Feb. 21, 1928. 1,659,967

J. M. WOOD

DYEING MACHINE

Filed May 11, 1925 2 Sheets-Sheet 1

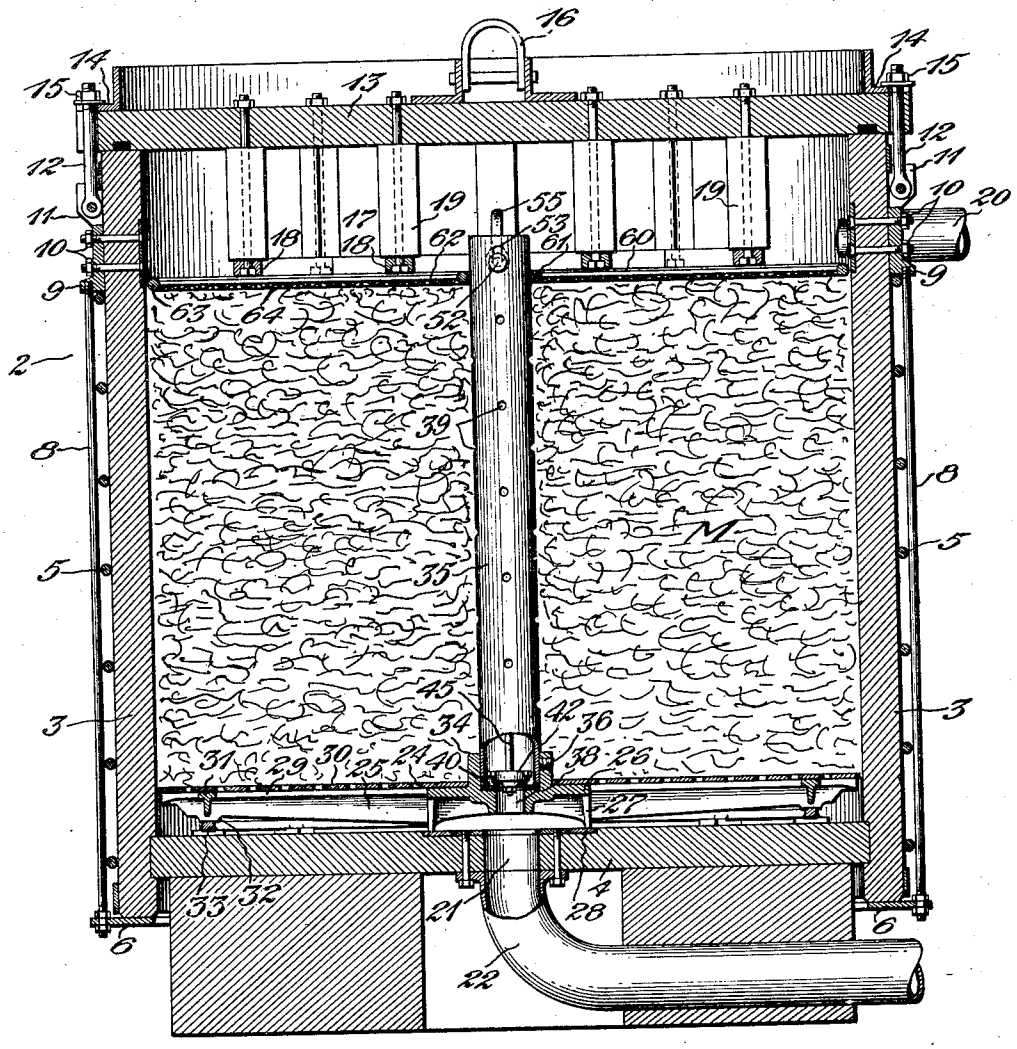


Fig. 1.

