H. M. DUDLEY.

DYEING MACHINE.

APPLICATION FILED MAR. 13, 1917.

1,280,185.

Patented Oct. 1, 1918.

4 SHEETS—SHEET 1.

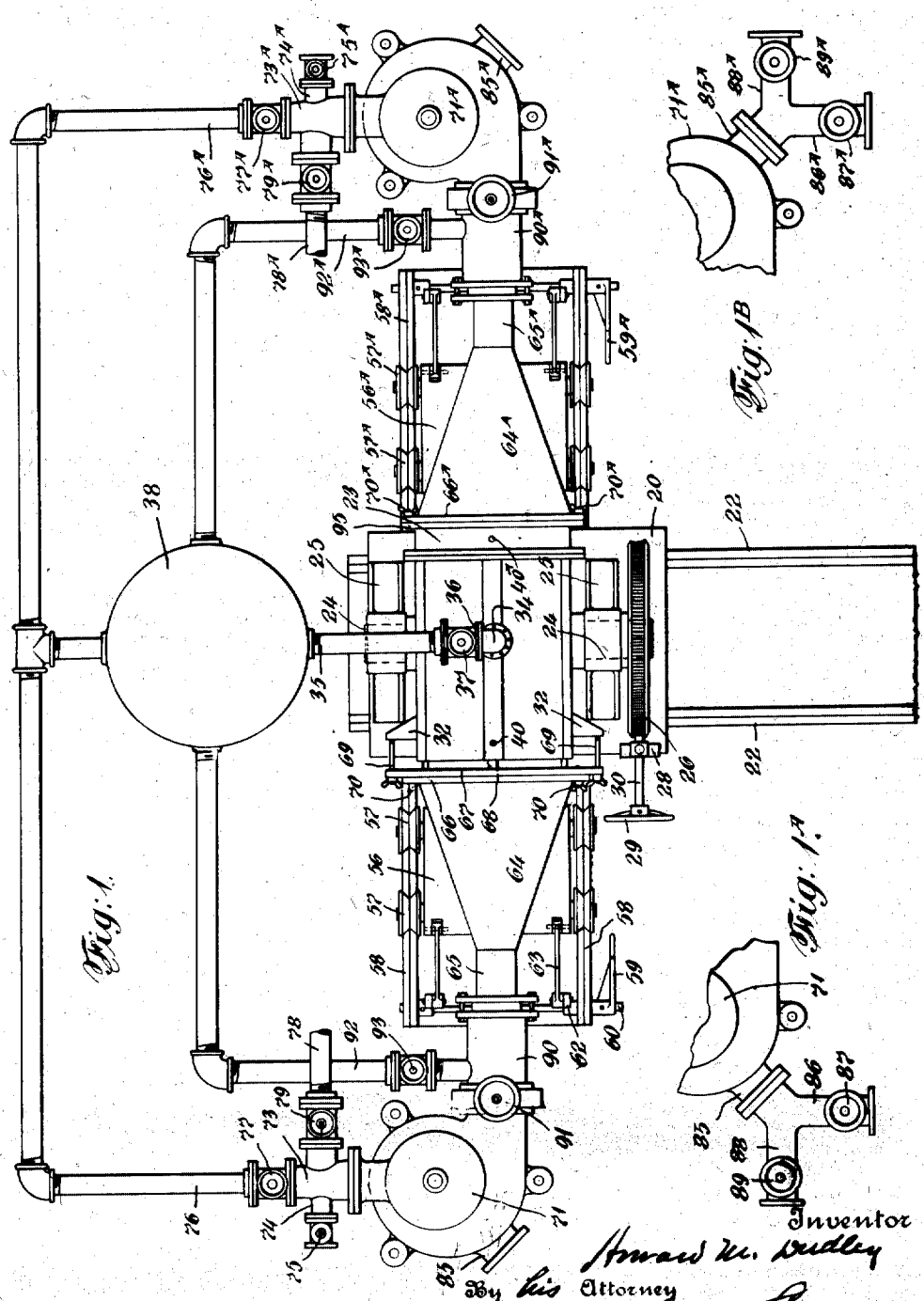


Fig. 1.

Fig. 1B

Fig. 1A

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4 SHEETS—SHEET 2.

