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M. B. DANIELL, EXECUTRIX OF F. H. DANIELL, DEC'D.

PREPARING AND TREATING TEXTILE MATERIAL WITH FLUIDS.

APPLICATION FILED JAN. 21, 1909.

997,292. Patented July 11, 1911.

2 SHEETS—SHEET 1.

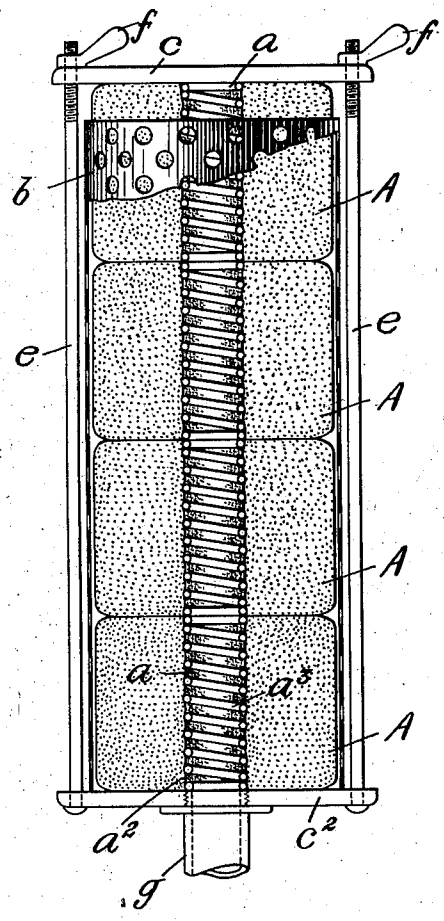

Fig. 1.

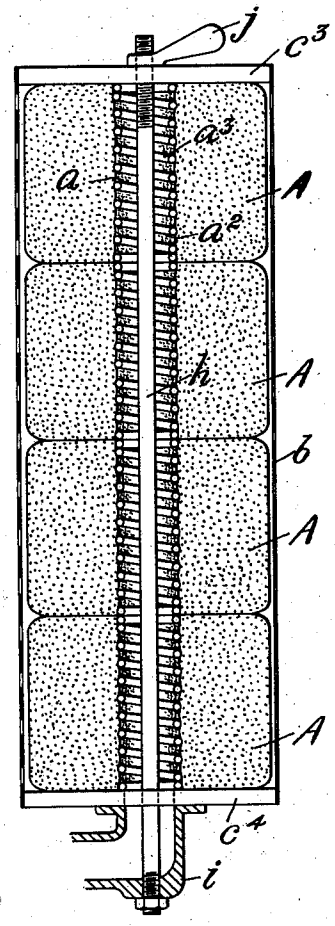

Fig. 2.

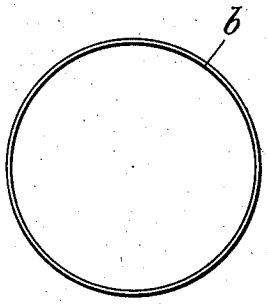

Fig. 3.

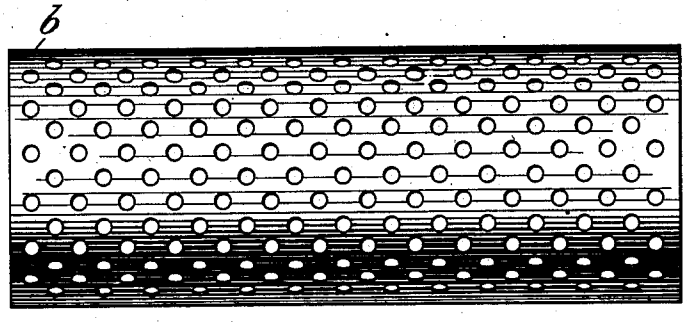

Fig. 4.

