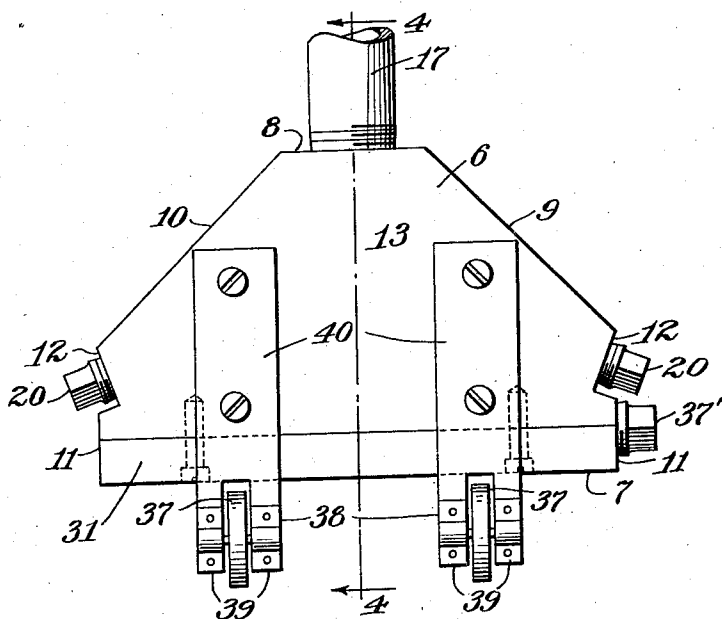


Fig. 1.

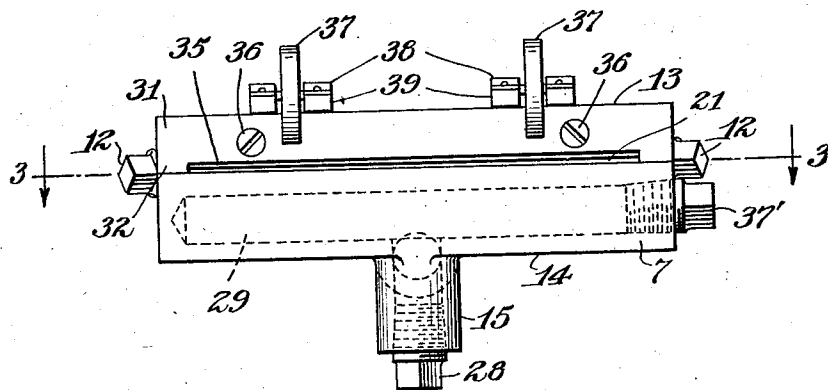


Fig. 2.

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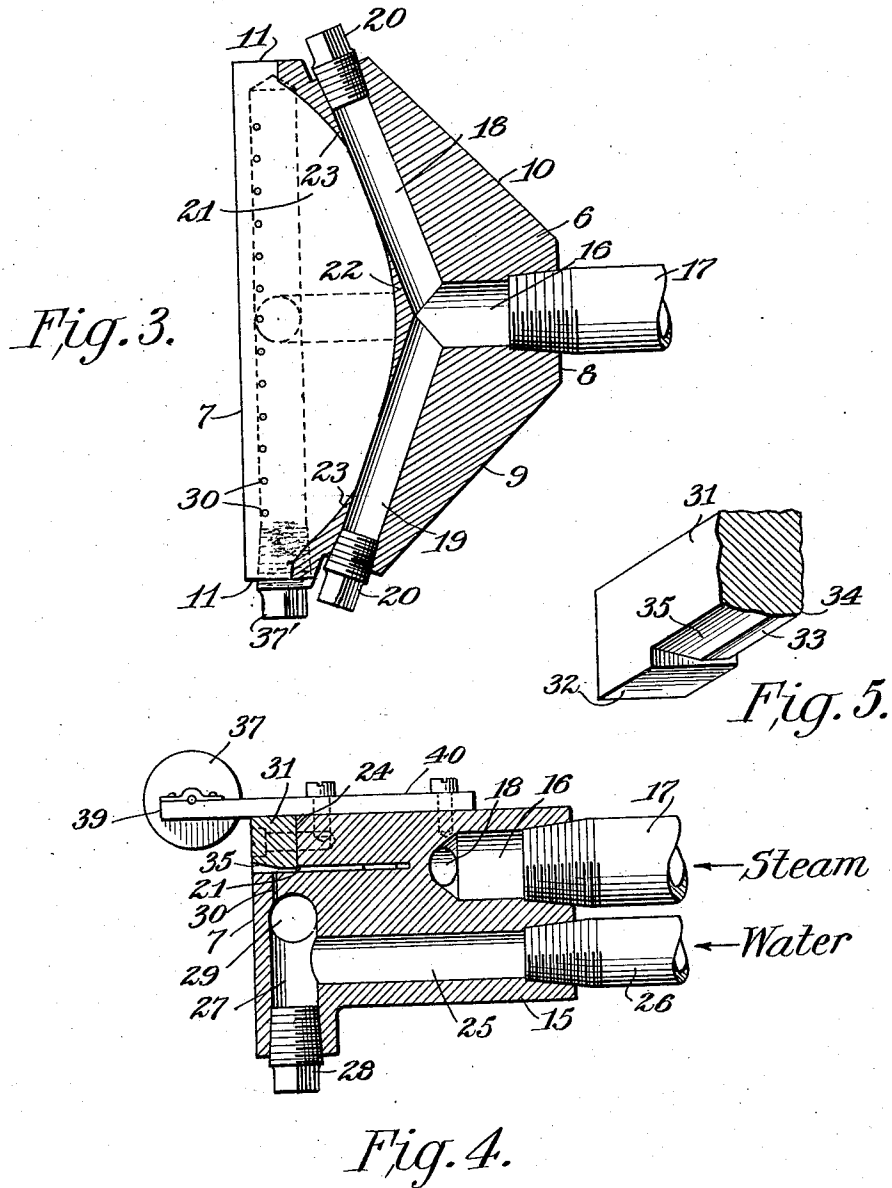
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UNITED STATES PATENT OFFICE

