T. FRUSHER & T. FRUSHER, JR.

DYEING AND BLEACHING MACHINE.

APPLICATION FILED DEC. 19, 1910.

1,000,251.

Patented Aug. 8, 1911.

3 SHEETS—SHEET 1

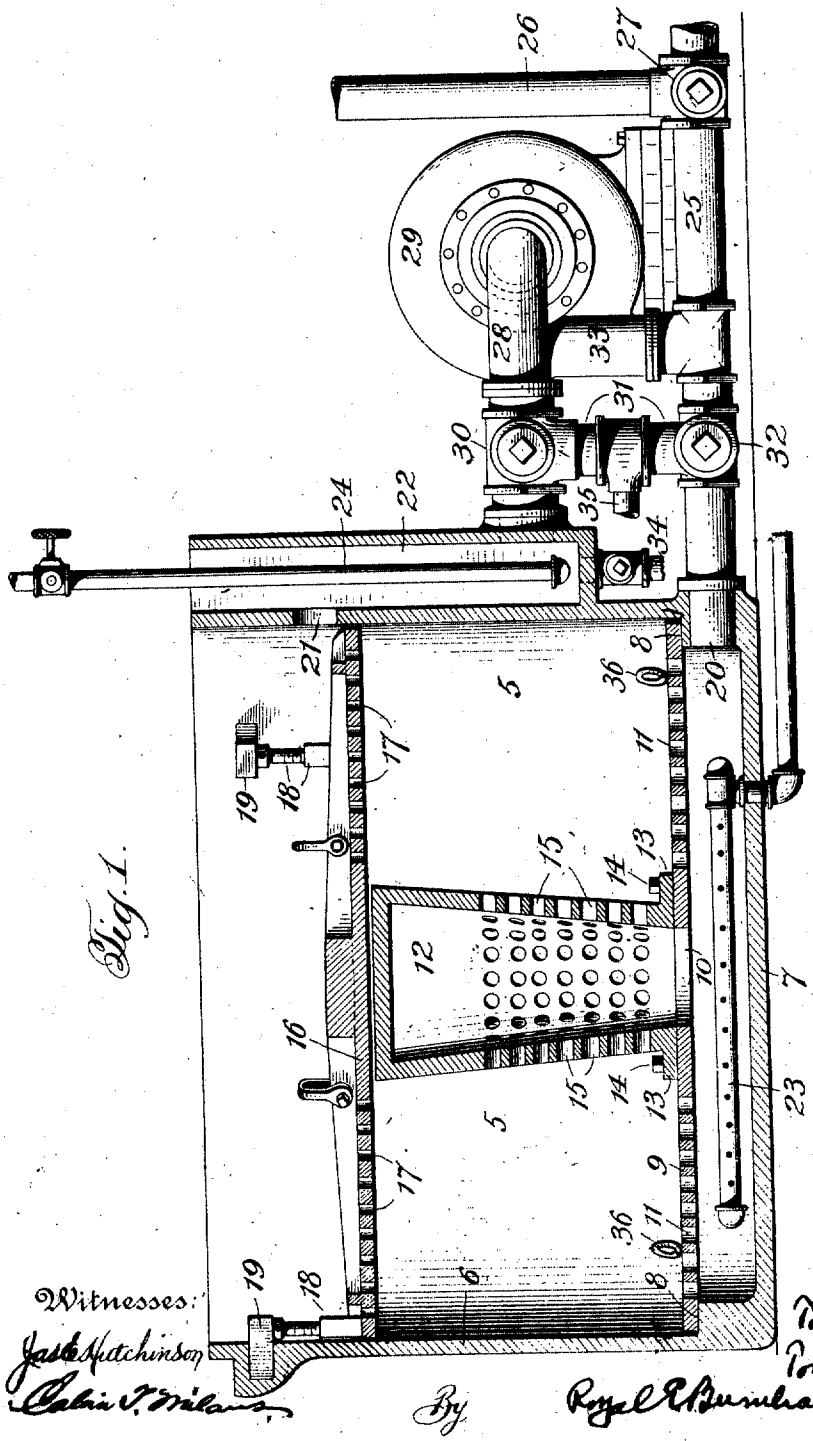

Fig. 1.

