

F. H. DANIELL & J. C. HEBDEN.

DYEING.

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942,166.

Patented Dec. 7, 1909.

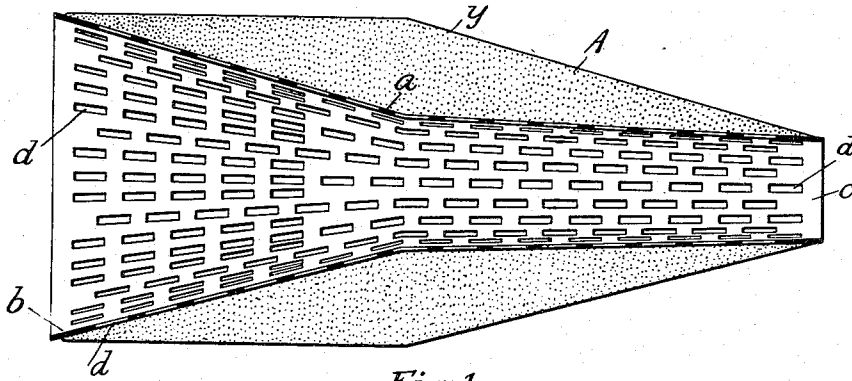


Fig. 1.

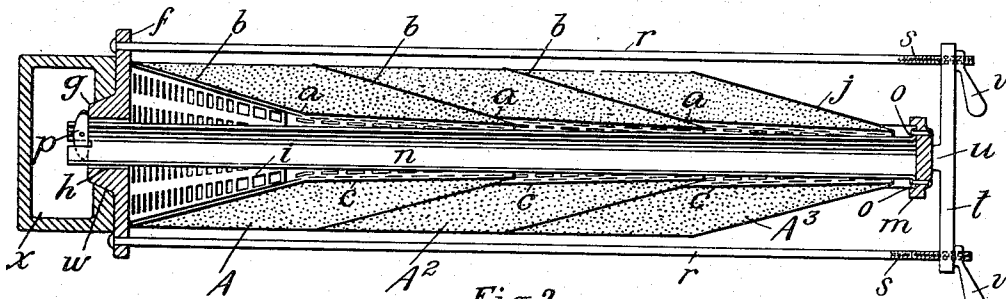


Fig. 2.

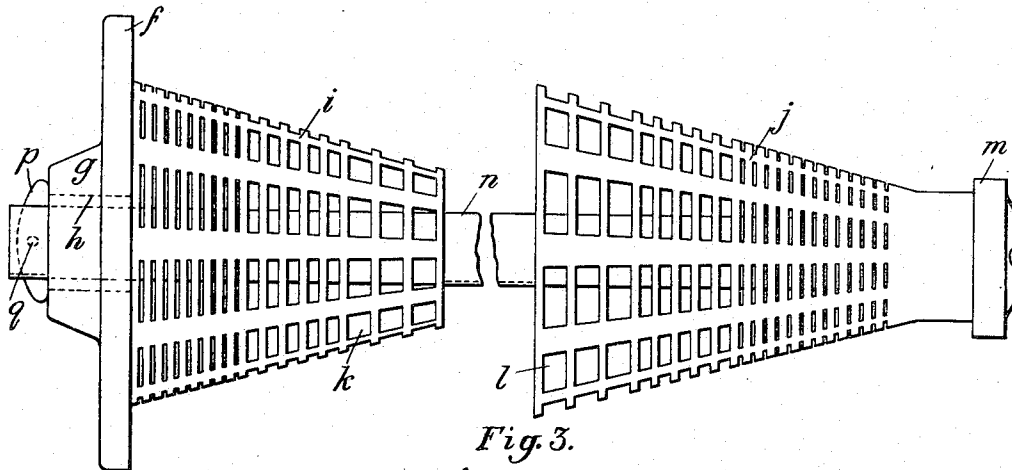


Fig. 3.

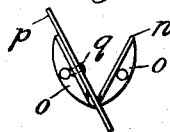


Fig. 4.

