

F. J. MUIR.
PRESSURE DYEING MACHINE.
APPLICATION FILED OCT. 23, 1911.

1,034,487.

Patented Aug. 6, 1912.

-3 SHEETS-SHEET 1.

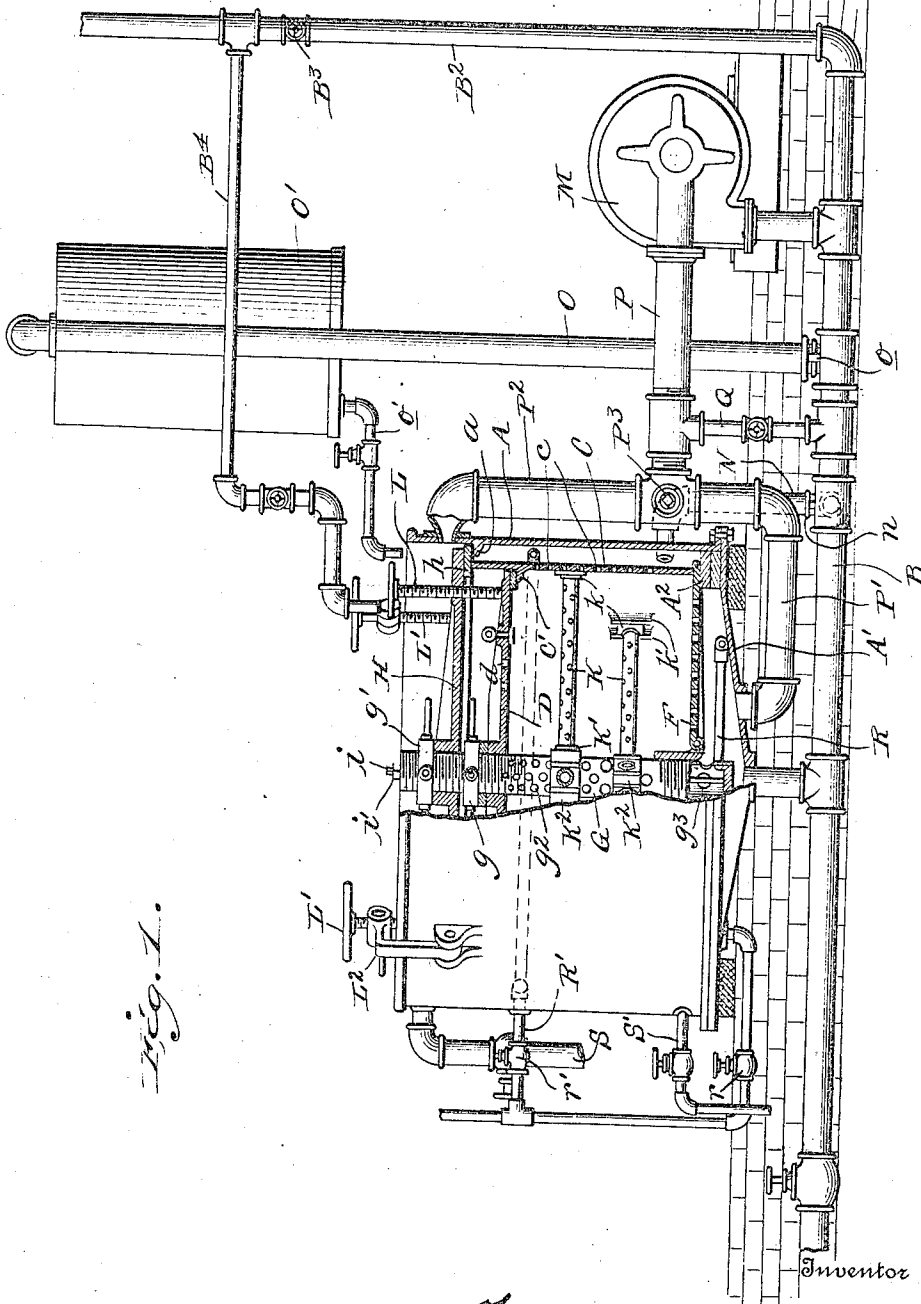


Fig. 1.

