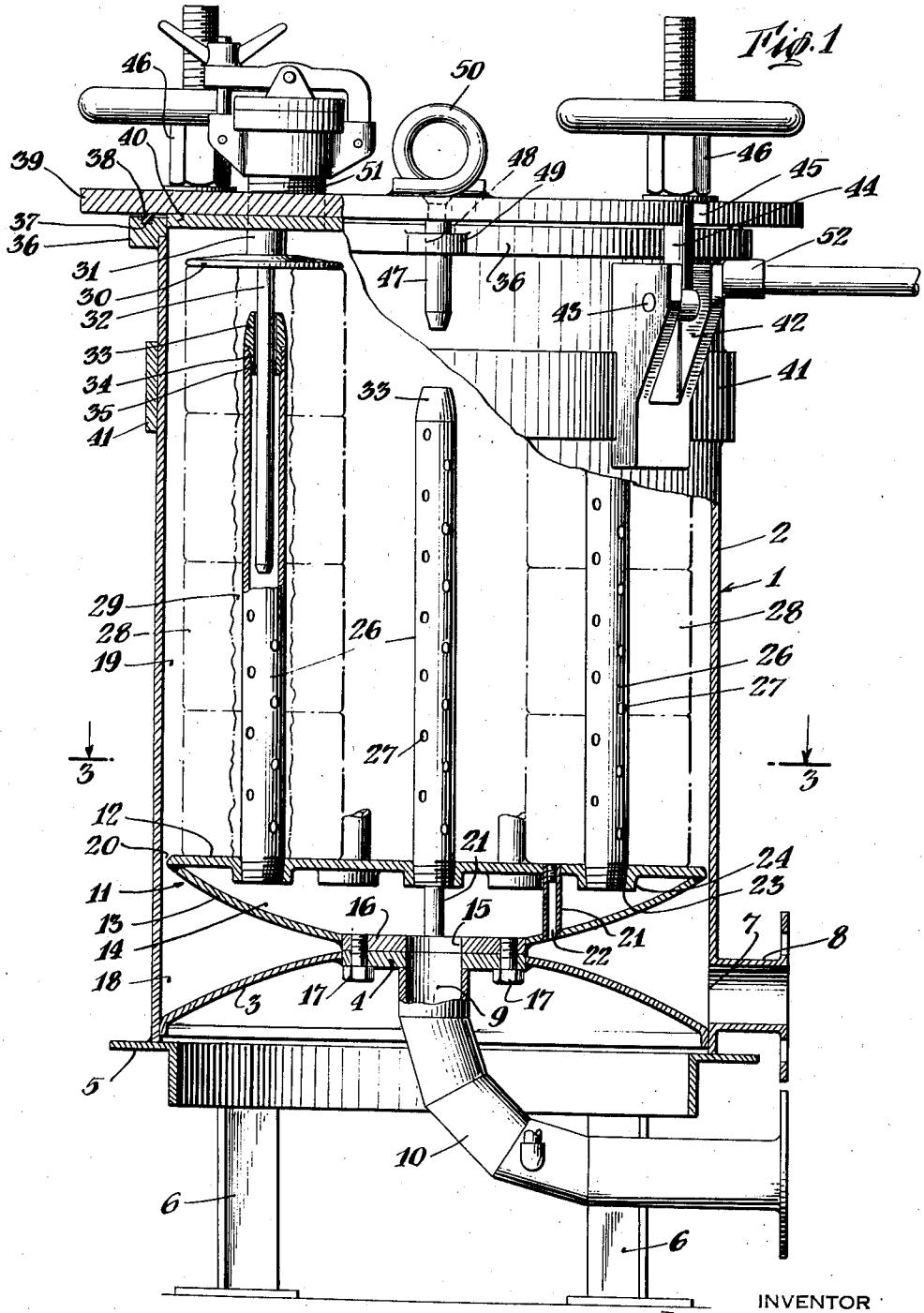
July 16, 1940. W. I. SEYMOUR 2,207,899

APPARATUS FOR TREATING YARNS AND LIKE MATERIALS

Filed July 2, 1937 3 Sheets-Sheet 1