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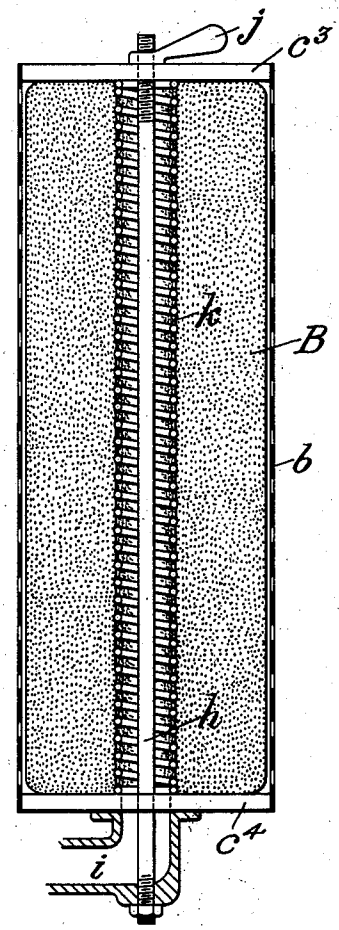

Fig. 5.

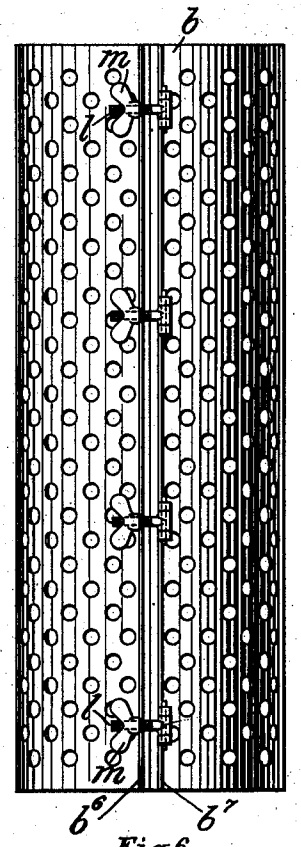

Fig. 6.

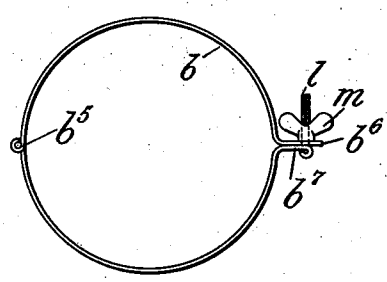

Fig. 7.

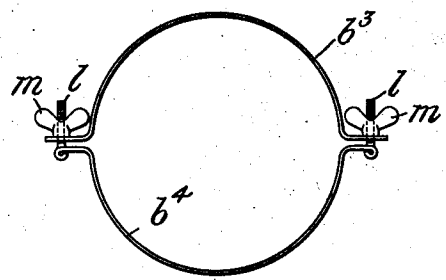

Fig. 8.

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UNITED STATES PATENT OFFICE.

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PREPARING AND TREATING TEXTILE MATERIAL WITH FLUIDS.

997,292. Specification of Letters Patent. Patented July 11, 1911.

Application filed January 21, 1909. Serial No. 473,438.

To all whom it may concern:

Be it known that we, JOHN C. HEBDEN and FREDERICK H. DANIELL, citizens of the United States, residing at Providence, in the county of Providence and State of Rhode Island, and Franklin, in the county of Merrimack and State of New Hampshire, respectively, have invented certain new and useful Improvements in Preparing and Treating Textile Material with Fluids, of which the following is a specification.

Our invention relates to the art of dyeing or similarly treating textiles and consists of improvements in the method of preparing slubbing, sliver, roving, lap or tops for treatment with fluids, and in the manner of compressing and confining the material for subjection to the action of liquors and gases in dyeing, mordanting, bleaching, steaming, scouring, washing and drying.

The invention is fully set forth in the following specification, illustrated by the accompanying drawings, in which:

Figure 1 is a sectional view showing a plurality of packages or bundles of sliver or similar material arranged to be compressed to secure the proper uniform density of the whole mass for subjection to the dyeing or other process; Fig. 2, a similar view showing another means for securing the desired effect; Figs. 3 and 4, details of a part of the apparatus; Fig. 5, a sectional view showing the arrangement applied to a single package or bundle; Figs. 6, 7 and 8, further details of the construction of the apparatus.

Heretofore it has been found extremely difficult to dye or similarly treat textile materials of the class above specified. This variety of material is of such a nature that it becomes easily disintegrated in handling and is too delicate in structure to resist the force of hydraulic pressure generally made use of in circulating dyeing processes. Unless the material is confined under pressure the fibers will be blown apart and separated to such an extent as to destroy the continuity of its structure. Further, even a slight disarrangement or disturbance of the fibers will detract from the ultimate value of the yarn or thread for which the slubbing or roving is intended.

