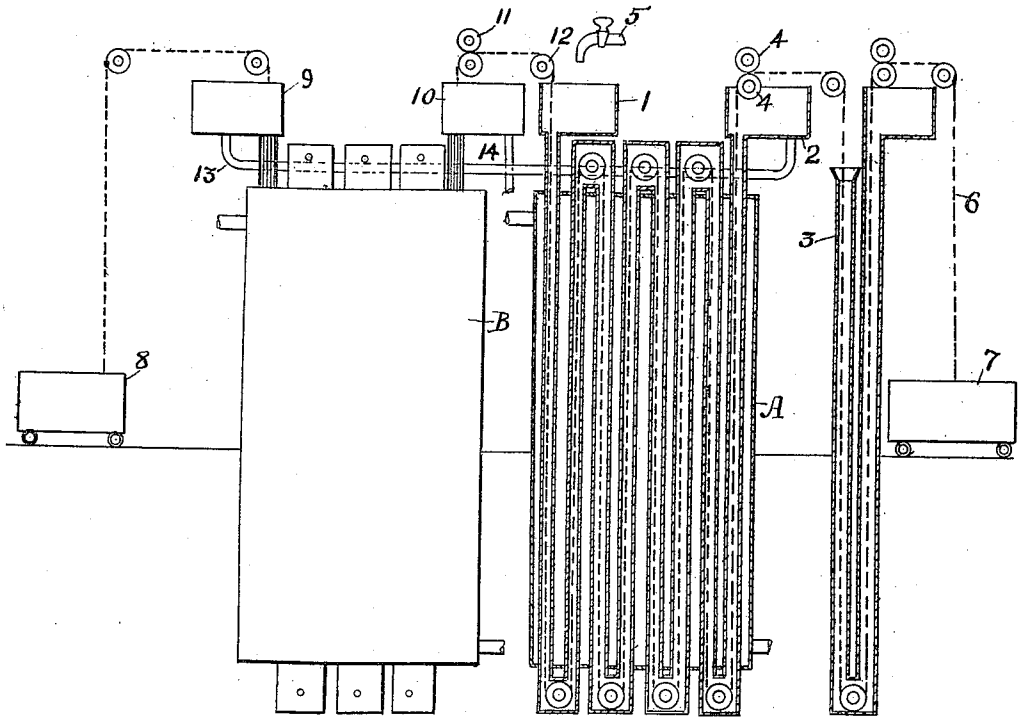
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WARP DYEING MACHINE.

APPLICATION FILED APR. 4, 1918. RENEWED SEPT. 15, 1920.

1,375,389. Patented Apr. 19, 1921.



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WARP-DYEING MACHINE.

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To all whom it may concern:

Be it known that I, WALTER F. HASKELL, 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 Warp-Dyeing Machines, of which the following is a specification.

My invention relates to warp dyeing machines and it relates particularly to certain improvements in the machine patented to me June 18, 1912 by Patent No. 1,029,866 for dyeing warps or other textile material.

In said machine, the warp was passed through a continuous coil of tubes which were filled with the dyeing solution so that the warp was continuously submerged in the dye and was not subjected to the atmosphere during its passage from one tube to the other.

In the use of dyeing machines, it has been found in the case of certain compound mixed dyes that in passing the warp through the coil certain elements in the dyeing solution are more readily absorbed by the warp than other elements so that the liquor in the machine is gradually exhausted of the more readily absorbed elements.

I have attempted to overcome this difficulty in the machine covered by my former Patent No. 1,029,866 in which the exhausted liquor, at the end of the coil, was continuously returned to the inlet of the coil where the warp first entered.

The idea in said patent was to restore the unabsorbed elements of the dye to the original dye solution and mixing it with said solution at the beginning of the coil to restore the unabsorbed material to the fresh solution.

I found by experience, however, that there are serious objections to this method, among them being that the proportion of the less readily absorbable material gradually changed, changing the shade of the dyed warp; also there was a constant addition to the new solution of the dirt and impurities which accumulated in the coil as the warp passed through and these impurities tended to gradually increase.

According to my present invention, I do not mix the exhaust liquor with the original dye, but by employing a plurality of units I employ one unit for the original or standard dye solution and carry the exhaust from that unit into another unit through which the warp may pass without being mixed with the standard dye solution. This auxiliary unit is placed in advance of the unit containing the original dye so that when the yarn reaches the standard dyeing solution it has been subjected to the action of the exhaust dye containing the less easily absorbed elements.

When the warp enters the coil containing the standard solution, it is in a better condition to receive the fresh dye than it would be where the exhaust dye is simply mixed with the original dye.

