

F. M. MORTON.  
 REVOLVING COLLAPSIBLE BEAM VACUUM DYEING MACHINE.  
 APPLICATION FILED JAN. 9, 1911.

1,010,513.

Patented Dec. 5, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

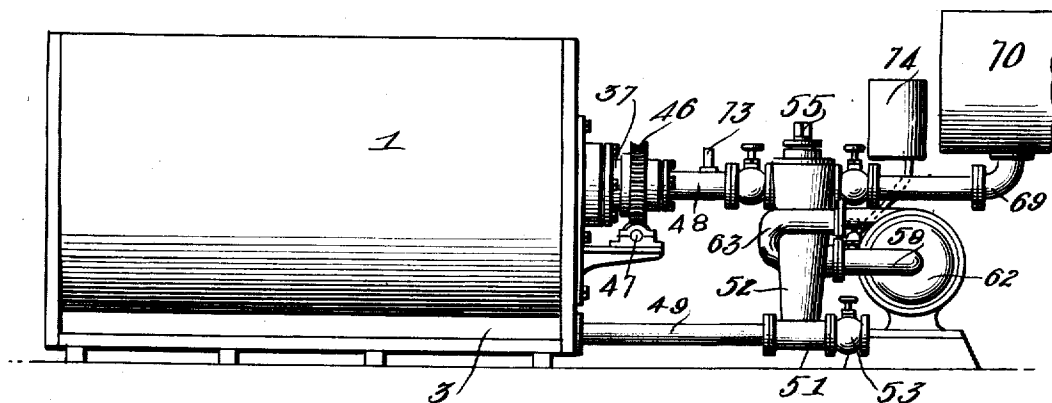


Fig. 2.

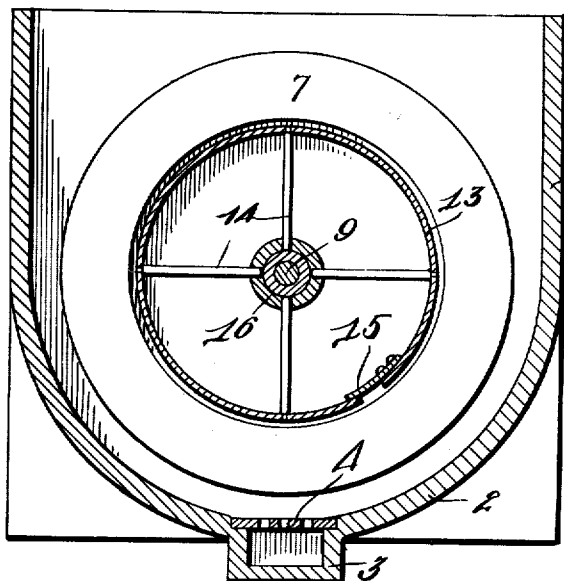


Fig. 3.

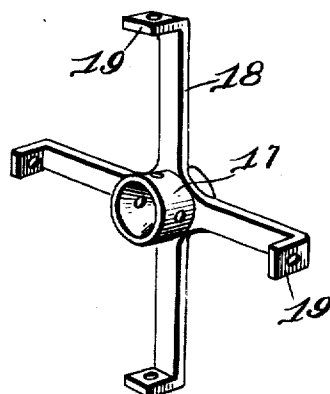
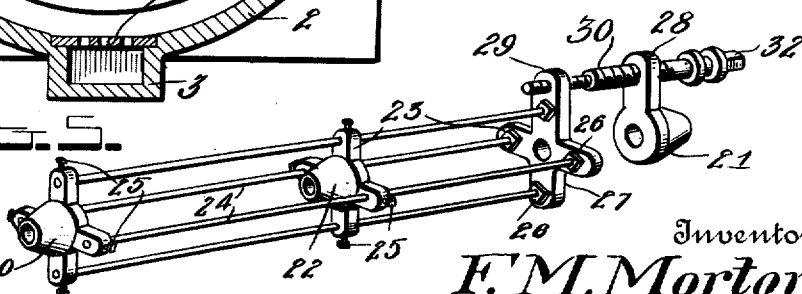


Fig. 4.



