

Sept. 2, 1924.

A. R. PERRIN

1,507,251

WARPER FOR BEAM DYEING

Filed Dec. 23, 1922

2 Sheets-Sheet 1

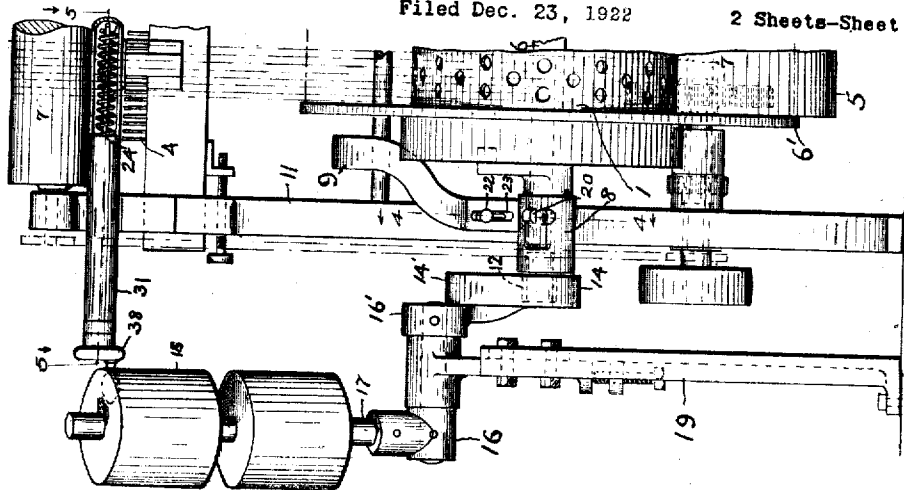


Fig. 2

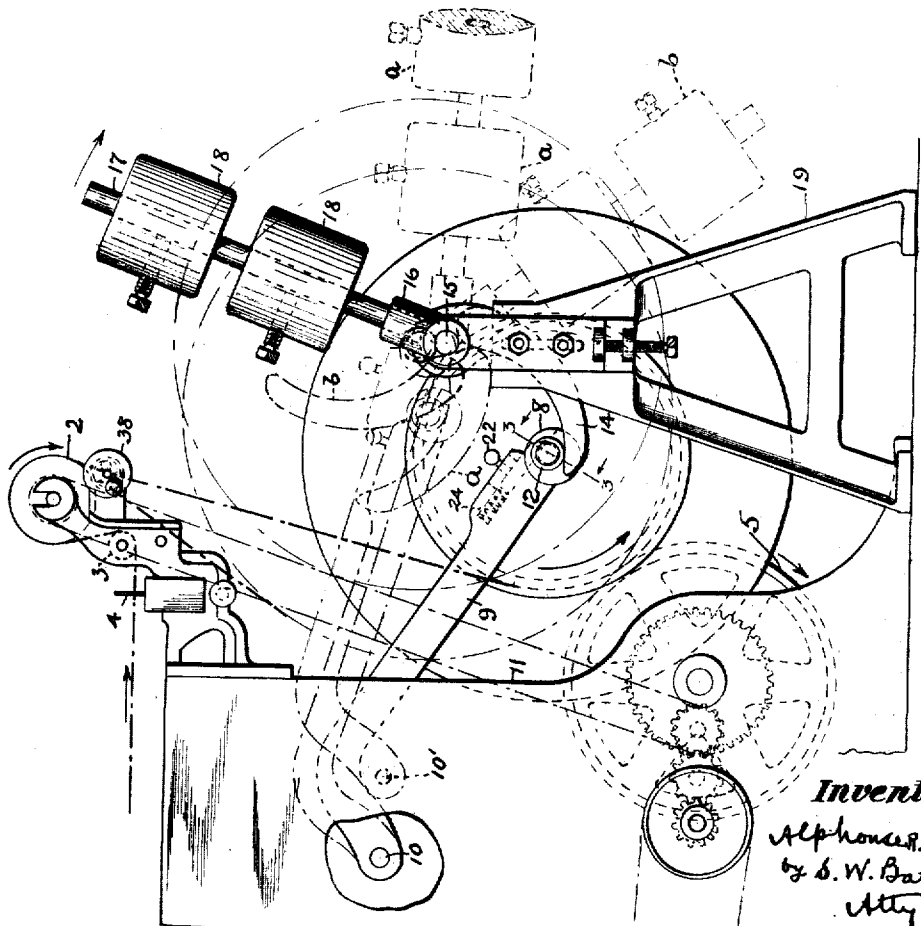


Fig. 1

Inventor:
Alphonse R. Perrin
by S. W. Bates
Atty.

