No. 620,579. Patented Mar. 7, 1899.

J. W. FRIES.

MACHINE FOR DYEING TEXTILE FABRICS.

(Application filed July 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

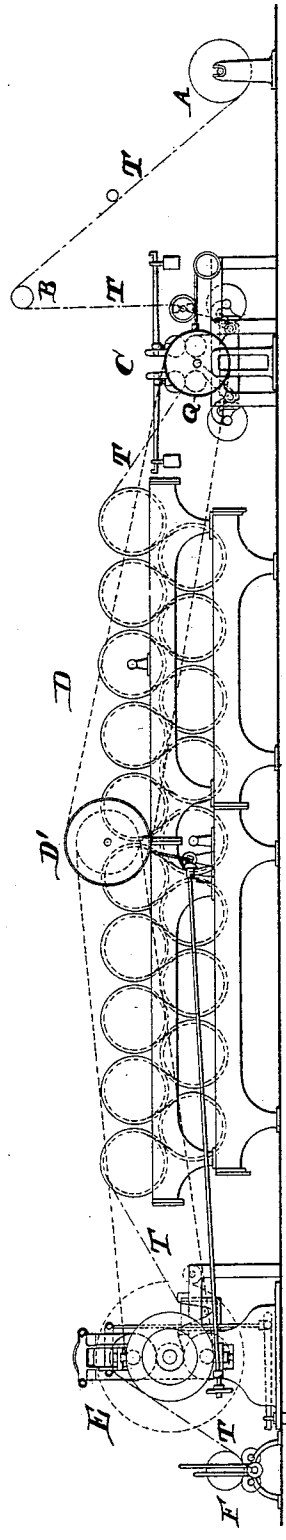


FIG. 1.

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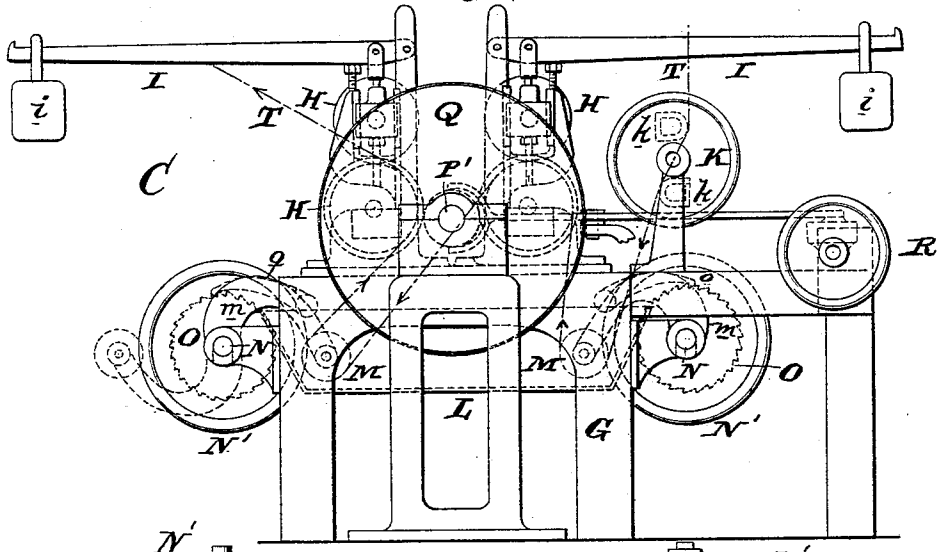
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(No Model.) 2 Sheets—Sheet 2.

FIG. 2.



