UNITED STATES PATENT OFFICE.

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METHOD AND PRODUCT FOR DYEING TEXTILE FABRIC.

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To all whom it may concern:

Be it known that I, JOHN W. FRIES, a citizen of the United States, and resident of Winston-Salem, county of Forsyth, and State of North Carolina, have invented an Improvement in Methods and Products for Dyeing Textile Fabric, of which the following is a specification.

My invention has for its object the production of an indigo dye compound which may be employed with positive results by dyers of ordinary skill and which will give bright shades of great durability.

My invention includes, not only an improved method of preparing a dye bath and of dyeing a fabric with indigo, but also the production of a dye compound in a dry or other suitable form which may be commercially marketed in condensed condition and available in the dye house with positive and fine results by dyers of ordinary intelligence.

My invention comprehends the production of a compound made from a mixture of indigo, preferably in the form of indigo paste, with a vegetable extract, such as made from logwood, quebracho, cutch and equivalent substances, which may be dried and powdered.

A dye compound of the indigo or indigo paste and vegetable extract, preferably of logwood or its equivalent, is soluble in an ordinary soap solution, and can be readily applied to yarn or cloth by padding or immersion; similarly, the dye compound may be dissolved in alizarin oil and employed in the same way. A dye compound of the above character retains its solubility in a soap or other suitable solution and may be packed for transportation and future use.

Heretofore, indigo has been employed in a reduced state as "indigo white" which is soluble in caustic soda, but the results secured by dyeing with an ordinary reduced indigo liquor of this character, fail to secure as stable shades as are desirable; and it has been my purpose to materially improve upon the practice heretofore in use; and by the employment of my new dye compound and method, I have found that the results are much more stable, the dye penetrates the yarns more readily, and does not turn blue by oxidation on mere exposure to the atmosphere, and moreover, the color is readily developed by after treatment with iron, copper or nickel salts, as more fully set out hereinafter.

In developing my improved dye compound of reduced indigo and vegetable extract, I have found that satisfactory results are secured by mixing together approximately one pound of ordinary logwood extract (for example) to three pounds of pure 20% indigo paste, but I do not restrict myself to these proportions. I have also found by experiment that where the vegetable extract has been standing for long periods and has become more or less oxidized, it fails, in approximately an inverse ratio to its condition of oxidation, to combine with the indigo and form a compound soluble in soap solution or alizarin oil; and when this occurs, I find it necessary to reduce the vegetable extract to a condition equivalent to a freshly made extract. In accomplishing this reduction of the oxidized vegetable extract, I have secured excellent results by subjecting the oxidized logwood or other extract to the action of a ferment, preferably yeast, and so effective is this treatment that an oxidized vegetable extract, such as of logwood, quebracho, or cutch, which would combine with very little indigo paste before the yeast treatment, will, after treatment, combine with as much as eight pounds of indigo paste for each pound of the extract, a result far in excess of my best earlier results. This is of considerable advantage, not only in producing a better and purer compound, but also from an economical standpoint, first, in requiring less of the extract of logwood, etc., and second, insuring in the dissolving of all of the admixed indigo or indigo paste in the solvent solution, so as to render it available in the dyeing operation. These experiments lead to the conclusion that the combining power of the logwood or other vegetable extract for the indigo paste is inversely proportional to the extent or degree of its oxidation; and by positively reducing the extract to a normal non-oxidized condition by definite treatment with yeast or other means, I am enabled to produce my improved dye compound in the most perfect form and in an economical manner.

The quantity of yeast required in reducing the vegetable extract is exceedingly small, as

it acts as a catalyst. I have found that excellent results may be obtained as follows:—2 to 2¼ grams of yeast is rubbed into 1000 cubic centimeters (or 1 liter) of water. 20 c. c. of the yeast solution so made suffices for 40 grams of extract of logwood or its equivalent. While I prefer yeast as the reducing agent, any other ferments capable of catalytic or enzymic action may be employed.