Fig. 1



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Fig. 2

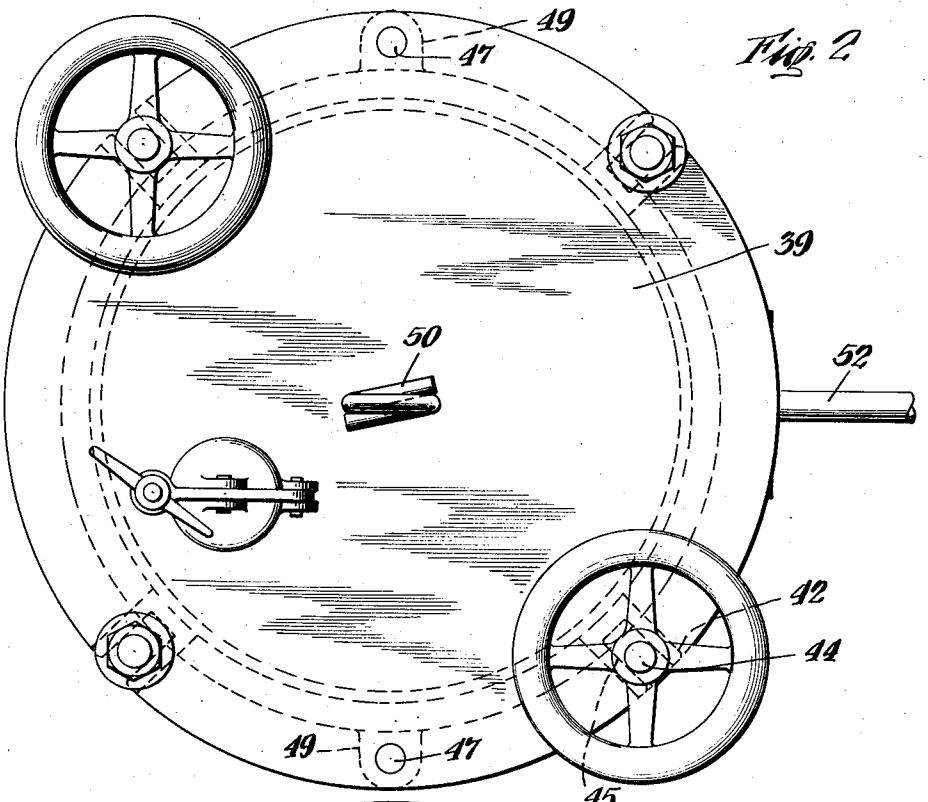
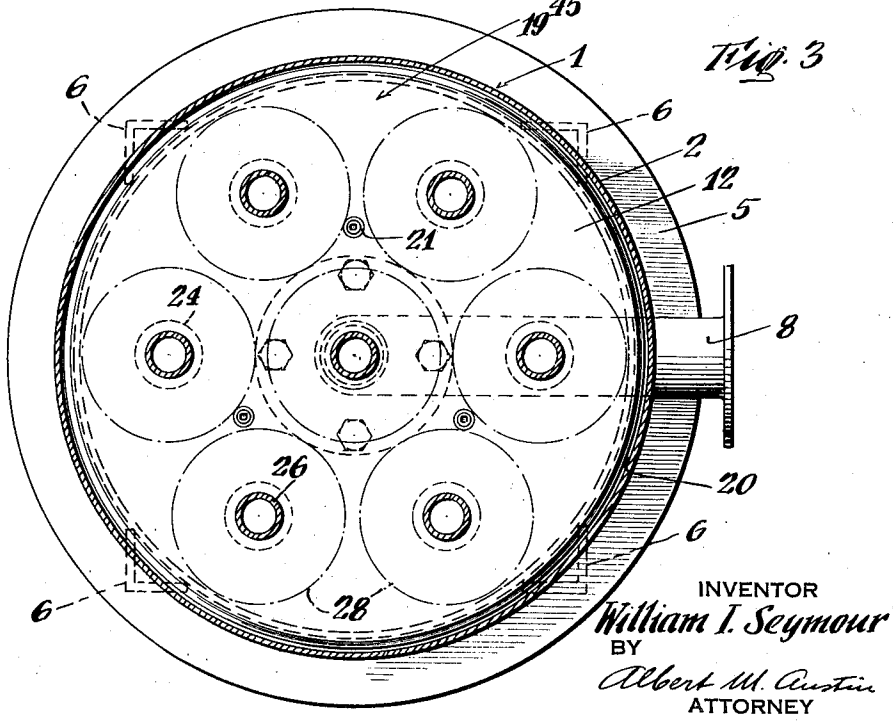