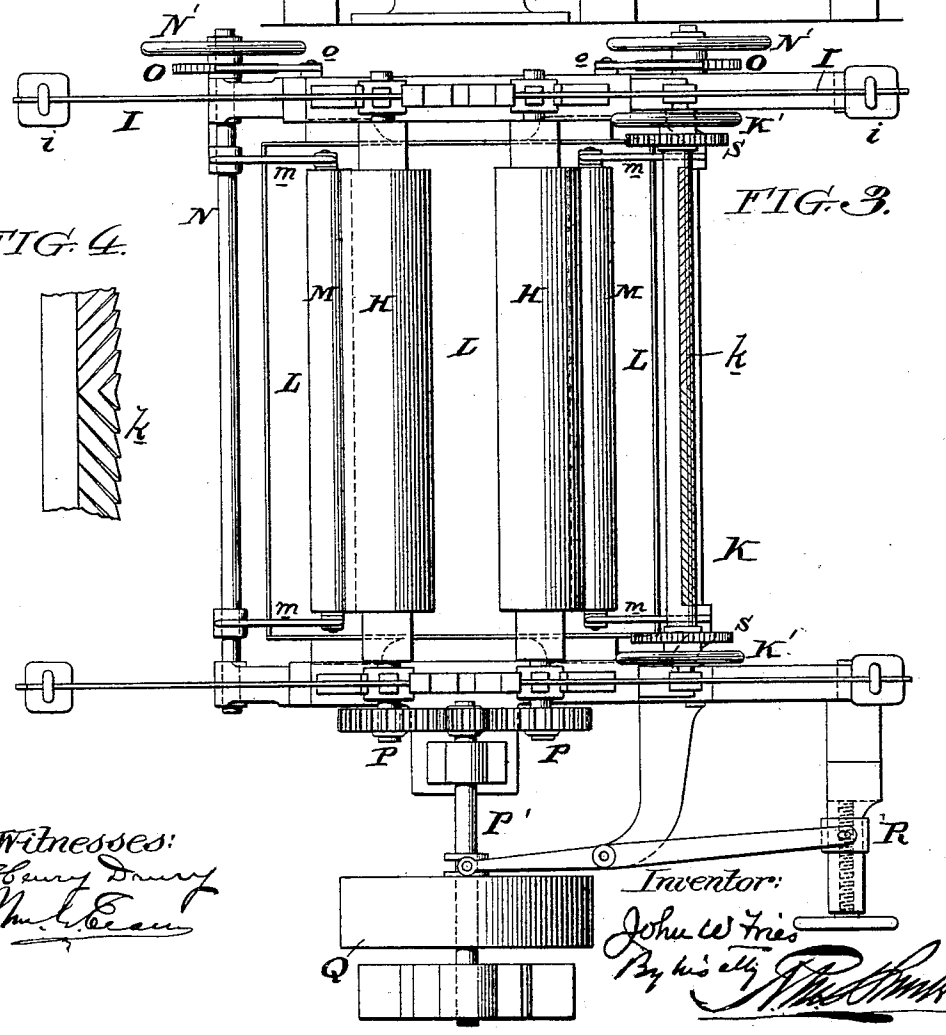


FIG. 3.

FIG. 4.

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UNITED STATES PATENT OFFICE.

JOHN W. FRIES, OF SALEM, NORTH CAROLINA.

MACHINE FOR DYEING TEXTILE FABRICS.

SPECIFICATION forming part of Letters Patent No. 620,579, dated March 7, 1899.

Application filed July 29, 1898. Serial No. 687,221. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. FRIES, of Salem, North Carolina, have invented an Improvement in Machines for Coloring Textile Material, of which the following is a specification.

My invention has reference to machines for coloring textile material; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings.

The object of my invention is to provide suitable apparatus for carrying out an improved process for coloring textile materials, preferably in the web, whereby the same may be colored, starched, dried, and calendered with one continuous operation and without handling.

In carrying out my invention I provide a suitable apparatus for receiving a web of textile material and after smoothing it out laterally subjecting it to a dye-bath containing a viscous or syrupy dyeing-size and thereafter subjecting the fabric so impregnated with the coloring-matter to the action of pressure-rolls, which perform the dual duty of expelling the air from the interstices of the fabric and forcing the coloring-size through and upon the yarn or threads making up the fabric. This operation may be repeated, if so desired, to secure the deposition of more coloring-matter which might be advantageous under some conditions of working. The body of the dyeing-size is composed of starchy ingredients, so that it imparts a stiffening tendency to the fabric being dyed simultaneously with the completion of the dyeing process. The fabric so treated to the dyeing-size and with the excess thereof removed is then passed to a series of drying-cylinders or other suitable drying devices, over or through which the fabric is passed and by which it is thoroughly dried. After the drying operation the fabric may be passed through calendering or finishing rolls to impart a finished appearance to the fabric prior to its being rolled or folded ready for shipment.