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 Chas. L. Greibauer.  
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by

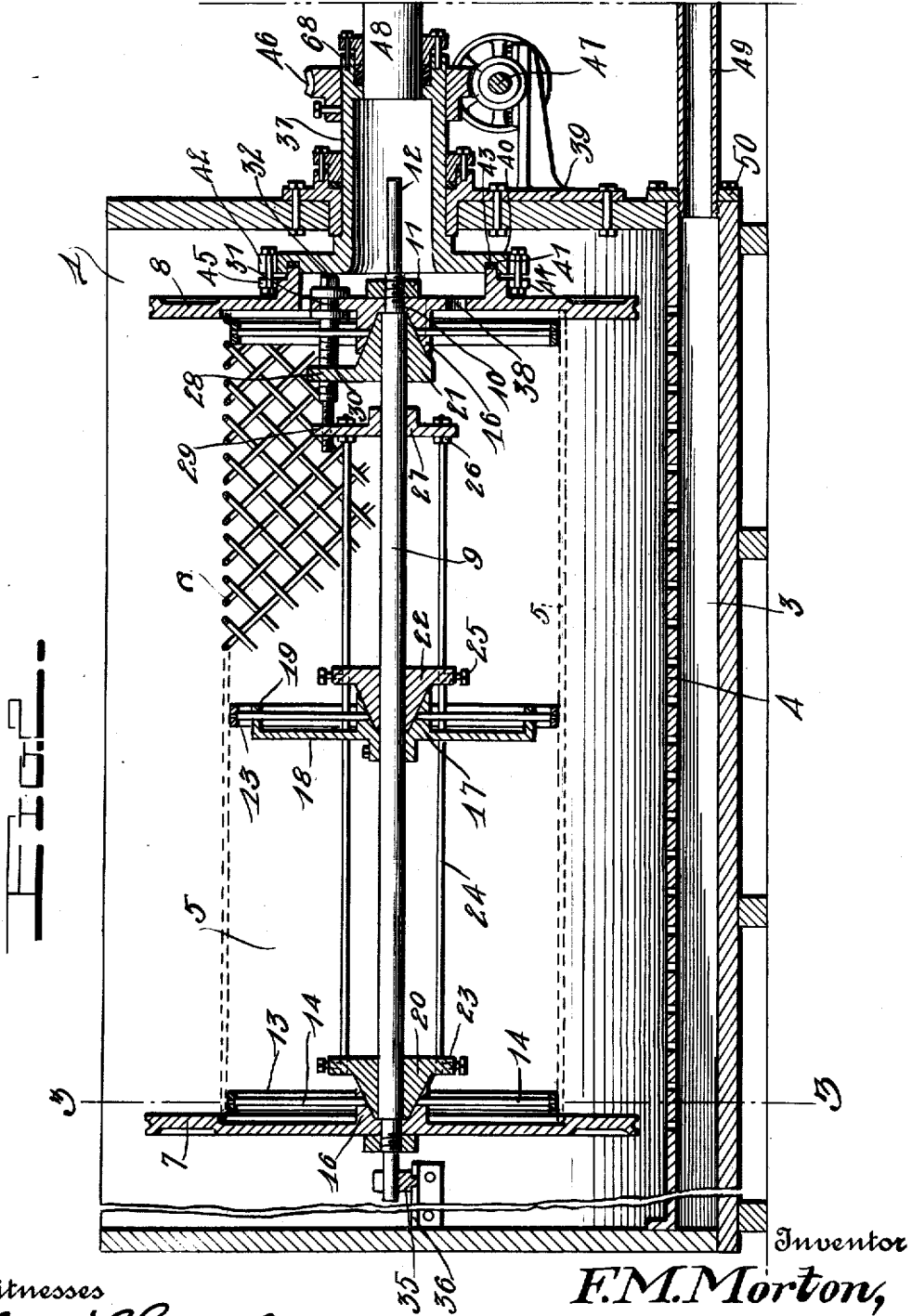
