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TREATMENT OF YARNS AND FABRICS.

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This invention relates to the dyeing or colouring of yarns, fabrics or other materials or articles.

The invention has for its principal object to provide a new or improved process or processes for the dyeing, printing or stencilling (all hereinafter in the claiming clauses included in the term dyeing) of fabrics, fibres or other materials with colouring matters or organic compounds by vatting, that is to say by or with the aid of vatting.

It is well known that the application of coloring matters to many textile products by "vatting" methods has hitherto been difficult or impossible, owing to the deleterious action upon the fibres of the strong alkalis, particularly caustic soda and caustic potash, necessary for use for the successful practice with these methods. Coloring matters which are applied by such methods are generally included in the term "vat dyestuffs", which term includes a considerable variety of typical chemical classes and the "sulphide" or "sulphur" dyestuffs, which include a wide variety of sulphurized organic compounds. Commercial fibres in connection with which the application of such colours by "vatting" methods showed this difficulty are chiefly the animal fibres such as wool and silk, and substances of animal origin such as hair, fur, leather and the like, cellulose acetate, and, to a less extent, artificial silks or artificial fibres of the cellulosic type. The deleterious action of caustic alkalis, such as hydroxides of soda and potash, in aqeous solution, in causing a degradation of these animal fibres, cellulose acetate or other artificial fibres is well known; in the case of the animal fibres or substances there results a loss in tensile strength, contraction, felting of the fibres and other physical results of partial degradation; in the case of cellulose acetate there is progressive loss in weight with some loss of lustre and strength, and change in dyeing properties; in the case of the artificial fibres of the cellulosic type, the degradation is less marked but may show loss of lustre and strength.

According to the present invention I prevent or ameliorate the aforesaid difficulties in the application of such coloring matters by "vatting" methods, by using in partial or total substitution of the strong alkalis before mentioned, compounds which have very much less tendency to attack the substances or fibres before referred to, but which nevertheless render possible the successful application of the dyestuffs.

The substances I employ in partial or total substitution of the strong alkalis before mentioned are salts of hydroxy or poly-hydroxy, or of simple ring-substituted derivatives of hydroxy or polyhydroxy compounds of the homocyclic or heterocyclic organic series, such as the benzene, naphthalene, anthracene, or pyrazol series and the like. Preferably I employ alkali metal or ammonium salts, though I do not limit myself in this respect, as I may employ, though less advantageously, salts of other metals, such for example as water-soluble earth alkali metal salts or other salts of the aforesaid hydroxy or polyhydroxy bodies, or their derivatives.

It is of course understood that I may employ any of such substances, or mixtures containing two or more of such substances.

The following are some examples of compounds which I may employ for the purpose of the present invention, it being understood that they are in no way limitative:

Sodium phenate; potassium phenate; sodium cresolate; potassium cresolate; sodium xylenolate; potassium xylenolate; sodium catecholate; potassium catecholate; sodium resorcinate; potassium resorcinate; sodium guaiacolate; potassium guaiacolate; sodium quinolate; potassium quinolate; sodium betanaphtholate; potassium betanaphtholate; sodium alphanaphtholate; potassium alphanaphtholate; sodium parachlorphenate; disodiumleucoanthraquinonate.

In carrying out the invention I may employ any coloring matters or organic compounds capable of being applied by vatting methods. Such coloring matters or compounds may for example belong to the generic series:

Benzoquinone; Naphthoquinone; anthraquinone (including dibenzanthrone and isodibenzanthrones, anthraquinone azines and hydroazines, flavanthrone, amino anthraquinones or aminohydroxy anthraquinones or substituted derivatives thereof containing one or more alkylamino or arylamino groups or both alkylamino and arylamino groups, acylamino or substituted acylamino anthraquinones, anthraquinonyl amines, anthrapyridones, anthraquinoneacridones and naph-

thacridones, anthraquinone thioxanthones); phenanthraquinone; aceanthrenequinone; naphthanthraquinone; indophenol; carbazol; indigoid (including naphthindigoid, acenaphthene-indigoid, anthracene-indigoid, isoindigoid); thiocarbazol, thio-indigoid or other sulphurized derivatives of the above mentioned classes usually comprised within the term "vat dyestuffs" and the sulphurized compounds usually comprised within the term "sulphur" or "sulphide" dyestuffs.