Fig. 3



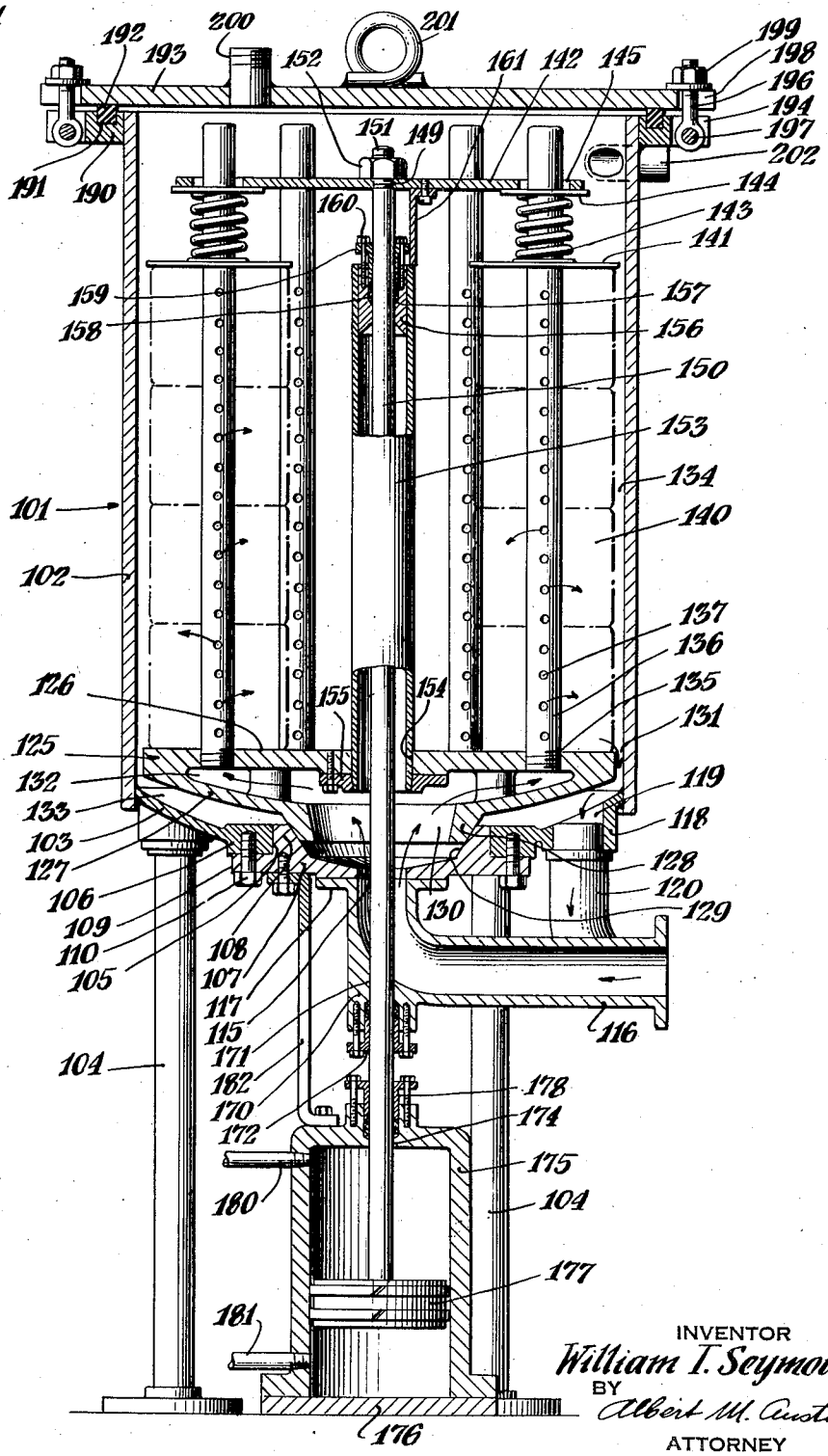
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Fig. 4