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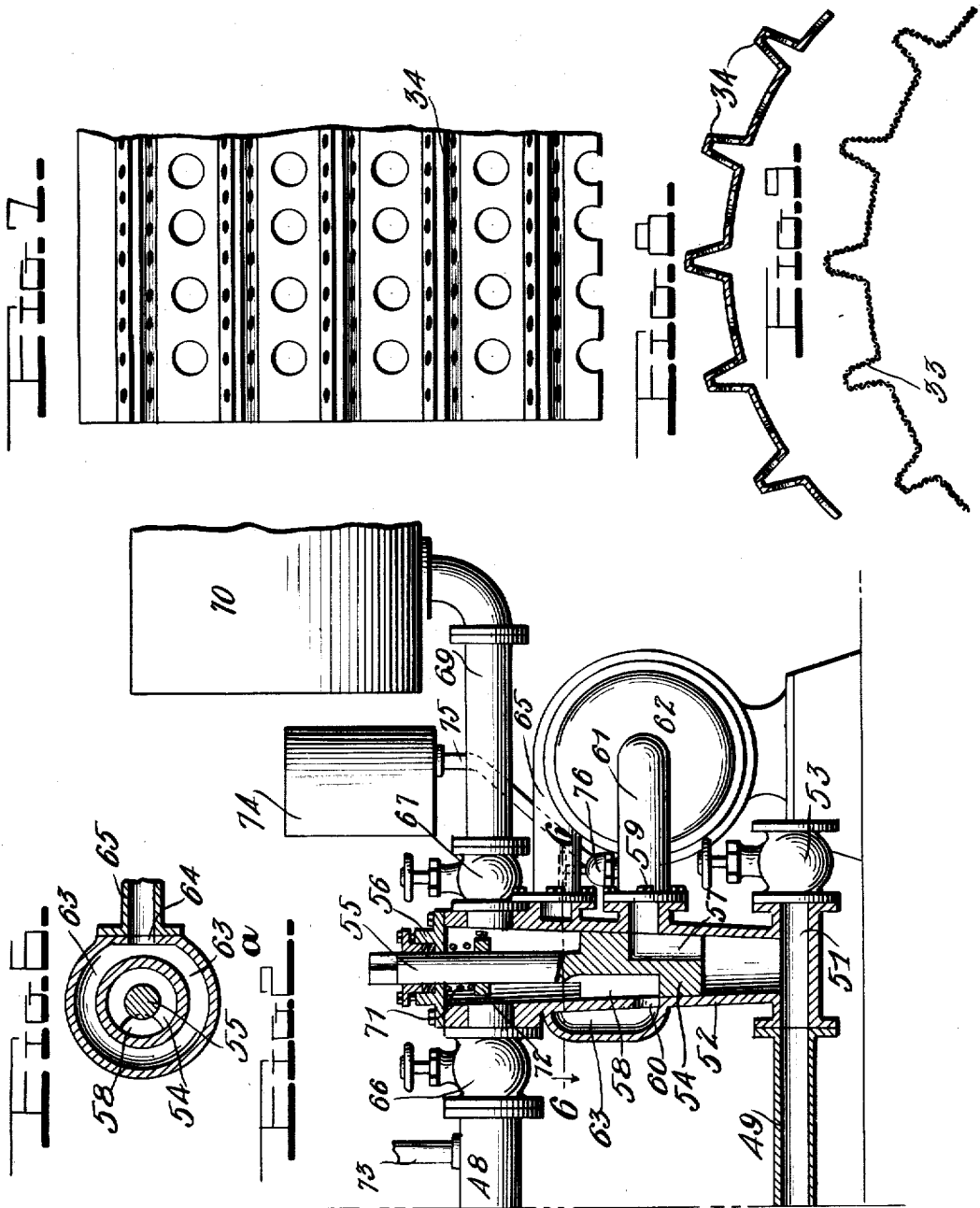
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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