In the ordinary known methods of application of such substances as before referred to, as vat dyestuffs, the coloring matter is employed with the alkali hydroxide in conjunction with the reducing agents commonly employed in vat dyeing, such for instance as hydrosulphites. In the case of "sulphur" or "sulphide" dyestuffs it is usual to employ sulphites in conjunction with the hydrosulphites or other reducing agents and alkali hydroxide.

In performing the present invention the alkali hydroxide may be partially or entirely substituted or replaced by one or more of the alkali metal or ammonium salts, or other water-soluble salts of hydroxy, polyhydroxy, or simple ring substituted derivatives of hydroxy or polyhydroxy, compounds of the homocyclic or heterocyclic organic series such for instance as those before mentioned, at any stage as desired, either in preparing the dyestuff in the reduced form in solution, or in the dyebath (or printing etc. preparation) itself, or both. The salts may be used as such, or they may be produced in solution by first carrying out the preparation of the coloring matter or dyebath with free alkali hydroxide, afterwards adding the free hydroxy body in suitably adjusted quantities. Similarly in the case of printing and like pastes or preparations the salts may be used as such or may be produced analogously within the paste or preparation.

It is well known that attempts have been made to reduce the causticity of the dyebaths or solutions in the application of vat and sulphur colors by "vatting" methods, by the use of acids such as benzoic, tartaric, acetic lactic and the like. Such substances, however, since they are usually more strongly acid or salt-forming than the leuco dyestuff molecule itself, frequently cause precipitation which is attended with difficulties. It is also well known that it has been proposed to substitute strong alkalis such as sodium hydroxide and potassium hydroxide by weaker alkalis of the hydroxide character such as ammonium hydroxide. The application of the salts of the hydroxy bodies of the present invention constitutes much superior processes to those formerly proposed.

The present invention enables the valuable classes of vat or sulphur colors to be applied to a much greater extent than was hitherto possible to animal fibres and cellulose acetate, and other fibres which are deleteriously affected by strong alkalis.

Besides enabling a more successful application of the anthraquinone, indigoid and other "vat" dyestuffs and "sulphide" dyestuffs individually to wool, real silk, and other substances of animal origin and to cellulose acetate and other artificial fibres, the invention enables valuable applications to be made to mixed goods containing such fibres, and to mixed goods containing such fibres and vegetable fibres. The dyeing, printing or stencilling of such mixed goods may be affected in solid or varying shades according to the relative affinities of the components towards the dyestuffs employed, and may be performed with or without previous or subsequent application of any other suitable dyestuffs to the goods. Thus for example mixtures of cotton or other vegetable fibres with wool, silk or other animal fibres, may be treated with "vat" or "sulphide" dyestuffs by the process of the present invention without causing such degradation to the animal fibres as was formerly experienced when using the strong alkali hydroxide methods; and uniform or differential effects may be obtained on such mixed goods with a suitable selection of the individual coloring matters and by the exercise of suitable practical control of temperature and other conditions of dyeing. In like manner mixtures of cellulosic artificial fibres with animal fibres may be dyed, printed or stencilled while preserving the original qualities of both components.

Similarly with mixtures containing cellulose acetate yarns, filaments or fibres, a wide variety of effects may be obtained according to the relative affinities of the components of the mixed goods for the selected colors. Thus mixed goods containing cellulose acetate and cotton or other cellulosic fibres or wool or other animal fibres may be treated to yield uniform or varying effects.

The present invention may be performed in presense or absence of protective colloids. In the case of "sulphide" colors, sulphites may be used in conjunction with the hydrosulphites used for forming the leuco compound.

The following examples are given by way of illustration of the invention, it being understood that they are in no way limitative.

Example 1.