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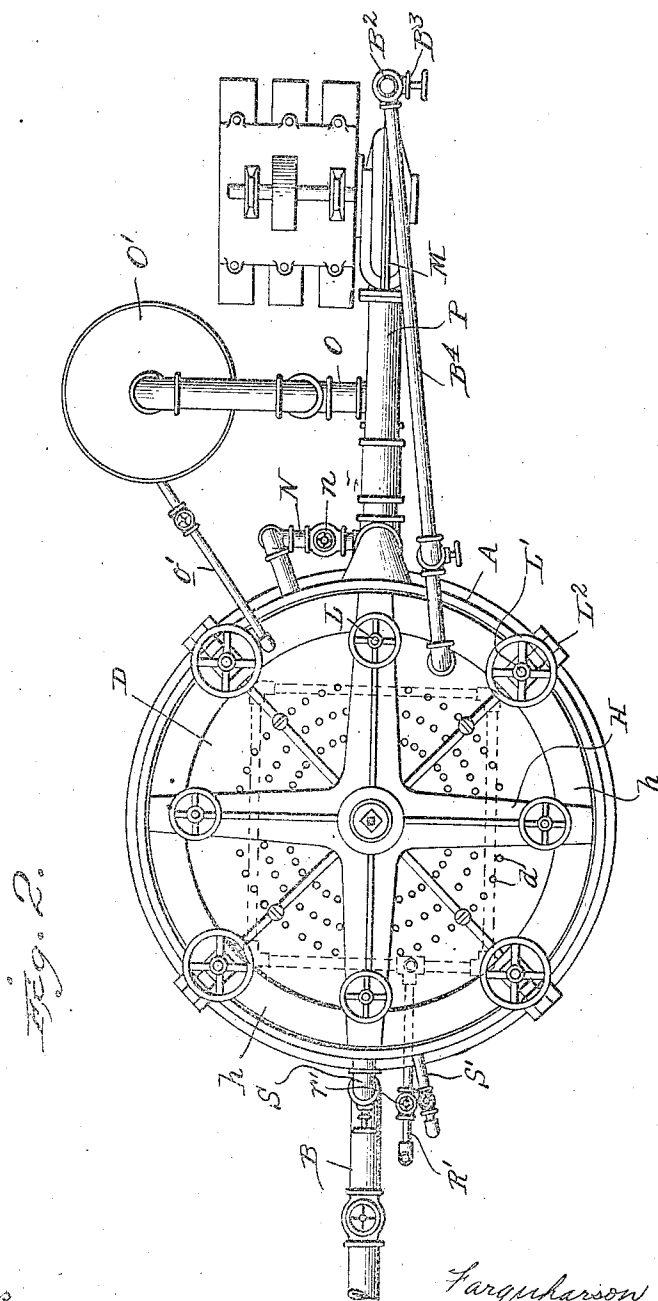
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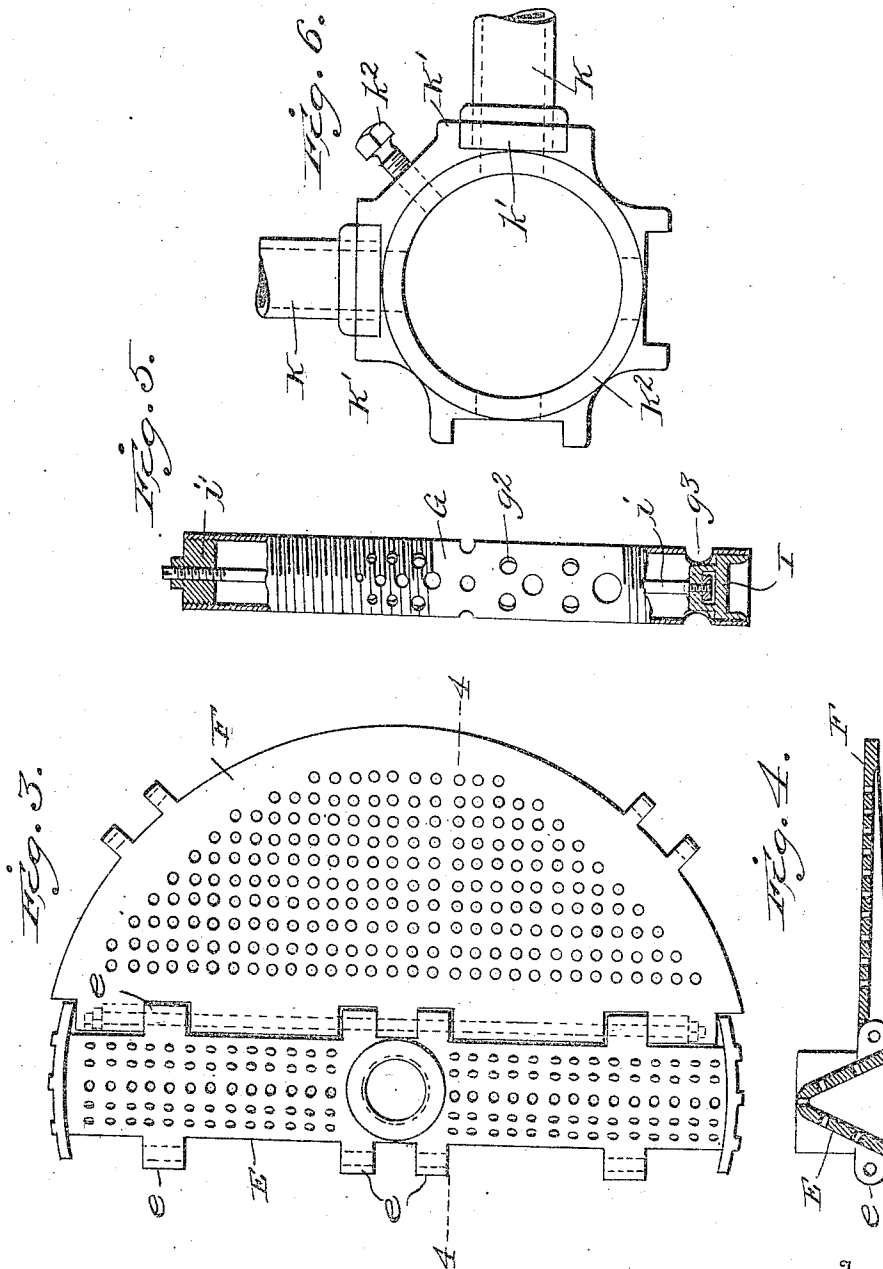
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UNITED STATES PATENT OFFICE