FRANK MELVIN MORTON, OF PHOENIX, ALABAMA.

REVOLVING-COLLAPSIBLE-BEAM VACUUM DYEING-MACHINE.

1,010,513.

Specification of Letters Patent.

Patented Dec. 5, 1911.

Application filed January 9, 1911. Serial No. 801,592.

*To all whom it may concern:*

Be it known that I, FRANK M. MORTON, a citizen of the United States, residing at Phoenix city, in the county of Lee and State of Alabama, have invented certain new and useful Improvements in Revolving-Collapsible-Beam Vacuum Dyeing-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in machines for dyeing yarn on a revolving beam or drum, of the class set forth in my Patent No. 975,269, granted November 8, 1910.

One object of the present invention is to improve the construction and operation of machines of this character, and more particularly the revolving collapsible beam or drum on which the yarn is wound.

Another object of the invention is to provide an improved machine in which the direction of flow of dye-liquor, may either pass from the interior of the beam outwardly through the yarn, or from the exterior inwardly through the yarn and beam.

With the above and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts, as will be more fully described and claimed.

In the accompanying drawings: Figure 1 is a side elevation of my improved revolving collapsible beam vacuum dyeing machine; Fig. 2 is an enlarged vertical longitudinal section through the tank and beam, a portion of the foraminous covering of the beam being omitted; Fig. 2<sup>a</sup> is a sectional view through the reversing valve and showing the mechanism for causing the circulation of dye-liquor through the tank and revolving beam; Fig. 3 is a vertical cross-sectional view taken on the plane indicated by the line 3—3 of Fig. 2; Fig. 4 is a detail perspective view of the spider arranged in the center of the beam; Fig. 5 is a detail perspective view showing the mechanism for connecting and shifting the cone-shaped expanding members; Fig. 6 is a detail horizontal section taken on the plane indicated by the line 6—6, Fig. 2<sup>a</sup>. Figs. 7 and 8 are plan and sectional views through a corrugated, perforated sheet-metal cover, which may be used on the revolving beam in place

of a woven wire or other foraminous or reticulate covering, and Fig. 9 is a sectional view similar to Fig. 8, showing a corrugated or ribbed covering for the beam constructed of woven wire.

Referring more particularly to the drawings, 1 denotes a suitable receptacle for the dye-liquor, which may be a tub or tank of any form and construction, but which, preferably, has a semi-cylindrical-shaped bottom 2, provided with a centrally arranged longitudinally extending channel 3, the top of which is covered by a perforated plate 4, or other foraminous covering, as shown more clearly in Figs. 2 and 3. By constructing the tank in this manner, and making the beam to substantially fill it, the dye-liquor will be kept well mixed because of its agitation by the motion of the beam, and there will be no waste space in the tank, which latter may be either of the open or closed type.

The yarn to be dyed is wound upon a revolving beam or drum 5, which may be a warper beam, if desired, and which is made collapsible by constructing it with a reticulate or foraminous covering 6 of cylindrical, or substantially cylindrical, shape, and providing improved means for supporting and expanding the covering, as shown more clearly in Figs. 2 and 5. The cover 6, with its improved expanding mechanism, is arranged between two circular heads 7, 8, which are fastened adjacent the ends of a central longitudinal shaft 9. These heads 7, 8, have central openings to receive reduced end portions 10 of the shaft 9, and they are held in place on said reduced portions by nuts 11, the extremities 12 of the shaft being further reduced, as clearly shown in Fig. 2.

The expanding mechanism for the beam or drum covering 6 consists of a series of annular expanding frames or wheels, each consisting of a split circular ring 13 of resilient material, and a series of inwardly extending radially-disposed spokes or rods 14. The openings between the ends of the split or divided rings 13 are closed, as shown in Fig. 3, by springs 15, each of which has one of its ends secured to one extremity of one of the rings and its other end slidably engaged with the opposite extremity of such ring, whereby the spaced ends of the ring will be supported while the ring will be permitted to expand or contract within certain

limits. The spokes or rods 14 of the two end-most expanding frames have their inner ends slidably arranged in radial openings in inwardly extending hubs 16 formed on the opposing inner faces of the heads 7, 8. The intermediate expanding frame 13 has the inner ends of its spokes slidably mounted in radial openings in a similar hub 17 formed at the center of a spider 18, the radially extending arms of which have right-angul-  
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The beam or drum is removably mounted in the tank, and, as shown, one extremity 12 of its shaft 9 turns in a bearing recess or opening in the cross-piece 35 mounted on suitable supports 36 on the side walls of the tank. The opposite end of the shaft 9 projects into a tubular trunnion or journal 37, which is rotatably mounted in one end wall of the tank, and to which the head 8 is detachably secured. The journal 37 is made hollow to permit the passage of the dye-liquor through it and through openings 38 formed in the head 8, whereby the liquor may be circulated through the drum and yarn upon the same. The journal 37 rotates in an opening in a suitable bearing 39 fastened to the tank, as shown in Fig. 2, and a stuffing box is provided to prevent leakage around the shaft or journal. In order to detachably mount the beam or drum on the journal 37, the inner end of the latter is formed with a radially-projecting flange or head 40 having its inner face provided with an annular packing groove 41 and its edges provided with notches 42. The head 8 is formed on its outer face with an annular flange 43 adapted to enter the packing groove 41 and provided with notched lugs 44. Bolts or similar fasteners 45 are engaged with the notches 42 and notched lugs 44, whereby the head 8 may be clamped to the head or flange 40 to detachably unite said parts and provide a liquid-dye connection.

Any means may be provided for revolving the drum or beam but, as illustrated, the outer end of the journal or trunnion 37 has secured to it a worm-gear 46, which meshes with a worm on a transverse shaft 47 suitably journaled and adapted to be driven from any source of power.

