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B. VEENSTRA

1,751,960

WATER FLOW DEVICE

Filed May 10, 1928

Fig. 1.

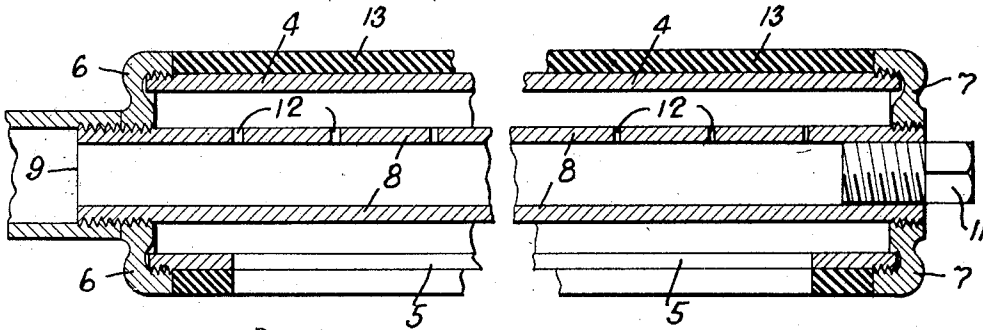


Fig. 3.

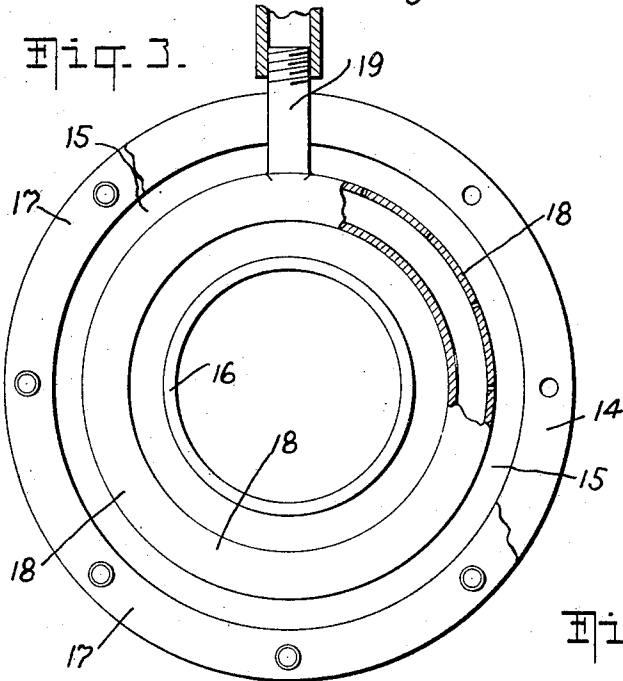


Fig. 2.

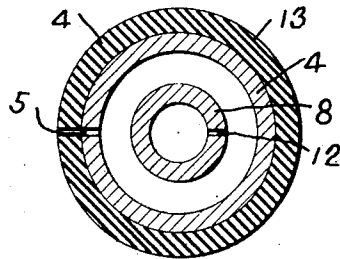
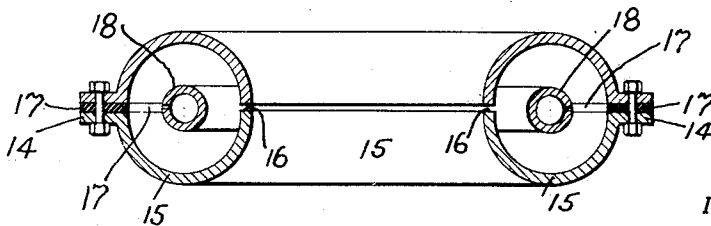


Fig. 4.



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WATER-FLOW DEVICE

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This invention relates to liquid-flow devices designed primarily for use in connection with the operations of dyeing piece-goods of silk or other material, although the same may be used in connection with operations in paper-making or for other purposes.