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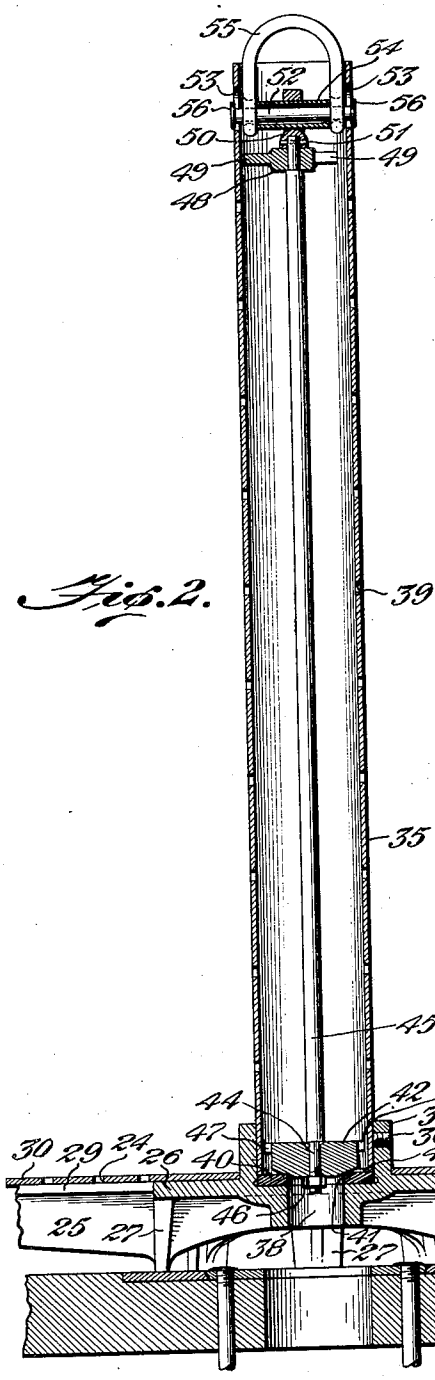


Fig. 2.

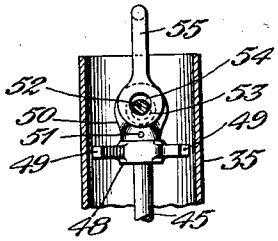


Fig. 3.

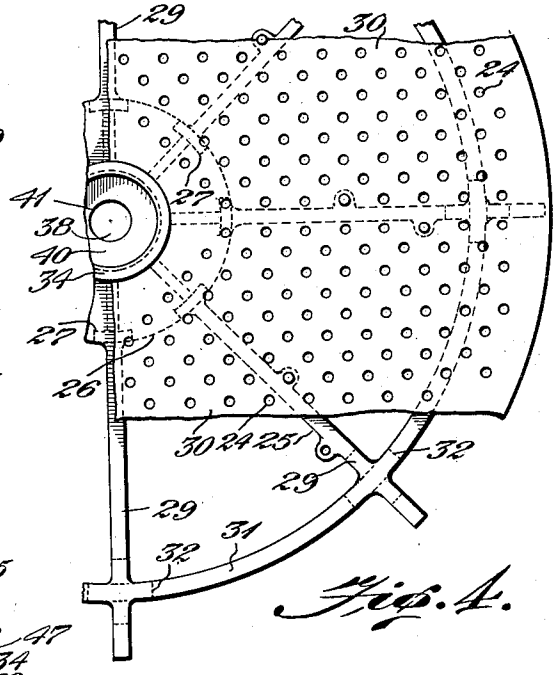


Fig. 4.

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UNITED STATES PATENT OFFICE.

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DYEING MACHINE.

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This invention relates to apparatus for dyeing and similarly treating fibrous materials and particularly to machines for dyeing or treating raw stock such as wool, worsted, mohair and other fibers.

One object of the invention is to provide a machine in which the material can be more easily handled in loading and unloading the kier or other vessel in which the fibers are dyed or treated.

Another object of the invention is to provide a machine in which the dye-liquor or other liquid employed for treating the material can be more completely drained from the material before it is removed from the kier.