Thus by my present invention, each unit contains a dye of a different degree of exhaustion and the warp is subjected to as many separate dyeing operations as there are units in the system.

The number of units used in this manner may be two or more and the greater the number of units the more completely will the dye be used.

The complete or regular dye solution may be used at the beginning of the sequence of units or at the end, that is, where the warp first enters the system or where it leaves.

In the accompanying drawing, I have illustrated the invention by the use of two units or coils designed to be used with the regular dye in the last unit of the series.

Referring to the drawings,

A represents one of my dyeing machines as described in my former Patent No. 1,029,866 and B is a second unit, 1 represents the inlet or supply tank for unit A and 2 is the overflow tank which receives the dye which is squeezed from the warp by the rollers 4—4 after it has passed through the unit A. The regular dye is supplied to the supply tank 1 from a spigot 5 or other suitable means.

After leaving the unit A the warp 6 passes through the washing tubes 3 and is finally delivered into the car 7. So far as the operation in this tank is concerned, the operation is as set forth in my prior patent. Before the warp reaches the unit A, it is made to pass through a unit B of the same construction as the unit A. The warp is taken from the carriage 8, passes through the supply tank 9 of the unit B, thence through the coil and out through the overflow tank 10 and the squeezing rolls 11, over the guide roll 12 and into the unit A through the supply tank 1. A waste pipe 14 leads from the tank 10.

The overflow tank 2 is connected with the inlet tank 9 of the other unit by the pipe 13.

The operation of the device in its present form is as follows: Assuming the apparatus in operation, the liquor in unit A is the regular composite dye some of the elements of which are more readily absorbed than others. The warp as it passes through the unit A absorbs more rapidly those elements which are most easily absorbed by the fibers of the yarn.

The dye which is squeezed out by rolls 4 contains larger quantities of the less absorbable elements than of the more absorbable elements which have been taken up by the warp.

This exhausted liquor is conveyed back to the supply tank 9 by pipe 13, thus into the unit B. The warp as it is drawn from the carriage 8 first enters the exhausted dye in the unit B and is subjected in passing through the unit B to the action of the dye from which much of the more readily absorbed elements have been removed. Thus when the warp enters the unit A, it is partially dyed, but has not yet taken up its proper proportion of the more absorbable parts of the dye. When it passes through the unit A it absorbs these and when it is delivered to the carriage 7 the dyeing process is complete and all the elements of the dye are more or less evenly exhausted. The really essential thing about the apparatus is that the warp is subjected for a longer time to the less absorbable elements of the dye than to the more absorbable elements, and the dye is therefore exhausted in all its parts more evenly than where a single unit is used. This is true because in each successive dyeing operation, or each successive exhausting of the dye, there is an increase of the proportion of the less absorbable elements over the more absorbable elements and in this way the dye is completely used and waste prevented. This result is accentuated by the use of a larger number of units and these units precede the unit where the regular dye is introduced. The exhausted liquor which enters the tank 10 passes off through the waste pipe 14.

Where more than two units are used the exhaust of each unit is conveyed to the supply or inlet tank of next unit, and finally run to waste.

An important advantage is that a constant supply of fresh dye is being used and the solution is therefore substantially fresh at all times, whereas if a larger body of dye was used in the regular way it would become contaminated after a while with a residue of waste material which gradually accumulates from the impurities in the dye.

It will be understood that the machine is capable of being used with woven goods as well as with warps by making the coil of flat tubes in place of round tubes, and tubes of any suitable cross section may be used depending on the character of the material to be dyed.

Any arrangement where the warp or fabric passes through a series of relatively narrow vertical passages or chambers connecting with each other at the top and bottom and substantially filled with dye, the warp being guided from one chamber to the next by rolls at the top and bottom, will act in the same manner and be in effect the same as the coils described.

I claim:

1. In a warp dyeing machine of the character described wherein the warp is drawn through a continuous coil of tubes containing the dyeing solution, a series of unit coils through which the warp is drawn in succession, said coils having inlets for the dye, means for supplying the last unit with the regular dyeing solution, the overflow for the exhausted liquor from the last unit being connected with the inlet of one of the preceding units.

2. In a warp dyeing machine of the character described wherein the warp is drawn through a continuous series of relatively restricted vertical openings communicating with each other alternately at the top and bottom and containing the dyeing solution, a plurality of units constructed as above through which the warp is drawn in succession, one of the units being supplied with the regular dyeing solution, the overflow for the exhausted liquor of said unit being connected with the inlet of another unit whereby the less readily absorbed elements of the dye are longer in contact with the warp than the more readily absorbed elements.

In testimony whereof I affix my signature.

WALTER F. HASKELL.