In this application I do not claim the process or composition of the dyeing-size, as these form the subject-matter of another pending application of mine filed July 29, 1898, Serial No. 687,183, this specification being confined to apparatus with which to carry out the process specified in the aforesaid application.

My improvements will be better understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a dyeing-machine embodying my improvements. Fig. 2 is a side elevation of that portion of Fig. 1 which directly applies the coloring-matter to the fabric. Fig. 3 is a plan view of same, and Fig. 4 is an enlarged view of a portion of the spreading devices shown in Fig. 3.

A is a roll of cloth such as is received from the loom or from a brush and shear. In practice it is customary to connect two or more lengths of woven fabric end to end and form them into a roll, so as to obviate the necessity of requiring the machine to operate in an intermittent manner due to the frequent insertion of additional rolls of fabric. The web of cloth T passes upward over a spreading device B, of any suitable construction and which is designed to draw the web out laterally while being fed forward, so as to remove the creases. One form of spreading device in use and well known consists of a series of slats movable lengthwise and arranged in the form of a drum, over which the cloth passes. The rotation of the drum causes the slats to move lengthwise and toward opposite ends by the influence of suitable cams. The friction of the cloth upon the slats causes the same to follow the movement of the slats as far as that is possible, and in this manner the fabric is stretched toward either or both selvages. As the specific construction of this stretching device forms no part of my invention it has not been illustrated except as indicated at B in Fig. 1. The fabric T after leaving the spreading devices B passes through the printing or dyeing mechanism C, and thence to the drying-cylinders D of the drying-machine, and finally when dried to the calendering-rolls E, from which it passes to the winding mechanism F and by which it is again rolled into a roll. The drying-cylinders D may be of any ordinary construction, steam being passed through the cylinders over which the web to be dried is passed. A suitable variable-speed band-pulley D′ is employed to vary the speed of rota-

tion of the cylinders, so as to cause them to have their speed adjusted to suit the travel of the web T. There is no special feature in the drying-cylinders or in the calendering-rolls, so that they need no further description or illustration than herein given.

Referring now to the means for imparting the coloring and stiffening materials to the fabric we have two sets of pressure-rolls H H, the pressure of which is imparted by levers I and weights *i*. By this means the pressure may be varied by simply adjusting the position of the weights *i;* but it is to be understood that any other mode of applying pressure to the two rolls H H of a pair may be employed in lieu of that here shown. Arranged below the said pressure-rolls H H is a dyeing-ink vat or pan L, carried on the main frame G.

M are inking guide-rolls carried on the ends of inverted-U-shaped arms *m*, which in turn are secured to transverse shafts N, which may be rotated by means of the hand-wheels N′ for the purpose of lifting the rolls M out of or inserting them into the ink-pan. They are shown in normal position with the web passing about them in Fig. 2, and also at the left-hand side one of these rolls M is indicated in dotted lines as withdrawn. The shafts N are each provided with ratchet-wheels O, with which pawls *o* lock for holding the shafts against rotation, and thereby maintaining the rolls M in a submerged condition in the dyeing-size in the pan L. There are two of these rolls M, they being arranged at opposite ends of the pan and so that the fabric T passes under one of them through the size, thence upward between one set of rolls H H, thence downward around the other guide-roll M, and thence upward between the other pair of pressure-rolls H H. From the pressure-rolls H H last mentioned the colored web passes to the drying-cylinders D.