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APPARATUS FOR TREATING YARNS AND LIKE MATERIALS

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2 Claims. (Cl. 68—189)

This invention relates to apparatus for treating yarns and like materials and more particularly to apparatus of the closed kier type for treating such materials in package form.

In the kier dyeing of yarn and like materials, it is desirable to provide a kier of relatively great strength in order to withstand substantial pressures and of such material that the kier is not readily attacked by the treating liquors which are often of a corrosive nature. Where the material to be treated is in the form of packages or other convenient unit form, it is desirable to apply a predetermined substantial pressure to the packages in order that all portions thereof may be uniformly subjected to the action of the treating liquor.

According to the present invention, the apparatus includes a tank or kier formed of a suitable metal or metals. The sides of the kier are formed of one or more plates bent to form a tubular structure and the bottom is constituted by one or more members secured to the side walls as by welding. Disposed in the kier is a diaphragm member or holder plate which supports one or more perforated standpipes adapted to receive the packages of material to be treated and which also assist in directing the flow of liquor through the packages. A presser plate or top plate is guided by each standpipe and bears against the top package of each stack. The presser plate may be urged against the top package by pressure exerted by the cover when closed. Alternatively, the presser plate may be attached to an actuating rod extending through the diaphragm member and bottom wall of the kier and connected to a suitable power device located outside of the kier, such as a piston and cylinder. The presser plate thus can be moved downwardly to apply pressure to all of the stacks of packages simultaneously and can be retained in any desired position to maintain the packages under the desired pressure. Suitable equalizing devices, such as springs, are interposed between the presser plate and the several stack of packages whereby equal pressure is applied to each of the stacks.

An object of the invention is to provide a tank or kier for use in treating yarns and like materials, which tank can be easily and economically fabricated and which is rugged and capable of withstanding relatively high pressures.

Another object of the invention is the provision of a kier having associated therewith apparatus for compressing packages of material within the kier, which apparatus does not interfere with the opening and closing of the kier cover.

Another object of the invention is the provision of kier dyeing apparatus having power operated mechanism for evenly and uniformly compressing stacks of packages within the kier simultaneously and for maintaining them under readily controlled compression.

Various other features and advantages of the invention will be apparent from the following particular description and from an inspection of the accompanying drawings.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which:

Fig. 1 is a vertical sectional view taken approximately medially of one form of kier constructed in accordance with the invention;

Fig. 2 is a top plan view of the kier shown in Fig. 1;

Fig. 3 is a horizontal sectional view taken along line 3—3 of Fig. 1; and

Fig. 4 is a vertical sectional view taken through another form of kier and showing also a novel power operated mechanism for compressing the stacks of packages.

In the following description and in the claims, various details will be identified by specific names for convenience, but they are intended to be as generic in their application as the art will permit. Like reference characters denote like parts in the several figures of the drawings.

In the drawings accompanying and forming part of this specification, certain specific disclosure of the invention is made for purposes of explanation, but it will be understood that the details may be modified in various respects without departure from the broad aspect of the invention.