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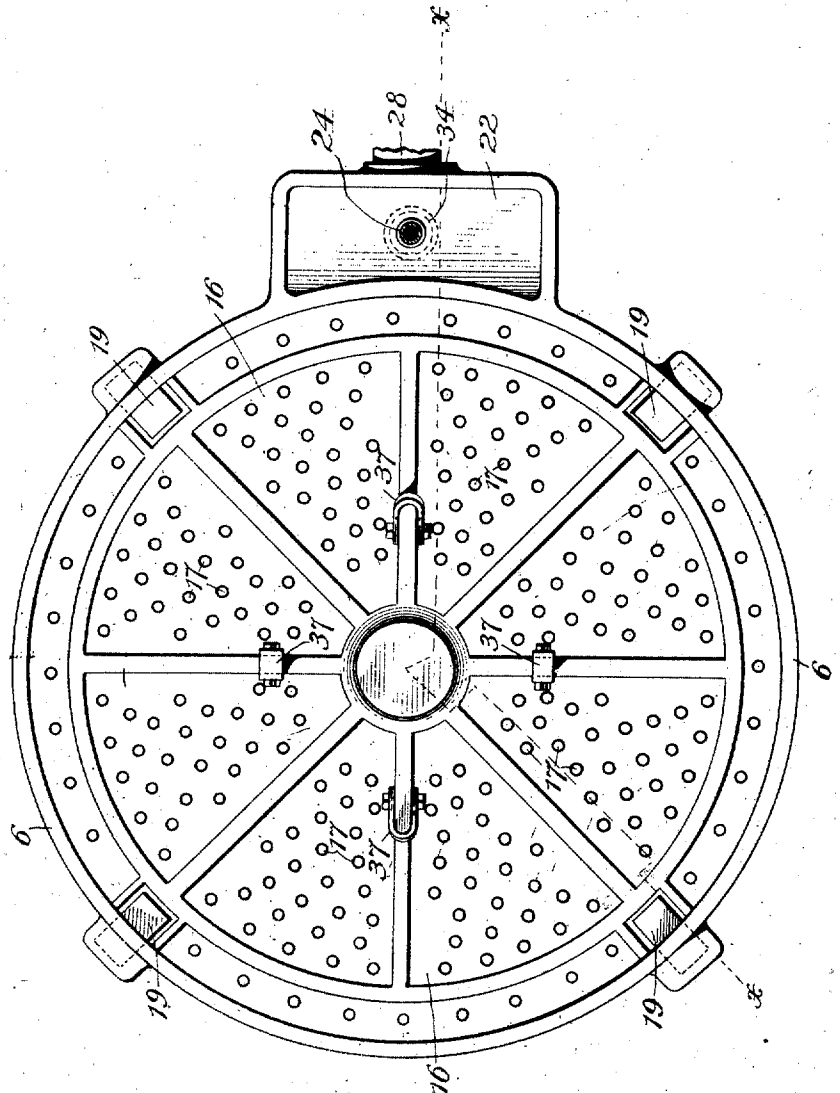