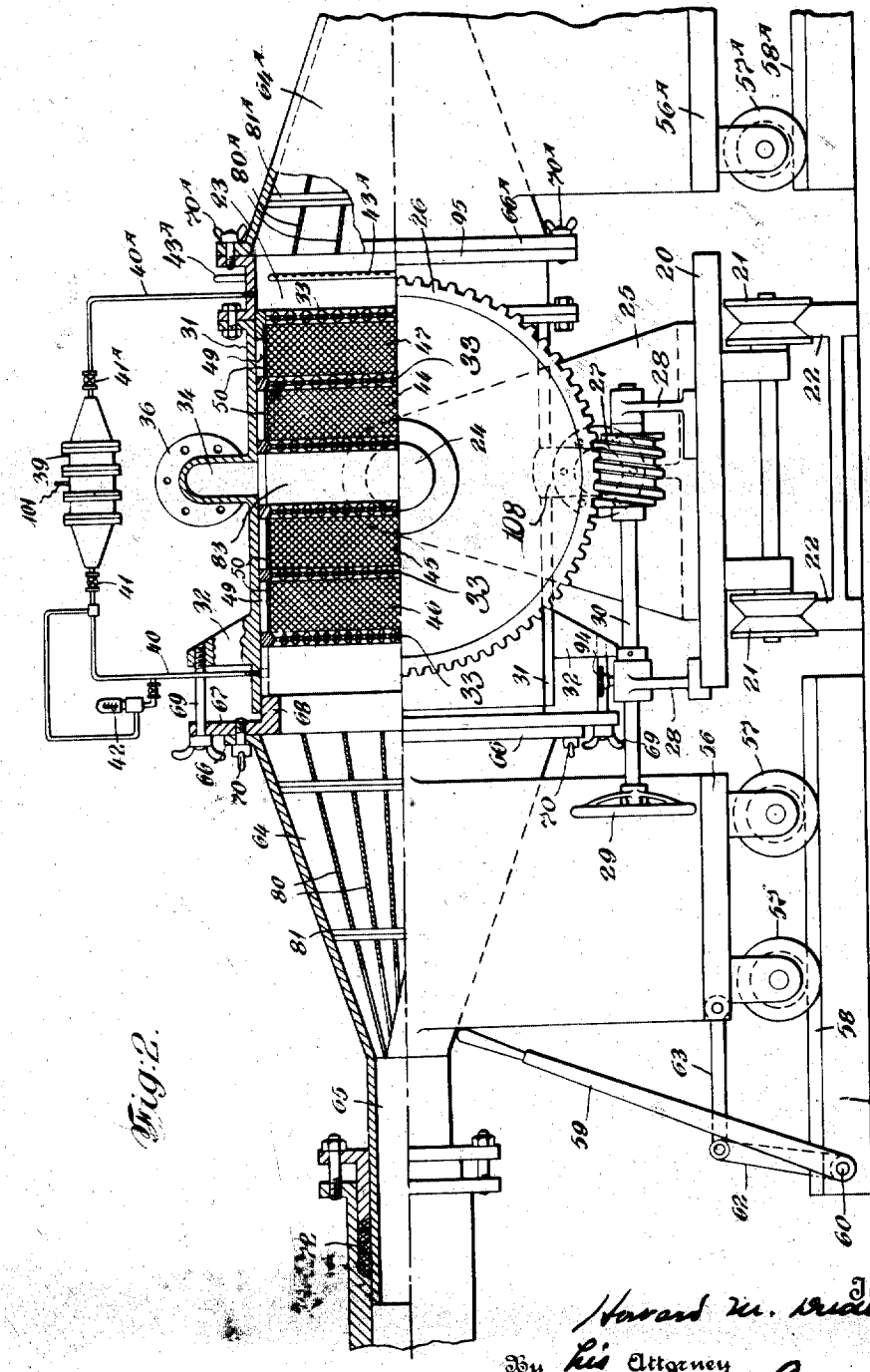


Fig. 2.

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4 SHEETS—SHEET 3.

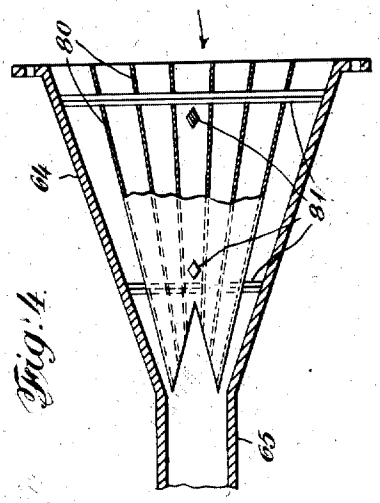


Fig. 4.