To dye a bright scarlet shade on 100 kilos of wool in the form of hanks, 2 kilos of 2-thionaphthene 2′ acenaphthylene indigo (known as Ciba scarlet G, pdr. color-index No. 1228) are made into a paste with 6 litres of sodium betanaphtholate solution 39.5% and when thoroughly wetted, 17 litres of soft water are added; the temperature of this mixture is then raised to 40° C. and 7 kilos of sodium

hydrosulphite powder are dredged in with gentle stirring. This stock vat is allowed to stand 20 minutes with occasional stirring, by the end of which time reduction is complete. It is then poured into a dyebath containing 2500 litres of soft water previously set with 2½ litres of sodium betanaphtholate solution of 39.5% and 400 grms., sodium hydrosulphite, and warmed to 40° C. The previously scoured wool is entered into this bath and dyed for 30–45 minutes, during which time the temperature is raised to 50° C. It is dyed for a further ¼ hr. at 50° C. then lifted, rinsed, and finished according to the method common in the art when dealing with such goods.

Example 2.

To dye a reddish-violet shade on 100 kilos of acetyl cellulose yarn in the form of hanks, take 2 kilos of 44′-dimethyl-5-5′ dichlor 7-7′ dimethoxy 2.2′ bisthionaphthene indigo (known as thio indigo violet 2B powder color index No. 1219), paste with a small quantity of an alkali salt of a sulphated oil such as sulphoricinoleic acid (e. g. Turkey red oil, soluble oil, Turkon oil, etc.) to aid wetting out, and gradually add 7 litres of disodium resorcinate 19% solution. To this now add 15 litres of soft water, heat up to 40° C. and dredge in 6 kilos of sodium hydrosulphite powder. Stir very gently for 20 minutes and add this stock vat to a dyebath of 2500 litres soft water at 40° C. set with 2½ litres of disodium resorcinate solution 19% and 400 grms. of sodium hydrosulphite powder. Enter the previously scoured yarn and dye from ½ to ¾ hr. at 40° C., lift, squeeze, rinse and oxidize in a bath containing 1 gram per litre soap and 1 gram per litre sodium perborate at 45° C. Finally rinse off and finish as may be required.

Example 3.

To dye a shade of bluish red on 20 kilos of wool in the form of hanks, the dyebath is prepared with 450 litres of soft water and 23 litres of caustic soda solution 10%, 400 grams of the anthraquinone vat color known as indanthrene red violet RRK powder color index No. 1161 are pasted with a small quantity of an alkali salt of a sulphated oil such as sulphoricinoleic acid (e. g. Turkey red oil, soluble oil, Turkon oil, etc.) to aid wetting out, and 1 litre of caustic soda solution 10%, and the resulting liquor is sieved into the aforementioned dyebath. 500 grams of sodium hydrosulphite are then dredged in and the bath gently raked at intervals during 20 minutes when vatting will be complete. 5.6 kilos of phenol are dissolved in a sufficiency of soft water and the solution slowly poured with stirring into the dyebath. After a thorough mixing the bath is ready for the dyeing operation which is carried out according to the procedure normally followed in the art.

Example 4.

To dye a dull blue shade on 100 kilos of woolen yarn in the form of hanks, take 2 kilos of the sulphide dyestuff known as thionol direct blue S, 20 litres of potassium phenate solution 34.5% and paste these together, adding 40 litres of soft water to the color paste; heat up to 30° C. and stir in gently 1 kilo of sodium hydrosulphite powder. Allow to stand for a short time until vatting is complete and add this stock vat to a dyebath containing 2400 litres of soft water to which has previously been added 2½ litres potassium phenate 34.5% solution and 400 grams sodium hydrosulphite and 20 kilos of common salt. Enter the previously scoured woollen yarn and gradually raise the temperature of the bath to 75° C. during ½ hr. Dye at this temperature for a further ½ to ¾ hour, lift, squeeze, oxidize and rinse according to the usual practice in the art for this type of goods.

Example 5.