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

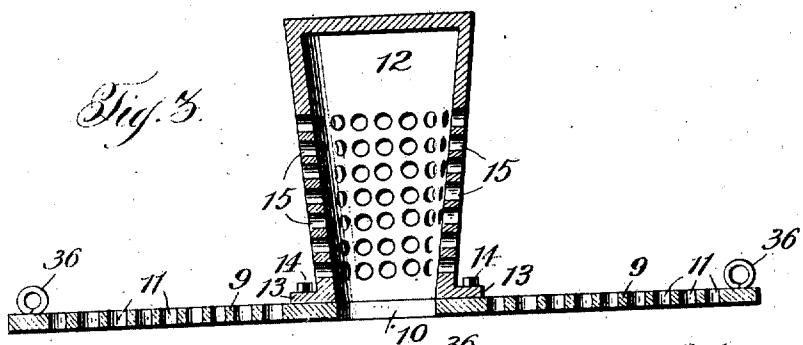
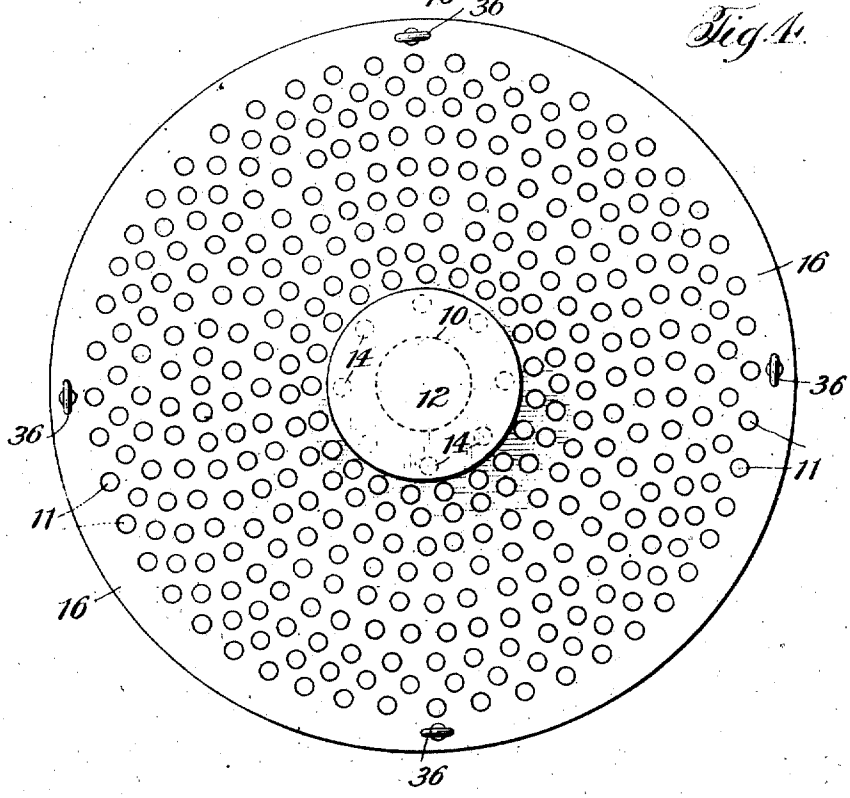


Fig. 4.



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UNITED STATES PATENT OFFICE.

TOM FRUSHER AND TOM FRUSHER, JR., OF BROOKLYN, NEW YORK.

DYEING AND BLEACHING MACHINE.

1,000,251. Specification of Letters Patent. Patented Aug. 8, 1911.

Application filed December 19, 1910. Serial No. 598,188.

To all whom it may concern:

Be it known that we, TOM FRUSHER and TOM FRUSHER, Jr., subjects of the King of Great Britain, (who have declared their intentions of becoming citizens of the United States,) residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Dyeing and Bleaching Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to machines for treating fibrous or other permeable materials with dyeing, fixing, bleaching, washing, or other liquor, and it pertains particularly to machines of this class in which the material to be treated is packed in a vat and the liquor circulated therethrough.

In some of the types of dyeing and similar machines now in use, fibrous material, such as raw wool, cotton, or skein yarn, is placed in a vat between foraminous members forming the cover and a false or removable bottom of the vat, and the treating-liquor, by suitable means such as a pump, is forced through one foraminous member, through the material under treatment, and out through the other foraminous member. Much difficulty has been experienced in machines of this kind in obtaining a uniform dyeing or other treatment of the material, for the reason that channels are formed in the material by the liquor and through which the liquor passes without being evenly distributed throughout the mass. This is particularly the case where the parts of the machine are so shaped that the capacity of the space between the foraminous material confining members is greater in the portion toward which the material is forced during movement of the liquor than in the other portion. This results in the loosening of the material or rendering it less tightly packed and in making more easy the creation of channels by the liquor, the liquor flowing in courses offering the least resistance and not equally permeating and uniformly dyeing or otherwise treating the mass of material.

Now it is an object of this invention to avoid the formation of channels by the liquor being forced through the material under treatment and the resulting uneven permeation of the material, and the arrangement provided by the invention is such that the pressure of liquor will tend to more tightly pack the material and close up any channels that may have formed upon the initial flow of liquor.

More specifically, the invention includes a foraminous member through which the liquor is forced into the material, which is usually the bottom member or false bottom, with a portion which extends toward the other foraminous member in increasing cross-sectional dimensions, so that it occupies more space toward the foraminous member through which the liquor is discharged and leaves less space in that portion of the vat for occupancy by material under treatment. The pressure of the entering liquor, in its tendency to force the material toward the opposed foraminous member, will wedge and more tightly pack the material between the sides of the extending portion and of the vat and thus close up any channels that may have formed when the liquor was first caused to flow, with the result that the liquor will be evenly distributed throughout the mass.