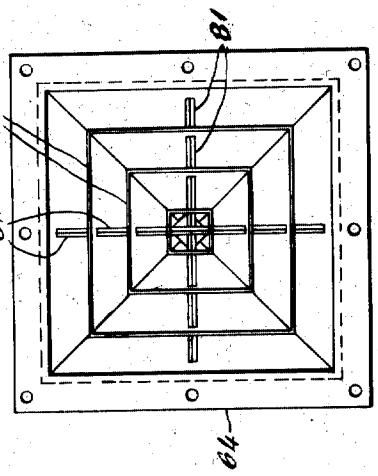


Fig. 5.

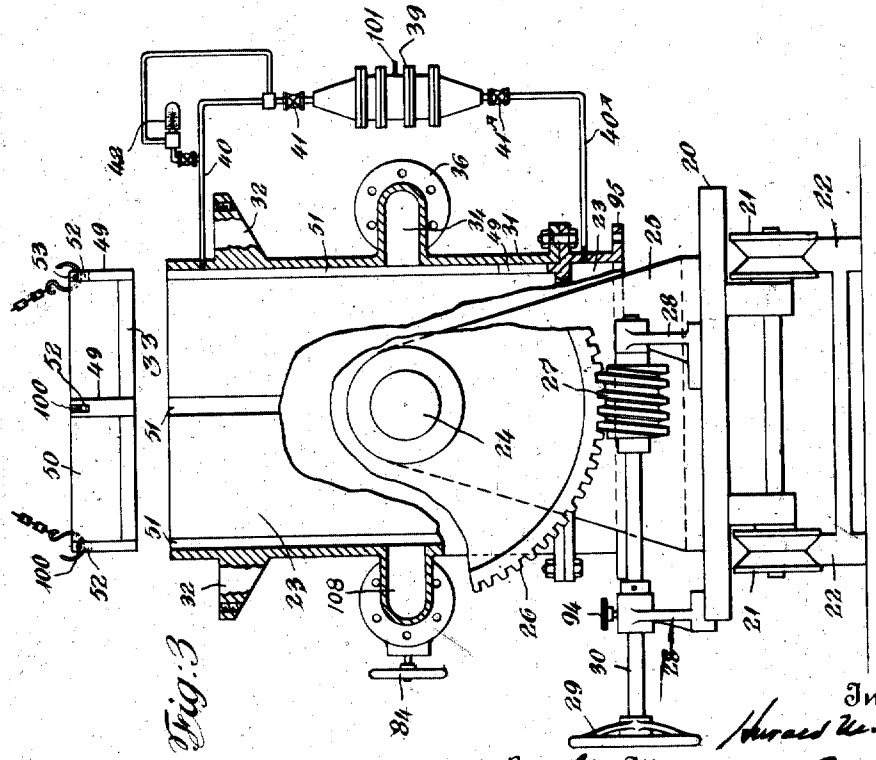


Fig. 3.

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DYEING MACHINE.

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4 SHEETS—SHEET 4.

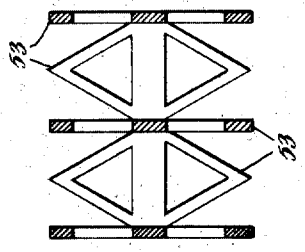


Fig. 8.

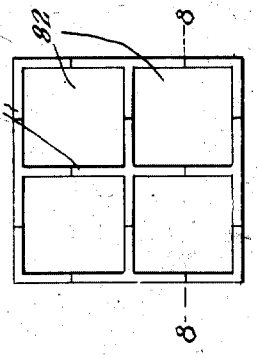


Fig. 9.

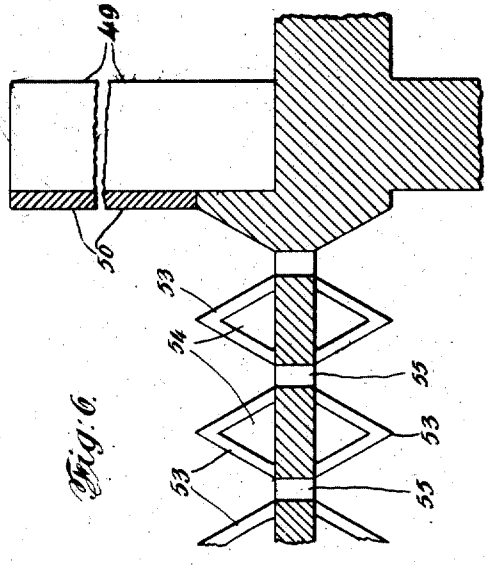


Fig. 6.