Materials of this class are usually wound into soft balls, packages or bundles for convenience in handling. We have discovered a method of preparing these bundles in such form as to be susceptible of longitudinal compression and we have devised a method of confining the bundles of material under pressure to secure a uniform density of the whole mass to be treated, so that it can be subjected to the hydraulic force of fluids without disarranging the fibers of material or damaging its structure. Fig. 1 shows a number of such bundles of sliver wound on porous, longitudinally compressible tubes. The packages A, A, etc., may be of the usual size and the pervious tubes for supporting them (represented by a, a, etc.) are preferably of the form shown and described in the patent application of Frederick H. Daniell, Serial No. 417,419, filed February 24th, 1908. These tubes or holders consist of flexible sleeves a^2, of some suitable reticulated fabric, supported and distended in tubular form by a helical coil of wire a^3, or by any equivalent skeleton or ribbed framework which will allow the tube to be contracted along its axis. In place of the tubes above described holders of the form shown and described in our application for patent, Serial No. 427,379, filed April 16th, 1908, might be substituted.

In arranging the packages for the dyeing process we combine them in a series of any convenient number and build them up end to end with their central openings alining. We next apply a cylindrical, perforated covering such, for instance, as that shown in Figs. 3 and 4 and designated b, to the outside of the bundles. Plates or flanges are next applied to the ends of the end packages and means are supplied for drawing the two plates c and c^2 together to compress the material inside of the cylinder b.

In Fig. 1 we have shown two rods e, e extending through holes in the rims of the flanges and having the ends headed over on the face of the flange c^2 and the opposite ends threaded to receive the hand-nuts f, f. The cylinder b is made shorter than the whole length of the series of assembled bundles so that the flanges c and c^2 may be brought together to compress the material and force it within the cylinder. A pipe g is screwed into a bore in the flange c^2 with its opening leading into the opening in the center of the packages.

In Fig. 2 the flanges c^3 and c^4 are of such

diameter as to adapt them to fit inside the cylinder b. In place of the two rods e, e we make use of a single rod h secured at one end in the pipe i and extending through the opening in the center of the packages. The opposite end of the rod h passes through a central hole in the flange c^3 and the hand-nut j is adapted to be screwed down against the flange to force it against the end of the end package A and compress the series of packages between the two flanges.

In some cases the sliver or slubbing is wound into one long package or bundle having an axial length several times its diameter. In Fig. 5 we have shown such a package B wound on the long continuous tube or holder k of the same structure as that of the shorter holders, shown in Figs. 1 and 2. Fig. 5 shows the same arrangement for compressing this single package as is delineated in Fig. 2, and described in reference thereto.

Figs. 6, 7 and 8 show modifications in the structure of the cylinder b. It has been found more convenient to apply the cylinder to the packages after they have been arranged between the flanges and to facilitate this operation the cylinder may be made in two parts, either hinged along one side as shown in Fig. 7, or composed of two sections b^3 and b^4 which are separable and can be fastened together as shown in Fig. 8. In Fig. 7 the two sections are hinged at b^5 and opposite the hinge the sections are formed into lips or flanges extending the length of the sections. Suitable bolts l, l are hinged in the lip b^7 and adapted to enter slots in the lip b^6. By screwing down on the thumb-nuts m, m, etc. the two sections of the cylinder can be drawn together and secured. In Fig. 8 we have illustrated the cylinder formed with lips on opposite sides of sections b^3 and b^4 and the same arrangement of bolts and thumb-nuts is used to draw the two parts of the cylinder together.

The above described arrangement, besides being more convenient for adjusting the cylinder, also provides for compressing the material radially within the cylinder. If the bundles are first compressed longitudinally the pressure of the end flanges will cause them to extend in diameter. By applying the cylinder and drawing the two halves together pressure can be exerted on the cylindrical surface of the mass to compress it radially inward. This insures that every portion of the mass is brought under confinement and compressed to an extent sufficient to give the required uniform density throughout.

