THE DYESTUFFS

OF THE

BERLIN ANILINE WORKS

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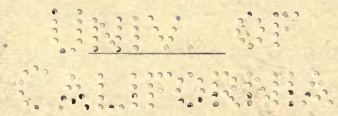
THEIR PROPERTIES

AND APPLICATION

IN

TEXTILE DYEING.



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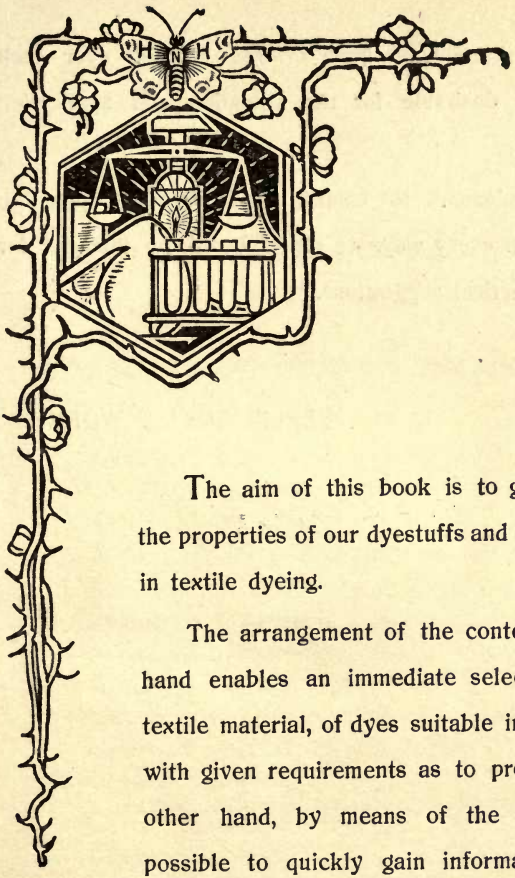

The aim of this book is to give a survey of the properties of our dyestuffs and their application in textile dyeing.

The arrangement of the contents on the one hand enables an immediate selection, for every textile material, of dyes suitable in a certain case with given requirements as to properties; on the other hand, by means of the „Tables", it is possible to quickly gain information respecting the relations of each single dye to the various textile fibres.

We hope thereby to have offered to the dyer such material as is desirable for the valuation and application of our dyestuffs.

In our endeavor to enlarge and improve upon the present work in every way, we shall always be thanktul for any further practical suggestions.

BERLIN ANILINE WORKS.

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Dyestuffs for

WOOL, SILK, COTTON,

LINEN, HALF-LINEN, CHINA GRASS, HEMP, JUTE, COCOANUT FIBRE, ARTIFICIAL SILK, HALF-WOOL, HALF-SILK, GLORIA.

TABLES

GENERAL OBSERVATIONS

ON

THE PROPERTIES OF THE DYES.

Of the properties of the dyes, the following chiefly come into account for the dyer:—

their *Solubility in Water,*

their *Behaviour in the Dyebath* during the dyeing process: their even-dyeing properties (levelling power), exhausting properties, sensitiveness to the influence of metal dye-vessels, and

their *Behaviour on the Fiber* towards the various physical and chemical influences which come into action during the manufacture and wearing of the dyed goods.

The **Solubility** of a dye depends not only on its nature, but also on the condition of the water. It is not advisable to add the dyes direct to the bath, as is frequently done; they should rather be *dissolved first* and the solution added to the bath by straining through a filter or sieve.

For 1 part of dye 250 parts of water suffice, even for dyes which are only with difficulty soluble. For easily soluble dyes 10—50 times the amount of water is enough, and, unless special instructions are given, *boiling hot water should always be poured on to the dye.*

If *pure* water (*i. e.,* water free from lime and iron) as for example condense water, is at disposal, no difficulties need be feared when dissolving and dyeing. If, on the other hand, one is obliged to employ *hard* water (*i. e.,* such containing lime), it must be corrected, according to the character of the dye to be employed, with sulfuric, acetic or oxalic acid, or with soda.

For *Basic Dyes* acetic acid should be added; for every degree of hardness use ¾ oz. acetic acid at 9° Tw. for every 100 gallons of water. The dyestuffs (such as Methyl Violet, Malachite and Ethyl Green, etc.) are usually stirred with a little cold water and a small quantity of acetic acid, and then dissolved in boiling water.

Guinea Carmine and *Guinea Bordeaux* (from the group of the *Acid Dyes*) must only be dissolved with the addition of acid or in the acid liquor.

When dissolving *Water Blue, Alkali Blue,* and *Acid Violet,* a little soda or borax (but no acid) should be added if the water is hard.

For the *Resorcine Dyes,* such as *Eosine, Erythrosine, Rose Bengale,* etc., the water is first boiled with the addition of a little soda, then allowed to settle and the clear alkaline liquid is used for dissolving the dye.

For all *Substantive Cotton Dyes* hard water should be softened with soda in the manner described. For delicate shades, impure water must be boiled up with soap and the scum which is formed — consisting of the combinations of lime, magnesia, iron, etc. with the fatty acid of the soap — removed.

The *Sulfur Dyes* are dissolved with an addition of sulphide of soda.

For the purification of water containing large quantities of iron, special plant is necessary, a description of which at this place would lead too far.

The precipitation of the dyestuffs when using standing baths is generally caused by the employment of impure water or through the gradual accumulation of too much salt in the bath. The amount of salt contained in the bath is best determined by means of the hydrometer; further particulars will be found in the respective dyestuff groups.

The **Levelling Power and Exhausting Properties** of the dyes stand in relation to their chemical nature and to the affinity for the fiber resulting therefrom.

As a rule dyestuffs which exhaust with difficulty dye more evenly than such as exhaust completely, but are then usually less fast to washing; however, by regulating the temperature and the additions to the dyebath, even dyeings may also be produced with dyestuffs which do not easily dye level.

When dyeing mixtures of dyestuffs, only such dyes should be employed together which exhaust in approximately the same degree.

Sensitiveness to Metals. If the dyeing is not carried out in *wooden* vats, apparatuses, etc. but in vessels consisting of metal, or possessing metal parts (*e. g.,* steam pipes, valves, pumps, etc.), it must be remembered that some

dyes are unfavorably influenced by the presence of certain metals during the dyeing process. Occasionally a reduction of the dye takes place, the consequence of which is a less intense dyeing; in other cases the shade is considerably changed, *e. g.* Scarlet Red to Crimson Red, etc. The metals which come into question are: copper, brass, bronze, iron, lead, tin, nickel.

The sensitiveness of some dyes towards copper may be somewhat suspended by well-known preventives, such as by means of zinc or by the addition of sulfocyanide of ammonia.

With the *Sulfur Dyes* copper, brass or bronze vessels must under no circumstances be employed on account of the destructive action of the sulfide of soda used in dissolving and dyeing these dyestuffs; wooden, iron or nickel vessels should be used.

The Behaviour of the Dyestuffs on the Fiber

towards chemical and physical influences, or in other words their *"fastness"* depends not alone upon their character, but also upon the nature of the fiber and upon the dyeing method, so that one and the same dyestuff, dyed upon different fibers, or according to different methods upon the same fiber, may shew very different properties. Thus Benzopurpurine, Brilliant Congo and other substantive dyes when dyed on wool, are considerably faster to light and washing than on cotton; Methylene Blue, on the other hand, when dyed upon cotton (with a tannin mordant) is considerably faster than on wool; basic colors are all fixed faster to light with tannin than with other mordants; and so forth.

To correctly define the fastness of a dyestuff for all cases is almost impossible, because the term "fastness" is not a clearly defined one, but is subject to the most varied interpretations.

With regard to fastness to milling for example, acid milling on the one hand, light milling in clear water on the other hand (such as is carried out with certain qualities of ladies' dress goods), or again milling with alkalies, as for flannels or buckskins, and finally the severe milling of military and officials' cloths, make totally different requirements on the resistance of the dyeing. A dyestuff which is perfectly fast in acid milling, may be quite useless even in the lightest alkaline milling. Another withstands the severest milling in light shades, but bleeds strongly in dark dyeings; a third is suffently fast to milling if the milled pieces are immediately washed and dried, but bleeds if they are left lying for some time. Further, the kind and cleanness of the dyed material, the duration of the dyeing process, and the manner of the dyeing, as well as the composition of the milling liquor, all go to determine the fastness to milling.

The degree of fastness can therefore in most cases only be termed good or bad in a general sense; a guarantee for all the cases possible in practice is of course out of the question.

When judging the fastness of a dye, it must be taken into consideration that the various degrees of fastness are not all equally important for a given case. To choose the more expensive one of two otherwise equally good dyestuffs for dyeing hose, because it is somewhat faster to light than the other, which fully satisfies all practical requirements, is just as injudicious as it is to prefer a cheap dye, which is not fast to washing and perspiration, to a somewhat more expensive one possessing these properties; for, the main point with dyed hose is, of course, fastness to perspiration and washing.

The fastness of a dyeing should therefore only be judged in relation to a distinct article for which the manner of its use exactly determines against which influences and in what degree the dyeing must offer resistance.

The statements in this work in general refer to the observations made in practice. With such dyestuffs, the behaviour of which in practice is not yet suffiently known, the results of the laboratory tests are given. These are chosen so as to permit of an opinion as to how the dyeings will behave towards the various influences which might come into action in the manufacture, in the finishing, and during the use of the finished goods.

When determining the fastness, the following points must chiefly be observed:—

The Behaviour of the Dyeing on Drying.

Cotton dyeings when dried, as a rule become lighter, wool dyeings become darker. The shade of a dyeing when coming immediately out of the drying-room will frequently deviate somewhat from the pattern, the difference however again disappears after a short time on exposure to the air. With Sulfur dyes a change of shade, caused by the oxidation of the dyestuff, besides take place. Sulfur Black dyeings come out of the dye-bath black-green, and on drying oxidise to blue-black; similarly, Sulfur Blue becomes all the brighter the more slowly the drying occurs.

When comparing trials, therefore, quite fresh dyeings should never be taken, but only such as have lain for several days.

Behaviour in Artificial Light.

Comparative dyeings should only be matched in pure white light, otherwise it may happen that for example by the reflection of a red wall, one dyeing may be influenced more than the other, thereby appearing either more or less favorable.

Every dyeing changes its shade according as the light varies. When dyeing to pattern it is frequently necessary to match off not only in daylight, but also in artificial light. A great change of shade in evening light is often troublesome; this appearance however no longer possesses the same significance as formerly, since at present many kinds of illumination are in use which prevent the change from being as apparent as in yellow gas or petroleum light.

Behaviour towards Sunlight.