To dye a deep blue shade on 100 kilos of real silk in the form of yarn, grind 8 kilos of the sulphide dyestuff obtained by the sulphurization of the indophenol derived from o-toluidine and p-nitrosophenol and known as thionone indigo R color index No. 959, into a paste with 80 litres of sodium ortho cresolate solution 32.5%. Warm the mixture to 60° C., add 4 kilos of sodium hydrosulphite powder and allow to stand. After 15 minutes, when vatting is complete, pour this solution of the reduced dyestuff into 4000 litres of soft water and add 4 litres sodium-ortho-cresolate solution 32.5%, 600 grams sodium hydrosulphite and 20 kilos of common salt in the form of a concentrated solution. Enter the previously degummed silk into the cold dyebath, raise the temperature to 80° C. in ½ hour, and dye at 80° C. for a further ½ hour. Lift out, squeeze, rinse off and oxidize by allowing to hang in the air. Finally soap and finish as may be desired.

Example 6.

To dye an old rose shade on 100 kilos of real silk yarn in the form of hanks, prepare a dyebath containing 2500 litres of soft water with 90 litres sodium parachlorphenate solution 37.5% the temperature of the bath being 20° C. Sieve in 15 kilos of the anthraquinone dyestuff known as indanthrene pink B paste and then dredge in 7½ kilos of sodium hydrosulphite powder. Rake the bath gently, and when vatting is complete, enter the previously boiled-off silk yarn; work for ½ hour, during which time the temperature is raised

to 60° C. Lift, squeeze and oxidize, finally finishing according to the method common in the art.

Example 7.

To dye a bright green on the cotton and a lemon yellow on the acetyl cellulose in 50 kilos of an acetyl cellulose and cotton fabric containing these two fibres in equal proportions, a stock vat is first prepared as follows:—

2 kilos of 3.3′ dichlor.N.dihydro 1.2:1′2′ anthraquinoneazine (known as duranthrene blue GCD color index No. 1113) are pasted with a small amount of the alkali salt of the sulpho acid of a higher fatty acid, for instance sulphoricinoleic acid (e. g. soluble oils, Turkey red oil, Turkon oil, etc.) to aid wetting out, and 2 litres of disodium resorcinate solution 19%. The paste is then poured into a bath containing 50 litres of soft water into which has been stirred 5 kilos of the brominated indigoid vat dyestuff known as Ciba yellow G color index No. 1196 paste and 98 litres of disodium resorcinate solution 19%. This bath is heated to 40° C. and 4½ kilos of sodium hydrosulphite powder dredged in; and bath is well raked and reduction is complete at the end of 15 minutes. The dyebath is prepared in a suitable machine containing 1000 litres of soft water, raised to a temperature of 40° C. from which the oxygen has been removed by the addition of 3 litres of disodium resorcinate solution 19% and 250 grams of sodium hydrosulphite powder: the stock vat prepared as above is added to the machine, the fabric entered and dyed for ½ to ¾ hour at a temperature of 50° C.; it is then removed and treated in the manner usual in the art when dyeing such goods.

Example 8.

To dye 25 kilos of fabric composed of cotton and acetyl cellulose yarns in equal proportions, so that a green shade is obtained on the cotton and a bluish red shade on the acetyl cellulose, the cotton is first dyed in a suitable machine, the dyebath being prepared as follows:—

600 litres of soft water are heated to 30° C. and 37.5 litres of sodium paracresolate 32.5% solution are added. Into this is sieved 2.5 kilos of the anthraquinonoid vat dyestuff obtained by oxidation of dibenzanthrone and subsequent treatment with methyl sulphate, and known as Caledon jade green color index No. 1101 paste. 650 grams of sodium hydrosulphite powder are now dredged in and the bath raked over gently until reduction is complete. The previously scoured off material is entered and worked for 20 minutes during which time the temperature is raised to 50° C. dyeing being then continued for a further 15 minutes at this temperature, when the goods are removed from the bath, squeezed, oxidized, rinsed and the full shade on the cotton is developed in a bath containing 1 gram per litre of olive oil soap and 1 gram per litre of sodium perborate, at 75° C. The acetyl cellulose component is now dyed a bright bluish red shade as follows:—125 grams of 2.4-dinitro-benzene-1-azo-diethylaniline are well stirred or ground with 1.25 litres of sodium sulphoricinoleate (50%); the mixture is heated under an open steam pipe and then diluted with water and further boiled. The liquor is then filtered into a dyebath containing 600 litres of cold soft water in which is dissolved with advantage sufficient sodium sulphoricinoleate (50%) to bring the final concentration of the bath to 3 cubic centimetres of the ricinoleate (50%) per litre. The goods are then entered and dyeing carried out in the customary manner, the temperature being raised to 75° C. to aid exhaustion. When the desired depth has been obtained the goods are lifted, rinsed, dried, and otherwise treated or finished as desired.