Another object of the invention is to provide means within the kier or other vessel for preventing suction or a vacuum in the bottom of the vessel when the mass of material is lifted out therefrom.

Further objects of the invention are to render the dyeing machine more convenient to operate and more efficient in use as will be hereinafter more fully set forth.

The following specification describes a preferred method of carrying out the invention as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a vertical sectional view of a cylindrical kier or dyeing-vessel showing the present invention applied to use therewith;

Fig. 2 is an enlarged vertical sectional view of the central standpipe about which the material is packed in the kier, also illustrating in fragmentary view a portion of the bottom grid or carrier and its drain-plate on which the material is held to be raised out of the kier;

Fig. 3 is a detailed view of the upper end of the standpipe showing the improved valve-operating device as applied to use therewith; and

Fig. 4 is a plan view of a portion of the bottom grid on the standpipe and its drain-plate.

The invention in general consists in a dyeing-vessel or kier having a suitable inlet at the top and an outlet at the bottom for circulating the treating-fluid therethrough, a holder or carrier for supporting the mass of material within the kier to adapt it to be lifted out therefrom, a valve in the carrier opening to the atmosphere, and means operated by the lifting of the carrier to open the valve to prevent a vacuum in the bottom of the kier.

My invention may be applied to use with any usual form of dyeing-vessel and is herein illustrated in connection with a cylindrical kier or vat 2. The kier 2 is usually constructed with wooden staves 3 rising from a circular base or bottom 4, and bound together by suitable metal-hoops 5. At the lower ends of the staves 3 is a metal ring or annulus 6, and reaching upwardly therefrom are vertical rods 8 clamped to an upper ring 9 which is bolted to the staves 3 at 10. The upper ring 9 is provided with ears 11 between which are pivoted bolts 12 adapted to clamp down a cover 13 which rests on the top of the kier. The cover 13 has an annular angle-iron 14 provided with slotted openings for receiving the bolts 12. Suitable nuts 15 on the ends of the bolts 12 screw down against the angle-iron 14 to clamp the cover tightly against the top of the kier. The cover 13 has a swiveled hook or shackle 16 by means of which it may be raised with a rope or chain operated from a suitable tackle. On the under side of the cover 13 is a wooden framework 17 comprising horizontal strips 18 secured to the ends of vertical struts 19.

Entering the upper part of the kier 2 through its side is a feed-pipe 20 which leads from an expansion-tank not herein shown. The bottom 4 of the kier is provided with a central orifice 21, to which is connected an exhaust-pipe 22 leading back to the expansion-tank through suitable valves or other connections. A circulating pump is usually employed to force the dye-liquor or other fluid from the expansion-tank through the inlet-pipe 20 into the kier 2 under pressure, while exhausting it therefrom through the pipe 22.

Adapted to rest on the bottom of the kier 2 in raised relation thereabove is a circular grid or spider-member 25, shown in detail in Figs. 2 and 4. The grid 25 is provided at its center with a circular flanged hub or plate 26 formed with feet 27 which rest on a metal plate or ring 28 let into the floor or bottom 4 of the kier 2. Radiating from the central plate or hub 26 are arms 29 supporting an outer circular rim or annulus 31. The arms 29 and rim 31 are ribbed on their under sides to strengthen and stiffen the

grid, and the rim 31 is provided with spaced lugs or feet 32 which rest on a circular track 33 secured to the bottom 4 of the kier. A circular drain-plate 30, shown in plan view in Fig. 4, rests on the grid or spider 25 to provide a carrier to support the material to be treated in raised relation above the bottom of the kier 2. The plate 30 is provided with suitable holes 24 through which the treating fluid drains into the bottom of the kier.

The central plate or hub 26 of the grid 25 is formed with an upstanding circular flange 34 providing a socket for the vertical standpipe 35 which is secured therein by suitable means, such as a set-screw 36. In the center of the hub 26 is an opening 38 adapted to drain the standpipe through the central orifice 21 in the bottom of the kier.