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MIXING NOZZLE

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This is an invention relating to mixing nozzles which are to be used for spraying, coating, cleaning or similar operations involving the use of a projecting fluid with which is to be mixed a modifying liquid. As an example of such use, although not necessarily restricted to this use, I have shown the invention embodied in a device intended for projecting a cleaning spray of water by means of steam under pressure, this spray or jet to be applied directly to a plane surface such as the wall of a building. In devices of this type it is an important consideration to be able to use for the motive force, a supply of steam under suitable pressure. This is usually found available where the cleaning operation is to be carried out. In this way it is possible to avoid the necessity of using compressed air or the like which would require special equipment and expense of operation.

In operating upon an extended plane surface, such as the outer wall of a building it is found that the best results are obtained from a jet which is relatively thin but of extended width so that a considerable area may be treated at a time. It is also noted that best results are obtained when the nozzle is held at a definite distance from the surface to be treated, this distance being determined by the relative pressures of fluid and liquid and the inherent proportions of the nozzle outlet.

The above and other desirable results are obtained by a device embodying my invention and which has been illustrated in the accompanying drawings by way of example, in which drawings:

Fig. 1 is a top plan view of the mixing nozzle;

Fig. 2 is a front elevation thereof;

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2;

Fig. 4 is a vertical section on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged perspective view of an end portion of the diffusing bar of the nozzle.

As illustrated in the several drawings, I provide a nozzle head, or casting 6 made of suitable materials such as brass or the like. This nozzle head may be cast from a pattern to the appropriate shape as shown, this shape

having a wide front edge 7, a rear face 8 and tapering sides 9 and 10. Side portions 11, 11 extend to the rear from the front wall 7 and are connected to the sides 9 and 10 by reentrant faces 12, 12. The top surface 13 of the casting is substantially flat. The bottom 14 of the casting is parallel to the top 13 except at the center portion where the boss 15 extends transversely.

The horizontal fluid inlet 16 extends inwardly from the rear wall 8 and is constructed either during the casting or by a subsequent operation. The end of the fluid inlet 16 is a screw-threaded to receive a pipe or fitting 17 adapted to be connected with a source of steam under suitable pressure. Suitable valve mechanism, not illustrated, is of course an adjunct to the source of steam supply.

At its forward end the inlet 16 connects with two divergent passageways 18, 19. These passageways are shown in Fig. 3 to extend from inlet 16 entirely through the casting as far as the reentrant side surfaces 12, 12 where the passageways are screw-threaded to receive pipe plugs 20, 20. The size of the passageways 18, 19 are appropriately proportioned to carry the flow of fluid from the inlet 16.

In the same horizontal plane with the inlet 16 and the divergent passageways 18, 19, the casting is slotted to provide a flat chamber 21. This chamber extends to within a short distance of the side walls 11, 11. On its inner periphery this chamber intersects the passageways 18, 19 over substantial distances as indicated in Fig. 3. There is left at the center, and opposite the inlet 16 a baffle or deflector 22 which serves to divide the flow of fluid into the passageways 18, 19 and to prevent the irregular delivery of the fluid into the chamber 21. As indicated in Fig. 3 the opening between passageways 18 and 19 and chamber 21 is limited at the opposite ends by the walls 23, 23.

It will be seen from Fig. 4 that the bottom of the chamber 21 extends to the front wall 7 of the casting while the upper part of the casting terminates short of said wall on a vertical plane 24. This vertical plane surface

has a contacting wall for a diffusing bar to be later described.