Sept. 2, 1924.

A. R. PERRIN
 WARPER FOR BEAM DYEING
 Filed Dec. 23, 1922

1,507,251

2 Sheets-Sheet 2

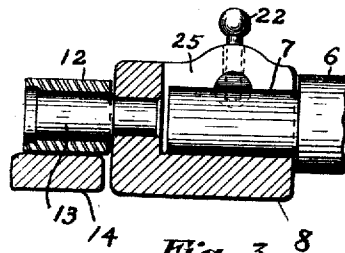


Fig. 3

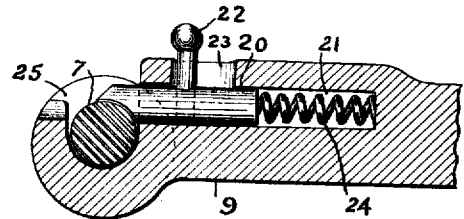


Fig. 4

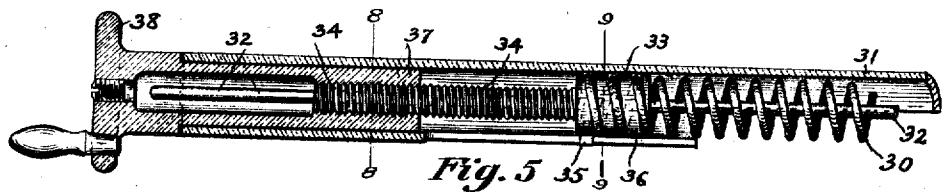


Fig. 5

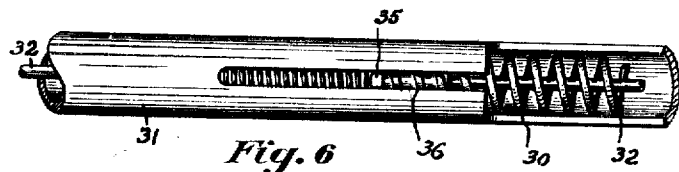


Fig. 6

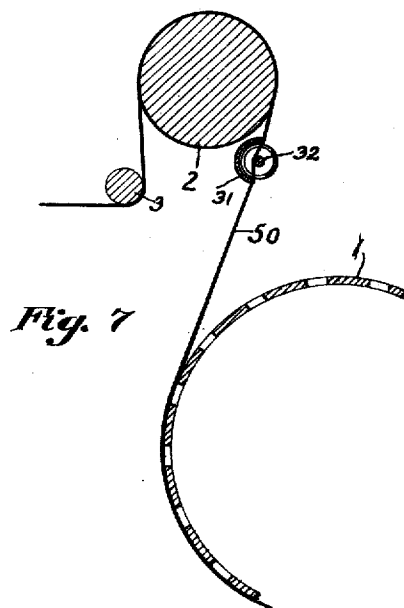


Fig. 7

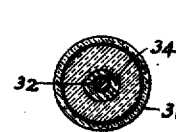


Fig. 8

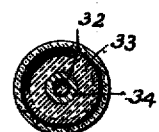


Fig. 9

Inventor:
 Alphonse R. Perrin
 by S. W. Butler
 Atty

UNITED STATES PATENT OFFICE.

ALPHONSE R. PERRIN, OF WESTBROOK, MAINE.

WARPERS FOR BEAM DYEING.

Application filed December 23, 1922. Serial No. 609,755.

To all whom it may concern:

Be it known that I, ALPHONSE R. PERRIN, a citizen of the United States, residing at Westbrook, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Warper for Beam Dyeing, of which the following is a specification.

My invention relates to beam dyeing and means by which the warp beams may be wound more loosely and porously and so that the dye will penetrate a greater number of warp threads than under the old and well known process.

This application has been divided and No. 704,548 filed April 7, 1924, is a part thereof.

According to the present process of beam dyeing, the warps or other yarns are wound upon a hollow perforated arbor or barrel and are placed bodily in a steam-tight retort. The dye is subjected to pressure in the retort, connection being made with the inside of the hollow arbor or barrel and the outside of the same so that the dyes are forced by the pressure through the body of the warp into the hollow arbor and also in the reverse direction.