Example 9.

To dye a dull shade of yellow on the cotton component and a bright shade of violet on the acetyl cellulose component in 25 kilos of a mixed fabric containing equal proportions of these two fibres, proceed to dye the cotton first as follows:—

500 litres of soft water are heated to 40° C. and 20 litres of sodium paracresolate 32.5% solution are added. 2 kilos of the sulphide dyestuff (known as thionone yellow 2R color index No. 948) obtained by heating meta-toluylenediamine and sulphur and then treating with sodium hydroxide are then made into a paste with water and this paste added to the bath, after which 1 kilo of sodium hydrosulphite powder is dredged in and the bath gently stirred for 15 minutes. The goods are now entered, worked at a temperature of 40° C. for 15 minutes, and the temperature then raised to 75° C. in 15 minutes, at which temperature the goods are worked for a further 15 minutes. They are then lifted squeezed and oxidized, and rinsed, and after full development of the shade on the cotton, the acetyl cellulose component is dyed a bright violet according to the 300 grams of dimethyl-para-aminophenyl-1.4-naphthoquinone-monoimide (33% paste) and 100 grams of 2.4-dinitrobenzene-azo-diethylaniline (25% paste) are well mixed with 1875 cubic centimetres of sodium sulphoricinoleate (50%) which has previously been heated to 100° C. After about 10 minutes the mass is diluted with boiling water and the whole is filtered into the dye machine containing 600 litres of cold soft water. Dyeing is carried out in the customary manner, the temperature being raised to about 75° C. to aid exhaustion. The goods when dyed as

required are lifted, rinsed, dried and finished as desired.

Example 10.

To dye a bright green shade on the wool and a bluish red shade on the acetyl cellulose yarns contained in 20 kilos of a fabric composed of equal proportions of these two fibres, the wool is first dyed according to Example 3 above, using 1½ kilos of the anthraquinone vat dyestuff known as Caledon jade green color index No. 1101 paste in place of indanthrene red violet RRK powder, the procedure being precisely similar. The acetyl cellulose component is then colored according to the method given in Example 8, but using 2.4-dinitrobenzene-1-azo-dimethylaniline instead of 2.4-dinitrobenzene-1-azo-diethylaniline therein cited, the procedure being otherwise precisely similar.

Example 11.

20 kilos of a fabric made up from equal weights of real silk and acetyl cellulose yarns, are dyed to give a yellow shade on the silk and to give a green shade on the acetyl cellulose according to the following method:—

Paste 400 grams of the dyestuff (known as Cibanone orange R color index No. 1169) yielded by hypochlorite oxidation of the product resulting from the sulphurization of 2-methylanthraquinone (or its chlor derivatives,) with 48 litres of sodium phenate solution 30% warmed to 60° C. and add 1½ kilos of sodium hydrosulphite powder. When vatted, pour into a suitable machine containing 600 litres of soft water previously set with 600 ccs. of sodium phenate solution of 30% and 100 grams of sodium hydrosulphite. Enter the previously prepared fabric, work for one hour, lift and treat as is usual when dyeing vat colors on such fabrics. Finally pull up the acetyl cellulose component to a green shade according to the method given in Example 9, using a mixture in any suitable proportions of 1-methylamino-4-paratolylaminoanthraquinone and 4-chlor-2-nitro-4'-ethoxy-diphenylamine in place of the dyestuffs therein cited. The procedure is otherwise precisely similar.