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PRESSURE DYEING-MACHINE.

1,034,487

Specification of Letters Patent.

Patented Aug. 6, 1912.

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To all whom it may concern:

Be it known that I, FARQUHARSON J. MUIR, a citizen of the United States, residing at Winchester, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Pressure Dyeing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to apparatus for dyeing fibrous material, the objects of the invention being to provide an apparatus which will effectually and uniformly dye large masses of cotton, wool, or other fibrous material when in either the loose form or in the form of yarns, slivers, or woven or knitted fabrics, and which will be simple both in construction and operation.

The invention is more especially adapted for embodiment in that type of dyeing apparatus in which the material to be dyed is confined in a basket and the dye liquor caused to circulate through the basket and material therein by the operation of a suitable power pump, said basket being held within a suitable tub or tank whereby the circulation of the dye liquor through the material may be forced under considerable pressure. Provision is also made whereby the basket may be conveniently removed from the tank to facilitate the discharge of the dyed mass.

Referring to the accompanying drawings—Figure 1 is an elevation with parts broken away and in section, of a pressure dyeing machine embodying the present improvements; Fig. 2 is a top plan view of the same; Fig. 3 is a plan of one half of the bottom of the basket; Fig. 4 is a section on the line 4—4 of Fig. 3; Fig. 5 is an elevation of the central pipe of the basket with portions in section to show the valve for in part controlling the circulation; Fig. 6 is a plan of one of the distributing pipe castings adapted to be mounted on the central pipe.

Like letters of reference in the several figures indicate the same parts.

The tub or tank A of the apparatus in the

accompanying drawings is preferably of the usual cylindrical form having a conical bottom A' communicating at the lowest point with a pipe B which, as will be hereinafter explained, may form either a part of the circulating system or the drain pipe for discharging the spent liquor into a suitable outflow.