When comparing two dyeings as to their fastness to light, it is absolutely necessary that both possess exactly the same depth of shade, or in other words, "strength", and that they are dyed on the same material. Even when these conditions are fulfilled, the result of the test occasionally varies according to the district in which it is carried out. Sea air acts different from land air, a short but intense exposure in the south different from a slight though lengthy exposure in the north, etc.

Dyed patterns are frequently exposed to light longer than is needed for practical requirements, finally fading completely. It may thus happen that differences appear between dyeings which, if exposed within a reasonable length of time, shew no change whatever, and may therefore be considered as being equally well applicable in practice.

For numerous articles a medium fastness to light is quite sufficient, as they are only exposed to light in shop windows at the most, but not in use.

On the other hand such dyeings, the fastness to light of which is particularly important, such as window blinds, carpet yarns, etc., must be tested very long

in order to arrive at reliable results. Sometimes a rapid though insignificant alteration in shade may be misleading with regard to fastness against light, whilst the shade, once changed, afterwards resists the action of light for a very long time.

Fastness to light is quite different from *fastness to atmospheric influences.* A dyestuff, which on account of its fastness to light may be excellent for upholstery, is perhaps useless for flags, since by its exposure to all kinds of weather it is quickly faded or washed out.

In conclusion be it observed that absolutely fast dyes do not exist; sunshine and rain finally bleach them all.

With many dyestuffs for wool and cotton the fastness to light can moreover be considerably increased by an after-treatment with copper salts.

Behaviour towards Water.

A material wetted by rain must neither lose its color, nor bleed into white material with which it comes into contact.

Yarns, especially in fancy weaving, when being sized must not bleed into the size, so that threads of other shades are not stained.

Yarns which are to be woven in a wet state, especially linen yarns, must not bleed into white threads on the loom.

Mixed woolen yarns, which are steamed, must not bleed even when drops of hot condense water fall on them.

Light ladies' dress goods must stand a slight milling in water without any alteration of shade.

Gentlemens' suitings, which have to undergo the potting process, must not bleed in the least.

All the properties required in the foregoing may be comprised in the term

Fastness to Water.

The test is usually carried out with distilled water, which corresponds to rain water. It must however be observed that ordinary water, which commonly contains lime, acts differently; that, further, a bleeding is much more pronounced when white threads are woven with dyed ones, than when they only lie beside one another in the same vessel. Alkaline residues in the goods can also strongly influence the bleeding. A slight bleeding of woolen and cotton goods can frequently be moderated by after-treating the dyeing with alum or acetate of alumina, or when milling in water (and sometimes in the potting process), can be prevented by the addition of a little acid.

Behaviour towards Alkalies.

Except in the washing and milling process, alkalies only act upon dyeings in the form of street dust. Of course the composition of the dust, and consequently also the degree of the action, vary very greatly. Of a dyestuff fast against soda, ammonia and lime water nothing is to be feared; there are however a number of dyes of perfectly sufficient fastness against dust, which alter their shades with the reagents mentioned. In such cases only a longer experience in use will decide.

The fastness against the action of mercerising, occasionally required of cotton dyeings, is on the whole equivalent to a good fastness against alkalies and washing.

Behaviour on Washing and Milling.

The active influences in washing and milling are:—

(a) Friction, and

(b) Solvent action of the milling and washing liquor.

The changes which can take place with the dyed material through these are the following:—

The dyeing changes its shade.

The dyeing loses in strength.

The dyeing bleeds into white material washed or milled at the same time.

Changes of shade which take place are generally due to the action of the alkali employed for washing, and are therefore rather to be termed a consequence of sensitiveness to alkalies.

If the dyeing loses in strength, the dyestuff is either dissolved off the fiber, or it is decolorised, as for example with Alkali Blue. In the latter case the color returns on acidulating.

The bleeding into white material may either be caused by a portion of the dyestuff being only fixed on the fiber superficially and thus rubbing off on to the white fiber, or it may result from the dyestuff being dissolved by the milling liquor and then dyeing afresh.

In the first case the result can be improved by a change in the dyeing process or by a thorough washing of the dyed fiber before its further use. In the second

case it is advisable, as a preventive, to leave the goods in the milling liquor only as long as is absolutely necessary. Above all, the goods should not be left lying in a wet state.

Definite statements regarding the fastness of a dyestuff to washing and milling which will serve as a general rule can scarcely be made, because the fastness of a dyeing depends not only on the dyestuff employed, but also on the manner of dyeing, the cleanness of the material, the depth of the dyeing, etc., as remarked above in the introduction. For shirtings or table linen, the term "fast to washing" has a quite different meaning than it has for knitting yarns; what is useless for cloths may for ladies' dress goods be quite fast enough to milling.

When, therefore, a new dye is to employed, it is always advisable to specially test it as to its fastness against milling and washing, by allowing a dyed sample to go through the whole process of manufacture.

If the dyestuff at the first trial proves unsatisfactory, it will nevertheless often be possible, by means of slight alterations, to enable its employment.

In laundrying the action upon the dyeing is frequently intensified by a slight bleaching with chloride of lime; a dyestuff destroyed by this treatment cannot however be termed loose against washing.

A particularly high degree of fastness to washing is required of such dyeings which are intended as lists for raw silk goods that are to be boiled off in the piece. Only few dyestuffs exist which can be employed for this purpose (for cotton the Sulfur Dyes).

Behaviour towards Acids.

In ordinary use dyed fabrics only occasionally come into contact with organic fruit acids, such as citric, tartaric or acetic acid. It is of course desirable that no spots thereby result, that, therefore, the tone of the dyeing is not altered. The test frequently made of dropping strong mineral acids — hydrochloric acid, sulfuric acid or nitric acid — on to the dyed material is only of value for distinguishing one dye from another, but is no criterion for the usefulness of a dye.

Carbonising.

It is true that sulfuric acid and hydrochloric acid come into question with materials which are to be carbonised; here too, the change of shade frequently caused by the acid is of no consequence in case it disappears again on washing out, or at least on neutralising with soda.

Cross-dyeing in an Acid Bath.

When cross-dyeing, the acetic or sulfuric acid bath employed is so strongly diluted that it can scarcely produce direct, much less therefore after rinsing the dyeing, an effect similar to that caused by the concentrated acid. For this reason a large number of dyes are fast to cross-dyeing inasmuch as they do not change their shade in a boiling acid bath. Unfortunately however, very few are so fast that they do not bleed over into white material.

Perspiration.

The alteration which dyeings occasionally undergo through perspiration is perhaps chiefly due to the in-

fluence of weak organic acids; since, however, several other secondary influences come into question, a reliable result can only be obtained by wearing the dyed goods. The dyeing must then neither alter its shade, nor bleed into or stain white material worn at the same time.

Fastness to Storing (Warehousing).

To some extent the alteration which some dyeings undergo on storing can with certainty be traced to the influence of acids. These acids are generally the products of the combustion of gas, which is seldom quite free from sulfur. Besides, the oxygen of the air has the effect of altering the shade of some dyeings on storing. The Sulfur Dyes especially oxidise further on the fiber, so that black and blue dyeings become somewhat bluer or brighter.

Fastness to Stoving.

The stoving process often carried out with wool and silk dyeings is based upon the action of sulfurous acid, which is produced either by burning sulfur or by evaporating the commercial liquid compressed acid. Bleaching with a solution of sulfurous acid is also usual. Stoved yarns should never be dried together with other yarns, so that the shade of the latter is not affected.

The Fastness to Rubbing

is of considerable importance for all goods which when worn come into immediate contact with white materials or with the human skin.

The rubbing off of dyeings depends not alone upon the dyestuff; the cleanness of the material to be dyed plays a very important part, likewise with some dyes the hardness of the water, the manner of dyeing or after-treating, etc. With complaints as to deficient fastness against rubbing, these matters must be considered in the first place.

With woolen goods perfect fastness to rubbing is frequently produced by washing with fuller's earth, which removes all the superficially fixed dyestuff.

With cotton goods a slight sizing serves the same purpose.

Union goods, the cotton warp of which has been covered with basic dyes, are improved in their fastness to rubbing by washing with Quillaya bark or with a little glue. A short rinsing after the tanning has the same effect.

The rubbing of dyeings in the wet state, which, during the milling and washing processes, has as a consequence the staining of white material woven together with them, has already been mentioned under the heading of "Fastness to Milling" (see page 10).

The Influence of Heat.

The use of heat plays an important part in the finishing of textile goods: drying, singeing, ironing, hot pressing, calendering, steaming, all occur with the help of dry or moist heat.

A large number of dyes are changed in shade by dry heat, but gradually regain their original shade on cooling. A permanent alteration should not take place.

The alterations which are caused by the steam when steaming — sometimes under pressure — are usually due to a decomposition of the dyestuff and cannot therefore be made retrograde. The fastness to steaming can however frequently be increased by means of chlorates or copper salts.

Alkaline residues in the steamed goods occasionally contribute to the destruction of the dyestuff. Further, the dyeings of some dyestuffs by themselves are very fast to steaming; in contact with white wool however, the dyestuff is destroyed.

Water spots, which sometimes result when steaming, are due to too moist steam. Only very few dyes can withstand the influence of steam and water simultaneously — as in the potting process.

Mangling and Beetling

sometimes alter the dyeings in an almost unforeseen manner. If a new dye is to be taken up for articles which undergo one or the other of these treatments, a special test is then always advisable, since the process cannot be exactly imitated in the laboratory.

Chlorinating

plays an important part in *cloth printing*. Also for fancy weaving, dyestuffs fast to bleaching are of considerable importance. That chlorine is frequently used in laundrying has already been mentioned. Unfortunately only comparatively few dyes are fast to bleaching; particularly the Sulfur Dyes, otherwise so extraordinarily fast, are almost all destroyed by hypochlorites.

Dyestuffs

for

Wool

Silk

Cotton

Linen, Half-Linen

China Grass, Hemp

Jute, Cocoanut Fibre

Artificial Silk

Union Material (Wool and Cotton)

Half-Silk (Silk and Cotton)

Gloria (Silk and Wool).

Dyeing Recipes

and

Properties.

Observations.

The statements in the dyeing recipes

concerning:— *refer to:—*

Percentages (%) : 100 parts by weight of the goods to be dyed.

Temperature : degrees Fahrenheit.

Salts and Acids.

Glaubersalt : crystallised Glaubersalt.
100 parts cryst. = 44 parts calcined Glaubersalt
100 „ calc. = 227 „ cryst. Glaubersalt.

Soda : soda ash.
100 parts soda ash = 270 parts crystal soda.
100 „ cryst. soda = 37 „ soda ash.

Sulfide of Soda: crystallised sodium sulfide.
The commercial concentrated molten sulfide of soda is about double the strength of the crystallised product.

