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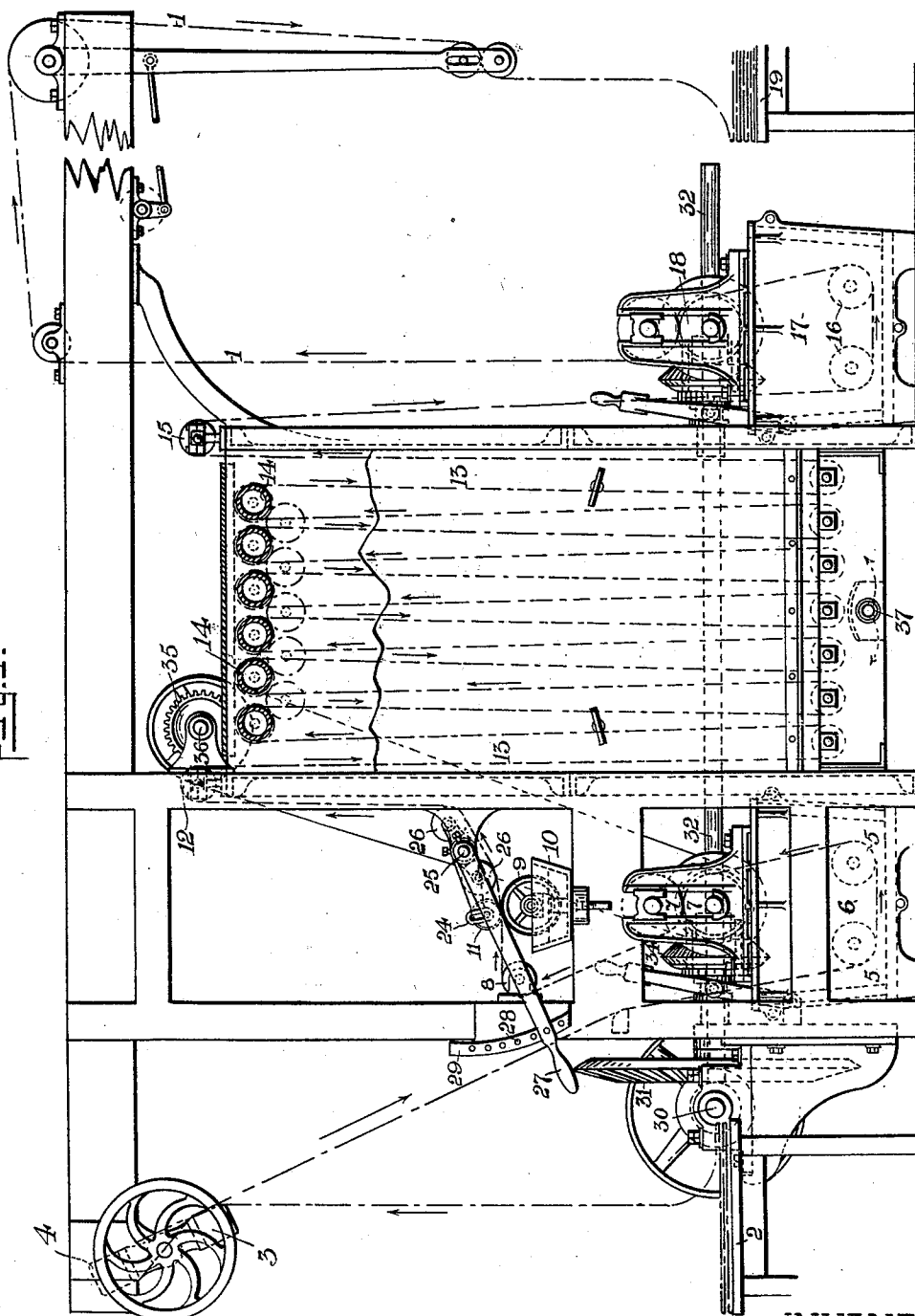
4 Sheets—Sheet 1.

J. REFFITT.
APPARATUS FOR DYEING.

No. 521,816.

Patented June 26, 1894.

Fig. 1.