The sliver or similar textile material is first wound on to the pervious, contractible tube, either in small bundles of comparatively short length or in one long bundle having an axial length several times greater than its diameter. The series of bundles A, A, etc., or the one long bundle B is then placed between the flanges c^3 and c^4 with the rod h extending through the central opening. The cylinder b is next applied to the outside of the cylindrical mass of material and if a series of bundles is being used the application of the cylinder will serve to bring the several packages into alinement so that their openings will make one continuous channel through the mass. The hand-nut j is next screwed down on to the rod h and the two flanges c^3 and c^4 are brought together to compress the material. The compression of the material is carried far enough to insure that all parts of the mass are of uniform density. In compressing the material the cylinder b will prevent the packages from bulging or being distorted in shape and the interior support or tube a will resist any tendency of the mass to collapse toward its center. In this way the material is so closely confined that the fibers will not be displaced or injured on account of the compression while, at the same time, the mass of material will be closely compacted and an even density secured throughout every portion.

The alternative method of compressing the material consists in first drawing the end flanges together, after the bundles have been arranged in axial alinement (if a series is being treated) and then applying the two-part cylindrical covering and drawing the halves together to compress the mass radially.

The dye-liquor or other fluid is forced into the mass through the pipe i and circulates through the interior channel in the packages. The hydraulic pressure causes the fluid to be forced radially outward from the central channel into the surrounding mass of material and it escapes through the perforations in the cylinder b. Preferably this application of the fluid takes place within a vat or keir which surrounds the whole arrangement of cylinder and flanges and the solution can be drawn back through the material by exhausting through the pipe i. With this latter process the fluid first flows through the perforations in the cylinder b, thence through the material and escapes through the central opening in the packages.

We are aware that materials of the character herein specified have hitherto been treated with fluids while confined under pressure, but before our invention it has never been possible to obtain sufficient compression of the material when it is wound into the cylindrical packages or bundles. If the material is wound on rigid tubes or holders the mass cannot be compressed longitudinally of the holders so that all parts cannot be brought to the same density.

With the usual method of simply stuffing

the material into a receptacle and pressing the cover down on the mass it has been found that some portions will be compacted more than others and, further, this method is liable to injure the delicate structure of textiles of the class here described. It is impossible to bring such an indiscriminate mass to a uniform density throughout as there will be irregular interstices where the material is looped and coiled upon itself.

With our new improvement the material is laid in regular coils which have a uniform contact throughout the bundles and provide that when the mass is subjected to pressure all portions will be compressed to a uniform density. The packages are so confined under treatment that the structure of the material cannot be disturbed and the bundles retain their original character and conformation so that the treated material is in shape to be delivered for subsequent processes in the manufacture of thread or yarn.

What we claim is:

1. The within described process of treating textile material of the class specified, consisting in winding the material into bundles of hollow form capable of being longitudinally compressed throughout, confining the mass of material radially, applying end pressure to compress the material to secure a uniform density of the whole mass, and then passing a fluid radially through the mass.

2. The within described process of treating textile material of the class specified with fluids, the same consisting in winding the material into hollow cylindrical bundles capable of longitudinal compression, then arranging a plurality of such bundles with their ends in contact and their openings alining, applying end pressure to compress the material in the series of bundles to a uniform density, applying radial pressure to the exterior of said bundles to compress and retain the material, mechanically maintaining the central opening in said bundles during compression and then passing fluid through the mass.

3. The herein described process of treating material of the class specified with fluids, consisting in winding the material in hollow longitudinally compressible packages, mechanically maintaining the central opening therein, applying end pressure to compress the whole mass longitudinally to a uniform density, confining the mass radially, and passing a fluid through the mass.

4. The within described process of treating a column of textile material wound in package form with a central opening, the parts of said column differing in density, consisting in applying end pressure until all parts of said column are of uniform density, mechanically maintaining the central opening through said column during compression, confining the mass radially, and passing a fluid through said compressed textile.

5. The herein described improvement in treating textile material of the class specified wound in hollow packages, longitudinally compressible throughout, consisting in supporting a plurality of such packages with their ends abutting and their openings alining, applying pressure to the end packages to compress the entire mass longitudinally to secure a uniform density, confining the mass radially, closing one end of the central opening in the mass, and forcing the fluid into the other end of the opening under pressure.

6. The within described process of treating material of the class specified, the same consisting in forming the material into hollow cylindrical packages compressible throughout, confining the material to prevent radial expansion and applying end pressure to bring all parts of the mass to a uniform density.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN C. HEBDEN.
FREDERICK H. DANIELL.

Witnesses:
CHARLES E. PEAKES,
ALEX. YOUNG DAVISON.