In the operation of dyeing piece-goods of silk or the like, there is frequent occasion to wash out the goods during or after application of the dye. Such washing of the goods, if in flat form, is done by subjecting the flat goods to the action of one or more spray-devices; and, when the goods are in "rope form," by immersing them into a vessel containing water. But spraying-devices deliver the water as a "spray", or plurality of individual jets; and these individual jets of water are quite liable to produce on the goods local discoloration or blurs, many of which will remain permanently and cannot be removed. When the goods in rope form are immersed into a vessel of fresh water, the water at once begins to be contaminated, and, moreover, there is liability of blurring the color of the goods.

The object of my present invention is to produce an effective yet inexpensive flow-device by which a continuous and uninterrupted sheet of fresh water—in contradistinction to a plurality of individual jets, and to a body of (still) water in a receptacle—can be applied at will to the goods, whether the latter be in flat form or in rope form.

Broadly stated, the gist of the invention consists of the combination of (1) a pipe that receives a flow of water from any suitable source and discharges the same in individual jets through a plurality of apertures, and (2) means for breaking-up and diffusing these water-jets so as to deliver the water as a continuous sheet of water; and, more specifically, in surrounding said apertured pipe by an enclosed space from which the only outlet is a narrow slot, so that the individual jets will impinge against the enclosing wall and be deflected thereby, and will become so diffused that the water will be discharged from the slot as a continuous sheet, a flat plane of water, as it were.

Other objects and advantages of the present invention will be set forth below, or will be obvious in view of the ensuing detailed description of preferred embodiments of the invention.

The invention will be best understood from the ensuing description of a preferred embodiment thereof, in connection with the accompanying drawings. These drawings are merely illustrative, in aid of the ensuing description; and the ensuing description itself is merely illustrative of the invention, and is not intended to limit the scope of the present invention, which will be defined in the appended claims.

In the accompanying drawings, Fig. 1 is a longitudinal sectional view of a preferred longitudinal form of the new liquid-flow device embodying the invention;

Fig. 2 is a transverse section through the device of Fig. 1;

Fig. 3 is a face view (partly in section), on a smaller scale, of a preferred circular or "doughnut" form of the new flow-device, the upper half-portion of the outer member being removed; and

Fig. 4 is a transverse section through the complete device of Fig. 3.

Referring to these drawings, 4 is an open-ended pipe, screw-threaded at each end. 5 is a continuous slot therein, which extends along one side of said pipe, and terminates a short distance from each end thereof. 6 is a centrally-apertured reduction-coupling that is threaded upon one end of pipe 4 and has a circular screw-threaded hole, which is here shown as concentric with the member 6; and 7 is a similar reduction-coupling threaded upon the other end of said pipe and having a similar screwthreaded central hole. 8 is a smaller open-ended pipe, externally screw-threaded on each end for engaging the threads around said holes of said coupling-members 6 and 7. These members 6 and 7 maintain the inner pipe 8 in fixed position, here shown as concentric, within the outer pipe 4, and serve to close the ends of the space between the two pipes. It is within this enclosed space that the individual water jets are broken up and diffused. 9 is an inlet-nozzle

at one end of the inner pipe 8; and 10 indicates a coupling for a valve-controlled water pipe (not shown). 11 is a removable plug that is screw-threaded into the opposite end of the inner pipe 8; 12—12, etc., represent a plurality of small apertures spaced apart along the length of the inner pipe 8, and all discharging away from the aforesaid slot 5. Preferably, these apertures are aligned rectilinearly, and are located diametrically opposite the slot 5.

In a device designed and successfully used for washing piece-goods, the slot 5 is about $\frac{1}{16}$ of an inch wide; the apertures 12 are $\frac{3}{4}$ of an inch apart; and half of them, those nearer the inlet 9, are $\frac{3}{16}$ of an inch in diameter, and the rest of them (those nearer the closure-plug 11) are smaller, or $\frac{1}{8}$ of an inch in diameter. In that particular device, designed for washing piece-goods 48 inches wide, the slot 5 is 48 inches long, and the outer pipe 4 extends about three inches at each end beyond the slot 5, so that the outer pipe is about 54 inches long; and the internal diameter of the inner pipe is $\frac{3}{4}$ of an inch, of the outer pipe is $1\frac{1}{2}$ inches. The apertures 12 might be regularly graduated in diameter, the one nearest to the inlet being the largest and those successively nearer the plug closure 11 being successively smaller; but in practice it has been found sufficient to have the first half of the apertures 12 of the same uniform larger diameter (say $\frac{3}{16}$ of an inch) and the remaining apertures of the same uniform smaller diameter (say $\frac{1}{8}$ of an inch). By practical tests it has been demonstrated that each of the two arrangements just set forth, wherein apertures of larger diameter are nearer the inlet 9 and those of smaller diameter are nearer the closed end at 11, give better results than reversed arrangements wherein apertures of smaller diameter are nearer the inlet, and better results than in arrangements wherein all the apertures are of the same uniform size.