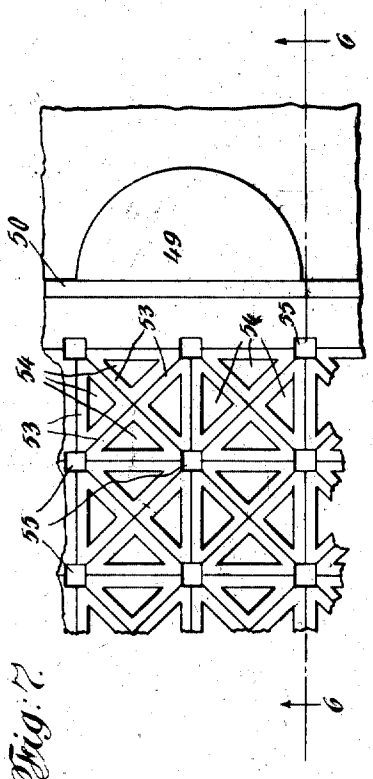


Fig. 7.

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UNITED STATES PATENT OFFICE.

HOWARD M. DUDLEY, OF PHILADELPHIA, PENNSYLVANIA.

DYEING-MACHINE.

1,280,185. Specification of Letters Patent. Patented Oct. 1, 1918.

Application filed March 13, 1917. Serial No. 154,575.

To all whom it may concern:

Be it known that I, HOWARD M. DUDLEY, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Dyeing-Machines, of which the following is a specification.

My invention relates to a dyeing machine and refers particularly to a machine adapted for the dyeing of textile fibers compressed within a dyeing chamber, the dyeing being accomplished by the forced passage of the dye liquor through the fiber mass.

Among the objects of my invention is a dyeing machine particularly suitable for the dyeing of warps in the ball, whereby the condition of the fiber may be accurately and readily judged at any stage of the treatment without opening the dyeing chamber and whereby even results may be obtained without disturbing the fiber to be dyed.

Another object of my invention is a dyeing machine in which the dyed goods may be after-treated with water, steam, air, or other materials or substances without handling the dyed goods, and whereby a series of batches of fiber may be treated simultaneously.

Other objects of my invention will be evident upon a consideration of my specification and claims.

I have found that the even or uneven dyeing results obtained in a machine of this general character depend largely upon the particular shape of the openings through which the dye liquor enters the fiber mass, and that unevenness can be prevented by the use of openings of a particular shape, the conformation of which enables the liquor to spread itself through the fiber mass without the formation of channels of flow.

I have further found that this desirable result may be enhanced by inclosing the fiber in a series of containers and passing the treating liquid through these containers and the fiber contained therein, first in one direction and then in the reverse direction.

In the use of many dyestuffs it is necessary, after dyeing to treat the dyed goods with water for washing purposes, or with solutions of chemicals such as metallic salts or oxidizing products, for the purpose of after-treatment, or with oxygen or air for oxidizing or drying purposes. In the following of these after-treatments it is essential that every portion of the dyed goods be thoroughly and uniformly treated and that the operation be performed as readily and quickly as possible. All of these results are obtainable by the use of the device of my invention, in which the goods are placed in the dyeing chamber and then rapidly, easily and completely dyed and after-treated without further handling of the goods and without the formation of channels by the liquids employed. The device therefore insures even and uniform results with a minimum of time, labor and expense.

One form of my device is shown in the accompanying drawings in which similar parts are designated by similar numerals.

Figure 1 is a top plan view of one form of the device of my invention.

Figs. 1^A and 1^B illustrate certain pipe connections carried by the chambers of the pumps.

Fig. 2 is a side plan view of a portion of Fig. 1, partly broken away.

Fig. 3 is a side plan view of a portion of Fig. 1, partly broken away, and showing the device in position for loading and unloading.

Fig. 4 is a cross-section of one of the members showing the plates.

Fig. 5 is a top plan view of Fig. 4 in the direction of the arrow.