Referring now particularly to Fig. 1, the kier proper or the tank 1 is constructed preferably from a metal, such as stainless steel, which is not attacked by corrosive liquors, particularly those which are commonly used in the treating of textile materials. I have found that the so-called stainless steels are particularly well adapted for forming kiers in view of their great strength, their suitability for welding, and their resistance to corrosion by liquors customarily used in treat-

ing textile materials. However, the kier may be formed of any suitable metal, such as iron, steel, bronze, aluminum, Monel metal and others. The other portions of the apparatus may be formed from the same material as the kier or some other suitable material.

The side wall 2 of the kier is constituted by a metal plate bent into cylindrical form and welded to form a cylindrical structure. In some cases it may be found desirable to use two or more plates but generally a single plate having a single welded joint will be found to be suitable. The bottom wall of the kier is constituted by a dished plate-like member 3 having a boss 4, formed integral therewith or as a separate member welded thereto. The bottom 3 is secured to the lower portion of the side wall 2 as by welding, and preferably, the weld is a continuous one which not only provides a joint of great strength, but also prevents the escape of liquor from the kier even under substantial pressure.

A ring 5, preferably of L-shaped cross-sectional shape, may be welded or otherwise suitably secured to the lower portion of the kier, which ring serves to strengthen and reinforce the lower end of the kier and provides convenient means for attachment of a plurality of supporting legs 6.

An inlet opening 7 is provided in the side wall 2 and an inlet conduit 8 registers therewith. An inlet opening 9 is provided in the bottom 3 and an inlet conduit 10 which may be in drawn or fabricated pipe extends therethrough for admitting liquor into the kier. The conduits 8 and 10 may be secured to the kier 1 as by welding.

A removable diaphragm member 11, which may be formed as a stainless steel casting or as a fabricated member, is disposed in the lower portion of the kier and includes an upper wall 12 and a lower wall 13 defining therebetween a manifold chamber 14. Where the member 11 is fabricated the walls 12 and 13 may be welded at their peripheries. The lower wall 13 has an outlet opening 15 surrounded by a boss 16 which may be an integral portion of wall 13 or a separate member welded thereto. The boss 16 seats on the boss 4 surrounding the opening 9 in the bottom 3 and the opening 15 registers with the opening 9 in the bottom; the bosses may be connected by bolts 17, which thus secures the diaphragm member 11 in position.

It will be seen that the diaphragm member 11 divides the interior of the kier to form a lower chamber 18 defined by the lower wall 13 and the kier bottom 3 and a treating chamber 19 defined by the upper wall 12 and the kier side wall 2. The diaphragm member 11 is of slightly less diameter than the interior of the kier and, when in position, terminates short of the side wall 2 of the kier to leave an annular passage 20 providing communication between the lower chamber 18 and the treating chamber 19. One or more tubular portions 21 integral with the upper and lower walls 12 and 13 of the diaphragm member 11 define passages 22 extending from the lower chamber 18 to the treating chamber 19.

A plurality of threaded openings 23 surrounded by depending flanges 24 are provided in the top wall 12, and a tubular standpipe 26 is threaded in each of these openings. Each standpipe is provided with a series of perforations 27 distributed throughout substantially its entire length. The standpipes 27 are adapted to receive one or more packages 28 of material to be treated, which packages are of generally ring-like form with central openings 29 whereby the packages may be telescoped on to the standpipes and arranged one upon the other to form a vertical stack. A suitable presser flange or cover plate 30 is provided for covering the top package of the stack and for maintaining the stacked packages under a suitable pressure.

The top plate 30 has an upstanding portion 31 adapted to abut the lower side of a cover 39 when the latter is in closed position on the kier, as hereinafter more fully described. A skewer-like extension 32 depends from and may be formed integral with the top plate 30 and is adapted to telescopingly enter the standpipe 26 for positioning the top plate 30. A standpipe head or end 33 has a reduced portion 34 threaded into the upper end of the standpipe 26 and has a bore 35 adapted to receive the extension 32. The head or end 33 may be tapered to facilitate telescoping the package 28 on the standpipe 26.