The standpipe 35, shown in detail in Fig. 2, rises nearly to the top of the kier 2 and is provided with perforations 39 in its sides. At its lower end is a valve-seat comprising a circular plate 40 held in the socket of the hub 26 of the spider 25 and provided with a central opening 41 registering with the opening 38 in the hub. The opening 41 is adapted to be closed by a stopper 42 having its under side beveled at 43 to engage the edge of the opening. The stopper 42 is secured to the reduced end 44 of a vertical rod 45 by means of a nut 46. On the sides of the stopper are radial prongs or lugs 47 which engage the inner walls of the standpipe 35 to centralize the stopper therein. As shown in Figs. 2 and 3, the upper end of the rod 45 extends through a hub 48 which also has radial lugs or arms 49 for centralizing it within the standpipe 35. Fastened to the upper end of the rod 45 which projects through the hub 48 is a ring-member 50 held thereon by a cross-pin 51. Extending laterally through the ring-member 50 is a bolt 52 which has its ends engaging slots 53 in the sides of the standpipe 35. The bolt 52 carries a sleeve or bushing 54 extending between the opposite ends of a U-shaped shackle 55 which is swiveled on the ends of the bolt. The slots 53 are elongated to provide for vertical movement of the bolt 52 therein and the ends of the bolt are provided with flanges or washers 56 secured thereto and overlapping the sides of the slots to prevent accidental removal of the bolt therefrom.

A pressure-plate or screen 60 is adapted to slide downwardly on the standpipe 35 to compress the material in the kier when the cover is placed over its top. The pressure-plate 60 comprises a wheel-like framework having a central hub 61 and radial arms 62 supporting an outer annular rim 63. On the under side of the framework is a screen 64 adapted to rest against the material disposed around the standpipe in the kier.

Having now described the construction and arrangement of my improved apparatus in detail, its method of operation will next be explained: To load the machine the standpipe 35 and its attached grid or spider 25 are first lowered into the kier 2 until the feet 27 and 32 on the grid rest on the plate 28 and track 33. The material to be treated is next deposited on the drain-plate 30 and packed around the standpipe 35 to fill the interior of the kier substantially to the top of the standpipe. The compression-member or screen 60 is then placed on top of the mass of fibers M and the cover 13 lowered into place to cause its framework 17 to bear down against the top of the screen. The weight of the cover will cause the screen 60 to be forced downwardly to compress the fibrous material M into a mass of substantially uniform density, and the bolts 12 are then swung up into place to engage the slots in the cover and the nuts 15 applied thereto to clamp the cover in place to make a tight joint with the top of the kier.

The valves are now opened and the dye-liquor or other treating fluid is circulated through the kier by admitting it at the top through the feed-pipe 20. The fluid will flow down through the pressure-plate or screen 60 and be forced through the material under the pressure from the circulating pump. When the standpipe 35 is lowered into the kier 2 the stopper or closure 42 will seat itself against the valve-ring 40 through the action of gravity to close the orifice 41, and consequently the fluid will be prevented from escaping through the standpipe to the outlet or exhaust-pipe 22. Therefore, the fluid forced into the upper part of the kier under pressure will be caused to seep down through the material massed around the standpipe and will drain off through the openings in the drain-plate 30 which is held on the grid 25 in raised position above the bottom of the kier. The treating fluid will therefore have a free passage beneath the drain-plate 30 to exhaust from the kier through the pipe 22, whence it passes back to the expansion-tank and is thence again circulated through the kier.