Fig. 6 is a cross-section through the line 6—6 of Fig. 7.

Fig. 7 is a top plan view of a portion of a foraminous plate.

Fig. 8 is a cross-section through the line 8—8 of Fig. 9.

Fig. 9 is a top plan view of a modification of the foraminous plate.

In the form of my device as illustrated in the accompanying drawings, the truck 20 is mounted upon the wheels 21, 21, which are capable of movement upon the tracks 22, 22. Pivotally mounted upon the truck 20, is a receptacle 23, fixedly attached to the pinion 24 which is revoluble within the frame 25. Fixedly attached to the pinion 24 is a toothed segmental wheel 26, meshing with the teeth of the worm 27. The worm 27 is revoluble within the supports 28, 28, mounted upon the truck 20 and is capable of revolution by revolving the wheel 29 fixedly attached to the shaft 30 of the worm 27. The turning of the wheel 29 therefore revolves the receptacle 23 through the medium of the worm 27 and the toothed wheel 26. The receptacle 23 is comprised of the shell 31 to

which is fixedly attached a series of outwardly extended shoulders 32, 32 positioned near one end of the shell 31. Extending across the shell 31 and removably attached thereto is a fiber-holding tray 47 having a foraminous plate 33. The pipe 34, 35 is attached to the shell 31 to coincide with an opening therein, and carries the coupling 36 and the valve 37. The pipe 35 opens into the top of a liquid reserve tank 38. A smaller apparatus 39, the interior arrangement of parts of 39 being similar to the interior arrangement of parts of the receptacle 23, is connected to the interior of the receptacle 23, by means of the pipes 40, 40A to which it is removably coupled, carrying respectively the valves 41, 41A and the thermometer 42, the interior of the apparatus 39 being connected to the top of the reserve tank 38 by means of the pipe 101 carrying a valve. Perforated steam pipe 43A is within the receptacle 23. A pipe 108, carrying the valve 84 opens into the interior of the receptacle 23 for drawing the liquid from said receptacle. The interior of the receptacle 23 carries a series of movable fiber-holding trays 44, 45, 46. Each of the fiber-holding trays 44, 45 and 46 is comprised of a foraminous bottom to which are fixedly attached a series of lugs 49, 49 and a side member 50 integral with the foraminous plate 33 extends upwardly to the top of the lugs 49, 49, said side member 50 being integral with and fixedly attached to the interior faces of the lugs 49, 49. The lugs 49, 49 are vertically movable within the lug-chambers 51, 51 of the shell 31. The interior of each of the fiber-holding trays 44, 45 and 46 is therefore formed by the foraminous bottom 33 and the side member 50. The lugs 49, 49 of all of the fiber-holding trays carry holes 52, 52 with inserted pins 100, 100 for the insertion of withdrawal means as hereinafter described. The fiber-holding tray 47 is integral with the walls of the receptacle 23 and is not removable.

Each of the foraminous bottoms 33, 33 is composed of a series of triangular members 53, 53 with the openings 54, 54. These triangular members 53, 53 are arranged in pyramidal formation as shown in Figs. 6 and 7, extending upwardly and downwardly, their bases abutting upon each other, while openings 55, 55 are made at the intersection of said bases.

A member 67 is extended into members 68, 68 capable of abutment upon the lugs 49, 49 of the end fiber-holding tray 46. The member 67 carries a series of screw-bolts 69, 69 by means of which it can be movably attached to the arms 32, 32 of the shell 31.

The fiber-holding member 83 is formed the same as the fiber-holding members 44, 45, 46, 47 except that it has no side member 50.