If desired, for the purpose of protecting the piece-goods, the outer pipe 4 may be covered with a shell 13, which may be of hard rubber or other composition, or may be otherwise covered, the slot 5 being of course left free.

The manner of using the new flow-device of Figs. 1 and 2, and its mode of operation, will now be obvious. The device is mounted in convenient location, usually a pair of them parallel and in horizontal position, where the piece-goods can be drawn in flat form between the two devices, which are so disposed that the slot 5 of the upper one will discharge downward, and the corresponding slot of the lower device will discharge upward. The water from the supply-pipe will be admitted, under the desired pressure and in the desired amount (by means of the control-valve, not shown), through the nozzle 9 and into the in-

ner pipe 8. Individual jets of water will be discharged from the inner pipe against the curved inner face of the outer pipe 4; but these individual jets will be broken up and diffused, and the body of water within the enclosed space between the pipes will be discharged through the slot 5, and against flat goods, as a uniform and uninterrupted sheet of water.

Referring now to Figs. 3 and 4, which illustrate a doughnut-like form of device embodying the same inventive thought: This form comprises a hollow outer member, made up of two half-portions that are identical, so that only one of them requires particular description. The lower half-portion seen in Fig. 3, consists of a flat annular outer flange-portion 14 and an inner annular trough-portion 15, the inner lip 16 of the latter lying in the plane of the flat upper surface of the flange 14. If the two half-portions should be placed together, the inner lips 16 of the two half-portions would lie in close contact with each other. However, before assembling the parts, a gasket 17, of rubber or the like, is to be interposed between the two flanges 14 which are then secured together as by bolts or the like, thus providing a continuous and uninterrupted slot between the two lips 16. There is an inner pipe 18 of circular form, located within the trough 15, and supported by a hollow stem 19 which is brazed or otherwise connected to one of the two complementary semi-cylindrical grooves (not shown) in the respective half-portions aforesaid. Then said gasket 17 is placed in position upon flange 14; the upper half-portion of the outer ring is then inverted and its flange seated upon said gasket, and the two flanges secured together to clamp the gasket. The outer end of said hollow stem 19, as with the aforesaid inner pipe 8 in Fig. 1, is then connected with a valve-controlled water-pipe (not shown), so as to conduct water into the circular member 18. The apertures of this inner member 18 are as already described with reference to the device of Figs. 1 and 2, all discharging away from the slot at 16, and preferably discharging in a direction radially (diametrically) opposite to said slot. The piece-goods, in rope form, will be passed through the eye of the ring-like device of Fig. 3, passing preferably in vertical direction through the horizontally-disposed eye of the device which discharges, in radially-inward directions, and against the entire circumference of the "rope form", an uninterrupted sheet of water of disk-like or annular shape.

Each of the two forms herein described has been used with complete success in connection with the operations of dyeing piece-goods of silk; and the longitudinal form of the device, as illustrated in Figs. 1 and 2, is applicable for use in washing any article in

flat form, e. g., for washing paper in the paper-making industry.