Sulfuric Acid : concentrated sulfuric acid at 168° Tw.

Acetic Acid : acetic acid 30% strong, at 9° Tw.

Where nothing is said to the contrary, the recipes serve for the supposition that for wool and silk 40 to 50 times the amount of water (of the weight of the goods to be dyed), for cotton not more than 25 times the amount, is used.

Abbreviations.

Rp. = Recipe	J = Jute
W = Wool	U = Union Material
S = Silk	HS = Half-Silk
C = Cotton	SW = Gloria (Silk and Wool).
L = Linen	

Wool.

ACID DYES
ON WOOL.

The acid dyes, i. e. those dyes which exhaust from an acid bath, form the most important class of dyestuffs for wool. Their method of application is extremely simple; in most cases they not only enable good penetration and level dyeing, but also preserve the gloss and feel of the wool.

Solution:—

The dyestuffs mentioned under Recipes 1—9 can almost all be easily brought into solution by pouring boiling-hot water upon them.

A few are less easily soluble, such as Azo Coccine 2R, Fast Red A, Cloth Red GA, 3GA, Emin Red, Martius Yellow, etc.

Guinea Carmine B, Guinea Bordeaux B and G must only be dissolved with the addition of acid or in a portion of the acid liquor.

Acid Violet 4B extra must first be stirred to a paste with cold water and then dissolved by pouring boiling hot water on to it.

(For further particulars regarding the solubilty and properties of the Acid Dyes, see Tables).

Recipe 1:— (for Acid Dyes on Wool).

Prepare the bath with the necessary quantity of dyestuff and

10—15% bisulfate of soda.

In place of bisulfate of soda

10% Glaubersalt cryst. and
3—5% sulfuric acid

may be taken.

Enter the material at about 140° F., raise to the boil, boil for ¾—1 hour and rinse.

It is only then advisable to enter direct into the boiling bath if the dyestuffs employed possess very good levelling powers.

For dyestuffs with less good levelling powers, such as Fast Red A, Bordeaux B and R, Fast Blue, etc.

2—5% acetic acid

should first be employed instead of sulfuric acid, and the latter only added towards the conclusion of the operation. Goods which are difficult to penetrate must be boiled with Glaubersalt before the addition of dyestuff; the acid is only added later.

Acid Dyes for Wool.

Red:—

Ponceau 4R, 3R, 2R, R, G
Ponceau 10RB, 6RB—4RB
Ponceau 2RB — 2GB
Ponceau BO extra
Ponceau 3RB
Ponceau S, SS
Crystal Ponceau
Coccine 2B
New Coccine
Victoria Scarlet 4R — G
Azo Coccine 2R
Double Brill. Scarlet 4R — G
Brilliant Scarlet 4R — G
Fast Red extra
Fast Red A, AB
Azo Rubine S, SG

Bordeaux B, R
Bordeaux S, SF
Brilliant Bordeaux S
E Eosamine B
E Guinea Red 4R
E Guinea Bordeaux B, G } must only be dissolved with the addition of acid or in a portion of the acid liquor.
E Guinea Carmine B }
E Azo Cardinal G
E Azo Orchil R
E Acid Magenta S
* Rhodamine B, G
Emin Red
Cloth Red BA, GA, 3GA
Chrome Fast Red B, R, G
} see also Recipe 9.

E The dyestuffs marked "E" possess particularly good even-dyeing or levelling powers and are therefore specially suited for shading purposes when dyeing light and fancy shades.

* Rhodamine, although belonging to the basic dyes, is either dyed acid with an addition of about 20% Glaubersalt and 1—3% bisulfate of soda, or according to Recipe 4.

Orange:—

E Mandarine G extra etc.

E Orange G, R

E Ponceau 4GB

Yellow:—

E Quinoline Yellow

E Acid Yellow G, R

E Acid Yellow D extra

Metanil Yellow extra

Resorcine Yellow

E Azo Acid Yellow

E Curcumeïne extra

E Naphtol Yellow

Green:—

E Guinea Green B, G, etc.

Blue:—

Water Blue 3BA, 2BN, BNW, R, RC, S2K, 4RW, 5RW (Solution see page 2.)

Fast Blue for Wool 3B, B, R, BA, RA

E Indigotine

Patent Blue A

E Patent Blue V

* Wool Blue 5B, 2B, R, G extra

† Victoria Blue B, R, 4R

E = Levelling dyes; see footnote on page 23.

* Wool Blue and Wool Violet are best dyed in a *neutral* bath and are chiefly employed in union dyeing (see Recipe 41); they can however also be dyed in a very weakly acid bath (with acetic acid) and further on a chrome mordant (see Recipe 9).

† Victoria Blue, although belonging to the basic dyes, is dyed in a strongly acid bath.

Violet:—

E Acid Violet 6B
Acid Violet 4B extra
(Solution, see pages 2 and 21).
Guinea Violet 4B
* Wool Violet 10B, 6B

Brown:—

Fast Brown G, GR, 3B,
Resorcine Brown

Grey and Black:—

Aniline Grey
Nigrosine
Wool Black 474
Acid Black B
Hat Black B, T
† Amido Acid Black 6B, 4B, B

The following brands:—

Wool Black 6B, 4B, 4BF, B, etc.

Wool Black N5B, N4B, N2B, NB, NG

Wool Jet Black 3B, 2B

Wool Black 6BW, 4BW, BSW extra, RSW, W, WB
(The W-brands and Acid Black do not stain, or only slightly stain, white cotton selvedges and fancy threads.)

Wool Black 4BL, 4BFL
(The L-brands are particularly fast to light.)

Wool Black GR
(A Wool Black of extraordinary fastness to light.)

are best dyed commencing with an addition of
10% Glaubersalt cryst. and
2—3% acetic acid
and adding later, in order to exhaust the bath,
5% bisulfate of soda
or 1—2% sulfuric acid.

E = Levelling dyes; see footnote on page 23.

* See footnote on page 24.

† The Amido Acid Blacks are dyed in a sulfuric acid bath with an addition of a comparatively large amount of Glaubersalt, entering at 100—120° F. and raising slowly to the boil.

Recipe 2:—

for Nerol B, 2B, 4B, 2BG, 4BG, A, etc.

Nerol, dyed on wool in a *weakly acid* bath, without previous mordanting and without after-treatment, yields black dyeings of *extraordinary fastness to washing*.

This property renders Nerol particularly valuable for the dyeing of *knitting yarns* and *hosiery*, as well as for *carded yarns, worsted yarns* and *slubbing*, provided that they are employed in the manufacture of goods which have to endure a severe washing or even a slight to moderate degree of milling.

On account of its simple manner of application and the good fastness of its dyeings, Nerol is an advantageous *substitute for logwood* in the dyeing of woolen yarns.

For rational working with Nerol, *water free from lime* is a primary requirement; hard water must be corrected with oxalic acid before the addition of dyestuff.

Very hard water requires about 4—8 oz. oxalic acid per 100 gallons.

Oxalic acid is added in small portions to the boiling liquor until the bath, after boiling for 5 minutes, still slightly reddens blue litmus-paper. The white scum which is formed is then skimmed off. An excess of oxalic acid

must be avoided. If the condition of the water is particularly bad, it may happen, when dyeing in the first bath, that the material appears brownish or bronzy; in this case an addition of oxalate of soda (3—8 oz. per 100 gallons) is advisable.

Recipe for the First Bath.

The dyebath is brought to the boil.

Then add 3% (of the weight of the goods to be dyed) acetic acid 30%, boil up for about 5 minutes and turn off steam.

The dyestuff is stirred to a paste with boiling liquor and added to the bath.

Again boil up the liquor and keep it boiling for 2—3 minutes; then turn off steam.

The liquor must represent a deep blue-black solution. If a strong bronzy scum appears on the surface, and if the liquor, when filled into a glass, is not black but brown, and only slightly colored, the water used is too hard. An additon of a mixture of 2½% lbs. oxalic acid and 2 lbs. soda ash must then be made in small portions (not more than 8 oz. of the mixture for every 100 gallons of water) until the bath is in order.

Now enter the material, work 3—4 times consecutively and then only once every 10 minutes. First dye for ½ hour without steam, again raise slowly to the boil

and dye gently boiling until the dyestuff is completely exhausted.

For a perfect fixation of the dye the goods should remain 10—15 minutes longer in the exhausted bath.

The whole dyeing process lasts about 1½ hours.

If a pattern of the dyed material does not bleed in a warm soap solution, the goods must be taken out, rinsed, hydroextracted and dried.

If after 1 hour the dye is not yet sufficiently exhausted (the liquor should then be only slightly colored), lay out the yarn, add 2—3% acetic acid more, boil up, stir well, enter again, continue to work until the bath is exhausted and then leave the material 10 minutes longer in the clear bath.

Continuous Dyeing in the Same Bath.

For the following baths the same amount of dye as for the first bath, besides 2% acetic acid 50%, must again be taken; allow the liquor to boil up for 2—3 minutes and continue to work in exactly the same manner as the first time.

Carbonised material, after neutralisation, is dyed without any addition, entering at about 140° F., slowly raising to the boil whilst working well, and boiling (for at least 1 hour) until the dyestuff is perfectly fixed.

Recipe 3:—

for **Indocyanine B** (see also Rps. 9, 10, 13, 41, and 47).

When dyed in a neutral bath with an addition of acetate or sulfate of ammonia, Indocyanine B* yields dyeings which are distinguished by their extraordinary *fastness to light, steaming and alkalies.* As the dyeings besides are well penetrated, possess an excellent fastness to rubbing, do not appear red in artificial light, and are only temporarily reddened by carbonising, Indocyanine B will find advantageous application in the dyeing of high-class gentlemens' suitings, especially for darker shades.

Indocyanine B, on account of its resistance against washing, is of interest for many washing and milling articles, yarns and slubbing.

In view of its ready solubility and slight sensitiveness towards metals, it is specially adapted for machine dyeing.

Dyeing Recipe:—

Indocyanine B will dye without any addition to the dyebath.

---

* Indocyanine B is a very important dyestuff for *Vigoureux printing.*

In order to counteract the injurious influence of alkaline water upon the wool, and to attain a better exhaustion of the bath in dark dyeings, it is advisable to add

15% acetate of ammonia liquid 30%*
or 5% sulfate of ammonia cryst.†

to the bath and then to boil up. Then add the dyestuff dissolved in boiling water, again boil up, turn off steam and enter the goods. As the dye only exhausts slowly below the boil, raise to the boil again and continue boiling.