In view of the fact that the pressure of liquor against the material in a vat arranged in accordance with this invention of itself tends to prevent formation of channels and that the greater the pressure the greater the tendency to close up or pack the material, it is possible to force liquor through the material under greater pressure and with a faster flow than heretofore, whereby a process of dyeing, bleaching or the like, may be more expeditiously pursued. The extending portion is preferably a hollow casing circular in cross-section, closed at the top, open at the bottom, secured to the false bottom over an opening therein, and formed with perforations in its side for discharge of liquor radially into the material under treatment. However, it will be understood that the so-called extending portion is not necessarily of circular form in cross section or immediately associated with the false bottom, as it may, if desired, be held within the vat in any other suitable manner and in any position which will serve to decrease the material-holding capacity of the vat from the member through which the liquor enters toward that through which it is discharged.

The invention further contemplates the arrangement of the liquor-exit of the vat in such manner that no scum or the like from

the top of the liquor is carried back through the circulating system into the material under treatment, thus eliminating, in the case of dyeing, dark and streaky blotches in the material at or near the bottom of the vat.

The pump included in the machine for circulating material-treating liquor is preferably of the centrifugal type, and it is provided with a larger feed-pipe than outlet, to insure a regular flow of liquor by always having the pump full.

Generally, the invention provides an apparatus, for use in dyeing or otherwise treating with liquor wool, cotton, or other permeable materials, which shall be simple in construction, strong, durable, and efficient in operation, and capable of being placed directly upon any suitable floor without the necessity of cutting away the floor or the provision of a special or expensive foundation.

When read in connection with the description herein, the details of construction and arrangement of parts contemplated by the invention will be apparent from the accompanying drawings, forming part hereof, wherein an embodiment of the invention, as applied to a dyeing and bleaching machine in which the material-treating liquor enters the material through a foraminous member at the bottom and leaves it through a foraminous cover, is disclosed, for purposes of illustration.

While the embodiment of the invention shown in the drawings is preferred, it is to be understood that the several instrumentalities of which the invention consists may be variously organized, without departing in the least from the nature and spirit of the invention, and that it is not the intention to be necessarily limited to the precise delineation of the invention herein in interpretation of claims hereinafter.

Like reference-characters refer to corresponding parts in the several views of the drawings, of which—

Figure 1 is a side view, partly in section, of a dyeing and bleaching machine in which this invention is embodied; Fig. 2 is a plan view, the circulating system being omitted; Fig. 3 is a sectional view of the false bottom and its distributing member; and Fig. 4 is a plan view of the false bottom.

The machine includes a vat or tank 5 for containing the material to be dyed, bleached, or otherwise treated. Sides 6 of the tank are preferably vertical. A bottom 7 is adapted to rest directly upon the floor of a dye-house or other place. A seat 8 extends around the sides inside of the vat near the bottom, and is adapted to support a false bottom or lower foraminous member 9 a suitable distance from the vat-bottom 7. The member 9 is preferably a flat plate having a central opening 10 and smaller perforations 11 arranged between the center and the edge. A casing or other suitable hollow member 12, closed at the top and open at the bottom, is secured to the false bottom over the central opening 10, by having its laterally-extending flange 13 held by machine-screws or bolts 14 passing into the false bottom. The member 12 is preferably of inverted frusto-conical shape with a flat top—that is, it increases in diameter from bottom to top—and its lateral surface approaches nearer to the sides 6 of the vat from bottom to top. Therefore, it occupies an increasing amount of space in the vat from the false bottom upwardly. While it is preferred to have the member 12 circular in cross-section, it will be understood that it may be made in other sectional shape, such as polygonal, so long as its lateral surface approaches the sides of the vat from the foraminous member through which the liquor enters toward the member through which it is discharged and that it occupies more of the vat toward the discharging member than in the vicinity of the receiving-member, thereby making the material-holding capacity of the vat less toward and at the discharging-member than at the receiving-member. The casing 12 is formed with perforations 15 through its lateral face for about two-thirds the distance from the false bottom, and the top and the remainder of the lateral face are imperforate, whereby an air-chamber is formed in the top of the casing.