Figs. 1 and 2 indicate that each of the pipes 4 and 8 is straight, and in cross-section is circular, and that the two pipes are arranged concentrically. In Fig. 3, the two hollow members (14—15 and 18 respectively) are indicated as rings, and as arranged concentrically; moreover, the transverse section seen in Fig. 4 shows that the circles 15 and 18 (representing cross-sections of the two hollow rings) are likewise arranged concentrically. In the device of Figs. 1 and 2, the apertures 12 are aligned rectilinearly, and are located diametrically opposite to the slot 5; and in the device of Figs. 3 and 4, the apertures are arranged around the ring 18 in the same plane as, and diametrically (that is, directly) opposite to, the slot at 16. All these details are preferable. Nevertheless, these hollow members, whether straight or rings, need not be of circular cross-section, nor need each pair of hollow members be arranged concentrically, nor need the apertures of the inner member (of either shape) be aligned rectilinearly or otherwise, provided always that these apertures do not discharge directly into the slot, and provided always that there be sufficient enclosed space for the individual water-jets to be broken up and diffused so as to discharge water from the slot as a sheet.

In the ensuing claims, the word "pipe" is to be understood as referring to a ring-like hollow member as well as to a straight hollow member, and to a hollow member that is non-circular in cross-section as well as to one that is circular.

It is also to be understood that the ensuing claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which as a matter of language might be said to fall therebetween.

The invention having been fully described in its details, what is claimed and desired to be patented is:

1. A water-flow device comprising, in combination, a pipe connected to a water-supply and whose only outlet consists of a plurality of lateral apertures, and means mounted upon said pipe for breaking up and diffusing the individual water-jets emitted through said apertures and delivering the water as a sheet of uninterrupted continuity.

2. A water-flow device comprising an inner pipe connected to a water-supply and surrounded by a space enclosed by an outer pipe whose only outlet is a slot, said inner pipe having apertures discharging away from said slot, whereby the individual water-jets emitted through said apertures will be discharged through said slot as a water-sheet of uninterrupted continuity.

3. A water-flow device comprising an inner pipe connected to a water-supply and sur-

rounded by a space enclosed by an outer pipe whose only outlet is a slot, said inner pipe having a plurality of aligned apertures all discharging directly away from said slot, whereby the individual water-jets emitted through said apertures will be discharged through said slot as a water-sheet of uninterrupted continuity.

4. A water-flow device comprising two pipes disposed one within the other and separated by an enclosed space, the inner pipe being connected to a water-supply and having a plurality of spaced-apart apertures of varying size whereof the larger are nearer the water-supply and the smaller are further away, and said outer pipe having a slot located along its side which is away from said apertures.

5. A water-flow device comprising two pipes disposed concentrically one within the other and separated by an enclosed space, one end of the inner pipe being connected to a water-supply and the other end being closed, said inner pipe having a plurality of spaced-apart and aligned apertures of at least two different sizes, the larger apertures being nearer the water-supply, and the smaller one being further away, and said outer pipe having a longitudinal slot located along that side thereof which is remoter from said apertures.

6. A water-flow device consisting of two pipes disposed one within the other, the inner pipe having communication with a water-supply and having also a plurality of small apertures that are spaced-apart and in alignment, and the only opening from said outer pipes being a continuous slot along the side away from said apertures.

7. A water-flow device consisting of two pipes disposed symmetrically one within the other and separated by an enclosed space, the inner pipe having means for communication with a water-supply and having also a plurality of small and spaced-apart and rectilinearly-aligned apertures, and the only free opening of the outer pipe being a continuous slot along the side furthest away from said apertures.

8. A doughnut-shaped water-flow device, which comprises an outer hollow ring, a hollow neck connected to a water-supply and extending into said outer ring, an inner hollow ring connected to said neck and located within the hollow of said outer ring, a continuous annular slot along the inner side of the wall of said outer ring, and a plurality of apertures spaced along the opposite side of the wall of said inner ring, whereby the individual water-jets emitted through said apertures are broken up and diffused and the water is discharged through said slot as a water-sheet of unbroken continuity.

9. A doughnut-shaped water-flow device, which comprises an outer two-part hollow

ring, a gasket upon which are clamped together the radially outermost portions of the two parts of said ring so as to provide a continuous slot separating the radially innermost portions thereof, and an inner hollow ring located within the hollow of said outer ring and having a hollow neck for connection with a water-supply, said hollow inner ring being provided with a plurality of apertures which discharge away from said slot, whereby the water is discharged through said slot as a continuous and disk-like sheet.

In testimony whereof I affix my signature.

BENJAMIN VEENSTRA.

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