The dyebath is not completely exhausted; about $\frac{1}{10}$ of the dyestuff employed remains in the bath, so that it is advisable to retain the bath for further use. For succeeding lots one-half of the above-mentioned additions will suffice. If the bath is not to be employed again, but exhausted, run in some cold water towards the conclusion of the dyeing operation and add 2—3% acetic acid (30%), in a well-diluted state.

It is very important for the uniform appearance of the goods that they should be quite clean. In doubtful cases it is advisable to clear the goods by boiling them with 1% bichromate of potash and $\frac{1}{2}$% sulfuric acid, then to rinse well and finally to dye with an addition of about 10% Glaubersalt.

---

* Acetate of ammonia is prepared by neutralising acetic acid with ammonia. 13 vols. acetic acid (30%) and 5 vols. ammonia (25%) yield 18 vols. acetate of ammonia (about 30%). It is advisable to employ a small excess of ammonia, so that the solution smells slightly of the latter.

† The sulfate of ammonia must not be acid; should this be the case, it must be neutralised with a little ammonia until it smells slightly of the latter.

For shading Indocyanine B, all dyestuffs are adapted which dye from a neutral or weakly acid bath, such as Mandarine, Cloth Red, Wool Black GR, Nerol, Guinea Violet and Patent Blue.

Indocyanine B is also suited for dyeing (together with dye-woods) in a neutral bath on a chrome mordant (see Recipe 9).

Indocyanine B is to be recommended as a valuable product with which to shade the Metachrome Colors (see Recipe 10).

Indocyanine B is further applicable for *Silk* (Recipe 15), *Union Material* (Recipe 41) and *Gloria* (Recipe 47).

Recipe 4:—

Dyeing in a Weakly Acid Bath.

(Eosine Dyestuffs, etc.)

The dyestuffs are readily soluble in clean hot water; water containing lime must be corrected with a little soda (see page 2).

Dye at about 200° F. with an addition of 5% acetic acid and rinse.

Eosine, all brands
Methyl Eosine
Erythrosine, all brands
Phloxine
Rose Bengale
Uranine
Martius Yellow

Rhodamine B, G

although belonging to the group of the basic dyes, are dyed according to this recipe or according to Rp. 1 (see page 22) with an addition of about 20% Glaubersalt and 1—3% bisulfate of soda.

Recipe 5:—

Dyeing in a Weakly Alkaline Bath and Acidulating in a Fresh Bath:—

for *Alkali Blue* (all brands).

The Alkali Blues are easily soluble in clear boiling hot water; hard water must be corrected with a little soda or borax (see page 2).

Dye in a boiling weakly alkaline bath with an addition of

2—5% borax
or 1—3% soda cryst.
or 5% water glass,

lighter shades for ¼—½ hour, darker shades for about 1 hour; develop the Blue in a fresh bath at about 140—160° F. with an addition of

2—5% sulfuric acid

and rinse again.

Alkali Blue can be shaded in the acid developing bath with acid dyes of good levelling powers, *e. g.* Acid Yellow G, Guinea Red 4R, Guinea Green B, Acid Violet, etc.

Recipe 6:—

After-treatment of Acid Dyes with Bichromate of Potash or Fluoride of Chrome.

Dye boiling in an acid bath for about ½ hour with an addition of

10% Glaubersalt cryst. and
3—5% acetic acid

and continue boiling for about ½ hour longer, adding gradually

about 5% acetic acid
(or 1—2% sulfuric acid).

Then allow to cool down somewhat, add

1—2% bichromate of potash,

boil for a further ½—¾ hour, and finally rinse.

When dyeing continuously it is advisable to carry out the chroming in a fresh bath with

1—2% bichromate of potash and
½—1% sulfuric acid.

Suitable dyestuffs for this treatment are:—

Cloth Red BA, GA, 3GA
Emin Red
Chrome Fast Red B, R, G
Chrome Fast Yellow R, 2G
Metachrome Yellow D, RD, 2RD (see also Rps. 9 and 10)
Cyprus Green B (see also Rps. 7 and 10)
Cyprus Blue R (see also Rp. 7).

Recipe 6a:—

Chrome Fast Black B is dyed strongly acid with an addition about 10% Glaubersalt and 5—8% sulfuric acid and after-treated in the same bath with ¾—1½% bichromate of potash, or better still in a fresh bath with 1—2% bichromate of potash and ½—1% sulfuric acid.

For after-treating the dyestuffs mentioned under Recipe 6 in the dyebath, fluoride of chrome is frequently employed instead of bichromate of potash (except for Cyprus Green B and Chrome Fast Black B).

Recipe 7:—

After-treatment of Acid Dyes with Bluestone.

Suitable for this treatment are:—

Cyprus Blue R

Cyprus Green B (see also Rps. 6 and 10)

which, whilst of *no interest* in *direct* dyeings, when *after-treated* however, yield dyeings *extremely fast to light* and of good fastness to washing and alkalis.

Dyeing:—

Prepare the dyebath with 10% Glaubersalt crysts. (of the weight of the material) and 5% acetic acid (30%) and boil up. Then add the solution of the dyestuff, again boil, cool down to about 140° F. with cold water and enter the clean material. Raise to the boil during ½ hour and boil for 1 hour.

The bath is almost completely exhausted.

After-treating:—

The after-treatment is best carried out in a *fresh* bath containing 2—3% acetic acid and ⅛—½ as much bluestone as the amount of dyestuff employed. Enter at 140° F., raise to the boil during ½ hour and continue boiling for a further ½ hour.

The after-treatment may also take place in the dyebath itself if the latter is well exhausted. In this case cool down to about 140° F., add about 2% acetic acid more and ⅛—½ as much bluestone (previously well dissolved) as the amount of dyestuff employed, again raise to the boil during ½ hour and boil for ½ hour. If these instructions are carefully followed out, the bluestone added will be completely fixed, so that the same bath can again be employed for dyeing.

For *shading purposes,* Patent Blue A, Guinea Violet, Acid Yellow G may be employed either in the dyebath or the developing bath.

Recipe 8:—

After-treatment of Acid Dyes with Bichromate of Potash and Bluestone.

Dyestuffs adapted for this treatment:—

Chromate Black 6B, 4B, T, TB

which, when after-treated, yield *dyeings of excellent resistance against milling, light,* and good *fastness to steaming.*

The dyestuffs possess good levelling powers and will readily penetrate even heavy goods.

Solution:—

The dyestuffs dissolve readily by pouring boiling water on to them.

Dyeing:—

Prepare the dyebath with 10% Glaubersalt (of the weight of the goods) and 3—5% acetic acid (9° Tw.), add the necessary amount of dye (4—6%), cool down to 150—160° F. with cold water, and enter the material. Then raise to the boil during about ½ hour, boil for a further ½ hour, and carefully add in several portions a strongly diluted solution of 2—5% bisulfate of soda or 1—2% sulfuric acid. After boiling for ¾—1 hour longer, the bath is generally almost exhausted.

After-treatment:—

The after-treatment of the dyeings is best carried out in a fresh bath containing bluestone, bichromate of potash and acetic acid or sulfuric acid. Acetic acid yields especially bloomy shades; those produced with sulfuric acid are somewhat redder, but particularly fast to milling.

For 4—6% dyestuff, an after-treatment with
1½—2% bichromate of potash,
1½—2% bluestone, and
3% acetic acid or ½—1% sulfuric acid
is to be recommended.

Enter at 160° F., raise to the boil, continue boiling for about ¾ hour and rinse.

In some cases, however, especially when dyeing loose wool, it is advantageous to carry out the after-treatment in the dyebath itself. The fastness to rubbing is thereby somewhat diminished, but on the other hand the whole process is considerably simplified.

For this purpose the dyebath is cooled down to about 180° F. with cold water (except when dyeing loose material), and only the quantities of bichromate of potash and bluestone stated — each dissolved separately — are added (no acid); then again raise to the boil, and boil for a further ¾ hour.

Observations.

A reduction of the quantity of bichromate of potash diminishes the fastness to milling. An increased addition of bluestone or sulfuric acid reddens the shade.

In the case of such piece-goods the cleanness of which is doubtful, it is advisable before dyeing to sadden for ½ hour with 1% bichromate of potash and 1% sulfuric acid, and then to rinse.

Cotton fancy threads are tinted only slightly reddish, silk ones on the other hand are strongly stained.

Dyeings done in copper vessels turn out more violet than in wooden ones; iron vessels are unsuited.

Recipe 9:—

Dyeing Acid Dyes on a Chrome Mordant.

(a) *Mordanting* first with

3 % bichromate of potash
2½ % tartar

or, for darker shades,

3% bichromate of potash
1% sulfuric acid.

Enter the material at 140—160° F., raise slowly to the boil, boil for about 1½ hour and rinse.

(b) *Dyeing:—*

Hard water must be corrected with acetic acid before the addition of dyestuff.

Enter cold, raise very slowly to the boil, boil for 1½—2 hours and rinse.

With darker shades the dye must be added in several portions, not all at once.

The following products are also recommended as substitutes for tartar:—

Lactic acid, Lactoline, Lignorosine, Vegetaline, etc.

The following can be dyed on a chrome mordant:—

Cloth Red BA, GA, 3GA
Emin Red
Chrome Fast Red B, R, G
Metachrome Orange R double, paste
Metachrome Yellow D, RD, 2RD
Chrome Fast Yellow R, 2G
Cyprus Blue R.

The following are suitable for shading:—

Indocyanine B
Wool Blue R, 2B, 5B, G extra
Guinea Violet 4B.

Recipe 10:—

Mordanting and Dyeing in One Bath with the Application of Metachrome Mordant.

(Dyeing-process patented).

Metachrome Colors.

The Metachrome Colors are wool dyes with which it is possible, by means of a *dyeing method patented* to us, to carry out the mordanting and dyeing processes with the addition of *Metachrome Mordant* in *one* bath, thus producing dyeings *fast to milling* without the necessity either of a preliminary mordanting or after-treatment.

	Quantity of Metachrome Mordant to employ:—
Metachrome Brown B paste Metachrome Bordeaux B paste Metachrome Bordeaux R paste Metachrome Yellow R paste	for 3 % dye and less: 3 % Metachrome Mordant; for more than 3 % dye: as much Mordant as dye.
Metachrome Yellow D powder Metachrome Yellow RD powder Metachrome Yellow 2RD powder Metachrome Orange R double, paste	for 1½ % dye and less: 3 % Metachrome Mordant; for more than 1½ % dye: twice as much Mordant as dye.

The following serve for shading purposes:—

Cyprus Green B Indocyanine B	for 3 % dye and less: 3 % Metachrome Mordant; for more than 3 % dye: as much Mordant as dye.

When dyeing *loose material,* first prepare the dye-bath with the Metachrome Mordant and then with the necessary amount of dye, which can either be added through a sieve after stirring with hot water, or dissolved in a sufficient quantity of boiling condense water.

