

UNITED STATES PATENT OFFICE.

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PROCESS OF DYEING AND PRINTING.

SPECIFICATION forming part of Letters Patent No. 499,649, dated June 13, 1893.

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To all whom it may concern:

Be it known that I, VICTOR G. BLOEDE, a citizen of the United States, and a resident of Baltimore, Maryland, have invented certain new and useful Improvements in Methods of Dyeing and Printing Yarns and Fabrics, of which the following is a specification.

My invention relates to a method of dyeing and printing yarns and fabrics by a continuous operation. Some dyes and mordants are of such constitution that they will remain inactive when in combination in the presence of certain acids and will not act upon one another until the acid is neutralized. I make use of this fact in preparing my dyes, and prefer those dyes which form soluble combinations with the mordant in a low form of oxidation and may be subsequently developed to the higher oxides and fuller colors by some form of oxidation. I saturate the goods to be dyed with the compound just described and squeeze them so as to remove all of the surplus of solution; I then pass them, after but one treatment with the dye solution to an alkaline, preferably an ammoniacal, vapor bath. The action of the vapor is to at once neutralize the free acid of the solution contained in the goods and liberate the dye and mordant to act upon one another. The conditions under which this reaction takes place and the perfection and character of the reaction and the results obtained from it constitute one of the important elements of my invention.

Heretofore it has been customary to dye goods by passing them a number of times through succeeding baths of dye and mordant, each time fixing a little more and a little more color until the desired shade was obtained. This operation involves the use of a large quantity of both dye and mordant solution, for the many successive baths and as the wet goods are passed from one bath to the next a quantity of the dye or mordant as the case may be, which is contained in the goods will be dissolved or washed out and a consequent precipitation of the material of the solution will take place and a corresponding loss. Then too for each shade of a color the whole quantity of the dye and mordant must be prepared fresh, and as in dyeing any quantity of goods, a large quantity of color must be pre-

pared, only a part of which is exhausted in the operation, the balance is in a great measure wasted.

In addition to the many successive applications of the dye and mordant with some colors and fabrics, many other stages are necessary either to prepare the goods or to fix the color or to finish; each of which introduces an additional element of cost of time, labor or material. By my process much of the expense of time, labor and material is avoided. What under the old method required as high as sixteen operations, I produce with two; with a consumption of probably not more than one-sixth of the material. One of the serious difficulties of all methods previous to mine, lay in the fact that it was very difficult with light shades to get a perfectly even tint throughout the goods in consequence of the loss of dye by the goods when run into a solution. A little more color would be dissolved from one part than from another and hence a little denser shade, in spots or streaks would be produced. By my invention I secure a perfect uniformity of shade with certainty and without difficulty. The single mixture of color and mordant through which the goods are passed, contains the color in a state of uniform distribution, so that when this solution is padded into the goods the color is necessarily distributed with perfect evenness throughout the fabric, and the dye and mordant being thoroughly mixed together and in perfect solution and in an equal state of subdivision, are each equally distributed throughout the fabric. Upon leaving the dye bath the goods are passed through squeeze rolls and all of the surplus dyeliquor removed so that when they pass to the vapor bath they are comparatively dry, and when the alkaline vapor neutralizes the acid, the dyes and mordant are in such close proximity to one another and to the fiber that all of their affinities are developed to the fullest extent and they act upon one another in what may be called a nascent state. The result of this union under such favorable conditions is to produce the strongest color of which the compounds are capable, and to unite them to the fiber with the greatest degree of firmness.

It will be readily seen that the advantageous

conditions secured with my process cannot be secured by the ordinary dye processes, for the reason, that the solution permeating the fabric interposes itself between the particles of dye and mordant which it is desired to have act upon one another and hence weakens their power of attraction and the strength of their union, as well as the firmness of their adhesion to the fiber.

10 If I desire to produce a number of shades of the same color, I have only to increase the quantity of color and mordant in the solution, and a correspondingly denser shade will be produced. It will thus be seen that practically I do not lose a particle of my dye material. I get a perfect distribution of color, so as to give me a level shade and I perform with two operations what has heretofore taken many more.