WITNESSES

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# UNITED STATES PATENT OFFICE.

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## DYEING.

942,166.

Specification of Letters Patent.

Patented Dec. 7, 1909.

Application filed November 10, 1908. Serial No. 461,911.

*To all whom it may concern:*

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

Our invention relates to the art of dyeing yarn in the cop or bobbin and consists of a novel method of preparing, arranging and treating masses of yarn of large volume in dyeing or similar processes, such as oxidizing, mordanting, bleaching, steaming, scouring, washing, drying and the like.

Our invention relates particularly to the dyeing or similar treatment of knitting bobbins or relatively large yarn packages which are adapted for use on knitting machines or for other purposes where an especially free delivery of the yarn is required.

The invention is fully described in the following specification, illustrated by the accompanying drawings, in which:—

Figure 1 is a longitudinal sectional view of a knitting bobbin wound on a porous tube or holder; Fig. 2, a longitudinal sectional view, illustrating the method of arranging a plurality of bobbins under compression for subjection to the dyeing or other process; Fig. 3 is an enlarged view showing the apparatus for supporting the bobbins in alignment under compression. Fig. 4, a view of a detail of the apparatus.

In winding yarn for delivery to knitting machines it is necessary that the bobbin be formed with a nose or delivery end of extreme taper so that the yarn may be unwound with the utmost freedom, without drag or resistance. The standard form of knitting bobbin now in general use is what is termed a "bottle bobbin" and approximates a bottle in shape, having a flat base, a cylindrical body, and a tapered nose. This form of bobbin is wound on a wooden holder (generally referred to as an empty bobbin, when bare) having a comparatively long barrel or shank and a frusto-conical head or base at one end. The winding is started on the conical former or base and continued in conical layers superimposed on each other,

so that the bobbin has a uniform diameter throughout its cylindrical portion equal to the base of the holder, and a delivery nose of the same taper as the wooden base. These bobbins contain a large quantity of yarn, several pounds, as a rule, and deliver from the conical end. It will be obvious that bobbins of this character are not adapted for dyeing or like processes. The solid core on which they are wound would prevent the dyeing fluid from circulating through the mass and, besides this, the bobbins could not be suitably compacted and compressed in the dyeing chamber to a proper density to insure a uniform permeation. We believe that it has never before been attempted to dye yarn in large packages or bobbins of this general form, but we have now devised a hollow, pervious holder which permits the nesting together of a plurality of these bobbins, so that the yarn masses may be subjected to a contracting pressure, and an interior channel provided, with openings for the flow of the liquor into the surrounding mass.

Fig. 1 is a sectional view showing the novel form of bobbin A wound on a holder *a* which is preferably made of sheet metal and shaped with a frusto-conical, hollow base *b* and a barrel or tube *c*. The tube portion *c* might be made cylindrical in form, but is shown as having a slight taper to provide for greater freedom of delivery as the yarn is unwound therefrom. The holder *a* is perforated with a sufficient number of openings *d*, *d*, etc. to provide for the flow of the liquor. These may be of any conventional form, but are shown as rectangular in shape and running lengthwise of the holder. The yarn *y* is wound on the holder *a* in the usual manner for producing bobbins of this general form. The first layers are deposited on the conical base portion *b* with a traverse equal to the length of the tapered portion of the base, and, as the winding continues, the traverse gradually shifts along the holder so that the bobbin grows by longitudinal extension, without any increase in diameter, until the end of the tube is reached. The perforations in the holder serve to roughen its surface slightly, so that the first coils wound on are prevented from slipping down from the tapered portion on to the barrel, but this

roughness is not enough to prevent free delivery of the last few coils, in unwinding, because of the tendency of the yarn to fly out or "balloon" in delivering. With the

5 previously mentioned wooden holder, now in general use, it is necessary to have the base covered with a rough cloth to prevent the coils from slipping, but with the present holder this is not required.