Enter hot (not below 140° F.) and dye boiling until the bath is tinted only slightly yellowish; *then boil for about one hour longer in order to completely fix the dye.* To this latter point we wish to draw especial attention; the dyeing operation must not be considered as completed when the bath appears exhausted. Not sufficiently long and too gentle boiling causes incomplete development of the dye and consequently results in diminished fastness to milling.

When dyeing *woolen yarn* and *piece-goods*, it is advantageous for the production of perfectly even dyeings with Metachrome Colors first to sadden the goods for ½—1 hour with about ⅔ the necessary Mordant, then to neutralise the bath (in case it shews an acid reaction) with a trace of ammonia, finally to add the dye with the remainder of the mordant, and to continue to dye boiling in the usual manner.

For dyeing, soft water is best employed. With hard water it is advantageous at first to add the Metachrome Mordant alone, and to boil up well for a few minutes in order to remove the excess of ammonia set free by the calcium carbonate of the water.

When working with apparatuses, it is advantageous to previously dissolve the dyes in boiling condense water and to add them to the liquor in a dissolved state.

BASIC DYES
ON WOOL.

Recipe 11:—

The basic dyes — in so far as they find employment at all on wool — are dyed at about 200° F. without any addition, or with 10% Glaubersalt. With Auramine however, the temperature must not exceed 160—170° F.

The dyestuffs are easily soluble in pure hot water.

Water containing lime must under all circumstances be corrected by an addition of acetic acid (see page 2).

Rubine, Camelia, Cerise, etc.
Rhodamine B, G
Victoria Blue B, R, 4R } are usually dyed acid; see Rps. 1 and 4
Methyl Violet, all brands
Auramine O, II
Bismarck Brown, all brands.

The basic dyes

Malachite Green and
Ethyl Green,

now seldom employed for wool, require for their fixation a previous treatment of the wool with the so-called "Sulphur Mordant".

Sulphur Mordant for 10 lbs. Wool:—

Dissolve

2 lbs. hyposulfite of soda and
1 lb. alum

and add

6½ oz. sulfuric acid.

Enter at 100° F., raise slowly to 180° F., work at this temperature for 1 hour and rinse well.

The material thus mordanted is then entered into the dyebath to which 3 oz. acetate of soda have been added, and dyed at not more than 180° F.

SUBSTANTIVE COTTON DYES ON WOOL.

A series of substantive cotton dyestuffs has gained considerable importance in wool dyeing, since even when dyed direct they generally yield dyeings faster to washing than the acid dyes; some of them can even be employed for articles which have to undergo a not too severe milling. A number of these dyes are distinguished by their fastness on wool towards the action of light and stoving.

The dyestuffs are readily soluble in boiling hot water.

Recipe 12:—

Dye in a neutral boiling bath with an addition of 10—20 lbs. Glaubersalt cryst. (or, if desired, common salt) per 100 gallons liquor. In some cases, especially with such dyestuffs as exhaust with greater difficulty, a small addition of acetic acid towards the end of the dyeing operation is to be recommended.

The most important substantive cotton dyes which come into question for wool are:—

Red:—

Brilliant Congo R
Diamine Red B, 3B
Brilliant Purpurine R, 10B
Benzopurpurine 4B, 6B
Columbia Fast Scarlet 4B
Erica B extra, G extra, 2GN etc.
Congo Rubine
Congo Corinth G, B,
Bordeaux COV

Orange:—

Congo Orange R, G
Brilliant Orange G
Toluylene Orange G

Yellow:—

Chrysophenine G
Chrysamine G, R

Green:—

Columbia Green

Blue:—

Chicago Blue 6B, RW
Chicago Blue 2R, 4R

Violet:—

Columbia Violet R

Brown:—

Congo Brown G, R
Wool Brown G, R

Grey and Black:—

Zambesi Black D, F
Nyanza Black B.

Recipe 12a:—

After-treatment of Substantive Cotton Dyes on Wool with Bluestone.

The dyeings produced on wool according to Recipe 12 with the dyestuffs

Chicago Blue 6B, RW
Chrysophenine G
Congo Brown G, R
Zambesi Black F

can be after-treated in a fresh bath for about ½ hour at the boil with

1—3% bluestone and
½—1% acetic acid.

The shade of Chicago Blue and Chrysophenine dyeings become very much greener.

Advantages of the After-treatment:—

Extraordinary increase in fastness to light.

Fastness of the dyeings against neutral soap-milling.

Recipe 12 b:—

After-treatment of Substantive Cotton Dyes on Wool with Bichromate of Potash and Bluestone.

The dyeings produced on wool according to Recipe 12 with the col dyestuffs

Chrysamine G, R
Congo Brown G, R
Zambesi Black F

can be after-treated in a fresh bath for about ½ hour at the boil with

½—1 % bichromate of potash
1½—3 % bluestone
½—1 % acetic acid.

Advantages of the After-treatment:—

Increase in fastness to light and milling.

Wool Dyes

grouped

according to their

Most Important Properties.

Wool Dyes of particularly good Levelling Powers.

(Levelling dyes or shading dyes, also for light shades.)

Acid dyes (Rp. 1).

Red:—

Guinea Red 4R
Guinea Bordeaux B, G
Guinea Carmine B
Eosamine B
Azo Cardinal G
Azo Orchil R
Acid Magenta S

Orange:—

Mandarine G extra
Orange G
Ponceau 4GB

Yellow:—

Acid Yellow G, R
Acid Yellow D extra
Quinoline Yellow
Naphtol Yellow
Curcumeïne extra
Azo Acid Yellow

Green:—

Guinea Green B, G, etc.

Blue:—

Patent-Blue V
Indigotine

Violet:—

Acid Violet 6B.

The remaining *Acid Dyes* (Rps. 1—10) as well as the *Substantive Dyes* mentioned under Recipe 12, satisfy all practical requirements as to levelling for medium and dark shades. Only the following dyestuffs, which do not so easily dye level, require a little care when dyeing:—

Fast Red A, Bordeaux B, R, Cloth Red, Water Blue, Fast Blue, Nigrosine, Aniline Grey and Silver Grey.

Wool Dyes which in an Acid Dyebath do not stain, or only slightly stain Fancy Cotton or China Grass Effects.

Red:—

Ponceau 4R, 3R, 2R, R, G
Ponceau 10RB—6RB—4RB
Ponceau 2RB—2GB
Ponceau BO extra
Crystal Ponceau
Coccine 2B
New Coccine
Victoria Scarlet 4R—G
Fast Red extra
Azo Rubine S, SG
Bordeaux B, R, S, SF
Brilliant Bordeaux S
Eosamine B
Guinea Red 4R
Guinea Bordeaux B, G
Azo Cardinal G
Azo Orchil R
Acid Magenta S
Cloth Red BA

Orange:—

Orange G, R
Mandarine G extra

Yellow:—

Acid Yellow G, R
Resorcine Yellow
Naphtol Yellow
Chrome Fast Yellow 2G,R (according to Rp. 6)

Green:—

Guinea Green B, G, etc.
Cyprus Green B (according to Rp. 6 or 7)

Blue:—

Indigotine
Patent Blue V
Indocyanine B (according to Rp. 3)

Violet:—

Guinea Violet 4B

Black:—

Amido Acid Black 6B, 4B, B
Acid Black B
Wool Black 474
Wool Black W, WB and the other W-brands: 6BW, 4BW, BSW extra, RSW.

Wool Dyes which in an Acid Dyebath do not stain, or only slightly stain Fancy Silk Effects.

(See pages 220 and 222).

Red:—

New Coccine
Azo Rubine SG
Bordeaux S
Guinea Red 4R
Eosamine B

Orange:—

Orange G

Yellow:—

Acid Yellow G
Naphtol Yellow

Blue:—

Indigotine

Further the following Mordant Dyes:—

Metachrome Brown B
Metachrome Yellow R
Metachrome Bordeaux R
} according to Rp. 10

Cyprus Green B according to Rps. 6 and 10.

Sensitiveness of the Wool Dyes to Metals.

Acid Dyes (Rps. 1—9).

As a rule it is advisable to dye the acid dyestuffs in wooden vessels, since metal vessels have an unfavorable influence on a large number of dyes of this group. Should however circumstances require the employement of metal vessels, tinned ones should be chosen, as in most cases these are not as harmful as copper or iron.

(Sensitiveness of the Wool Dyes to Metals).

(a) *The following are not affected by iron:—*

Blue:—

Water Blue S2K, 3BA
Fast Blue for Wool
Indigotine
Alkali Blue

Violet:—

Acid Violet 6B
Guinea Violet 4B

Grey and Black:—

Aniline Grey
Silver Grey
Nigrosine
Wool Black 474
Chrome Fast Black B.

(b) *The following are not or are only slightly affected by copper:—*

The dyestuffs mentiond under (a) and further:—

Red:—

Emin Red
Cloth Red BA
Rhodamine B, G (become only slightly duller)

Green:—

Cyprus Green B* according to Rp. 7

Blue:—

Indocyanine B (becomes only slightly lighter)
Cyprus Blue R* according to Rp. 7

Black:—

Acid Black B
Wool Black
Wool Jet Black
Hat Black B, T
} all brands
Nerol, all brands (are somewhat reddened)
Chromate Black 6B, 4B, T, TB (become somewhat more violet)

---

* Cyprus Green B and Cyprus Blue R in *direct* dyeings yield bluer shades in copper vessels than in wooden ones; on after-treating with bluestone (Rp. 7) however, this difference again disappears.

(Sensitiveness of the Wool Dyes to Metals).

(c) *The following are not affected by tin:—*

The dyestuffs mentioned under (a) and (b) and further:—

Red:—

Ponceau 4R, 3R, 2R, R, G	Brilliant Scarlet G
Ponceau 10RB—6RB—4RB, 2RB—2GB	Fast Red extra, A, AB
	Acid Magenta S
Ponceau 3RB	Eosine
Ponceau BO extra	Erythrosine
Ponceau S, 2S	Methyl Eosine, Phloxine
Crystall Ponceau	Rose Bengale
Double Brilliant Scarlet G	Chrome Fast Red B, R, G.

The following red dyes become only a little lighter with tin:—

New Coccine	Double Brilliant Scarlet R, 2R
Victoria Scarlet 3R—G	Brilliant Scarlet R, 2R

Orange:—

Mandarine G extra	Ponceau 4GB
Orange G, R	

Yellow:—

Quinoline Yellow	Chrome Fast Yellow 2G,R according to Rp. 6 (somewhat lighter)

Green:—

Guinea Green B, G (somewhat lighter)	Cyprus Green B

Blue:—

Water Blue 2BN, BNW, R, RC	Wool Blue 5B, 2B, R, G extra
Water Blue 4RW, 5RW	
Patent Blue A, V (somewhat lighter)	Victoria Blue B, R, 4R
	Cyprus Blue R.