The apparatus for causing the circulation of the dye-liquor through the revolving beam or drum either from the outside inwardly, or from the inside outwardly, is shown more clearly in Fig. 2, and it comprises two pipes 48, 49, which serve both as inlet and discharge pipes. The pipe 49 is connected as shown at 50 to one end of the channel 3 in the bottom of the tank, and its other end is connected to a T-shaped head 51 formed on the lower end of the casing 52 of the reversing valve, the opposite end of the T-shaped head 51 having connected to it a suitable valve 53 whereby the tank may be drained. The valve casing 52 has a slightly tapered or cone-shaped body portion which receives a rotary plug-valve 54, the reduced upwardly projecting stem 55 of which extends through a stuffing box or gland provided on a removable cover-plate 56 at the top of the casing 52. The valve 54 has formed in it two passageways or ports 57, 58, adapted to coact with ports 59, 60, in the casing 52. The port or connection 59

communicates with the eye or inlet 61 of a suitable pump 62, the latter being here shown as of rotary or centrifugal type. The port 60 communicates with the branch passages 63 which are formed on the exterior of the valve casing 52 and extend around the same to a port or connection 64, which communicates with the passage 65 of the pump 62. Connected to the upper portion of the valve casing 52, at opposite points, are suitable controlling valves 66, 67, the former of which is connected to one end of the pipe 48. The other end of this pipe 48 extends through a suitable stuffing box 68 provided in the outer end of the trunnion or journal 37, see Fig. 2. The valve 67 is connected to a pipe 69 which leads to a suitable storage tank or reservoir 70, into which the dye-liquor may be pumped from the tank 1. As explained above, the valve 54 is a plug-valve of the rotary type, and its exterior is tapered to fit the tapered bore of the casing 52. In order to prevent leakage, a coil spring 71 surrounds the stem 55 of this valve and is arranged between the cover 56 and a stop collar 72 held in position on the stem by a set screw. The upper extremity of the stem 55 may be turned by any suitable device, so as to reverse the position of the valve and thereby cause the reversal of the flow of dye-liquor through the apparatus.

73 denotes an air pipe communicating with the pipe 48 for the purpose of extracting water or liquor from the yarn on the drum or beam after the yarn has been dyed or bleached.

74 denotes a tank in which the dye-liquors may be mixed. This tank has a discharge pipe 75 which is connected to a pump inlet 61 through a suitable controlling valve 76, see Fig. 2<sup>a</sup>.

In operation, the yarn or other material to be dyed or bleached is wound upon the beam in the warper, or in any other manner, the beam being, of course, in its expanded position. The double or right-and-left-hand screw is then turned to allow the expanding frames to contract, and, consequently, to allow the foraminous or reticulate covering of the beam to contract so that the yarn will be loose on the beam or drum. The latter is then placed in the tank and its head 8 connected to the tubular journal or trunnion while its opposite end is supported in the bearing provided therefor. In removing the beam from the tank it will be understood that it must be shifted endwise and the bearing 35 must be shifted longitudinally of the tank on its supports 36 a distance sufficient to enable the end 12 of the shaft 9 to be disengaged from the tubular journal 37. It will be seen that by collapsing the beam when it is placed in the tank, the yarn will be slack and, consequently, the dye-liquor will pass freely through it. Furthermore,

by making the cylindrical covering of the beam of woven wire or perforated sheet-metal, the dye-liquor will be enabled to readily reach the yarn in contact with the beam, and at the same time the beam is comparatively light in weight, and, consequently, can be more readily handled. After the beam has been placed in position the trunnion is rotated through the worm gearing to revolve the beam, and with the reversing valve in the position shown in Fig. 2<sup>a</sup>, the pump is started. The dye-liquor passes from the discharge 65 of the pump through the ports 63, 60, then up through the valve 54, and the valve casing 52, and then through the pipe 48, the tubular journal or trunnion 37 and into the hollow beam or drum, through the openings 38 in the head 8. The dye-liquor then passes through the yarn on the beam and returns through the channel 3 in the bottom of the tank, the pipe 49, the bottom of valve casing 52, the valve 54 and the inlet 61 of the pump. When it is desired to reverse the direction of flow of the liquor, the stem 55 of the reversing valve is given a half turn so as to bring the port 58 in communication with the inlet 61 of the pump and the port 57 in communication with the port 60 of the valve casing, whereupon the flow will be in the opposite direction. In other words, instead of the dye-liquor flowing first into the beam or drum and then outwardly through the yarn, it will flow from the outside through the yarn and into the hollow beam. When it is desired to remove the dye-liquor from the tank to save the same for the next dyeing operation, the valve 66 is closed and the valve 67 opened, the valve 54 remaining in the position shown in Fig. 2<sup>a</sup>, so that when the pump is started the dye-liquor will be drawn from the tank and forced up into the storage reservoir 70. The mixing tank 74 is provided so that the dye-liquor may be properly mixed and then fed to the pump through the valve 76 so that the used dye-liquor may be strengthened by a fresh mixture. After the yarn on the beam has been dyed or bleached, water may be forced through the system to wash out the surplus dye, and after the washing operation the yarn may be dried on the beam by means of the air-pipe 73.