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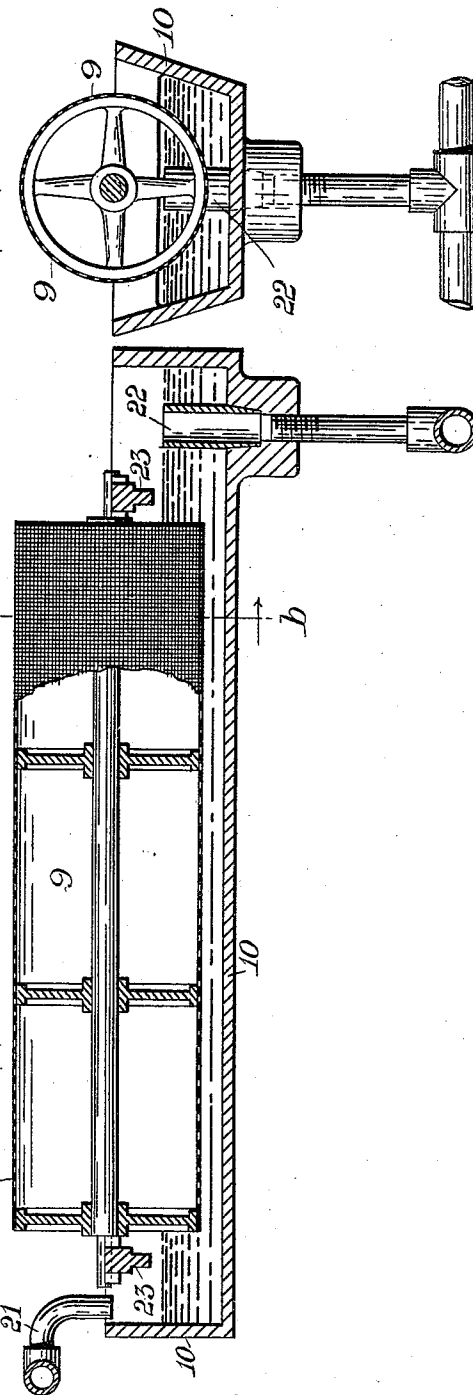
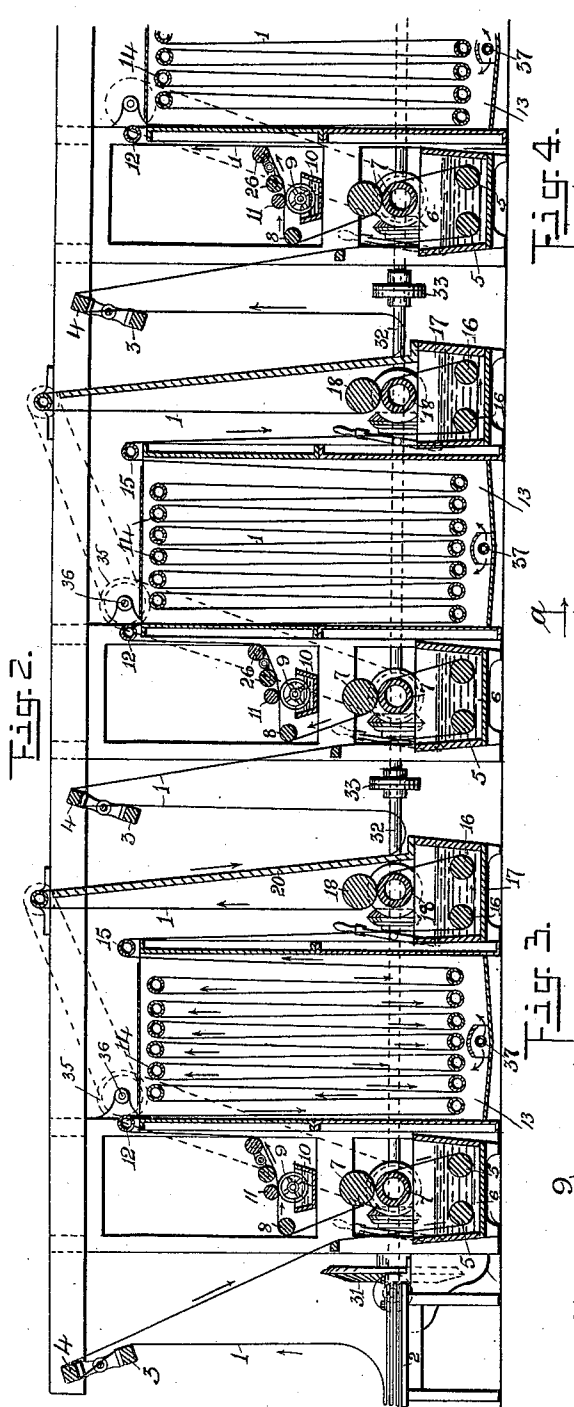
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J. REFFITT.
APPARATUS FOR DYEING.