(Sensitiveness of the Wool Dyes to Metals).

Violet:—

Acid Violet 4B extra (somewhat lighter) — Wool Violet 10B, 6B

Brown:—

Fast Brown G, GR, 3B — Resorcine Brown

Black:—

Nerol, all brands (a little redder) — Chromate Black 6B, 4B, T, TB

The *Metachrome Colors* (Rp. 10):

Metachrome Bordeaux R
Metachrome Yellow R, D, RD, 2RD
Metachrome Orange R double
} are scarcely at all affected by iron, copper and tin

Metachrome Bordeaux B
Metachrome Brown B
} become somewhat lighter with copper only.

Basic Dyes (Rp. 11).

The basic dyes for wool are scarcely at all affected by copper; with tin they become only a little lighter. The following are somewhat sensitive to iron:—

Camelia, Cerise, Auramine, Victoria Blue, Methyl Violet.

Substantive Dyes.

When dyed on wool, the following of the dyestuffs mentioned under Recipe 12 are only affected by iron:—

Chrysamine G, R — Congo Brown G
Chicago Blue 6B, RW — Zambesi Black F.

The shades of the remaining dyes are only very slightly, or not at all, influenced by metal vessels.

Wool Dyes of extreme Fastness to Light.

Acid Dyes (Rp. 1, if nothing is said to the contrary).

Red:—

Ponceau 10RB—6RB—4RB
Ponceau 2RB—2GB
Ponceau BO extra
New Coccine
Azo Coccine 2R
Fast Red A
Azo Rubine S, SG
Eosamine B
Guinea Red 4R
Guinea Carmine B
Guinea Bordeaux B, G
Cloth Red BA, GA (Rps. 6 and 9)

Orange:—

Mandarine G extra
Orange G
Ponceau 4GB
Metachrome Orange R (Rps. 9 and 10)

Yellow:—

Quinoline Yellow
Acid Yellow G
Curcumeïne extra
Chrome Fast Yellow 2G, R (Rp. 9)
Metachrome Yellow R, D, RD, 2RD (Rps. 9 and 10)

Green:—

Cyprus Green B (Rp. 7)

Blue:—

Indocyanine B (Rp. 3)
Cyprus Blue R (Rp. 7)

Brown:—

Metachrome Brown B (Rp. 10)

Black:—

Wool Black GR
Wool Black 474

(of the remaining Wool Blacks the L-brands are the fastest to light).

Acid Black B
Amido Acid Black 6B, 4B, B
Hat Black B, T
Chromate Black 6B, 4B, T, TB (Rp. 8).

In the above list only those dyestuffs possessing a particularly high degree of fastness to light are mentioned. Most of the dyes which are not mentioned as a rule completely satisfy all practical requirements. For further particulars see the *"Tables"*.

The Fastest of the Substantive Dyes to Light on Wool (Rp. 12) are:—

Red:—

Brilliant Congo R
Diamine Red B
Columbia Fast Scarlet 4B
Erica B extra, 2GN, etc.

Orange:—

Congo Orange G, R

Yellow:—

Chrysophenine G
Chrysamine G, R

Blue:—

Chicago Blue 6B } after-treated with bluestone
Chicago Blue RW } according to Rp. 12a

Violet:—

Columbia Violet R

Brown:—

Congo Brown G, R (Rp. 12a and 12b)

Black:—

Zambesi Black D
Zambesi Black F (Rp. 12a and 12b).

Wool Dyes fast to Water.

Acid Dyes (Rps 1—9).

On lying for 24 hours in *cold* distilled water

the following bleed neither into wool nor into cotton:	the following bleed a little into wool but not into cotton:
Red:—	
Ponceau 4R, 3R, 2R	Ponceau R, G
Ponceau 10RB—6RB—4RB	Ponceau 2GB
Ponceau BO extra	
Ponceau 3RB	
Ponceau S, SS	
Crystal Ponceau	
Coccine 2B	
New Coccine	
Victoria Scarlet 4R, 3R	Victoria Scarlet 2R, R, G
Fast Red extra, A, AB	Double Brilliant Scarlet 4R-G
Azo Rubine S, SG	Brilliant Scarlet 4R—G
Bordeaux B, S	Brilliant Bordeaux S
Eosamine B	Guinea Red 4R
Guinea Bordeaux B	Guinea Carmine B
Azo Cardinal G	Guinea Bordeaux G
Azo Orchil R	
Acid Magenta S	
Emin Red	
Cloth Red BA, GA. 3GA	
Chrome Fast Red B, R, G	
Eosine, Methyl Eosine	Rhodamine B, G.
Erythrosine, Phloxine	
Rose Bengale.	

(Wool Dyes fast to Water).

Acid Dyes (Rps. 1—9).

On lying for 24 hours in *cold* distilled water

the following bleed neither into wool nor into cotton:	the following bleed a little into wool but not into cotton:
Orange:—	
Orange G moderate, but the best product of the group	Mandarine G extra Ponceau 4GB
Yellow:—	
Acid Yellow G moderate, but the best product of the group	Quinoline Yellow Acid Yellow R, D extra Metanil Yellow Azo Acid Yellow Curcumeïne extra Naphtol Yellow
Uranine	Martius Yellow
Chrome Fast Yellow R	Chrome Fast Yellow 2G
Green:—	
Guinea Green B	Guinea Green G
Blue:—	
Water Blue 3BA, 2BN, BNW, R, RC, S2K, 4RW 5RW	Victoria Blue B, R, 4R.
Fast Blue for Wool 3B, B, R, BA, RA	
Indigotine	
Patent Blue A, V	
Wool Blue 5B, 2B, R, G extra	
Indocyanine B (Rp. 3)	
Alkali Blue (Rp. 5).	

(Wool Dyes fast to Water).

Acid Dyes (Rps. 1—9).

On lying for 24 hours in *cold* distilled water

the following bleed neither into wool nor into cotton:	the following bleed a little into wool but not into cotton:
Violet:—	
Acid Violet 6B	Acid Violet 4B extra
Guinea Violet 4B	
Wool Violet 10B, 6B	
Brown:—	
Fast Brown 3B	Fast Brown G, GR
	Resorcine Brown
Grey and Black:—	
Aniline Grey	Hat Black B, T
Silver Grey	Woll Black 6B, 4B, 4BF, B
Nigrosine	
Acid Black B	Wool Black 4BL, 4BFL, W, WB.
Wool Black 474	
Wool Black 6BW, 4BW, BSW extra, RSW, GR	
Nerol, all brands	

All the dyestuffs after-treated according to Rps. 6—8, as well as those dyed on a chrome mordant according to Rp. 9, are *fast to water,* with the exception of Chrome Fast Yellow 2G, which bleeds somewhat into wool.

All *Metachrome Dyes* (Rp. 10) are fast to water.

Substantive Dyes.

All the dyestuffs mentioned under Recipe 12 are fast to water as far as wool is concerned, but bleed into cotton. The substantive dyes after-treated according to Recipe 12a and 12b bleed neither into wool nor into cotton.

Wool Dyes fast to Alkalies

(fast against street-dust).

Acid Dyes:—

Red:—
Orange:—
Yellow:—

All the red, orange, and yellow dyestuffs mentioned under Recipes 1—4 are fast to alkalies except Acid Magenta S, Ponceau S, 2S, and Uranine

Green:—

Gulnea Green B
(only moderately fast to alkalies)

Blue:—

Indigotine
Patent Blue A, V
Wool Blue 5B, 2B, R, G extra
Indocyanine B (Rp. 3)
Alkali Blue (Rp. 5) decolorised by alkalies; the shade returns on acidulating

Violet:—

Acid Violet 4B extra
Guinea Violet 4B
Wool Violet 10B, 6B

Brown:—

Resorcine Brown
Fast Brown G

Black:—

Wool Black, Wool Jet Black, Acid Black B — all brands
Hat Black B, T
Nerol B, 2B, 4B, etc. (Rp. 2)
Amido Acid Black 6B, 4B, B.

Basic Dyes (Rp. 11).

Red:—

Rhodamine B (also Rp. 1)

Violet:—

Methyl Violet.

Substantive Dyes (Rp. 12).

All the dyestuffs mentioned under Recipe 12 are fast to alkalies.

Wool Dyes fast to Washing,

which also withstand a slight milling.

Acid Dyes (Rp. 1). The dyestuffs do not bleed, or only very slightly bleed, into wool or cotton washed at the same time.

Red:—

Fast Red A
Emin Red
Cloth Red BA, GA, 3GA
Chrome Fast Red B, R, G (bleed a little into cotton)

Yellow:—

Acid Yellow G, R
Curcumeine extra
Azo Acid Yellow

Blue:—

Wool Blue 5B, 2B, R
G extra
Patent Blue A
Victoria Blue B, R, 4R
Indocyanine B (Rp. 3)

Violet:—

Guinea Violet 4B
Acid Violet 4B extra
Wool Violet 10B, 6B

Black:—

Wool Black 474
Nerol, all brands.

Substantive Dyes on Wool (Rp. 12, 12a and 12b).

All the dyestuffs mentioned under Recipe 12 are fast to washing or resist a slight milling, though they stain cotton washed at the same time.

Wool Dyes fast to Washing and Milling.

Red:—

Cloth Red BA, GA, 3GA
Emin Red
Chrome Fast Red B, R, G
} according to Rp. 6 or 9.

Metachrome Bordeaux B, R according to Rp. 10.

Orange:—

Metachrome Orange R double
according to Rp. 10.

Yellow:—

Chrome Fast Yellow 2G, R
according to Rp. 6 or 9.

Metachrome Yellow R, D, RD, 2RD
according to Rp. 6, 9 or 10.

Green:—

Cyprus Green B
according to Rp. 6, 7 or 10.

Blue:—

Cyprus Blue R
according to Rp. 6.

Indocyanine B
according to Rp. 10 (for shading purposes).

Wool Blue R, 2B, 5B, G extra
according to Rp. 9 (for shading purposes).

Violet:—

Guinea Violet 4B
according to Rp. 9 (for shading purposes).

Brown:—

Metachrome Brown B
according to Rp. 10.

Black:—

Chrome Fast Black B
according to Recipe 6.

Chromate Black 6B, 4B, T, TB
according to Rp. 8.

Wool Dyes fast to Acids.

Acid Dyes.

All the dyestuffs mentioned under Recipes 1 to 10 are fast to acids with the exception of

Acid Yellow D extra	Eosine
Metanil Yellow	Methyl Eosine
Martius Yellow	Erythrosine
Uranine	Phloxine
	Rose Bengale.