Secured to the upper end of the side wall 2, as by welding, is a ring 36 having an annular groove 37 in which is heated a gasket 38. A disc-like cover 39 is provided for closing the top of the kier, which cover is adapted to seat on the gasket 38, and has a liner plate 40 which may be integral therewith or welded thereto, and which is adapted to fit snugly in the kier 1. The cover 39 preferably is formed from a plate of incorrodible material, as for example, stainless steel.

Surrounding and secured to the upper end of the kier wall 2 is a ring or band 41 on which is secured a suitable number of brackets 42. Swiveled in each bracket 42, as by a pivot member 43, is a bolt 44 adapted to enter a correspondingly position notch 45 in the cover 39 when the latter is in position on the kier. A nut 46, which may be provided with a suitable handle, is threaded on the bolt 44 for locking the cover 39 in position.

Secured to and depending from the cover is a pair of positioning pins 47 adapted to extend through openings 48 in lugs 49 secured to or integral with the ring 36. Also secured to the cover as by welding is a ring 50 by which the cover can be manipulated.

A sampling pipe 51 may be extended through the cover 39 and is secured as by welding or threading and welding. A bleeder pipe 52 extends into the side wall 2 of the kier and may be secured as by welding or threading and welding. Preferably the bleeder pipe is disposed immediately under and in abutment with the ring 36, as shown.

The operation of the apparatus thus far described is as follows:

Packages 28 of yarn, thread or other material are telescoped on to the several standpipes 26 and the cover plates 30 are assembled on the holders by inserting the extensions 32 in their respective standpipes 26. The cover plates 30 drop down into engagement with the top packages of the stacks and serve to close the central opening therein.

The cover is assembled on the kier by registering the pins 47 with the openings 48 in the lugs 49 and the cover is locked in position by inserting the bolts 44 in the notches 45 and tightening the nuts 46. When the cover is locked in position, the liner 40 bears against the upstanding portions 31 of the top plates and forces the top plates against the stacks of packages to compress the latter.

Treating liquor is introduced through the inlet conduit 7 and flows into the lower chamber 18, from whence it flows simultaneously through the

passages 22 and the annular passage 20 into the treating chamber 19. The liquor then is forced through the packages 28 and the openings 27 in the standpipes and then flows downwardly through the standpipes and into the manifold chamber 14 from whence it flows into the outlet pipe 10 and out of the kier. It will be understood that, if desired, the direction of flow may be reversed, in which case the liquor is introduced through conduit 9 and flows in a direction reversely to that above described, the liquor being expelled through the conduit 7.

Referring now to Fig. 4, there is shown apparatus including a somewhat modified form of kier and having associated therewith, a modified mechanism for compressing the stacks of packages.

The kier 101 is formed with a side wall 102 which preferably is constituted by one or more plates of stainless steel or other suitable material, and a bottom wall which may be formed of similar material is secured to the side wall 102, as by welding. The kier is supported in a suitable manner, as for example, by a plurality of legs 104 secured to the bottom wall 103 and/or the side wall 102.

The bottom wall 103 is formed with a central opening 105 surrounded by a flange or boss 106, and a closure member 107 has a projecting portion 108 snugly seated in the opening 105. The closure member 107 has a flange 109 which is secured to the boss 106 as by bolts 110. Formed in the closure member 107 is an opening 115 with which registers a conduit 116 provided with a flange 117 which is suitably secured to the closure member 107.

The bottom wall 103 is provided with a boss portion 118 defining an outlet opening 119 in which is suitably secured an outlet conduit 120.

Disposed in the lower portion of the kier is a diaphragm member 125 having an upper wall 126 and a lower bottom wall 127 defining therebetween a manifold chamber 132. Depending from the lower wall 127 is a conical flange 128 adapted to seat in a conical seat 129 formed in the closure member 127. The flange 128 surrounds a central opening 130 through the lower wall 127 which thus provides communication between the conduit 116 and the manifold chamber 132.

The seat 129 cooperates with the flange 128 to position the diaphragm member 125 in the kier, the diaphragm member 125 being of slightly less diameter than the interior of the kier whereby there is provided an annular passage 131. The passage 131 provides communication between a lower chamber 133 defined by the lower wall 127 and the bottom 103 and a treating chamber 134 defined by the upper wall 126 and the kier side wall 102.