20 One of the features of my process as above suggested consists in using a dye which forms with the mordant a low oxide and which upon exposure to the air or other oxidizing agent will be raised to a higher form of oxide and thus fully develop the color desired. To do this, after the goods have received the treatment with ammoniacal vapor, they are run into a chamber through which a current of air is forced, or simply laid over or loosely folded down. The exposure to the atmosphere will oxidize the dye and develop the color. The goods may then be washed if desired, or if not, starched and finished or finished without starching.

35 Having now described the principle underlying my process, I will proceed to describe the manner in which I carry it out in practice. As a base for the production of my direct colors, I prefer to use such dye stuffs or combinations as require super oxidation for their highest development. In the aniline series, I find those colors best adapted for my purpose which are capable of being de-oxidized into the colorless or leuco state, and can be re-oxidized without decomposition or loss of coloring matter. These constitute a large class among which safranine, induline, indophenol, and many others may be mentioned as examples. To produce a dye suitable for direct application to the fiber by my process, I take a color of the description given, dissolve it in water, and compound with it, sulphate, chloride, or other proto salts of iron or other metallic salts, preferably though not necessarily in the lower state of oxidation, and to insure better fixation, some vegetable matter such as extract of bark, extract of fustic, extract of logwood, starch, or other vegetable matter is added with enough acid to hold the color in solution. The first effect of my treatment seems to be the precipitation or liberation of the metallic oxide in the nascent state, which acting upon the aniline color or vegetable matter, reduces it. By rapid absorption of oxygen, the color is almost immediately developed, and it becomes firmly fixed upon the fiber.

From the preceding description, it will be seen that I do not confine myself to any one composition or groups of colors in the production of my direct dyes, but that a wide range of combinations may be employed either natural or artificial dye stuffs being used that possess the property of forming soluble compounds with salts of the metals, and are capable of developing a full and fast color upon being reduced to an alkaline condition or super oxidized.

I am aware that it has been suggested by some English dye-masters to prepare goods for dyeing by saturating them with a mordant, then fixing the mordant with an alkaline vapor bath and then running the goods charged with mordant into the solution of dye stuffs, but this method does not differ materially from the usual method and is open to all of its objections. A number of repetitions of the application of mordant and dye are necessary and the use of the dye solution introduces the objectionable feature of the mordant being dissolved out of the goods and the dye precipitated in the bath by it, besides the unevenness of the distribution of color due to the removal of more or less of the mordant from different parts of the fabric. It has also been suggested to employ solutions similar to those I use, that is to say dye, mordant and free acid, and then to pass the goods into a liquid alkaline bath, but this process differs essentially from mine and principally in practical results. The alkaline solution into which the goods are passed to neutralize the acid, dissolves so much color from the goods that in a very short time it becomes saturated with color and its usefulness destroyed. The operation must then be stopped and a fresh bath supplied and the old one thrown away; besides which it is found impossible to produce level or uniform results. This difficulty alone so interferes with the practical value of the process that it has not been used to any extent by dyers and cannot be used economically. My method differs from both of these and the difference of method develops most striking differences of economy and result.

What I claim, and desire to secure by Letters Patent, is—

1. The process of dyeing or printing fabrics which consists of first immersing the goods to be dyed in a solution composed of a dye and mordant suitable to fix it and a free acid which will hold them both in solution and then subjecting the goods so saturated to the action of a bath of alkaline vapor of such character as to neutralize the acid and allow the mordant and dye stuff to combine.

2. The process of dyeing and printing fabrics which consists of first immersing the goods to be dyed in a solution composed of a dye and mordant suitable to fix it and a free acid which will hold them in solution, then squeezing the goods to remove the surplus liquor and then subjecting the goods so saturated

to the action of a bath of alkaline vapor of
such character as to neutralize the acid and
allow the mordant and dye stuff to combine.

3. The process of dyeing or printing fabrics
5 which consists of first immersing the goods to
be dyed in a solution composed of a dye and
mordant suitable to fix it and a free acid which
will hold them in solution, and then subject-
ing the goods so saturated to the action of a
10 bath of alkaline vapor of such character as to

neutralize the acid and allow the mordant and
dye stuff to combine and then exposing the
goods to the action of an oxidizing agent such
as air.

Signed at Baltimore, in the State of Mary- 15
land, this 20th day of July, A. D. 1891.

VICTOR G. BLOEDE.

Witnesses:

FRANK M. BENZINGER,
RAYMOND M. GLACKEN.