Situated at the sides of the truck 20 are trucks 56, 56A mounted upon wheels 57, 57A which are movable upon the tracks 58, 58A. The means for moving the trucks 56, 56A upon the tracks 58, 58A consists in each case of the lever arm 59 fixedly attached to the pivotal member 60 revoluble within the track-carrying member 61. Fixedly attached to the pivotal member 60 is the arm 62, which is pivotally attached to the arm 63, which in turn is pivotally attached to the truck 56. A movement of the arm 59 will therefore move the truck 56 upon the track 58. Situated upon each of the trucks 56, 56A are the hollow members 64, 64A extended into the hollow members 65, 65A. The larger end of each of the members 64, 64A is of the same size and shape as the end of the receptacle 23, upon which it is capable of abutment, and carries the collars 66, 66A, through which pass a series of screw bolts 70, 70, 70A, 70A capable of engagement within threaded holes of the member 67 of the receptacle 23, and the flange 95 which is fixedly attached to the shell 31, thus allowing tight engagement between the members 64, 64A and the receptacle 23. The centrifugal pumps 71, 71A are connected at their discharge ends with the members 65, 65A by means of the extension bushings 72, 72A, which allow of the vertical movement of the members 64, 65 and 64A, 65A without disengagement from the pumps. The charging ends of the pumps 71, 71A are connected with three-way pipes 73, 73A, which three-way pipes are connected with the pipes 74, 74A carrying the valves 75, 75A, the pipes 76, 76A carrying the valves 77, 77A and the pipes 78, 78A carrying the valves 79, 79A. The pipes 74, 74A lead to a source of water supply, the pipes 76, 76A lead to the bottom of the liquid reserve tank 38, which is situated above the pumps 71, 71A and the pipes 78, 78A lead to a tank containing the liquid in which the dye is dissolved. Connected with the pumps 71, 71A respectively are the two-way pipes 85, 85A, branching into the pipes 86, 86A carrying the valves 87, 87A and opening into the air, and the pipes 88, 88A carrying the valves 89, 89A, connected with an exhaust and compression pump not shown. The pumps 71, 71A are connected with the pipes 90, 90A carrying the valves 91, 91A, the pipes 90, 90A being connected to the top of the reservoir-tank 38 by the pipes 92, 92A carrying the valves 93, 93A.

Situated within each of the members 64, 64A is a nested series of converging rectangular members comprised of the plates 80, 80A, supported by the supporting members 81, 81A, the length of the plates of each rectangular member being somewhat greater than that of the rectangular member directly within it, as shown in Fig. 4.

In the modifications of the foraminous

plate shown in Figs. 8 and 9, the triangular members 53, 53 instead of forming pyramidal members as shown in Figs. 6 and 7, are situated in planes parallel to and perpendicular to each other, their bases meeting at the angles, thus forming a series of rectangular openings 82, 82, the members 53, 53 extending upwardly and downwardly therefrom.

The operation of the device is as follows, assuming that the dyeing or treating operation has been finished, and the device in the position shown in Figs. 1 and 2: The valves 77, 75, 79, 89, 87, 77^A, 75^A, 79^A, 89^A and 87^A are closed. The valve 84 is opened, allowing all the liquid contained within the receptacle to drain out. The pipe 35 is then uncoupled. The series of screw-bolts 70, 70, 70^A, 70^A are withdrawn and the two trucks 56, 56^A are withdrawn slightly upon the tracks 58, 58, 58^A, 58^A from contact with the receptacle 23 by means of the lever-arms 59, 59^A, the latter corresponding to 59. Truck 20 is then withdrawn from its position between the trucks 56, 56^A by rolling it upon the tracks 22, 22. The receptacle 23 is then given a quarter revolution by turning the wheel 29, and if necessary may be maintained in that position by the screw-bolt 94, the receptacle 23 then being in the position shown in Fig. 3. The series of screw-bolts 69, 69 (Figs. 1 and 2) are then withdrawn from engagement with the lugs 32, 32 and the member 67 withdrawn from within the receptacle 23. The fiber-holding members 46, 45, the member 83 and the fiber-holding member 44 is then removed in the order stated by means of hooks inserted beneath the pins 100, 100, in the lugs 49, 49, as illustrated in Fig. 3. When it is desired to load the device with fiber, fiber is introduced into the fiber-holding tray 47, the device being in the position shown in Fig. 3. The fiber-holding member 44 with the fiber is then similarly placed upon the member 47. The member 83 is then introduced, no fiber being contained therein, and finally the fiber-holding member 45 and 46 with fiber are introduced. The member 67 is then introduced, its lugs 68, 68 abutting upon the lugs 49, 49 of the member 46, and the series of fiber-holding members brought into intimate and fixed contact with each other by means of the screw-bolts 69, 69. The receptacle 23 and its contents are then given a quarter revolution by means of the wheel 29 and its connecting members. The truck 20 with the receptacle 23 is then moved along the tracks 22, 22 until the receptacle is positioned between the members 64, 64^A as shown in Figs. 1 and 2. The trucks 56, 56^A with the members attached thereto are then moved inwardly along the tracks 58, 58^A until the flange members 66, 66^A of the members 64, 64^A abut against the members 67 and 95 between which a gasket has been placed, and the joints made tight by means of the series of screw-bolts 70, 70^A. The pipe 35 is fixedly attached to the shell 31. The device is then in the position shown in Figs. 1 and 2.