In using the machine, the material to be treated is packed in the vat on top of the false bottom and around its central extending portion, and then an upper foraminous member or cover 16 is let down over the packed material. The cover is formed with perforations 17, preferably of less aggregate capacity than those of the false bottom and its extending member, whereby pressure of liquor may be maintained between the false bottom and cover. The cover is held down in place on the material by jack-screws 18 in engagement therewith and with removable lugs 19 projecting from the vat-sides. The vat is provided with a liquor-entrance 20, leading into the space beneath the false bottom, and with a liquor-exit 21, positioned just above the cover 16 when the cover is in its normal position in the vat, and below the normal surface-level of the liquor in the vat. The exit leads to a steam-box 22 at the side of the vat. Steam-pipes 23 and 24, to maintain the material-treating liquor at the proper temperature, are positioned, respectively, in the space in the vat below the false bottom and in the steam-box; and they are supplied with steam from a boiler or other suitable source, not shown.

Dyeing, bleaching, or other material-treating liquor is furnished to and circu-

lated through the vat by means of a system which includes a pipe 25, leading to and connected with the vat at the entrance 20. A feed-pipe 26, leading from any suitable source of supply, such as a dye-storage tank (not shown), is connected to pipe 25 by a T 27, in which there is a three-way valve. A pipe 28 leads from the lower portion of the steam-box 22 to the suction-entrance of a pump 29, and in this pipe, between the steam-box and pump, there is a T 30, to which is connected a pipe 31, leading to a T 32 in pipe 25 between the liquor-entrance 20 and the feed-pipe 26. The T's 30 and 32 each contains a three-way valve. A pipe 33, leading from the discharge portion of the pump, is connected to pipe 25 between the feed-pipe 26 and the T 32.

The pipe 28, leading from the steam-box to the pump, is of greater capacity than the pipe 25, leading to the bottom of the vat, in order that the pump may at all times receive an adequate flow of liquor to keep it full and a faster discharge than inflow prevented. This insures reliable operation in case a centrifugal pump, which is preferred, is used. A valve-controlled pipe 34 leads from the bottom of the steam-box to a sewer or other desired place of disposal, in order that the box may be drained when desired. The portion of pipe 25 extending beyond the T 27 also leads to a sewer or other disposal place. A valve-controlled water-supply pipe 35 leads into pipe 31 between the T's 30 and 32.

The machine may be operated as follows: The valves are set to lead liquor from the pipe 26 through pipe 25 into the vat, and the liquor is permitted to so flow until it has passed through the false bottom and its extending member, through the material packed thereon and therearound, and through the cover, and attained a level above the exit 21, through which it flows into the steam-box. Then the valves are set to close the pipe 25 at T 27, to open pipe 28 from the steam-box to the pump, and to close pipe 31. Thereupon, the pump is started and operated and liquor circulated from the steam-box through pipe 28, the pump, pipe 33, and pipe 25 to the bottom of the vat, and thence forced upwardly through the false bottom and radially or outwardly from the central member into and through the material under treatment, and through the cover, from above which it flows through exit 21 to the steam-box. The valve in water-supply pipe 35 is closed during this operation.

The liquor, in being forced upwardly and radially through the material from the false bottom and its central upwardly-extending portion or member, will tend to move the material upwardly toward the cover into the smaller space formed by the central member, and it will, therefore, tend to pack the material more tightly and thus obviate the formation of channels through which the liquor would tend to flow without being evenly distributed throughout the mass. If any channels have formed during the initial flow of liquor, when the pressure is increased by operation of the pump they will be closed up as the material is wedged into the smaller space toward the top and the liquor evenly forced through the material and the material uniformly treated.

The upper portion of the central member 12 of the false bottom, which is defined by the imperforate portion thereof, forms an expansion-chamber, wherein air will be compressed by the pressure of the liquor rising above the perforations 15. If any diminution in the pressure of the liquor occurs, the air compressed in the chamber will force the liquor below it downwardly and outwardly and thus contribute to the maintenance of a regular flow of liquor through the material under treatment.

The liquor-exit 21, being positioned below the normal surface level of the liquor in the vat, foam, scum, and the like floating on top of the liquor will not flow to the steam-box and will, therefore, not be circulated through the mass of material under treatment. The introduction of scum and the like which forms on the top of dye-liquor often results in the appearance of streaky blotches in dyed material, particularly in that part into which the liquor first flows.