No. 521,816.

Patented June 26, 1894.



WITNESSES:

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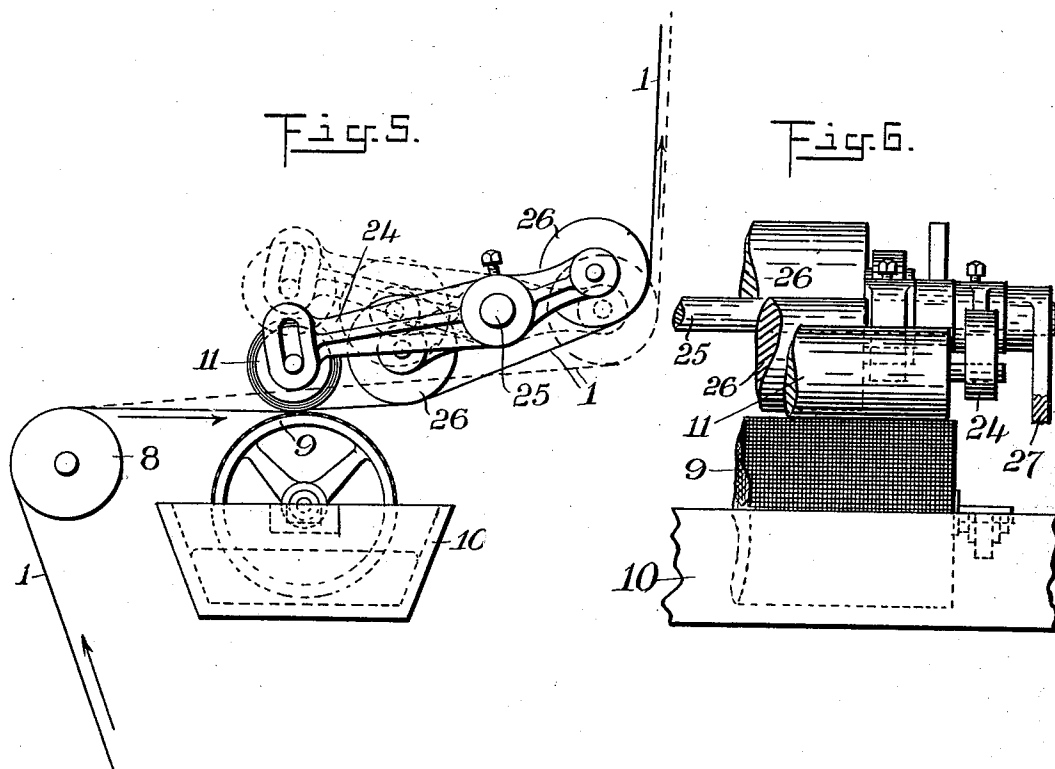
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J. REFFITT.
APPARATUS FOR DYEING.

No. 521,816.

Patented June 26, 1894.