Example 12.

Pleasing two-tone effects are obtained on 100 kilos of a material in the form of hanks composed of equal weights of real silk and acetyl cellulose yarns dyed according to the following method:—

2 kilos of 2(5-bromoindole)-2' thionaphthene indigo (known as Ciba grey B color index No. 1220) are pasted with 30 kilos of dipotassium resorcinate solution 23% and the temperature raised to 60° C. 8 kilos of sodium hydrosulphite are now sieved in and the liquor gently stirred. After 15 minutes, when reduction is complete, this stock vat is poured into 5000 litres of soft water 50° C. previously set with 5 litres of dipotassium resorcinate solution 23%, and 800 grams of sodium hydrosulphite powder. The previously scoured off yarn is entered into the well stirred dye bath, and worked for 1 hour at 55° C. It is then lifted, squeezed, rinsed and oxidized by treatment in a bath at 75° C. containing 1 gram per litre soap and 1 gram per litre sodium perborate. The yarn is finally finished as required. The silk will have acquired a pale blue violet shade, while the acetyl cellulose has a deep and redder violet tone.

Example 13.

To dye 20 kilos of a fabric composed of a mixture of equal weights of cotton, wool and acetyl cellulose yarns, so that the cotton is coloured a fawn or brown, the wool a bright blue and the acetyl cellulose a bright red shade, the cotton is first dyed as follows:—

600 grams of the sulphide dyestuff known as thionone dark brown MD are vatted according to the method given in Example 9 hereof, replacing the thionone yellow 2R by this color, and the dyeing of the cotton is carried out as there directed. The acetyl cellulose component is now dyed a bright red by dispersing 66 grams of 2.4-dinitro-benzene-azo-p-xylidine in 650 grams of sodium sulphoricinoleate (50%), heating, diluting with water and boiling in a manner similar to that given in Example 8. This dispersion is then added to a fresh dyebath containing soft water in the ratio of about 30:1 on the weight of the goods. Dyeing is then done in the usual manner and the goods are removed and afterwards rinsed as desired. After lifting and rinsing off the goods from this process the wool is then dyed up to a bright blue shade from a bath containing the sodium salt of 4.8 diamino-1-5-dihydroxyanthraquinone-2-6 disulphonic acid, and Glauber's salt, the free color acid being liberated by addition of acids, organic or mineral, in known manner as desired.

According to an alternative form of the present invention any of the coloring matters or compounds hereinbefore referred to which are capable of application in "sulphide" solutions may be applied to the dyeing, printing or stenciling of the goods by the so-called sulphide method, i. e. in "sulphide" solutions, instead of being reduced by hydrosulphites or the like; and in this method also I replace partially or entirely by the alkali metal, ammonium or other salts hereinbefore referred to, the strong alkali ordinarily employed in such processes. Coloring matters or compounds which may be applied by this method are generally termed "sulphur," "sulphide" or "sulphur vat" dyestuffs or coloring matters. Preferably in employing this modification of the invention I employ alkali hy-

drogen sulphides in place of the alkali sulphides usually employed in sulphide dyeing.

According to another part of my invention the alkali metal, ammonium or other salts hereinbefore referred to may be applied wholly or partly in place of strong alkalis in baths or solutions for desizing thread, yarns and fabrics liable to be detrimentally affected by strong alkali, especially yarns, threads and fabrics consisting of or comprising cellulose acetate.

The term "materials" used in the claims is intended to cover any of the materials previously mentioned whether used singly or in combination. It is to be understood that the term "materials comprising artificial fibres derived from cellulose" used hereinafter in the claims includes materials comprising artificial silks or other artificial fibres of organic substitution derivatives of cellulose, such as cellulose acetate, as well as materials comprising artificial silks or other artificial fibres of the cellulosic type. Furthermore the phrase "methods normally using strong alkali" in the claims is to be understood to include both the vatting and the sulphide methods referred to above.