When it is desired to drain the vat of liquor, the valve in T 27 is set so as to direct flow either into the feed-pipe 26 or to the portion of pipe 25 leading to a sewer, dependent upon whether it is desired to return the liquor to the storage-tank or release it from further use. The valve in T 32 is set to direct flow upwardly into pipe 31 and to prevent flow toward T 27, and the valve in T 30 is set to direct flow from pipe 31 into pipe 28 and thence to the pump and to shut off flow to or from the steam-box through pipe 28. With the valves so set, the pump will operate to draw the liquor from the bottom of the vat and force it to the storage-tank or to the sewer, as desired.

Water may be introduced into the vat for washing or other purposes by setting the valve in T 32 so that liquid may flow along pipe 25 into the vat at entrance 20, but not upwardly from that pipe into pipe 31, the valve in T 27 being closed against all passage; by setting the valve in T 30 to direct flow from pipe 31 through pipe 28 to the pump and to prevent flow between that pipe and the steam-box; by opening the valve in pipe 35; and by operating the pump to force the liquid through pipe 33 into pipe 25. When a sufficient quantity of water has been introduced into the vat and it is de-

sired to circulate it through the material therein, the valve in pipe 35 is closed, and the valve in T 30 set to close passage from pipe 31 and to direct flow from the steam-box to the pump, whereupon the circulation will continue as has already been described with respect to liquor.

The false bottom is provided with eye-bolts 36 and the cover with shackles 37, with which may be engaged the usual appliances for lifting purposes.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A machine for treating permeable material with liquor comprising a vat, and a material-holding bottom having an upwardly-extending liquor-distributing portion containing an expansion-chamber.

2. A machine for treating permeable material with liquor comprising a vat, and a foraminous bottom therefor having an upwardly-extending hollow portion formed with perforations for a portion of the distance from the bottom along its side and being imperforate in the remaining portion of its side and in its top, whereby an expansion-chamber is formed.

3. A machine for treating permeable material with liquor comprising a vat, in the vat a foraminous bottom, and a foraminous casing closed at the top and open at the bottom and secured to said bottom over an opening therein, said casing extending upwardly from said bottom and having a side gradually approaching the side of the vat from the bottom toward the top of the casing.

4. A machine for treating permeable material with liquor comprising a vat, and in the vat a foraminous bottom, and a member secured thereto and extending upwardly therefrom with a lateral surface approaching the side of the vat from the bottom toward the top of the member.

5. In a machine for treating permeable material with liquor, the combination, with a vat, of a foraminous member in the vat through which liquor passes into material thereon under treatment, an opposed foraminous member through which the liquor is discharged, and a foraminous casing arranged to receive and distribute liquor secured to and extending from the foraminous member through which the liquor enters toward the other foraminous member in increasing transverse dimension, whereby it occupies an increasing amount of space from the entrance toward the discharge member.

6. In a machine for treating permeable material with liquor, the combination, with a vat, of a foraminous member in the vat through which liquor passes into material thereon under treatment, an opposed foraminous member through which the liquor is discharged, and a foraminous casing of frusto-conical shape, arranged to receive and discharge liquor, having its larger end closed and its smaller end open and secured to the foraminous member through which the liquor enters.

7. In a machine for treating permeable material with liquor, the combination, with a vat, of a foraminous member in said vat through which liquor is expelled from material under treatment, another foraminous member, through which the liquor enters, having a comparatively large opening therein, and a casing, closed at one end and open at the other and having foraminous sides, secured at its open end to said entrance foraminous member over said opening therein and extending toward the other foraminous member in increasing size, whereby it occupies more space toward the liquor-discharging member than at the liquor-entrance member.

8. A distributing member for the vats of dyeing and like machines, comprising a hollow casing closed at one end and open at the other end and having its side formed with perforations for a portion only of the distance from the open end toward the closed end.

9. A distributing casing for the vats of dyeing and like machines of frusto-conical shape having its larger end closed and its smaller end open and the side of said member being perforated.

10. A distributing member for dyeing and like machines comprising a hollow casing closed at one end and having an inlet at the other end and gradually increasing in transverse dimension from the inlet end toward the closed end, said member having perforations in a side.

In testimony whereof we affix our signatures in presence of two witnesses.

TOM FRUSHER.
TOM FRUSHER, JR.

Witnesses:
WILLIAM RIJNNON.
E. H. BARTLETT.