Basic Dyes.

The following are fast to acids:—

Rhodamine B, G
Victoria Blue B, R, 4R.

Substantive Dyes.

All the dyestuffs mentioned under Recipe 12 are fast to acids, with the exception of

Benzopurpurine
Brilliant Purpurine
Congo Rubine
Congo Corinth.

The dyestuffs

Congo Orange G, R
Zambesi Black D

which are largely employed for woolen and union materials, although only of medium fastness to acids, perfectly satisfy all practical requirements.

Wool Dyes fast to Carbonising.

The *Acid Dyes* and *Basic Dyes* mentioned as being *fast to acids* are also fast to carbonising.

Of *Substantive Dyes* the following are fast to carbonising:—

Red:—

Brilliant Purpurine R
Benzopurpurine 4B
Columbia Fast Scarlet 4B
Erica B extra, 2GN, etc.
Bordeaux COV

Yellow:—

Chrysophenine G

Green:—

Columbia Green

Blue:—

Chicago Blue 6B, RW
in direct dyeings
Chicago Blue 2R, 4R

Violet:—

Columbia Violet R

Grey and Black:—

Zambesi Black F.

Wool Dyes fast to Stoving.

Acid Dyes (Rp. 1) and *Basic Dyes* (Rp. 11).

Red:—

Ponceau 4R, 3R, 2R, R, G
Ponceau 10RB
Ponceau 3RB
Double Brilliant Scarlet 4R
Brilliant Scarlet 4R
Fast Red A
Brilliant Bordeaux S
Eosamine B
Guinea Red 4R
Guinea Carmine B
Guinea Bordeaux B, G
Azo Orchil R
* Rhodamine B, G
Emin Red
Cloth Red 3GA
Eosine, Methyl Eosine, Erythrosine, Phloxine, Rose Bengale (Rp. 4).

Orange:—

Orange G

Yellow:—

Quinoline Yellow
Azo Acid Yellow
Curcumeïne
Uranine (Rp. 4) fairly good.
Chrome Fast Yellow 2G
* Auramine (see Rp. 11)

Blue:—

Fast Blue for Wool 3B, B, etc.
Indigotine
Patent Blue A, V fairly good.
Wool Blue 5B, 2B, R G extra
* Victoria Blue B, R, 4R
Alkali Blue (Rp. 5).

---

* For the production of shades on wool which are to be subsequently stoved,
Rhodamine, Auramine and Victoria Blue
are preferably employed in a soap-bath at about 120° F.

(Wool Dyes fast to Stoving).

Violet:—

Acid Violet 4B extra
Wool Violet 10B, 6B
Guinea Violet 4B

Brown:—

Fast Brown G

Grey and Black:—

Aniline Grey
Silver Grey
Nigrosine
Amido Acid Black 6B, 4B, B
Chrome Fast Black B (Rp. 6)
Nerol B, 2B etc. (Rp. 2) fairly good.
Chromate Black 6B, 4B, etc. (Rp. 8) fairly good.

Substantive Dyes (Rp. 12).

Of the dyestuffs mentioned under Recipe 12 the following are particularly fast to stoving:—

Red:—

Brilliant Congo G, R
Diamine Red B, 3B
Brilliant Purpurine R, 10B
Columbia Fast Scarlet 4B
Erica B extra, 2GN, etc.
Bordeaux COV

Orange:—

Congo Orange G, R

Yellow:—

Chrysophenine G

Blue:—

Chicago Blue 6B, RW
Chicago Blue 2R, 4R

Violet:—

Columbia Violet R

Brown:—

Congo Brown G, R.

Wool Dyes fast to Steaming.

Acid Dyes (Rps. 1—10).

Red:—

Ponceau 4R, 3R, 2R, R, G very good.
Crystal Ponceau very good.
Coccine 2B fairly good.
New Coccine
Victoria Scarlet 4R, 3R, 2R
Victoria Scarlet R, G fairly good.
Azo Coccine 2R
Ponceau BO extra
Double Brilliant Scarlet 4R—G
Brilliant Scarlet 4R—G
Fast Red extra, A, AB very good.
Azo Rubine S, SG
Bordeaux B, S, SF
Brilliant Bordeaux S
Guinea Red 4R
Guinea Carmine B
Eosamine B fairly good.
Guinea Bordeaux B, G fairly good.
Azo Orchil R
Acid Magenta S very good.
Rhodamine B, G fairly good.
Emin Red very good.
Cloth Red BA, 3GA
Chrome Fast Red B, R, G
Eosine fairly good.
Methyl Eosine
Erythrosine
Phloxine
Rose Bengale
Metachrome Bordeaux B, R (Rp. 10)

Orange:—

Mandarine G extra
Orange G, R
Metachrome Orange R (Rp. 10)

Yellow:—

Quinoline Yellow
Curcumeïne
Acid Yellow G, R moderate, but applicable.
Chrome Fast Yellow 2G, R (Rps. 6 and 9)
Metachrome Yellow D, RD, 2RD

Green:—

Guinea Green B, G, etc.
Cyprus Green B
Rps. 6 and 7 moderately good
Rp. 10 very good.

(Wool Dyes fast to Steaming).

Blue:—

Water Blue 3BA, 2BN BNW
Water Blue R, RC S2K, 4RW, 5RW
Fast Blue for Wool 3B, B, R
Fast Blue for Wool BA, RA moderately good.
Indigotine
Patent Blue A, V
Wool Blue 5B, 2B, R, G extra
Victoria Blue B, R, 4R
Indocyanine B very good.
Alkali Blue (Rp. 5)
Cyprus Blue R (Rps. 6 and 7) moderately good.

Violet:—

Acid Violet 6B, 4B extra
Guinea Violet 4B
Wool Violet 10B, 6B

Brown:—

Fast Brown G
Metachrome Brown B (Rp. 9) very good.

Grey and Black:—

Aniline Grey
Silver Grey
Nigrosine
Acid Black B very good.
Amido Acid Black 6B, 4B, B
Hat Black B, T very good.
Wool Black all brands (except 474) very good.
Nerol B, 2B, 4B, etc. moderately good.
Chrome Fast Black B
Chromate Black 6B, 4B, etc.

The *Basic Dyes* applicable for wool (except Auramine) possess good fastness to steaming.

Substantive Dyes.

Of the dyestuffs mentioned under Recipe 12 the following are fast to steaming:—

(Wool Dyes fast to Steaming).

Red:—

Brilliant Congo R
Diamine Red B, 3B
Brilliant Purpurine R, 10B
Benzopurpurine 4B, 6B
Columbia Fast Scarlet 4B
Erica B extra, G extra
2GN, etc.

Orange:—

Congo Orange R, G
Brilliant Orange G
Toluylene Orange G

Yellow:—

Chrysophenine G
Chrysamine G, R

Blue:—

Chicago Blue 6B, RW
Chicago Blue 2R, 4R

Brown:—

Congo Brown R, G

Violet:—

Columbia Violet R

Black:—

Zambesi Black D
fast against moderate steaming.

Silk.

ACID DYES
ON SILK.

Recipe 13:—

Dye in a boiled-off liquor bath broken with sulfuric acid, commencing at 100—120° F. and later at about 200° F. After dyeing, rinse and brighten in water slightly acidulated with sulfuric acid.

The acid dyes can also be dyed without boiled-off liquor. Enter the material at 70—90° F., commencing simply with an addition of acetic acid, and only add sulfuric acid after having raised the temperature. Rinse and brighten with sulfuric acid.

For the dyeing of silk all the acid dyes mentioned under Recipe 1 (pages 23—25) can be employed. In the first place, however, only the following of those dyes come into question:—

Acid Dyes for Silk.

Red:—

Ponceau 4R, 3R, 2R, R, G

Ponceau 10RB, 6RB, 4RB to 2GB

* Ponceau BO extra

* Ponceau 3RB

Crystal Ponceau

Coccine 2B

New Coccine

Victoria Scarlet 4R—G

W * Azo Coccine 2R

Double Brilliant Scarlet 4R—R

W * Double Brilliant Scarlet G

Fast Red extra

W * Fast Red A

Azo Rubine S, SG

Bordeaux B, R

Bordeaux S, SF

Eosamine B

W Azo Cardinal G

Azo Orchil R

Acid Magenta S

W Emin Red

W Cloth Red GA, 3GA

Orange:—

Mandarine G extra

Orange G, R

* Ponceau 4GB

W The dyes marked "W" are particularly fast to water.

* The dyes marked thus * are also adapted for silk weighted with tin (see Rp. 13a).

Yellow:—

* Quinoline Yellow

Acid Yellow D extra, Metanil Yellow — brighten with acetic acid, see page 63.

Resorcine Yellow

W * Azo Acid Yellow

W * Curcumeïne

Naphtol Yellow

W Metachrome Yellow D—2RD after-treated with bichromate of potash and sulfuric acid.

Green:—

W Guinea Green B, G, etc.

Blue:—

W * Light Blue for Silk 1000, 1001, 1010

Brilliant Silk Blue 10B

* Brilliant Silk Blue 7B

W * Methyl Blue OO

W Water Blue 6B—B, BR, R, S2K

Indocyanine B to be dyed according to Rp. 15.

W * Fast Blue for Silk 2B

Indigotine

Patent Blue A, V

W * Wool Blue 5B, 2B, R, G extra

W * Victoria Blue B, R, 4R †

Violet:—

W * Acid Violet 6B

W * Guinea Violet 4B

W * Wool Violet 10B, 6B

W The dyes marked "W" are particularly fast to water.

* The dyes marked thus * are also adapted for silk weighted with tin (see Rp. 13a).

† Victoria Blue, although belonging to the basic dyestuffs is also dyed according to this Recipe.

Brown:—

W*Fast Brown 3B

W*Resorcine Brown

Grey:—

W*Aniline Grey

Silver Grey

W*Nigrosine

Black:—

Wool Black 6B

Wool Black GR

Silk Black 4BF extra,
6B extra.

Recipe 13a:— (for weighted silk).

Dye in a boiled-off liquor bath (with as little water and as much boiled-off liquor as possible) only very slightly broken with acetic acid. Enter at 100° F., raise after a while to about 140° F. and later near to the boil. After dyeing rinse well and brighten with acetic acid.

All the dyestuffs in the preceding list marked thus * can be dyed according to this recipe.

Recipe 14:— (for Alkali Blue *).

Dye with an addition of $\frac{1}{6}$—$\frac{1}{3}$ oz. Marseilles soap per gallon at about 200° F., rinse and acidulate in a fresh bath at 120° F. with 2—5 % sulfuric acid.