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

1. In a process of dyeing materials by methods normally using strong alkali, the step of replacing, at least partially, the strong alkali by a soluble salt of a hydroxy compound of the cyclic organic series.

2. In a process of dyeing materials comprising artificial fibres derived from cellulose, by methods normally using strong alkali, the step of replacing, at least partially, the strong alkali by a soluble salt of a hydroxy compound of the cyclic organic series.

3. In a process of dyeing materials by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the cyclic organic series.

4. In a process of dyeing materials by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of hydroxy compound of the homocyclic organic series.

5. In a process of dying materials by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a salt of a hydroxy compound of the homocyclic organic series and having a monovalent inorganic base.

6. In a process of dyeing materials by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a sodium salt of a hydroxy compound of the homocylic organic series.

7. In a process of dyeing materials comprising artificial fibres derived from cellulose, by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the cyclic organic series.

8. In a process of dyeing materials comprising artificial fibres derived from cellulose, by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the homocyclic organic series.

9. In a process of dying materials comprising artificial fibres derived from cellulose, by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a salt of a hydroxy compound of the homocyclic organic series and having a monovalent inorganic base.

10. In a process of dyeing materials comprising artificial fibres derived from cellulose, by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a sodium salt of a hydroxy compound of the homocyclic organic series.

11. In a process of dyeing materials comprising artificial fibres derived from cellulose, by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the benzene series.

12. In a process of dying materials comprising artificial fibres derived from cellulose, by a vatting method, the step of replacing, at least partially, the strong alkali normally used by sodium phenate.

13. In a process of dyeing materials comprising cellulose acetate by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the cyclic organic series.

14. In a process of dyeing materials comprising cellulose acetate by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the homocyclic organic series.

15. In a process of dyeing materials comprising cellulose acetate by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a salt of a hydroxy compound of the homocyclic organic series and having a monovalent inorganic base.

16. In a process of dyeing materials comprising cellulose acetate by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a sodium salt of a hydroxy compound of the homocyclic organic series.

17. In a process of dyeing materials comprising cellulose acetate by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the benzene series.

18. In a process of dyeing materials comprising cellulose acetate by a vatting method,

the step of replacing, at least partially, the strong alkali normally used by sodium phenate.

19. In a process for dyeing materials comprising cellulose acetate and cellulosic fibre by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of the hydroxy compound of the cyclic organic series.

20. In a process for dyeing materials comprising cellulose acetate and cellulosic fibre by a vatting method, the step of replacing, at least partially, the strong alkali normally used by by a soluble salt of a hydroxy compound of the homocyclic organic series.

21. In a process for dyeing materials comprising cellulose acetate and cellulosic fibre by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a salt of a hydroxy compound of the homocyclic organic series and having a monovalent inorganic base.

22. In a process for dyeing materials comprising cellulose acetate and cellulosic fibre by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a sodium salt of a hydroxy compound of the homocyclic organic series.

23. In a process for dyeing materials comprising cellulose acetate and cellulosic fibre by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the benzene series.

24. In a process for dyeing materials comprising cellulose acetate and cellulosic fibre by a vatting method, the step of replacing, at least partially, the strong alkali normally used by sodium phenate.

25. In a process for dyeing materials comprising cellulose acetate and cotton by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the cyclic organic series.

26. In a process for dyeing materials comprising cellulose acetate and cotton by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the homocyclic organic series.

27. In a process for dyeing materials comprising cellulose acetate and cotton by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a salt of a hydroxy compound of the homocyclic organic series and having a monovalent inorganic base.

28. In a process for dyeing materials comprising cellulose acetate and cotton by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a sodium salt of a hydroxy compound of the homocyclic organic series.

29. In a process for dyeing materials comprising cellulose acetate and cotton by a vatting method, the step of replacing, at least partially, the strong alkali normally used by a soluble salt of a hydroxy compound of the benzene series.

30. In a process for dyeing materials comprising cellulose acetate and cotton by a vatting method, the step of replacing, at least partially, the strong alkali normally used by sodium phenate.

In testimony whereof I have hereunto subscribed my name.

GEORGE HOLLAND ELLIS.