The web T after passing from the spreader B passes about the spreading-bars *k k* of a second spreader K, forming part of the machine C. This spreader consists of the two bars *k k*, about which the fabric passes, as indicated in dotted lines in Fig. 2. The opposite faces of the bars *k k* are provided with oblique ribs, as shown in Fig. 4, and these ribs extend obliquely in opposite directions on either side of the center line, as clearly shown in Fig. 3. As the fabric is drawn over or against these bars *k k* the friction due to the oblique ribs acting upon the fabric causes it to creep laterally from the center toward each selvage, which action is increased or diminished by adjusting the relative position of the bars *k k* with regard to the vertical or horizontal plane. This adjustment may be secured through the hand-wheels K′, and any suitable locking device or means for holding the bars in position after they have been set may be used—such, for example, as the pawl and ratchet-wheels K^2. It will now be observed that the fabric T after passing about the ribbed faces of the bars *k k* is fully stretched laterally and is devoid of all wrinkles or creases. In this condition it passes downward into the bath of dye-size, and after being guided about the first roller M it passes upward between the first pair of squeeze-rolls H H. As the dye-size is of a syrupy or viscous nature, it is evident that it does not become thoroughly impregnated in the fabric until the same passes between the pressure-rolls H H. In passing between these rolls the air from the interstices of the fabric is expelled and the dye is pressed into and upon the fibers with positive action, insuring a most thorough and uniform coloring thereto. The excess of the coloring matter or size is forced backward upon the fabric, and thereby prevents any waste. The backward flow of the excess of dye-size adds additional dyeing material to that which is being brought upward by the textile material in passing through the dye-vat and insures an ample supply of the coloring and stiffening material to the fabric at all times for the proper treatment by the pressure-rolls. It will be further observed that the spreading devices *k k* impart to a greater or less extent a tension upon the fabric, so that the same is kept in a taut condition in passing through the rolls and dye-bath. After passing over the first set of rolls H H the fabric passes under a second guide-roller M, held in a position below the surface of the size by the pawl-and-ratchet devices heretofore referred to. The fabric then passes upward and over the second set of pressure-rolls H H, and as the speed of the two sets of rolls H H is equal no additional tension device is required to act upon the fabric between these pressure-rolls.

The rolls H H are driven by gearing P from the power-shaft P′, which has the desired speed of rotation imparted to it by an adjustable pulley Q, of any well-known construction, which has its diameter increased or decreased by the hand adjusting mechanism R. These variable-speed pulleys are well-known articles of commerce, and therefore I have not shown the details of the construction of the same, as the specific construction forms no part of my invention. It is important, however, in an organized apparatus such as here shown in Fig. 1 to have the dyeing-machine adjustable as to its speed, so as to enable it to be run in exact commensurate speed with that of the drying-cylinders, so as not to put excessive and injurious tension upon the fabric or cause any slippage thereof over the surface of the drying-cylinders.

For treating the fabric I prepare the dyeing and stiffening-size by mixing, together solutions of starch and caustic soda, and to this I add acetic acid, together with acetate of lime, acetate of iron, or calcium chlorid, together with the proper coloring basic dyes, which are soluble in an excess of acetic acid, but precipitated upon the application of heat, such as imparted by the drying-cylinders.

This action is due to the evaporation of the acetic acid, permitting the dyes to be precipitated upon the fiber through the action of the lime, &c.

By my improvements it is evident that the dye-size being composed of a syrupy consistency and employing in its composition a stiffening element, such as the starch and caustic soda, I secure the double function of simultaneously coloring and stiffening the fabric at one and the same operation, and, furthermore, employ the stiffening material as the basis for securing the proper consistency to the dye, whereby it may be made to cling to and be carried up by the fabric, so as to secure the proper action between the pressure-rolls. The process and method of preparing and applying the coloring and stiffening size is more fully set out in my other application, hereinbefore referred to.

While I have shown the ordinary drying-cylinders as a means for drying the textile material after being subjected to the dyeing-size, it is to be understood that my invention is not confined to the use of any particular character of drying apparatus, as any suitable means for accomplishing this purpose may be employed in lieu of the cylinders shown. As an example of another form of drying apparatus suitable for this purpose I would refer to that illustrated in Patent No. 580,317, dated April 6, 1897.