Beneath the inlet 16 and extending through the boss 15, the casting has a fluid inlet passageway 25 to which is connected a fitting 26 adapted to supply and control the volume of water.

At its front end and near the wall 7 the passageway 25 connects with a vertical conduit 27. The lower end of this conduit is closed by a pipe plug 28.

The upper end of conduit 27 has a transverse horizontal chamber 29 connecting therewith. This chamber 29 extends the greater distance across the front of the casting and beneath and parallel to the chamber 21. A series of small holes 30 connect the chamber 29 with the front portion of the lower wall of the chamber 21.

Mounted upon the vertical plane surface 24 of the casting and extending full length of the front wall 7 is a diffusing bar 31. This bar is intended to rest upon the floor of the chamber 21 at its ends 32. The lower surface of the bar is cut away to form the lip 33 which as a result is slightly spaced from the floor of the chamber 21 and provides an extended narrow orifice. The rear edge of the face 33 is curved as shown at 34 to reduce the resistance offered to the flow of the fluid. The front portion of the face 33 merges with an outwardly flaring face 35 as indicated in Fig. 5 thus forming a venturi for more efficiently diffusing the mixture.

It will be noted from Fig. 4 that the flaring face 35 meets the lower face 33 in rear of the fluid openings 30 for a purpose as will later be described more fully.

Screws 36 serve to fasten the bar 31 on the casting. A pipe plug 37 closes the passageway 29 when the same is made by drilling inwardly from end wall 11.

In order to position the tool at a desired distance from the surface to be treated, a pair of rollers 37, 37 are carried in journals 38, 38 on the bifurcated ends 39, 39 of bars 40, 40. These are suitably bolted to the top surface 13 of the casting with the rollers 37, 37 projecting beyond the front face 7. In this manner it is possible to limit the approach of the jet to the surface being treated and thus obtain uniform results and at the same time serve to partially support the weight of the equipment during operation.

Where it is desired to use this device for projecting a spray of mixed steam and water on building stone for cleaning purposes, water under the usual pressure is admitted through pipe 26 and the conduits 25, 27 and 29. From the latter the water rises in small drops or jets through the outlets 30 where it is mixed in the flow of steam from the chamber 21.

The steam is drawn through fitting 17 from

any convenient source of high pressure steam and divided by means of the deflector or baffle 22 so that the flow is evenly distributed through passageways 18 and 19, and thence as a thin sheet through chamber 21. The diffusing bar 31 serves to restrict the flow outwardly from chamber 21 and at the same time to spread the steam evenly across the plate 33. The steam expands by reason of the flaring face 35 and at approximately the same time picks up the drops of water from the outlets 30 serving to mix the liquid and fluid and produce an advantageous jet of substantially saturated water vapor. It will be noted that the relative positions of the outlets 30, the wall 33 and chamber 21 is such that no undesirable back pressure or other effect will be caused upon the water due to the mixing of the latter with the steam.

The mixture leaving the jet will cover a substantial area of the wall against which the rollers 37 rest and will be most effective at the distance governed by the rollers.

It will be understood that the operating characteristics of the jet are independent of whether or not rollers 37 are used. In like manner it will of course be evident that the journals 18 and 19 may be drilled through from the side walls 9 and 10 respectively instead of from the reentrant walls 12.

While the above description applies to one preferred form of my invention numerous changes in minor details and proportions may be made without departing from the spirit of the invention as defined in the appended claims.

What I claim is:

1. A nozzle comprising an inlet for a fluid under pressure, divergent passageways therefrom, a flat chamber connected with both said passageways, an outlet from said chamber, and means for conducting liquid into the flattened stream on its discharge through said outlet.
2. A nozzle comprising an inlet for a fluid under pressure, means for forming the fluid into a flattened stream, a discharge opening flaring perpendicularly to the plane of the flattened stream and means for supplying a liquid evenly over the width of the stream beneath the said flaring discharge opening.
3. A nozzle comprising an inlet for a fluid under pressure, means for forming the fluid into a flattened stream, a discharge opening flaring perpendicularly to the plane of the flattened stream, a liquid inlet and means for conducting liquid into the stream as it passes through the said discharge opening.
4. A nozzle comprising an inlet for a fluid under pressure, means for forming the fluid into a flattened stream, a discharge opening flaring perpendicularly to the plane of the flattened stream, a liquid inlet and a series of

liquid outlets into the stream opposite the said opening.

5 5. In combination, a nozzle comprising an inlet for a fluid, means for delivering the fluid in a flattened stream, means for mixing a liquid with the stream and rollers project-
ing beyond the front wall of the nozzle with their common axis parallel with the plane of the flattened stream.

10 In witness whereof I have hereunto affixed my signature.

HAROLD H. DUTTON.

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