In employing my improved logwood-indigo dye compound in the process of dyeing yarn or cloth, I proceed as follows:—The compound is made into a solution with soap or alizarin oil, as a red liquor which is stable and readily applied to yarn or cloth by padding or immersion. The yarn or fabric is colored a reddish brown by the treatment. The soap solution bath may be made by dissolving one gram of soap to 100 c. c. of water to be employed in the dye liquor; and to this soap solution, in sufficient volume to provide the necessary bath, I add the dye compound aforesaid and which, when dissolved, provides the dye bath necessary. By using the soap solution in dilute form, I secure greater penetrating power and better dyeing of the textile fiber. I do not restrict myself in this respect.

The action with my improved compound differs from results with ordinary reduced indigo liquor, in that my results are more stable, the dye penetrates the yarn more readily and does not turn blue due to oxidation on exposure to the atmosphere. The color must be developed by after treatment with iron, copper, nickel or equivalent salts, and in this manner insure definite results which are permanent. I prefer, as giving the brightest and best shade, a solution of copper oxid in carbonate of ammonia; and this solution may be made by mixing one pound of soda ash with two and one-half pounds of powdered blue-stone, and pouring on this dry mixture enough 26% aqua ammonia to dissolve it. Of this compound, a very weak solution is made by dilution and the dyed yarn or cloth is immersed therein to develop the blue on the fiber. As a strong copper bath dulls the shade, it is important that the developing solution shall be a very dilute or weak one, if the best results are to be attained.

In making up my dye compound from indigo or indigo paste and the vegetable extract of logwood or its equivalent, I prefer to reduce it to a fine dry powder as before stated, but it is manifest that it may be put up for commerce as a paste in sealed containers, if so desired, my invention comprising a compound of indigo-logwood (or other equivalent extract) which is soluble in a soap solution or alizarin oil.

While it is more satisfactory to make my dye compound from indigo paste, I do not limit myself in this respect, because I may use indigo in the dry condition and grind it up with the extract of the vegetable ingredients, such as logwood, quebracho, cutch, etc., in the requisite proportion; and the compound paste so produced may be dried and powdered and thereafter used as the basis of the dye bath. I may, if desired, market the dye compound in the paste condition, in sealed containers.

I have now set out my improved dye compound and the method for making it which I have found best suited to its manufacture, and have also described its use in preparing a dye bath suitable for dyeing textile materials, but I do not confine or restrict myself to the minor details, as manifestly my invention comprehends the employment of a vegetable extract as a means of forming a compound with the indigo or indigo paste to insure its being dissolved in the soap or other dye bath, and also comprehends the reducing of an oxidized vegetable extract by treatment with yeast to increase its combining power with the indigo, indigo paste or coloring base.

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

1. A dye composition formed of indigo material and vegetable dye extract in a dry powdered condition.

2. A dye composition in a dry powdered condition formed of indigo paste and logwood extract or its equivalent.

3. A dye composition formed by combining indigo material and an extract of logwood or its equivalent, in which the indigo is greatly in excess.

4. A dye composition in a dry condition formed by combining indigo paste and an extract of logwood or its equivalent, in which the indigo paste is greatly in excess.

5. A dye composition formed by combining a quantity of 20% indigo paste with a relatively less quantity of logwood extract or its equivalent.

6. The method of making a dye composition, which consists in combining indigo paste with a vegetable dye extract, and finally drying the same.

7. The method of producing a dye composition which consists of first reducing an oxidized or partly oxidized vegetable dye extract by treatment with a ferment, and then mixing the treated vegetable extract with a greater quantity of indigo material.

8. The method of reducing an oxidized vegetable dye extract, which consists in treating the extract with a ferment.

9. The method of reducing an oxidized extract of logwood, which consists in treating the extract with yeast.

In testimony of which invention I hereunto set my hand.

JOHN W. FRIES.