After the fibers have been treated as described with the dye-liquor or other fluid the material is usually washed by circulating water through the kier in the same manner. When the washing process is completed the cover 13 is lifted off from the top of the kier by releasing its bolts 12 and raising it with a tackle or other suitable hoist. The whole mass of treated material is then removed from the kier on its carrier by lifting out the standpipe 35 and its attached spider 25 carrying the drain-plate 30; this operation being accomplished by fastening a rope or chain to the shackle 55 and employing a hoist or tackle to raise the standpipe and its

carrier out of the kier. As the rope or chain starts to raise the standpipe 35 the pull on the shackle 55 will cause its bolt 52 to slide upwardly in the slots 53, whereby to lift the valve-rod 45 longitudinally of the standpipe 35. The lifting of the rod 45 unseats the closure or stopper 42 from the valve-opening 41, whereupon any fluid in the standpipe 35 will be released to drain out of the kier through the exhaust-pipe 22. The opening of the valve 41 also permits any surplus fluid remaining in the fibers massed around the standpipe to drain off through the perforations therein while the whole mass of material is being raised out of the kier. The main purpose of the automatically operated valve, however, is to prevent suction in the bottom of the kier, or, in other words, to break the vacuum which ordinarily would be formed when the mass of material is slid upwardly on the interior of the kier. That is to say, the damp mass of fibers which are compacted closely around the standpipe 35 and compressed against the inner walls of the kier would normally act as a suction plunger to create a vacuum in the bottom of the kier when the standpipe and its spider are raised therein; it being understood that the valve or valves connected with the exhaust-pipe 22 are closed when the kier is being unloaded. Without the improved arrangement herein described the suction created by the lifting of the mass of material from the kier would ordinarily be so great as to place undue strain on the standpipe and its attached grid or carrier, while entailing more labor in raising the batch and further hindering expeditious unloading of the kier.

With the present improvement, immediately the hoisting rope or chain starts to raise the standpipe 35 and its grid 25 the closure 42 is unseated from the valve 41 so that not even a partial vacuum will be formed in the kier, and hence no undue resistance is encountered while raising the relatively heavy mass of material out of the kier. Moreover, the opening of the valve provides for the complete drainage of the liquid from the mass of material surrounding the standpipe and therefore assists in extracting the liquid from the whole batch during the removal of the material from the kier.

It is also to be observed that the closing of the valve 41 in the standpipe 35 is automatic so that there is no danger of the machine being improperly operated That is to say, when the material is lowered into the kier on the carrier or grid 25 the release of the hoisting shackle 55 causes the rod 45 to drop, whereby to automatically close the valve 41 without attention on the part of the operator. This insures that the valve will not be left open through carelessness or negligence. It will thus be seen that the present improvement provides a particularly simple and efficient device for the purpose specified and makes for greater convenience and facility in removing the treated batch of material from the kier.

While I have herein shown a preferred embodiment of the improved apparatus, it is to be understood that various modifications may be made in the structure and arrangement of the machine without departing from the spirit or scope of the invention. Therefore, without limiting myself to the exact construction and arrangement herein shown and described, I claim:

1. In an apparatus for dyeing or otherwise treating fibrous materials, the combination of a closed vessel, a carrier for holding the material within the vessel, a valve opening to the atmosphere, and automatically operable means for opening the valve to prevent a vacuum forming in the bottom of the vessel when the material is lifted out on the carrier.

2. In an apparatus for dyeing or otherwise treating fibrous materials, the combination of a closed vessel, a carrier for holding the material within the vessel, a valve communicating with the atmosphere, and means operable upon the raising of the carrier to open the valve to prevent a vacuum forming in the bottom of the vessel when the material is lifted out therefrom.

3. In an apparatus for dyeing or otherwise treating fibrous materials, the combination of a vessel, means for supporting the mass of material above the bottom of the vessel, a perforated standpipe about which the material is massed, a valve in said standpipe, and means operable automatically upon the lifting of the material out of the vessel to open the valve to prevent suction at the bottom of the vessel.

4. In an apparatus for dyeing or otherwise treating fibrous materials, the combination of a kier having an inlet at its top and an outlet in its bottom for circulating the fluid therethrough, a carrier for supporting the mass of material above the bottom of the kier, a perforated standpipe extending upwardly from the carrier through the material supported thereon, a valve at the bottom of the standpipe, and means operable upon the raising of the carrier to open the valve.