The upper wall 126 is provided with a plurality of threaded openings 135, each of which receives a standpipe 136 which is supported in vertical position by the diaphragm member 125. Each standpipe 136 is provided with a series of perforations 137 distributed throughout its length which provide communication with the interior of the standpipe.

Each standpipe is adapted to receive a stack of packages 140 and a presser flange 141 is telescopingly received on the standpipe and adapted to bear against the top package of the stack. A presser plate 142 is provided for applying pressure simultaneously to all of the pressure flanges 141 and is formed with suitably disposed openings 145 whereby the plate 142 can be telescoped over all of the standpipes 136.

A spring 143 may be interposed between each presser flange 141 and the presser plate 142 whereby the pressure may be transmitted from the presser plate to the several pressure flanges with equal force. Preferably, the opening 145 in the presser plate 142 is of sufficient size to provide considerable clearance for the presser plate 142 thereby to prevent binding. For this reason, it may be found desirable to provide a seating plate 144 to serve as an abutment for the upper end of the spring 143.

The presser plate 142 is carried by a control rod 150 having a reduced threaded end 151 extending through an opening 149 in the presser plate; a nut 152 secures the plate in position. The actuating rod 150 is received in and guided by an upright guide tube 153 suitably secured in an opening 154 in the upper wall 126 as by a flange 155 attached to the upper wall 126. The rod 150 is guided in a bearing member 156 having a recess 157 adapted to contain a sealing material 158. An adjustable gland 159 is forced against the packing 158 by one or more screws 160 to thereby seal the rod 150 in the bearing 156.

The rod 150 is axially slidable in the bearing 156 and its travel downwardly is limited by a collar 161 secured to the lower face of the presser plate 142 and positioned to abut the top end of the guide tube 153.

The rod 150 extends through the opening 115 in the closure member 107 and projects through an opening 171 in a boss 170 which preferably is integral with the conduit 116. The rod 150 is guided in a sealed bearing 172 generally similar to the bearing provided at the top end of the tube 153. It will be noted that this arrangement of widely separated bearings firmly supports the rod 150 against displacement or bending.

The rod 150 extends through an opening 174 in a cylinder 175 and is provided with a piston 177 snugly fitting the cylinder 175. The opening 174 is sealed by a sealed bearing 178 generally similar to the bearing 172. The lower end of the cylinder 175 may be closed by an end plate 176 in a suitable manner. The cylinder 175 may be rigidly positioned relatively to the kier by one or more connecting bars 182 attached to the cylinder and to a convenient portion of the kier, as for example, the closure member 107.

Conduits 180 and 181 lead into the cylinder 175 on opposite sides of the piston 177 respectively, whereby an actuating fluid, such as steam, compressed air or the like, can be admitted on either side of the piston to effect upward or downward movement as may be desired.

Secured to the upper end of the side wall 102 is a ring 190 having an annular groove 191 in which is seated a gasket 192. A disc-like cover 193 is adapted to rest on the gasket 192. The ring 190 is provided with a plurality of projecting lugs or ears 194 in each of which is pivoted an eye bolt 196 swinging on a pivot pin 197. Each eye bolt is adapted to enter a notch or slot 198 in the cover 193 and receives a nut 199 by which the cover may be clamped securely in position.

Extending through the cover is a sampling pipe 200 which may be secured in the cover as by welding or threading and welding. A handle ring 201 is also secured to the cover as by welding.

A bleeder pipe 202 extends through the side wall 102 of the kier and may be secured as by welding or threading and welding. Preferably,

the pipe 202 is disposed immediately under the ring 190 and may be secured thereto as by welding.