Within the tub A there is located a basket for the mass of material to be dyed, said basket being also of cylindrical form, its cylindrical wall C being provided with apertures *c*, or made foraminous, and on the inner side provided with a bracket *c'* adapted to support the periphery of a cover plate D. Extending transversely across the bottom of the basket C and rigidly connected with its lower edge is a cross brace E, best seen in Figs. 3 and 4, which cross brace is conveniently of inverted V-shape in section and made foraminous or provided with perforations for the passage of dye liquor. Along its edges the cross brace is provided with eyes *e* forming part of the hinge connections between the cross piece and semi-circular hinged bottom sections F adapted to extend at their peripheries beneath the cylindrical wall C of the basket and to be suitably connected thereto by catches if so desired, which may be released when the contents of the basket are to be discharged. In the normal position of the parts, however, as indicated in Fig. 1, the peripheries of the bottom section, or the lower edge of the basket as a whole, is adapted to rest on an annular seat A² in the bottom edge of the tub, the seat serving in effect as a partition which will separate the space in the tub below the basket and the space in the tub around the basket into two chambers, to either or both of which the dye liquor may be delivered by the pump. The cross brace is tapped centrally for the reception of a central pipe G and said pipe is threaded at its upper end for the reception of screw collars *g* and *g'* respectively, the former being adapted to rest on the central hub of the cover D and the latter to rest on the central hub of a spider H which lies over the basket and is provided with an annular periphery or sealing ring *h* adapted to seat on the upper edge of the cylindrical

wall C of the basket and also on the internal rib *a* of the tub so as to seal the upper end of the chamber between the wall C and the wall of the tub whereby liquor supplied in said chamber will be forced to pass into and through the basket itself. The central pipe G is provided, in that portion lying within the basket, with a series of perforations or openings *g*² which are of graduated size, the openings near the bottom being relatively large and those at the top very small, the size in the actual machine preferably ranging from three inches at the lower end to one half inch at the upper end of the pipe. At its lower end the central pipe communicates with the space below the basket through transverse openings *g*³, adapted to be closed at will by a vertical movable plunger or valve I, best seen in Fig. 5. The stem *i* of the valve extends up through the upper end of the pipe and through a plug *i*¹ in which the end of the valve stem is preferably threaded whereby upon rotation of the stem the valve will be raised or lowered for controlling the admission of liquor to the lower end of the pipe.

The bottom F of the basket is preferably perforated or made foraminous throughout its entire area, while the cover D is only provided with openings for the passage of the dye liquor at a point intermediate its center and periphery. Thus, as shown in Figs. 1 and 2, it will be seen that the openings *d* in the cover extend in a band around the center and at a point some distance removed from the periphery of the cover. Thus the central portion as well as the periphery of the cover is imperforate and the only escape for dye liquor is through said perforations, this construction being important for the reason that the imperforate portions of the cover form abutments as it were against which the mass of material being dyed may compact to prevent the formation of channels and to force the liquor to penetrate and pass through the entire mass of material.

In the operation of the apparatus it will be understood that the dye liquor is supplied under pressure to the bottom, periphery, and center of the mass of material within the basket and that the pressure at the several points may be regulated at will by the attendant. While this arrangement has the capacity for insuring a very thorough and complete penetration of the mass and distribution of the dye therein, in order to still further distribute the liquor throughout the mass, a series of distributing pipes are preferably employed. These distributing pipes are radially arranged, are removable in either an upward or a downward direction, and communicate at their opposite ends with the perforations in the central pipe and cylindrical wall of the basket, respectively.

Conveniently, they are in the form of foraminous pipes K having at their opposite ends square or rectangular heads *k* adapted to be guided in slide ways *k*¹ on the inner face of the cylindrical wall C of the basket and in slide ways *K*¹ on castings *K*² held by the central pipe G. The castings *K*², it will be understood are secured on the central pipe as by set screws *k*² and at points opposite the slide ways *K*¹ are provided with perforations or apertures which will register with perforations or apertures in the central pipe. In operation, the distributing pipes K rest loosely in the slide ways being held within the mass of material being dyed, and are free to drop with the mass when the basket is lifted and the bottom sections allowed to open, although it is obvious that if so desired the pipes may be omitted or permanently mounted in position but the latter construction would interfere with the free discharge of the material when the basket is removed from the tub.

The cover D and spider H are adapted to be held down at their peripheries by clamping screws L and L', respectively, the screws L working through the spider arms and the screws L' being held by swinging brackets L² mounted on the wall of the tub and adapted to swing in over the spider as will be readily understood from Figs. 1 and 2.