10 Fig. 2 illustrates the method of assembling the bobbins in units for subjection to the dyeing or other process, and also the manner of compressing the yarn into a continuous, tubular mass of uniform density. 15 Any number of bobbins might be combined, but we have preferred to show a convenient number, three, assembled as now described: The bobbins are nested together in male-and-female fashion and for convenience in handling we provide the apparatus shown more particularly in Figs. 3 and 4. This consists of a flange or base-plate *f*, formed with a tapered plug *g* and a central bore *h*. Secured to the base-plate *f* is a hollow, perforated, 25 conical form *i*, adapted to fit the opening in the base end of the bobbin holder *a*. A similarly shaped, perforated form *j* is adapted to fit over the nose of one of the bobbins. The perforations *k* in the form *i* are graduated in size, with the largest holes near the small end, and the perforations *l* in the form *j* are also of graduated dimensions, but arranged in opposite relation, with the largest openings near the large end of the form. 30 The purpose of this arrangement will be described later.

The form *j* is closed at its small end by a cap *m*, suitably secured thereto, and fastened to the inside of the cap by its 40 end is a tie-piece or stringer *n*. The stringer *n* serves as a central support or skewer on which to string the bobbins and, while not absolutely necessary for their arrangement, is a convenient means for handling the bobbins in assembling them in 45 units and in transporting them to and from the dye vat or keir. The preferred form of the stringer *n* is shown in the end view, Fig. 4, illustrating an angle-iron of V-shaped section of dimensions to adapt it to pass through the small end of the barrel *c* of the bobbin holder. The angle form of the stringer *n* provides for a channel through the openings in the bobbins, without ob- 50 struction to the flow of the liquor. At one end of the stringer its sides are bent out in the lips *o—o*, which are riveted or otherwise suitably secured to the cap *m*. At its opposite end the stringer is provided with a button or latch *p*, pivoted at *q* to allow it to be turned parallel with the stringer to pass through the bore *h* of the base-plate *f*. After the bobbins are assembled on the stringer, the base-plate *f* is set up against 65 the base of the first bobbin *A*, with the form

*i* entering the opening in the latter, and the end of the stringer *n* projecting through the bore *h*. The button *p* is then turned to engage the end of the plug *g* and the bobbins are thus held assembled in alinement in a 70 unit adapted to be conveniently handled. To force the cops together to compress the yarn masses, two headed rods *r—r* are carried through suitable holes near the rim of the flange *f*, the ends of the rods being 75 threaded at *s—s*. A cross-piece *t*, having holes to receive the ends of the rods *r—r*, is placed with its boss or lug *u* against the end of the cap *m* and suitable hand-nuts *v—v* are screwed down on the rods. It 80 will be obvious that a flange or plate might be substituted for the cross-piece *t* with any number of rods arranged around the outside of the bobbins, but for all practical purposes the two rods shown are sufficient. 85

By screwing the hand-nuts *v—v* down on the rods *r—r* the form *j* is pressed firmly down on the nose of the bobbin *A*<sup>3</sup>, and this bobbin, in turn, is forced downward to bring its base into close contact with the nose of 90 the next bobbin *A*<sup>2</sup> and so on with all of the bobbins in the series; the bobbin *A* being forced on to the form *i* with its base tight against the base-plate *f*. Fig. 2 shows the bobbins drawn together in the manner above 95 described, but before the dyeing fluid is applied it is advantageous to compress the bobbins slightly to insure that their yarn masses shall all be of uniform density, and to prevent the liquor, or gas, if the latter is 100 used, from escaping between adjoining ends of the bobbins. To effect this compression it is only necessary to screw the hand-nuts *v—v* still farther down on the rods *r—r*. The yarn between the form *j* and form *i* will 105 then be compressed longitudinally of the axes of the bobbins into one continuous, tubular mass, with only the porous base- portions *b—b*, etc. of the holders intervening between the several bobbins. It will be under- 110 stood that the stringer *n* is free to slide through the bore *h* of the base-plate *f* as the latter and the form *j* are brought together under influence of the pressure of the cross-piece *t*. It will also be seen that the 115 stringer *n* might be dispensed with except for the convenience of carrying the bobbins on it.