By supporting the guide-rollers M on the rock-shafts N and the inverted-U-shaped arms *m*, I am enabled to withdraw said guide-rolls entirely clear of the dye-size, and therefore remove the fabric from the vat whenever desired, and, furthermore, I am enabled to apply a new web to the machine in a speedy and satisfactory manner and without the necessity of inserting the hands into the dyeing-size. The pivoted connection therefore is most desirable, and while I prefer the construction thereof shown, it may be modified so long as it accomplishes the same general method of operation. The various other constructions of the dyeing-machine C may be likewise modified or varied with regard to other details without departing from the essential features or spirit of the invention. Hence I do not limit myself to the identical construction shown.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for imparting coloring effects to a web or continuous length of textile fabric, the combination of a tray or vat for containing a dye or stiffening size, a guide-roller arranged in the vat or tray and about which the fabric is passed, and two pressure-rolls arranged at a higher level than the dye vat or tray between which the web is required to pass after being passed through the dye-size, means external to the vat or tray for adjusting the position of the guide-roller relatively to the pressure-rolls, power devices for positively rotating the said rolls, and means for forcing the rolls together so as to subject the fabric and its contained dyeing-size to heavy pressure.

2. In a machine for imparting a body-color to a web or continuous length of textile fabric, the combination of a tray or vat for containing a dye or colored stiffening size, a guide-roller arranged in the vat or tray and about which the fabric is passed, means extending above the level of the size in the vat for supporting and holding the guide-roller outside of or within the vat below the level of the size, two pressure-rolls arranged at a higher level than the vat or tray between which the web is required to pass after being guided through the dyeing-size by the guide-roller, power devices for positively rotating the said rolls, and means for forcing the rolls together so as to subject the fabric and its contained dyeing-size to heavy pressure whereby the size is forcibly introduced throughout the fabric and the air expelled.

3. In a machine for imparting coloring effects to a web or continuous length of textile fabric, the combination of a tray or vat for containing a dye or stiffening size, a guide-roller arranged in the vat or tray and about which the fabric is passed, two pressure-rolls arranged at a higher level than the dye vat or tray between which the web is required to pass after being passed through the dye-size, power devices for positively rotating the said rolls, means for forcing the rolls together so as to subject the fabric and the contained dyeing-size to heavy pressure, a transverse shaft, arms extending from the shaft and into the dye vat or tray for supporting the guide-roller, and means for locking the transverse shaft in position for holding the guide-roller within the vat or tray.

4. In a machine for coloring textile fabric, the combination of a dye vat or tray, two guide-rollers arranged within the vat, arms extending from the guide-rollers and pivoted external to the vat or tray for moving the guide-rollers into or out of the vat, independent locking devices for locking the supporting-arms of the respective guide-rollers in position to hold the rollers within the vat, two sets of pressure-rollers arranged above the vat or tray, and power devices for pressing the said rolls together, the construction being such that the textile fabric passes around one guide-roller through the dye-size in the vat, thence upward and between two of the pressure-rollers, thence downward about the other guide-roller so as to be again sized and thence upward between the second set of pressure-rollers.

5. In a machine for coloring textile fabric, the combination of a dye vat or tray, two guide-rollers arranged within the vat, arms extending from the guide-rollers and pivoted external to the vat or tray for moving the guide-rollers into or out of the vat, independent locking devices for locking the supporting-arms

of the respective guide-rollers in position to hold the rollers within the vat, two sets of pressure-rollers arranged above the vat or tray, power devices for pressing the said rolls together, the construction being such that the textile fabric passes around one guide-roller through the dye-size in the vat, thence upward and between two of the pressure-rollers, thence downward about the other guide-roller so as to be again sized and thence upward between the second set of pressure-rollers, and power devices connecting the two sets of pressure-rollers and rotating them at the same surface speeds.

6. In a machine for coloring textile fabric, the combination of a dye vat or tray, two guide-rollers arranged within the vat, arms extending from the guide-rollers and pivoted externally to the vat or tray for moving the guide-rollers into or out of the vat, independent locking devices for locking the supporting-arms of the respective guide-rollers in position to hold the rollers within the vat, two sets of pressure-rollers arranged above the vat or tray, power devices for pressing the said rolls together, the construction being such that the textile fabric passes around one guide-roller through the dye-size in the vat, thence upward and between two of the pressure-rollers, thence downward about the other guide-roller so as to be again sized and thence upward between the second set of pressure-rollers, power devices connecting the two sets of pressure-rollers and rotating them at the same surface speeds, and a variable-speed driving mechanism for operating said pressure-rolls.

In testimony of which invention I hereunto set my hand.

JOHN W. FRIES.

Witnesses:
A. F. PFOHL,
LEDOUX SIEWERS.