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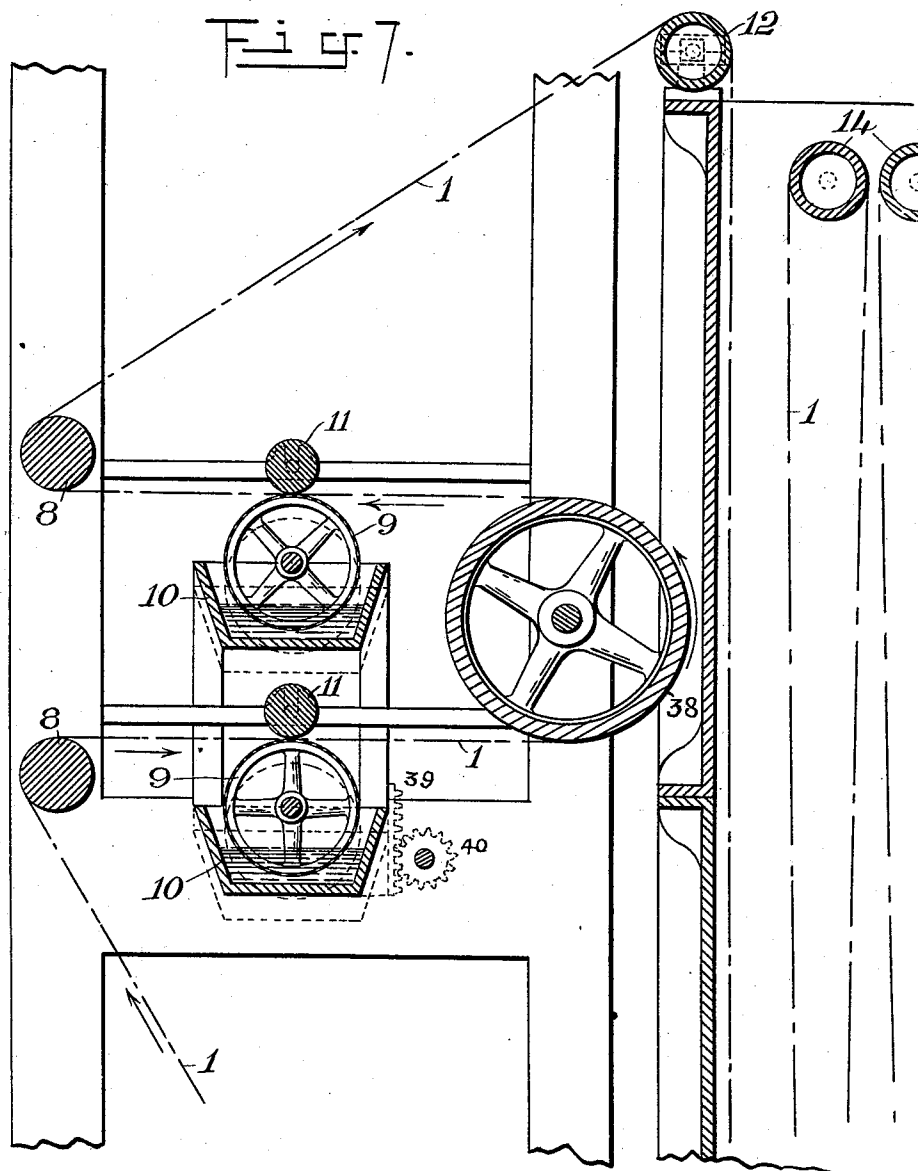
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J. REFFITT.
APPARATUS FOR DYEING.

No. 521,816.

Patented June 26, 1894.



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UNITED STATES PATENT OFFICE.

JOSEPH REFFITT, OF LEEDS, ENGLAND.

APPARATUS FOR DYEING.

SPECIFICATION forming part of Letters Patent No. 521,816, dated June 26, 1894.

Application filed February 19, 1894. Serial No. 500,761. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH REFFITT, a subject of the Queen of Great Britain, residing at Leeds, in the county of York, England, have invented certain new and useful Improvements in Methods of and Apparatus for Dyeing, Mordanting, and otherwise Treating Woven or Felted Fabrics and Yarns; and I do hereby 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.

This invention has reference to a new apparatus for dyeing fabrics and yarns, the primary object of my invention being to insure a greater degree of certainty in shade of color and to effect economy in both dyeing ingredient and in water and steam, and consequently in fuel.

In carrying out my improvements I pass the fabric through a bath of water and between a pair of nipping rollers so as to insure equal wetting of the fabric throughout. The wetting of the fabric encourages capillary attraction and the equal wetting insures equal shade in color. After the fabric leaves the nipping rollers it is caused to travel in contact with a suitable form of gauze or perforated roller made to revolve in a trough partially filled with dyeing liquor. This roller gathers up a quantity of the dye liquor and transmits or conveys it to the wetted fabric that readily absorbs the coloring matter by which it is dyed. The fabric thus treated then enters a steam box through which it is conveyed over a series of rollers in a zigzag manner where it is subjected to steam at a high temperature whereby the dye is set or fastened upon the fabric. After the fabric leaves the steam box it passes between a pair of nipping rollers revolving in water which cools the fabric and partially washes it.