Thus, the dye is forced through the warp from the periphery of the beam inward toward the center and also in the opposite direction, passing back and forth until the yarn is entirely dyed.

In carrying out this process in practice, it is found that there is a limit to the amount of yarn that can be placed on a beam as the permeability of the mass of yarn decreases as the roll or beam grows larger and denser.

Thus, in dyeing cotton warps, it is found that about 8000 yards is the limit for a single beam as the dye will not penetrate through a greater thickness than this when wound in the ordinary way and with the usual tension on the warp beam.

In dyeing warp yarns, the yarn is wound on the hollow metal arbor or barrel by means of a rotating cylinder.

The warp beam carrying its warp rests directly on the cylinder from which it takes its motion by frictional contact with the surface of the cylinder.

The size of the beam when the winding process first begins is about 12 inches in diameter but as the yarn accumulates it builds up to a diameter of approximately 23 inches when the beam is completely filled. The consequence is that as the beam fills up the pressure on the driving cylinder becomes relatively very great and as a consequence, the yarn is compressed becoming more and more dense and impermeable as the size of the warp beam grows greater.

As a consequence, it is necessary to stop the accumulation on the warp beam long before it is entirely filled because it becomes impermeable to the dye by reason of the dense character of the beam yarn as it builds up on the hollow arbor.

As a result of this condition, much time and expense are wasted in limiting the quantity of yarn treated in a single dyeing operation.

According to my invention, I render the yarn as it winds on the beam permeable to the dye by relieving it of a portion of the pressure due to the weight of the accumulating body of yarn as it builds up on the beam.

As a result of this operation, I build up what is called a "soft" beam by winding the yarn on the arbor with a uniform pressure which averages much less than its normal pressure, thus imparting to the beam as a whole a softness and permeability which allows the dye to pass freely through it.

In the form in which I prefer to carry out my invention, I suspend the shaft of the warp beam on the arms of a pair of pivoted counter-weighted levers so that as the beam builds up with yarn it is forced by contact with the driving cylinder nearer to the fulcrum of the levers. Thus, the counterweights by exerting continuously increasing leverage tending to lift the beam are able to relieve the driving cylinder of an increasing portion of the weight of the beam and to cause the beam to exert on the cylinder always a substantially uniform pressure, this pressure being always less than the normal pressure.

The yarn beam as thus built up, becomes a uniformly lightly wound permeable mass of yarn soft and yielding to the touch and

in the best possible physical condition to be acted upon by the dye in the process of beam dyeing.

By the use of my improved system of dyeing warp beams, I have nearly doubled the amount of yarn which may be placed on any given beam, thus effecting a great saving in the time and expense of the beam dyeing with other advantages hereinafter pointed out.

In the accompanying drawing, I show a warping device arranged to make soft and permeable warp beams in accordance with my invention.

In the drawing:—

Fig. 1 is an end elevation of the beam and adjacent parts,

Fig. 2 is a rear elevation of the same,

Fig. 3 is a section on an enlarged scale on the line 3—3 of Fig. 1,

Fig. 4 is a section on the line 4—4 of Fig. 2,

Fig. 5 is a section on the line 5—5 of Fig. 2,

Fig. 6 is an elevation of one end of spiral spring comb for guiding the yarn just before it passes to the beam,

Fig. 7 is a section on the line 7—7 of Fig. 2,

Fig. 8 is a cross section on the line 8—8 of Fig. 5 and,

Fig. 9 is a cross section on the line 9—9 of Fig. 5.

Referring to the drawing, 1 is the perforated hollow metal barrel on which the yarn is wound. 2 is the friction roll over which the yarn passes before reaching the beam. 3 is the guide roll placed next before the friction roll, 4 is the first comb located in front of the guide roll, 5 is the driving cylinder which partially sustains the weight of the barrel and the yarn wound thereon and 6' is the head of the beam.

The parts thus far referred to are old and well known in warping machines and form no part of my present invention.

The beam is provided with a central arbor 6 extending through the barrel and head, each end of the arbor being somewhat reduced in diameter as at 7 in Fig. 3. The reduced end 7 is supported in a socket 8 formed on the end of an arm 9. The inner end of the arm 9 upon the outer end of which the beam is supported is normally pivoted to the machine frame 11 at 10 but means are provided on the regular warper whereby when the beam is to be taken away after being filled, the pivoting point may be moved forward to the position 10'.