The dyeing operation is then conducted as follows:—

All of the valves with the exception of valves 79^A, 91^A and 93 are closed. The pump 71^A is then started, which takes the dye liquor from the dissolving tank not shown to which pipe 78^A is attached, through the pipe 78^A, and forces it through the various fiber-holding trays 47, 44, 83, 45 and 46 into the pipe 92 through which it flows into the reserve tank 38. When all of the liquor from the dissolving tank has been delivered to the pump 71^A, the valve 79^A is closed and the valve 77^A is opened, thus allowing a free circulation of liquor by means of the pump 71^A from the tank 38, through the device and the fiber contained therein back into the tank 38. If it is desired to reverse the flow of the dye liquid through the device and the fiber, the pump 71^A is stopped, all of the valves with the exception of valves 77, 91 and 93^A are closed and pump 71 started, thus allowing a circulation of the liquor in tank 38, through the pipe 76, the pump 71, the devices and through the pipe 93^A back into the tank 38. If it is desired to pass the liquid from both ends of the device toward the middle and out through the space formed by the member 83, all of the valves are closed with the exception of 77, 91, 77^A, 91^A and 37 and both pumps 71 and 71^A started, the liquor will thus circulate from the tank 38, through both pump 71 and 71^A inwardly through the fiber and back into the tank 38 through the pipe 35.

When the dyeing operation is completed the liquor in the dyeing chamber is removed by allowing it to drain through the pipe 108 by opening the valve 84 at the bottom thereof.

If it is desired to wash the goods, water is admitted through the pipe 74, 74^A by opening the valves 75 and 75^A, and the water forced through the device and the goods contained therein, the other valves being in such an open or closed position as to cause the water to enter either through the pipe 74 or 74^A and exit through the other one, the circulation being caused by either the pump 71 or 71^A.

If it is desired to treat the dyed fiber with air, the valves 87 and 89^A are opened and the exhaust pump (not shown) started, the other valves being arranged to allow air to be sucked in through the pipe 86, the device and fiber, by the suction upon the pipe 88^A, or by using the compression side of the pump (not shown) air may be forced through the device and the fiber in an opposite direction from that just described.

During all of these operations the valves 41 and 41^A are maintained in an open condition, thus allowing the fiber in the smaller device 39 to receive exactly the same treatment as that in the larger device, and the condition of the fiber in the larger device may be determined at any time without interrupting the process by closing the valves 41, 41^A and examining the fiber in the smaller device 39.

I do not limit myself to the particular size, shape, number or arrangement of parts as described and illustrated, all of which may be varied without going beyond the scope of my invention as described and claimed.

What is claimed is:—

1. In a dyeing machine, in combination, a dyeing receptacle, a chamber at each end of the dyeing receptacle and abutable thereon, means whereby the two chambers may be moved outwardly from abutment upon the dyeing chamber, means for revolving the dyeing chamber, means for forcing a liquid through both chambers into the dyeing receptacle and means for permitting the escape of the liquid from the dyeing receptacle.

2. In a dyeing machine, in combination, a dyeing receptacle, means within the dyeing receptacle for containing fiber, a chamber at each end of the dyeing receptacle and capable of abutment thereon, means whereby the two chambers may be moved outwardly from abutment upon the dyeing chamber, means for revolving the dyeing receptacle, and means whereby a continuous circulation of liquid may be caused to pass through both of the chambers into the dyeing receptacle and through the fiber contained therein and means whereby the liquid may be permitted to escape from the dyeing receptacle after passage through at least a portion of the fiber contained therein.

3. In a dyeing machine, in combination, a dyeing receptacle, a series of parallel foraminous plates spaced from each other within the dyeing receptacle, a chamber at each end of the dyeing receptacle and capable of abutment thereon, means for circulating a liquid through the two chambers and the foraminous plates, means whereby the two chambers may be moved outwardly from abutment upon the dyeing chamber, means for revolving the dyeing chamber and means for removing the foraminous plates from the dyeing chamber.