The plug *g* on the base-plate *f* is adapted to fit a bore *w* in a pipe or chamber *x* 120 through which the dyeing fluid is supplied. The plug can be arranged to screw into this bore, or the base-plate *f* might be clamped down to hold it in position by any suitable means, as preferred. 125

The arrangement and relation of the parts of the apparatus having now been particularly described the operation of the whole device will next be explained.

The bobbins having been wound on the 130

hollow holders *a* they are assembled on the stringer *n* with the nose of each bobbin projecting into the hollow of the base of the next bobbin. Two ways of assembling the bobbins are available: The base-plate *f* may be set on the floor and the first bobbin *A* set on the form *i* and the succeeding bobbins *A*<sup>2</sup>, *A*<sup>3</sup> (and others, in series, if required) built up, one upon another. The stringer *n* is then run through the several holders, to skewer them together, and its end secured to the base-plate. It will be understood that the yarn can be compressed enough by hand to force the stringer through the base-plate far enough to allow the button *p* to be turned to engage it with the end of the plug *g*. Another method is to skewer the bobbins on to the stringer *n* first, and then apply the base-plate *f*. When a suitable number of bobbins have been assembled to fill the stringer, the cross-piece *t* is applied and pressed down on the cap *m* by means of the hand-nuts. This may be done before or after the base-plate is connected with the liquor supply chamber. As the yarn is compressed it contracts along the axes of the bobbins, the coils of winding closing up slightly at points where the bobbins are softest, so that finally the yarn mass is of uniform density throughout. It will be seen that the tubes *c* telescope, one within another, to allow this contraction so that it is not necessary to employ contractible tubes. This is one of the advantages of forming the tube portion *c* of the holder *a* tapered, but a cylindrical tube might be used by providing the construction shown and illustrated in our applications for patents, now pending, Serial No. 417,419, filed February 24, 1908, and Serial No. 459,960, filed September 14, 1908, in which cases the tubes shown are longitudinally contractible. It would, of course, only be necessary to attach such a tube to the base portion *b* of the holder.

The dye liquor, or other liquid or gas, according to the process contemplated, is supplied through the chamber *x*, and it is intended that a number of units of bobbins be treated at one time from the same supply, all being connected with the chamber *x* and inclosed in the same keir or vat. The liquor or gas is forced into the chamber *x* under pressure and passes through the bore *h* in the base-plate *f* into the opening or channel running through the tubes *c*. The cap *m* prevents escape of the fluid at the end of the series of bobbins and the perforations in the holders provide egress for the fluid from the tubes into the yarn mass. The base portions of the holders being also perforated, there will be no restriction of the flow of the liquor or gas at the points where the bobbins adjoin, so that, virtually, the whole yarn mass constitutes a porous tube susceptible to thorough permeation. The form *i*,

as before explained, has the largest perforations nearest its small end, and the reason for this is, that as there is a greater proportion of the yarn mass contiguous to the holder at this point than at the large end of the form, it is advantageous to have a freer flow of liquor where there is more resistance to its circulation through the yarn. For the same reason the form *j* has the largest perforations at the large end where, in this case, there is more yarn, while the apertures are smaller at the small end where there is comparatively less thickness of yarn. After the liquor or gas has been forced through the bobbins from the inside the process may be reversed, if desired, and the liquor pumped back through the yarn from the outside, using the interior channel as an outlet or exhaust. After the dyeing process has been completed the yarn can be washed by pumping water or a solution through the bobbins in the same manner, and, again, air or steam can be forced through them for drying purposes. Both the saturation and drying processes might be accomplished in one container or keir but it has been found preferable to use a separate receptacle for drying, and it will be seen that the bobbin units can be handled very conveniently in changing from one to the other. It is not required to separate the bobbins of the different units during the several operations, but is only necessary to make new connections of the base-plates with the different apparatus. After the bobbins have been treated and dried the cross-piece *t* is taken off, and the stringer *n* removed. The yarn will then be in practically the same condition as when first wound, ready for delivery direct to the knitting or other machine. It will be realized that the several rewinding processes necessary to convert the yarn from the skein, hank or cop, in which it is usually dyed, to the bobbin are thus eliminated and an immense saving in cost is therefore realized.