In order that my invention may be more clearly understood I will now make reference to the accompanying sheets of drawings, wherein—

Figure 1 is a side elevation of a single machine constructed according to my invention for dyeing, mordanting or otherwise treating woven or felted fabrics and yarns. Fig. 2 is a sectional elevation showing a serial machine consisting of three machines such as the one

shown at Fig. 1 coupled together for repeating the operation of dyeing, mordanting or otherwise treating fabrics or yarns during one journey or traverse of the material through the machine. Fig. 3 is an enlarged longitudinal section of the dye trough and my improved dyeing roller which I employ for transmitting the liquor onto the fabric. Fig. 4 is a cross section of same taken through the line *a, b*, of Fig. 3. Figs. 5 and 6 are an end and a front elevation, respectively, of the means I employ for moving the fabric or yarn out of contact with the dyeing or transmitting roller when desirable to do so. Fig. 7 is an end elevation, partly in section, showing a modification of the dyeing devices, whereby the material is dyed on both sides.

In the drawings the fabric to be dyed is represented by the numeral 1 and is first of all placed upon a table 2, one end of the said fabric being taken and passed around tension rods or brakes 3 thence over guide bar 4 under rollers 5 immersed in cold water contained in the trough 6 up and between squeezing or nipping rollers 7 over the guide roller 8 and also over the dyeing or transmitting roller 9 revolving in the trough 10 containing the dye liquor, from thence the fabric passes under the guide or pressing rollers 11 over another guide roller 12 to the steam box or chest 13, through which steam box the fabric or yarn passes in a zigzag manner, for setting or fixing the dye, around the top and bottom series of rollers 14 and is finally conducted out of the said steam box over another guide roller 15 whence the fabric is taken under rollers 16 immersed in cold water in the second trough 17 whereby the fabric is cooled and partially washed, it then passes through squeezing rollers 18 and finally drops upon a table 19 placed to receive it.

In Fig. 2 I have shown three machines compounded or connected together. The fabric after leaving the first machine falls from the guide roller 15 onto a scray or inclined board 20, and it is drawn from thence over the tension or brake rollers 4 of the second machine, and the operation of moistening, dyeing, steaming and cooling of the fabric is repeated and also in the subsequent machines, but the fabric is cuttled after leaving the series of machines. The dyeing or mordanting trough

10 is a shallow receptacle and it is kept supplied with fresh dyeing liquor by means of a pump or by gravitation from a suitable reservoir, the said liquor entering the trough through supply pipe 21, see Fig. 3, said trough being provided with an overflow pipe 22, but if required the overflow pipe may answer as a plug to be taken out to let off the liquor. During the operation of dyeing the overflow or excess liquor passing out through pipe 22 is conducted back to the reservoir or source of supply, each trough in the serial machine being connected to the said pipe by pipes to the source of supply which thereby serves for all the troughs in use.

The dyeing or transmitting roller 9 is journaled in bearings 23 in the trough, the said roller being caused to rotate therein by the pull or frictional contact of the wet traveling fabric, the rotation of which dyeing roller transfers the liquor to the surface of the fabric 1 which having been previously wetted by passing through the water in the trough 6 is in a condition to freely absorb the liquor on the roller 9 by capillary attraction this being further insured by the roller 11 which is preferably covered with pile fabric, towel- ing, or other suitable soft material, which on rolling over and pressing upon the fabric causes the liquor to pass through the fabric and to be dyed thereby. The pressing roller 11 is carried by two slotted arms 24, see Figs. 5 and 6. Each slotted arm is fastened on the shaft 25, on which said shaft the brackets carrying the guide rollers 26 are also mounted and made fast so that when it is necessary to remove the fabric 1 from contact with the dyeing or transmitting roller 9, the lever or handle 27, see Fig. 1, also fixed to the shaft 25 is lifted upward whereby the series of rollers are elevated as shown in dotted lines Fig. 5, and it is retained in its elevated position by pin 28, fitting into one of the holes in the quadrant 29. Thus the fabric can be removed from contact with the dyeing roller when desirable. The periphery of the dyeing or transmitting roller 9 is composed of fine wire gauze, the interstices of which become filled with the dyeing liquor, which is thereby carried to the fabric, contact with which, causes the liquor to leave the interstices which is absorbed as already stated by the wetted fabric setting up a capillary attraction, thus the operation of dyeing is effected, the process being repeated as many times as may be found necessary to give the required shade or strength of color. The rotary motion to the various rollers of the machine is imparted from the main driving shaft represented at 30 which by means of bevel wheels 31 gives rotary motion to the horizontal shaft 33 supported in bearings at each side of the machine and where two, three, or more machines are connected together to form one serial machine, the shafts 32 thereof are connected together by the coupling 33 as illustrated in Fig. 2 so that each shaft is thus