The circulating system embodies a power pump which may be, as illustrated, of the centrifugal type, preferably located at one side of the tub as indicated at M in Figs. 1 and 2. The discharge from the pump leads into the pipe B before referred to and between the pump and connection with the bottom of the tub. Said pipe is provided with a branch N leading into the tub at a point above the bottom and within the chamber formed between the cylindrical walls of the basket and tub. This branch is controlled by a valve *n* whereby the supply of liquor to the annular chamber referred to may be readily controlled or entirely cut off as occasion demands. From the pipe B in proximity to the pump connection there also extends a branch O controlled by a three-way valve *o* leading to a dye liquor supply tank O'. The tank O' in turn has a valve controlled discharge pipe *o*¹ leading to a point over the tub whereby dye liquor may be supplied to the tub by gravity. The pipe B is also in communication with a water supply pipe B² controlled by a valve B³ and having a valve controlled branch B¹ leading to a point above the tub, whereby fresh water may be supplied for flushing the tub, from either the bottom or the top. The eye or intake of the pump communicates through a pipe P with branches P¹ and P² leading respectively from the bottom of the tub and from the top of the tub above the basket

when the latter is located therein. A three-way valve P³ controls the branches leading to the pump whereby during the normal operation of dyeing the only liquor supplied to the pump will be that which has passed upwardly through the mass of material being dyed, but when it is desired to remove the dye liquor it may be taken from the bottom of the tub and forced up into the tank O'.

For convenience in cleaning and draining, a short cut off pipe Q may be introduced between the pipes B and P with a suitable valve for closing and opening the same.

Steam is supplied for heating the dye liquor and mass of material to be dyed, through perforated steam pipes R and R' located respectively in the bottom of the tub and in the annular chamber formed between the peripheries of the tub and basket. Each branch is controlled by a valve r, r' respectively, and in addition the tub may be provided with the ordinary gravity overflow connections and discharge pipe connections S and S', respectively.

In the operation of the machine it will be understood that the liquor is supplied under considerable heat and the pressure acts from the bottom of the mass upward; from the periphery upward and inward; and from the central distributing pipe outward and upward to the outlet holes provided in the cover midway between the outer wall of the basket and the central distributing pipe. The supply through the central pipe and through the annular peripheral chamber is controlled by a valve independently of the supply to the bottom of the basket, and owing to the capacity for thus operating the machine difficulties encountered in the operation of machines as previously constructed are very largely eliminated. For instance, the operator may apply the pressure from the bottom upward, until the mass of material is firmly pressed against the top or cover of the basket before the valves are opened for admitting pressure from the center outward or from the periphery inward, or from the distributing pipes to the center of the mass. Thus the mass of material will not be split into two parts, nor will the material be channeled by shrinkage due to the action of the dye liquor and heat. When the liquor is being supplied after the mass has been properly seated it will be distributed with great uniformity throughout the mass and in fact it will be supplied to the very center of the mass of material with substantially equal pressure and with substantially the same flow of liquor as to other parts. Thus the filtering effect by which the first portion of the mass penetrated by the liquor would arrest more than its proper proportion of the pigment is practically eliminated and each portion of the

mass received its due proportion of liquor fully charged with the dye material.

In the preferred construction the perforations c in the periphery of the basket are of graduated size with the larger perforations at the bottom, as shown, this construction being especially designed to equalize the pressure and in practice the oppositely disposed holes in the central pipe and in the periphery are of corresponding size.

With other types of dyeing machines, the construction must be definitely determined beforehand so as to secure proper equalization of the pressure and flow of liquor from the bottom upward and from the center outward, but with the machine of the present application these pressures can be adjusted to the proportions that will give the best results in thorough and equal penetration of the mass, and, consequently, the machine may be made of standard size for dyeing practically any and all materials, and subsequently adjusted for handling any particular material.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:—

1. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a basket in the tank, said basket having a foraminous bottom and peripheral wall, means for withdrawing the liquor from the tank above the basket, and means for supplying liquor under pressure to the bottom and periphery of the basket independently, whereby the relative pressures at the bottom and periphery may be regulated.

2. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a foraminous basket located in the tank and having a cover provided with imperforate central and peripheral portions against which the material may compact to prevent channeling, an intermediate circular foraminous portion for the escape of liquor, and means for forcing dye liquor into the lower portion of the basket and for withdrawing the liquor from above the cover.

3. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a basket located in the tank and having a foraminous bottom and foraminous top, a central foraminous pipe in the basket communicating with the space below the foraminous bottom, a valve located at the entrance of the pipe, controlling the supply of dye liquor therefor independent of the supply of dye liquor below the foraminous bottom, means for supplying liquor under pressure to the space below the foraminous bottom, and means for withdrawing the liquor from above the basket.

4. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a basket located in the tank and having a foraminous bottom, periphery and top, a foraminous pipe arranged centrally of the basket, independent valves controlling the supply of liquor to the periphery and central pipe, means for supplying liquor below the bottom of the basket, and means for withdrawing the liquor from above the top of the basket.
5. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank having a peripheral seat in the bottom, a basket resting on said seat whereby separate bottom and peripheral chambers are formed, said basket having foraminous bottom and peripheral walls, means for sealing the peripheral chamber at the top, a cover having an imperforate peripheral portion, and means for supplying dye liquor to said chambers independently whereby the dye liquor may be forced through the basket from the bottom alone or simultaneously from the bottom and periphery.
6. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a basket mounted in the tank and having a transverse cross brace at the bottom with downwardly opening foraminous bottom sections hinged at their proximate edges to the cross brace, means for supplying liquor under pressure to the under side of the basket, and means for withdrawing the liquor from above the basket.
7. An apparatus for dyeing fibrous material by forcing the dye carrying liquor through the same, embodying a tank, a foraminous basket mounted within the tank, a foraminous cover for the basket, a removable sealing ring for closing the space between the basket and tank at the top of the basket, means for clamping said cover and ring in place, and means for supplying dye liquor under pressure to the tank around and below the basket and for withdrawing the dye liquor from above the sealing ring.
8. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a foraminous basket located in the tank, means for sealing the space between the peripheral walls of the basket and tank at top and bottom, a central foraminous pipe within the basket, means for supplying dye liquor under pressure to the peripheral chamber and to the central pipe and space beneath the basket, and independent valves controlling the supply of liquor to the peripheral chamber and central pipe.
9. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same embodying a tank, a basket located within the tank and having a central foraminous pipe, a foraminous peripheral wall and foraminous distributing pipes bridged between the central pipe and peripheral wall whereby liquor supplied to the central pipe and to the space surrounding the basket is free to pass into the distributing pipe from both ends.
10. An apparatus for dyeing fibrous material by forcing the dye carrying liquor through the same embodying a tank, a foraminous basket seated in the tank and having downwardly opening bottom sections to permit of the escape of the dyed material when the basket is removed from the tank, and removable foraminous distributing pipes extending transversely of the basket and adapted to receive liquor through the wall of the basket, substantially as described.
11. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a foraminous basket seated in the tank, a central pipe in said basket having apertures therein of graduated size with the smaller apertures near the top, a cover for the basket having a foraminous section remote from the central pipe, means for supplying dye liquor under pressure to the under side of the basket and central pipe, and means for withdrawing the dye liquor from above the foraminous top.
12. An apparatus for dyeing fibrous material by forcing dye carrying liquor there-through embodying a tank, a basket seated in the tank and having a foraminous bottom, a central pipe in the basket having apertures of graduated size therein, transversely extending foraminous distributing pipes removably mounted on the central pipe at one end, a cover for the basket having imperforate central and peripheral portions with an intermediate foraminous portion, and means for supplying dye liquor under pressure to the under side of the basket and central pipe, substantially as described.
13. An apparatus for dyeing fibrous material by forcing dye carrying liquor through the same, embodying a tank, a basket seated in the tank and having apertures therein of graduated size with the smaller apertures near the top, a central pipe in said basket having apertures therein of graduated size with the smaller apertures near the top, a cover for the basket having a foraminous section remote from the central pipe, means for supplying dye liquor under pressure to the under side of the basket and central pipe, and means for withdrawing the dye liquor from above the foraminous top.
14. An apparatus for dyeing fibrous material by forcing dye carrying liquor there-

through embodying a tank, a basket seated
in the tank and having a foraminous periph-
ery the apertures being of gradually in-
creasing size toward the bottom of the bas-
ket, a central pipe also having apertures
therein of gradually increasing size toward
the bottom of the basket, and means for forc-

ing dye liquor under pressure through the
apertures in the pipe and periphery of the
basket.

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Witnesses:

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