The operation of this form of apparatus is as follows:

The packages of material to be treated are telescoped on to the standpipes 136 in stacks, as shown in Fig. 4, whereafter the presser flanges 141, springs 143 and seating plates 144 are telescoped on their respective standpipes. The presser plate 142 is then placed down over the standpipes with the standpipes extending through the openings 145, the central opening 149 in the presser plate being telescoped over the threaded end 151 and the securing nut 152 being threaded on to the rod 150. Thereafter, the cover 193 is placed in position and secured by the eye bolts 192.

After the cover has been secured, a pressure fluid is introduced under predetermined pressure, through the conduit 180, into the interior of the cylinder 175, which causes the piston 177 to be depressed and draw the rod 150 downwardly. This depresses the presser plate 142 to thereby exert pressure on the springs 143 which in turn force the presser flanges 141 against the top packages of the respective stacks. Thus all of the packages in the stacks are placed under substantially equal compression.

When the desired compression of the packages has been effected, a suitable treating liquid, as for example, dyeing liquor, is introduced into the conduit 116 and flows through the opening 129 and the chamber 132 and into the several standpipes 136. The liquor passes through the perforations 137 and outwardly through the packages into the treating chamber 134. The liquor then returns through the annular passage 131 and chamber 133 and is discharged through the conduit 120. Inasmuch as the piston 177 is positioned positively by the compression fluid, the packages are maintained under constant compression throughout the treating operation.

If desired, the flow of treating liquor can be reversed, in which case it passes into the conduit 120 and inwardly through the packages and returns to the standpipes and the chamber 132 and passes out through the conduit 116.

When the treating operation is completed and the treating liquor drawn off, the pressure on the packages is released by releasing the pressure on the fluid above the piston and by introducing a pressure liquid through the conduit 181 which drives the piston 177 and connecting rod 150 upwardly. The presser plate can then be removed and the seating plates 144, springs 143 and presser flanges 141 removed, whereupon the packages 140 can be removed from their respective standpipes.

It will be seen that the present invention provides kier dyeing apparatus which is relatively simple and inexpensive to build but which is rugged and capable of standing up under the customary conditions of use. All of the parts which are subject to contact with the treating liquors are formed of incorrodible material, such as stainless steel, and thus the apparatus is not readily attacked by the treating liquors.

The construction of the diaphragm member is relatively simple but this member nevertheless assists in effectively guiding the treating liquor from the inlet conduit through the packages of material and out through the outlet conduit. The diaphragm member also provides a convenient support for the standpipes and serves, with the standpipes, as a rigid, positively positioned support for the packages of textile material.

The novel mechanism for compressing the packages permits any degree of controlled predetermined pressure to be applied simultaneously to all of the stacks of packages. The equalizing arrangement insures that all of the packages in all of the stacks will be under identical pressures and thus all portions of the material treated will be uniformly impregnated and acted upon by the treating liquor.

The mechanism for compressing the packages is entirely separate from the kier cover and does not interfere in any way with the opening or closing of the cover. Hence, the packages can be compressed either before or after the kier is closed. Furthermore, the kier can be opened or closed without the necessity of manipulating any connection between the cover and the package compressing mechanism.

While certain novel features of the invention have been disclosed and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In combination, a kier including a side wall and a downwardly concave bottom wall secured at its periphery to said side wall, a diaphragm member disposed in the lower portion of said kier and having a relatively planar upper wall and an upwardly concave lower wall joined to said upper wall adjacent the periphery thereof, said upper and lower walls defining therebetween a chamber, said lower wall being disposed upon and secured to said kier bottom wall and defining a chamber therewith, and a plurality of standpipes upstanding from said upper wall and communicating with the chamber defined by said upper and lower walls.

2. In combination, a kier including side and bottom walls, a diaphragm member disposed in said kier to define upper and lower chambers and spaced from the side walls thereof to provide a peripherally located passage between said upper and lower chambers, said diaphragm having a chamber therein, and a plurality of conduits through said diaphragm providing direct communication between said upper and lower chambers, a plurality of standpipes upstanding from said diaphragm and communicating with the chamber therein, and means for forcing a liquid current in parallel circuits through said conduits and said passage in one direction and in a reverse direction through said standpipes and the chamber in said diaphragm.

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