This mechanism being old and well known, it is not necessary to fully describe it herein.

The beam is driven and the greater portion of its weight sustained by the driving cylinder 5 which rotates beneath the beam

in a fixed position and by means not here necessary to describe.

It is evident that as the beam builds up with yarn, it will increase in weight, the pressure on the yarn between it and the cylinder will increase and the body of the yarn as it lies on the beam will become more hard and impermeable to the dye when subjected to the beam dyeing operation. To overcome this difficulty and to make the beam more soft and permeable, I provide means for gradually taking more and more of the weight from the cylinder so that a uniform light tension will be always exerted between the beam and the cylinder. As here shown, I journal at one side of the socket 8 an anti-friction roller 12 rotatable on a stud 13, the stud 13 being securely riveted to the side of the socket 8. Pressing upward beneath the roll 12 and partially supporting the weight of the beam is the curved arm 14 which extends forwardly from a pivoted lever 16 with a journal 15 and a weighted arm 17 having thereon weights 18. The lever 16 has a hub 16' and the journal 15 is mounted to rotate in the upper end of an upright stand or bracket 19 secured to the floor. The curved arm 14 is of a general crescent shape with the roll 12 resting on the upper concave surface. The arm is offset somewhat from the hub 16' so as to allow the beam to be dropped onto a truck and moved away laterally. When this is done, the end 7 of the arbor will not interfere with the stand 19.

It will be seen that the arrangement of the weights 18 on the arm 17 results in an upward lift on the crescent shaped arm 14 taking a portion of the weight of the beam from the cylinder. The position of the pivot 10 and the outer end of the arm 9 are such that as the beam fills and the center rises, the roll 7 will travel slowly toward the hub of the lever 16. The dotted lines in Fig. 1 show two successive positions of the arm 14 and the roller 12 as the beam grows larger.

The dotted position marked *a* shows the weights 18 fallen to about a horizontal position with the arm 14 slightly above such horizontal position and the roll 12 moved in to a point more than half way toward the center of rotation of the lever.

As a result of this change of position, the lifting force exerted on the roll 12 has more than doubled, about counter-balancing the additional weight of the yarn put on the beam at this point. As the rise of the beam continues to increase, the roll approaches nearer to the hub until it passes to the position shown in dotted lines marked *b* in which the roll 12 rests directly over the journal 15. When the beam is in this position, it is forced bodily forward allowing the roll to drop over the inner end of arm

14 onto a truck or other receptacle by which it is removed. As it is moved bodily back, the pivot point 10 is moved by well known means to the position 10' so that the roll 12 is free to drop down by the arm 14.

The arbor is now in position to be released from the end of the arm 9. The arbor and the arm 9 are held in engagement until the arbor is released from the arm by a bolt 20 sliding in a longitudinal opening 21 in the arm 9 and is controlled by a pin 22 extending out through a slot 23.

The outer end of the bolt 20 is shaped to partially enclose or fit over the arbor 7 so that it is held in engagement with the socket 8.

When the bolt 20 is retracted, the arbor 7 is at liberty to pass through the opening 25 in the socket and the arm then can be dropped down freeing it from the arbor. It will thus be seen that the roll 12 travels along the arm 14 as the weights 18 fall until it comes to the hub when it passes over the rounded inner ends 14' of the arms 14 at which point the beam and the arm may be separated as shown.

In order to produce the most loose and permeable beam, it is desirable not only to relieve the pressure or tension between the beam and the driving cylinder as explained but it is also desirable to feed the yarn to the beam with as little tension as possible at the same time laying it smoothly and evenly on the beam.

For this purpose, I interpose between the friction roll 2 and the beam a comb of special construction which has the quality of guiding a very slack yarn and laying it on the beam with considerable regularity. My comb instead of being made up of pins or teeth in the usual way, is constructed of a spiral spring 30 held in an elongated tube 31 having a central rod 32 passing through the spring. The end of the rod passes through a sliding head 33 and an elongated screw 34 journaled in said head.

The head 33 has a spiral groove on its outer surface in which fits the spiral spring 30, the head being thus securely fastened to the end of the spring so that the spring may be expanded or contracted endwise by the movement of the head. To prevent the rotation of the head 33, a stop 35 slides in a longitudinal slot 36 formed in the tube 31.