5. In an apparatus for dyeing or otherwise treating fibrous materials, the combination of a vessel having inlet and outlet passages, a perforated standpipe, a perforated carrier on the standpipe for supporting the material above the bottom of the vessel, a valve at the bottom of the standpipe communicating with the exhaust passage in the vessel, and means operable automatically upon the raising of the standpipe to open the valve to relieve the

vacuum when the material is lifted out of the vessel.

6. In an apparatus of the type specified, the combination of a kier, a carrier for the material to be treated comprising a grid, a perforated standpipe rising from the grid, a valve at the bottom of the standpipe opening beneath the grid, a closure for closing said valve, and means for unseating the closure from the valve when the carrier is raised in the kier.

7. In an apparatus of the type specified, the combination of a kier, a grid adapted to rest on the bottom of the kier, a perforated plate supported on the grid to hold the material raised above the bottom of the kier, a perforated standpipe rising from the grid, a valve at the bottom of the standpipe opening through the grid, and means operable upon the raising of the grid to open the valve.

8. In an apparatus of the type specified, the combination of a closed kier, a carrier for holding the material within the kier, a valve in the carrier communicating with the atmosphere, means for raising the carrier to lift the material out of the kier, and means operable from the raising-means to open the valve to prevent suction beneath the carrier.

9. In an apparatus of the type specified, the combination of a kier, a carrier for the material adapted to be supported in raised position above the bottom of the kier, a perforated standpipe extending upwardly from the carrier, a valve at the bottom of the standpipe opening through the carrier, a closure for closing the valve, means at the top of the standpipe for raising the carrier out of the kier, and means operable from the raising-means to open the valve in the standpipe when the carrier is lifted away from the bottom of the kier.

10. In an apparatus of the type specified, the combination of a kier, a carrier for supporting the material above the bottom of the kier, a perforated standpipe projecting upwardly from the carrier, a valve at the bottom of the standpipe, a shackle at the top of the standpipe, and means connecting the shackle to open the valve when the standpipe is raised to lift the carrier in the kier.

11. In an apparatus of the type specified, the combination of a carrier for supporting fibrous material, a central perforated standpipe projecting upwardly from the carrier, a valve at the bottom of the standpipe, a closure for closing said valve, a shackle connected to the standpipe to raise the latter and adapted to play up and down thereon, and means connecting said shackle to the valve-closure to unseat the latter when the shackle is operated to lift the standpipe and carrier.

12. In an apparatus of the type specified, the combination of a carrier for the material, a perforated standpipe projecting upwardly from said carrier, a valve at the bottom of the standpipe, a closure for said valve, a bolt slidable in slots at the top of the standpipe, a shackle carried by said bolt, and a rod connecting the bolt with the valve-closure to adapt it to unseat the latter when the shackle is raised to lift the carrier and its standpipe.

13. In a device of the type specified, the combination of a grid having a central orifice, a perforated standpipe surrounding the orifice and projecting upwardly therefrom, a valve in said orifice, a closure seating against the valve, means at the top of the standpipe for lifting the grid, and means connecting said lifting-means to raise the valve-closure off from its seat.

14. In an apparatus of the type specified, the combination of a spider, a perforated plate supported on said spider, a perforated standpipe rising from the center of the spider, a valve at the bottom of the standpipe opening through the spider, a closure for closing said valve, a shackle connected to the top of the standpipe and slidable with respect thereto, and a rod connecting said shackle to the valve-closure and adapted to raise the latter off its seat when the shackle is operated to lift the spider.

15. In an apparatus of the type specified, the combination of a kier, a spider having feet resting on the bottom of the kier, a perforated plate supported on the spider to receive the material to be treated in the kier, a perforated standpipe at the center of the spider, a valve at the bottom of the standpipe opening through the spider, means at the top of the standpipe for raising the spider, and means connecting the raising-means to open the valve when the spider is lifted off from the bottom of the kier.

In testimony whereof I affix my signature.

JOHN M. WOOD.