Having now described our invention in full, it is pointed out that the novel features for which we wish to secure protection are the improved form of knitting bobbin shown, and the method and apparatus for treating it in dyeing or similar processes. While we are aware that the dyeing of yarn packages of large volume is not new in the art, we believe that the present invention possesses patentable novelty in that, heretofore, no attempt has been made to dye yarn in this particular form, the distinguishing feature of which is a bobbin built up on a hollow conical former or base constituting a part of the holder, and having a tapered nose or delivery end. It will be realized that certain modifications might be made in the parts shown and described without departing from the scope of the invention.

We do not here claim the within described

yarn support as the same forms the subject-matter of a separate application Serial No. 489,143.

We claim:

- 5 1. An improved method of dyeing or similarly treating textiles, consisting of winding yarn into bobbins of cylindrical body and tapered delivery end, on porous holders having hollow, frusto-conical bases and tubular barrels; arranging a series of bobbins in axial alinement with the delivery end of one bobbin fitted into the hollow base of the next bobbin; compressing the bobbins into a continuous tubular mass; and forcing a fluid through the holders to cause it to radiate into the yarn mass.
- 10 2. An improved method of dyeing or similarly treating yarn wound into hollow bobbins having tapered noses and hollow base ends, consisting of arranging a plurality of bobbins in axial alinement with the tapered nose of one bobbin fitted into the hollow base of the next bobbin; compressing the bobbins into a continuous, tubular mass, and forcing a fluid through the mass under pressure.
- 15 3. An improved method of dyeing or similarly treating textiles, consisting of winding the yarn into bobbins having pointed delivery ends and hollow base ends, with the cavities in the bases of the same taper as the delivery ends; supporting the bobbins on a stringer in axial alinement with the tapered end of one bobbin fitted into the cavity of the next bobbin; applying pressure to the end bobbins to compact the yarn into a continuous tubular mass; and forcing a fluid through the mass.
- 20 4. An improved method of dyeing or similarly treating textiles, consisting of winding the yarn into bobbins formed with one end tapered and the opposite end concave with a cavity corresponding to the taper of

the pointed end; arranging the bobbins on a stringer having a perforated form adapted to fit the cavity of the bobbin at one end and a second perforated form adapted to fit over the pointed end of the bobbin at the opposite end; forcing the two forms together to compress the yarn into a continuous tubular mass; and pumping a fluid through the mass.

5 5. An improved method of dyeing or similarly treating yarn, consisting of winding the yarn into hollow bobbins having one end tapered and the opposite end concave to correspond with said taper; arranging the bobbins in series with the tapered end of one bobbin fitted into the cavity of the next; supporting the bobbins between a plate adapted to bear against the base of the bobbin at one end and a form fitted to the tapered end of the bobbin at the other end; pressing the plate and form together to compress the yarn into a continuous tubular mass and forcing a fluid through the mass.

6 6. An improved method of dyeing or similarly treating yarn, consisting of winding the yarn on porous holders into hollow bobbins having tapered noses and concave bases of corresponding taper; arranging the bobbins in series with the nose of one bobbin fitted to the cavity of the next; supporting the bobbins between a porous form fitted to the cavity at the base of the end bobbin and a porous form fitted to the tapered nose of the other end bobbin; compressing the bobbins longitudinally between the two forms; and forcing a fluid through the mass.

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

FREDERICK H. DANIELL.  
JOHN C. HEBDEN.

Witnesses:

FRED MERRILL,  
EDGAR A. JONES.