The spring may be stretched or allowed to contract by the action of the screw 34 and this is effected by an annular nut 37 rotated by a hand wheel 38 and having an internal screw thread engaging the screw thread 34. Thus, when the hand wheel 38 is turned in one direction the head 33 is pulled toward the end of the tube 30, stretching out the spring and when it is turned in the opposite direction, it pushes in the head 33 allowing the spring to contract.

Thus, by the stretching and contracting of the spiral spring 30 any number of turns of the spring may be evenly distributed within a given space across the face of the beam and a quickly adjusted comb produced which requires far less manipulation than a comb of ordinary construction.

The effective portion of the comb has about half the cylindrical body of the tube removed with the ends left substantially complete. The yarn passes through the coil as shown in Fig. 7 extending down by the upper edge of the tube, thence by the lower edge passing inside of the central rod 32. It is not necessary to insert the central rod until the threads are placed in position between the turns of the spring when the rod is lipped in and the comb is complete.

The tubular comb and spring are preferably fixed at one end with the opposite end slidable within the tube as shown in Figs. 5 and 6.

If desired, however, the fixed portion of the spring may be in the center of the tube with the two ends adjustable toward the center in substantially the same manner as the single end shown in Fig. 5.

It is to be understood that the counterweighting mechanism as shown in Figs. 1 and 2 is duplicated at each end of the beam so that the counterweights at each end act in concert to relieve the weight of the beam on the cylinder 5.

By the use of a comb and particularly the improved comb, herein set forth, between the friction roll and the beam and by the reduction of the pressure between the cylinder and the beam, I am enabled to relax the tension of the yarn as it is wound on the beam and still produce an even body of yarn and an even degree of permeability resulting in more even distribution of the dye.

If the tension on the yarn is relaxed by increasing the speed of the friction roll, still retaining the high pressure of the old apparatus, the yarn as it builds up forms ridges which the excessive pressure is apt to topple or crush over, forming streaks when the beam dyeing process is applied. By relieving the pressure between the beam and the cylinder, and relieving the tension on the yarn by speeding up the friction roll and inserting a comb between the frictional roll and the beam, I embody a combination of elements resulting in a soft beam of great permeability.

In addition to the advantage of treating a greater quantity of yarn on a single beam, I am enabled by the use of my invention to extend the adaptability of beam dyeing to a class of dyes which could not before have been used on account of the fact that they could not be forced to penetrate the solid body of yarn produced by the old process and this is particularly true of the more

delicate shades of color where even permeability is most desirable.

While I have shown one form of mechanism for relieving the tension or pressure on the beam, other means may be devised for winding the yarn on the beam so that it will become more permeable.

I claim:—

1. In a warping machine for beam dyeing, the combination of a warp beam, a driving cylinder on which said beam rests, a pivoted lever having a counter-weighted arm extending outwardly on one side of the pivotal point and a lifting arm extending on the opposite side of said pivotal point for exerting a lifting force on the warp beam and so formed as to shift the lifting force of said lever to approach the fulcrum of said lever as the warp builds up.

2. In a warping machine for beam dyeing, the combination of a warp beam, a driving cylinder on which said beam rests and a counterweighted lever having a vertically curved arm for exerting a lifting force under the beam arbor and arranged to increase in leverage as the arbor slides toward the fulcrum of the lever.

3. In a warping machine for beam dyeing,

the combination of a warp beam, a driving cylinder on which said beam rests and a lever pivoted between its ends, one of its ends having a counter-balancing weight and the opposite or lifting end being curved vertically, a roll connected to said arbor for carrying the weight of the same and for rolling along said lifting end, said lifting end being formed to increase the lifting leverage as the roll approaches the pivoting point of the lever.

4. In a warping machine for beam dyeing a combination of a warper beam a driving cylinder on which said beam rests, an arbor for said beam, a pivoted supporting arm having at the end thereof a roll pivoted in line with the beam arbor, a lever pivoted to a standard having on one side of the pivotal point a counter-weighted arm and on the opposite side a curved arm, said curved arm acting to lift said roll, the curve of the arm and the pivotal position of the lever being so adjusted that as the beam builds up the counter-weight will exert an increased lifting force corresponding to the increased weight of the beam.

ALPHONSE R. PERRIN.