4. In a dyeing machine, in combination, a dyeing receptacle, a series of parallel foraminous plates having extended convergent members with openings between them within the dyeing receptacle, means for maintaining the plates at predetermined distances from each other, a chamber at each end of the dyeing receptacle and capable of abutment thereon, means for passing a liquid through the chambers and the foraminous plates, means for permitting the escape of the liquid from the dyeing chamber after it has passed through a chamber and some of the foraminous plates, means for removing the dyeing receptacle from abutment with the chambers and means for revolving the dyeing receptacle.

5. In a dyeing machine, in combination, a dyeing receptacle, a series of parallel foraminous plates having oppositely disposed pyramidal members, means for maintaining the plates at predetermined distances from each other, a chamber at each end of the dyeing receptacle abutting thereon, means for circulating a liquid through the chambers and the foraminous plates, means for removing the chambers and the dyeing receptacle from abutment upon each other, means for revolving the dyeing receptacle to allow of the removal of the plates and means for removing the plates.

6. In a dyeing machine, in combination, a dyeing receptacle, a series of parallel foraminous plates having oppositely disposed pyramidal members, means for maintaining the plates at predetermined distances from each other, a chamber at each end of the dyeing receptacle abutting thereon, a series of divergent elements within each chamber, a pump connected with each chamber, each pump being connected with a liquid source and capable of circulating the liquid between the nested members in the chambers and the foraminous plates in the dyeing receptacle, means for removing the dyeing receptacle from between the chambers, means for revolving the dyeing receptacle and means for removing the foraminous plates.

7. In a dyeing machine, in combination, a dyeing receptacle, a series of parallel foraminous plates having extended convergent members with openings between them within the dyeing receptacle, means for maintaining the plates at predetermined distances from each other, a chamber at each end of the dyeing receptacle and capable of abutment thereon, means for passing a liquid through the chambers and the foraminous plates, means for forcing air through the chambers and the foraminous plates, means for permitting the escape of the liquid from the dyeing chamber after it has passed through a chamber and some of the foraminous plates, means for removing the dyeing receptacle from abutment with the chambers and means for revolving the dyeing receptacle.

8. In a dyeing machine, in combination, a dyeing receptacle, a chamber at each end of the dyeing receptacle and abutable thereon, means whereby the two chambers may be moved outwardly from abutment upon the dyeing chamber, means for revolving

the dyeing chamber, a smaller testing device exterior to the larger device and having a receptacle similar and proportionate to the receptacle of the larger device, connecting means between the two devices for the passage of a liquid or air whereby fiber in the two devices will be treated equally thereby, means for forcing a liquid and air through both devices and means for permitting the escape of the liquid and air from the dyeing receptacle and means for allowing the examination of the fiber in the smaller device without interrupting the treatment of the fiber in the larger device.

9. In a dyeing machine, in combination, a dyeing receptacle, a series of parallel foraminous plates spaced from each other within the dyeing receptacle, a chamber at each end of the dyeing receptacle and capable of abutment thereon, means for circulating a liquid through the two chambers and the foraminous plates, means whereby the two chambers may be moved outwardly from abutment upon the dyeing chamber, means for revolving the dyeing chamber and means for removing the foraminous plates from the dyeing chamber, a smaller testing device, exterior to the larger device and having a receptacle similar and proportionate to the receptacle of the larger device, connecting means between the two devices for the passage of a liquid or air whereby fiber in the two devices will be treated equally thereby, means for forcing air through both devices and means for permitting the escape of the liquid and air from the dyeing receptacle and means for allowing the examination of the fiber in the smaller device without interrupting the treatment of the fiber in the larger device.

10. In a dyeing machine, in combination, a dyeing receptacle, a series of parallel foraminous plates having extended convergent members with openings between them within the dyeing receptatcle, means for maintaining the plates at predetermined distances from each other, a chamber at each end of the dyeing receptacle and capable of abutment thereon, means for removing the dyeing receptacle from abutment with the chambers and means for revolving the dyeing receptacle, a smaller testing device, exterior to the larger device and having a receptacle similar and proportionate to the receptacle of the larger device, connecting means between the two devices for the passage of a liquid or air whereby fiber in the two devices will be treated equally thereby, means for forcing a liquid and air through both devices and means for permitting the escape of the liquid and air from the dyeing receptacle and means for allowing the examination of the fiber in the smaller device without interrupting the treatment of the fiber in the larger device.

Signed at New York city in the county of New York and State of New York this 10th day of March 1917.

HOWARD M. DUDLEY.