driven by and from the same source and at the same surface speed. The bottom roller of each pair of nipping or squeezing rollers is driven by bevel wheels 34 from the horizontal shaft 32 and the top series of rollers 14 in the steam box have rotary motion given to them by pinions driven by spur wheel 35 fixed on the cross shaft 36 to which motion is communicated by strap and pulley from the bottom squeezing roller 7. The guide rollers 14 in the serial machine are likewise rotated by strap and pulley as indicated in dotted lines in Fig. 2. In the bottom of each steaming chest I fix a hood 37 over the steam inlet for the purpose of breaking up and distributing the steam as it enters. The steam box sides are removable to give easy access to the interior of the box.

When dyeing thick or heavy goods, it may be necessary to transmit the dyeing liquor on both sides of such fabrics in order to insure that the dye liquor penetrates through the fabric, therefore to meet the requirements of such a case, I have shown in Fig. 7 a method whereby both sides of a fabric can be dyed where it will be seen that I employ two transmitting rollers 9, dyeing troughs 10 and pressing rollers 11.

According to the drawings the under side of the fabric is first dyed, and after passing over guide roller 38 the other surface of the fabric is dyed by coming into contact with the upper transmitter 9, by this means both sides of the fabric are dyed.

Instead of lifting the fabric out of contact with the surface of the transmitter by hand lever 27 as fully described with reference to Figs. 1, 5, and 6, in this case I lower the transmitting rollers and dyeing troughs as shown in dotted lines Fig. 7, this being effected by a rack 39 gearing with pinion wheel 40 which on being operated by means of a lever or hand wheel the said transmitters can be made to lower clear of the fabric as will be well understood.

Although I have referred in this specification to the dyeing of fabrics I wish it to be understood that the apparatus can be used with equal advantage for applying mordant or other solutions wherever distribution is desirable or for otherwise treating fabrics in an open or extended state and the method and apparatus herein described may also be used in treating yarns.

It will be easily understood that by the means and method herein described of applying the dye an even shade of color can be obtained with very little liquor and the quantity which is usually in excess of that required will not be made, consequently there is not only less waste, but the pollution of rivers now occasioned by running off excessive dye liquors will be avoided, while the method and apparatus will be found of great advantage in dyeing small quantities of fabrics, as will be apparent to and appreciated by all dyers.

I claim as my invention—

1. The combination, with the two water troughs 6 and 17, and the rollers journaled therein for the material to pass under; of the squeezing rollers 7 and 18 journaled above the said troughs, driving mechanism for revolving the last said rollers simultaneously; a dye trough, a dye transmitting roller journaled therein, and presser and guide rollers for the material, all arranged above the rollers 7; and a steam box provided with rollers at its top and bottom for the material to pass around and arranged between the dyeing devices and the rollers 18, substantially as set forth.

2. The combination, with the water trough 6, and the rollers 5 journaled therein for the material to pass under; of the squeezing rollers arranged above the said trough; the dye trough, the dye transmitting roller journaled therein, the guide rollers 8 and 26, and the

movable presser roller 11 for holding the material in contact with the said dye transmitting roller, substantially as set forth.

3. The combination, with the dye trough, 25 and the dye transmitting roller journaled therein; of the revoluble shaft 25, the guide rollers 26 mounted in brackets secured to the said shaft, the slotted arms 24 secured on the said shaft, the presser roller carried by the 30 said slotted arms, and a lever for oscillating the said shaft and pressing the material upon the dye transmitting roller, substantially as set forth.

In testimony whereof I affix my signature in 35 presence of two witnesses.

JOSEPH REFFITT.

Witnesses:

ARTHUR CROSSLEY,
WILLIAM H. TEMPEST,
Both of Commercial Street, Halifax.