It will be noted that by employing a revolving beam with a foraminous or reticulate covering, and arranging it in a tank of the shape shown and described that the dye-liquor will be constantly in motion and will not settle to the bottom so as to make different portions of the yarn different shades. The revolving motion of the beam causes the yarn to be constantly moved about in the dye-liquor and keeps the latter in constant agitation, so that the dyeing or bleaching will be uniform.

While I have shown and described in de-

tail the preferred embodiment of my invention, I wish it understood that I do not limit myself to the construction set forth, since various changes in the form, proportion and arrangement of parts and in the details of construction may be made within the spirit and scope of the claimed invention.

I claim:

10 1. In combination with a tank for dye liquor, of a tubular trunnion journaled in one wall of the tank, a collapsible beam consisting of a shaft, heads fixed to the shaft adjacent its ends, expanding frames surrounding the shaft and consisting of split resilient rings and radial spokes, the latter having their outer ends fixed in said rims, a foraminous covering on said frames, a right and left hand screw shaft journaled in one of said heads, cone members mounted for sliding movement on said shaft and operated by said screw shaft, said members engaging with the free inner ends of said spokes of the expanding frames, means for guiding the inner portions of said spokes, means for detachably connecting one of said heads to said tubular trunnion, the last mentioned head having openings affording communication between the interior of the beam and the trunnion, means for supporting the opposite ends of said beam shaft, means for rotating said trunnion, and means for causing the circulation of the dye-liquor through the tank, the beam and the trunnion.

2. The combination of a tank for dye-liquor having vertical sides and ends and a semi-cylindrical shaped bottom, a longitudinal projection formed on and depending from the center of the semi-cylindrical bottom of the tank, said projection containing a longitudinal channel, a foraminous plate covering the top of said channel, a tubular trunnion journaled in one wall of the tank, a beam revolvably mounted in the tank and having a foraminous covering on which the yarn is wound, said beam being detachably connected to said trunnion and having its interior in communication with said trunnion, a rigid pipe extending into the outer end of the trunnion, an apertured plate secured on one end of said longitudinal pro-

jection, a pipe secured in the aperture of said plate and communicating with said channel, a pump, and a single reversing valve affording communication between said pipes and said pump.

3. In a collapsible beam of the character set forth, the combination of a shaft, heads secured adjacent the ends of the shaft and having on their inner faces circular recesses and hubs formed with cone-shaped recesses and radial openings, expanding frames surrounding the shaft and consisting of split rings and radial spokes, the latter being slidable in the radial openings of said hubs, a foraminous covering on said rings and extending into the circular recesses in the heads, cone members slidable on said shaft and coacting with the inner ends of said spokes, and a right-and-left-hand screw shaft swiveled in one of said heads and operatively connected to said cone members.

4. In a collapsible beam of the character set forth, the combination with a shaft, heads secured to the shaft adjacent its ends and formed on their inner faces with circular recesses and hubs, the latter having radial openings and cone-shaped recesses, a spider on the intermediate shaft and provided with a hub and radial arms, said arms having apertured guide lugs and said hub having radial openings and a cone-shaped recess, end and intermediate expanding frames, each consisting of a split ring and radial spokes, the spokes being slidable in the radial openings in said heads, the spokes of the intermediate frame being slidable in the apertured lugs on the arms of the spider, cone members slidable on the shaft to coact with said spokes, a frame connecting two of said cone members and a right-and-left-hand screw shaft swiveled in one of the beam heads and operatively engaged with said connecting frame and one of the end cone members.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK MELUIN MORTON.

Witnesses:

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W. J. INGERSOLL.