The dyeings are fast to water.

W The dyes marked "W" are particularly fast to water.

* The dyes marked * are also adapted for silk weighted with tin (see Rp. 10a).

BASIC DYES
ON SILK.

Recipe 15:—

Dye in a boiled-off liquor bath broken with acetic acid (or tartaric or citric acid) at 100—180° F., or — without boiled-off liquor — only with an addition of acetic acid, entering cold and heating gradually to 180° F. After rinsing, brighten in water slightly acidulated with acetic acid.

* Basic Dyes for Silk.

Red:—

Rubine
Camelia
Cerise
Isorubine
Safranine
Brilliant Safranine
Rhodamine

Orange:—

Chrysoïdine

Yellow:—

Phosphine extra, N
Aurophosphine 4 G
Auramine

---

* All basic dyes are adapted for silk weighted with tin (see Rp. 13 a).

Green:—

W Ethyl Green Malachite Green

Blue:—

Methylene Blue.

W Diphene Blue B, R (Base)

Violet:—

W Methyl Violet 6B—2B W Methyl Violet B—4R

Brown:—

Bismarck Brown.

Recipe 15a:—

The basic dyes can be fixed on silk very fast to washing and water by dyeing with an addition of acetic acid and then mordanting (a) with tannic acid, and fixing (b) with tartar emetic in fresh baths.

The weakly acid

Eosine Dyes *

Eosine	Phloxine
Methyl Eosine	Rose Bengale
Erythrosine	Uranine

can also be dyed according to Recipe 15 (see page 31).

W The dyes marked "W" are particularly fast to water.

* The Eosine Dyes are also adapted for silk weighted with tin (see Rp. 13a).

SUBSTANTIVE COTTON DYES ON SILK.

Like on wool (see page 43), a number of substantive cotton dyes also yield dyeings fast to washing and water on silk; the good fastness to light of almost all these dyes is particularly worthy of note (see page 86).

Recipe 16:—

Dye either in a boiled-off liquor bath slightly broken with acetic acid, commencing at 100—120° F. and later at about 180° F. or, without boiled-off liquor, with an addition of 10% Glaubersalt and very little acetic acid, entering at 120—140° F. and after a while raising to the boil.

With dyestuffs which exhaust less easily, a little acetic acid should be added towards the end of the dyeing operation.

After dyeing, rinse and brighten in water slightly acidulated with acetic acid.

Substantive Cotton Dyes for Silk.

Red:—

Brilliant Congo R
Benzopurpurine 4B
Brilliant Purpurine R, 10B
Diamine Red B
Congo Corinth G, B
Congo Rubin
Columbia Fast Scarlet 4B
W Erica B extra, etc.
W Salmon Red

Orange:—

Congo Orange G, R
Brilliant Orange G
Toluylene Orange G
W Mikado Orange GO-4RO

Yellow: —

Chrysophenine G
Chrysamine G, R
W Columbia Yellow
W Curcumine S

Green:—

Columbia Green

Blue:—

Chicago Blue 6B, 4B, B, RW
W Chicago Blue R
Chicago Blue 2R, 4R

W The dyes marked "W" are particularly fast to water.

Violet:—

Columbia Violet R

Brown:—

Congo Brown G, R
Columbia Brown R
Catechu Brown DX, 2DX, 3DX
W Zambesi Brown G, 2G

Grey and Black:—

Neutral Grey G
Zambesi Black D.

Recipe 16a:—

After-treatment of Substantive Cotton Dyes on Silk.

Certain substantive dyes can also undergo the usual after-treatments on silk, in the same way as on the cotton fibre (see *"Cotton"*, Rps. 21—26).

For silk

Diazotising and Developing (according to Recipe 21)

first come into question in case special requirements are made as to the *fastness* of the dyeings *against water, washing and milling.*

W The dyes marked "W" are particularly fast to water.

The following dyes are suitable for diazotising and developing on silk:—

	to be developed with:—
Primuline Zambesi Pure Blue 4B Naphtogene Blue 2R, 4R Zambesi Indigo Blue R	β-Naphtol
Zambesi Brown G, 2G Columbia Brown R Zambesi Black D, F, BR, R, V	Toluylene Diamine or Nerogene D.

The remaining methods of after-treatment (Rps. 22—26) are as a rule seldom employed on silk, but can also be into consideration if particular fastness is required, as is for example the case when dyeing

Silk Noils, Waste Silk and Silk Burls,

which are intended to serve as silk effects in woolen piece-goods; if no special requirements as to fastness are made, all the other silk dyes can of course be employed.

Silk Dyes

grouped

according to their

Most Important Properties.

Silk Dyes of extreme Fastness to Light.

Acid Dyes (Rp. 13).

Red:—

Ponceau 10RB, 6RB, 4RB
Ponceau 2RB—2GB, G
Ponceau BO extra
Ponceau 3RB
Ponceau 4R—R (somewhat inferior to the preceding brands)
Crystal Ponceau
Coccine 2B
New Coccine
Victoria Scarlet 4R—G
Fast Red extra
Azo Rubine S, SG
Bordeaux S
Eosamine B
Azo Cardinal G
Azo Orchil R
Cloth Red BA, GA

Orange:—

Mandarine G extra
Orange G, R
Ponceau 4GB

Yellow:—

Quinoline Yellow
Acid Yellow D extra
Metanil Yellow
Resorcine Yellow
Azo Acid Yellow
Curcumeine
Metachrome Yellow D—2RD (after-treated with bichromate of potash and sulfuric acid)

Green:—

Guinea Green B, G, etc.

Blue:—

Light Blue for Silk 1000 1001, 1010
Methyl Blue OO
Water Blue 6B—B, BR, R, S2K
Indocyanine B (Rp. 15)
Patent Blue A, V
Alkali Blue (Rp. 14).

(Silk Dyes of extreme Fastness to Light).

Brown:--

Resorcine Brown

Grey and Black:—

Nigrosine Wool Black GR

In the preceding list only those dyestuffs of especial fastness to light are mentioned. Of the rest the majority perfectly satisfy all the requirements usually made in practice. See the *"Tables"*.

Of the

Basic Dyes

mentioned under Recipe 15 the fastest to light are:—

Rhodamine
Ethyl Green
Malachite Green
Diphene Blue R Base

The fastness to light of the

Eosine Dyes

is only slight. The

Substantive Cotton Dyes

mentioned under Recipe 16 possess very good fastness to light on silk, with the exception of the Chicago Blue brands in *direct* dyeings. The dyeings of

Chicago Blue 6B, 4B, B, RW

after-treated with bluestone according to Recipe 25, on the other hand, are extraordinarily fast to light.

The dyes mentioned under Recipe 16a, diazotised and developed according to Recipe 21, also possess good fastness to light on silk.

Fastness to Light of the Dyes on Silk Weighted with Tin.

In the following list the dyes which are fastest to light on silk weighted with tin are marked "L", of these again the fastest ones with "L!"

Of the dyestuffs mentioned under Rps. 13—15 those are specially pointed out which also dye on silk weighted with tin according to Recipe 13a. Of these however only the following chiefly find employment in practice:—

Basic Dyes.	*Acid Dyes.*
Red:—	
L Rubine	L Double Brilliant Scarlet G
L Camelia B, 2B	L! Ponceau BO extra
L Cerise G, B, 2B	L Fast Red A
L Isorubine	
Brilliant Safranine G	
Rhodamine B, G	
Orange:—	
Chrysoïdine	L! Ponceau 4GB
Yellow:—	
Auramine	L! Quinoline Yellow
Aurophosphine 4G	L Azo Acid Yellow
	L Curcumeïne
Green:—	
L Malachite Green	

(Fastness to Light of the Dyes on Silk Weighted with Tin).

	Basic Dyes.	*Acid Dyes.*
Blue:—		
	L Methylene Blue	L Light Blue for Silk 1000, 1001, 1010
	L Diphene Blue B, R (Base)	L Brilliant Silk Blue 7B
	Victoria Blue B, R, 4R	L Methyl Blue OO
		L! Indocyanine B
		L Fast Blue 2B for Silk Wool Blue 5B, 2B, etc.
Violet:—		
	Methyl Violet 6B—2R	Guinea Violet 4B
	L Methyl Violet 4R	
Brown:—		
	Bismarck Brown	L Resorcine Brown
Grey:—		
		L Nigrosine G, 3G,
		L Aniline Grey.

Silk Dyes fast to Water.

	Acid Dyes.	
Red:—		
	Azo Coccine 2R	Azo Cardinal
	Double Brill. Scarlet G	Emin Red
	Fast Red A	Cloth Red 3GA, GA
Yellow:—		
	Curcumeine	Metachrome Yellow D—2RD (after-treated with bichromate of potash and sulfuric acid)
	Azo Acid Yellow	
Geen:—		
	Guinea Green B	

(Silk Dyes fast to Water).

Blue:—

Light Blue for Silk 1000 1001, 1010
Methyl Blue OO
Water Blue 6B—B, BR, R, S2K
Fast Blue 2B for Silk
Wool Blue 5B, 2B, etc.
Victoria Blue B, R, 4R
Alkali Blue (Rp. 14)

Violet:—

Acid Violet 6B
Guinea Violet 4B
Wool Violet 10B, 6B

Brown:—

Fast Brown 3B
Resorcine Brown

Grey:—

Aniline Grey
Nigrosine

Basic Dyes.

The following are particularly fast to water:—

Green:—

Ethyl Green

Blue:—

Diphene Blue B, R Base

Violet:—

Methyl Violet 6B—2B.

The remaining basic dyes are only moderately fast to water, but can be fixed according to Recipe 15a.

Substantive Cotton Dyes.

The dyestuffs mentioned under Recipe 16 are fairly fast to water, especially those marked "W"

(see also page 90).

Silk Dyes fast to Water, Washing and Milling.

Acid Dyes and *Basic Dyes.*

Emin Red
Cloth Red 3GA, GA
Nigrosine
Victoria Blue B, R, 4R
Diphene Blue B, R Base
Metachrome Yellow D—2RD (after-treated with bichromate of potash and sulfuric acid)

The

Basic Dyes,

dyed and subsequently fixed with tannin according to Recipe 15a, are fast to washing and water.

The

Substantive Dyes

mentioned under Recipe 16 are all fairly fast to washing on silk, but bleed into cotton washed simultaneously.

The following dyes are particularly *fast to washing* and at the same time *fast to water:*—

Erica B extra, 2GN, etc.
Salmon Red
Mikado Orange GO—4RO
Columbia Yellow
Chicago Blue R
Zambesi Brown G, 2G

The substantive dyes mentioned under Recipe 16a and diazotised and developed according to Recipe 21, are *fast to water, washing* and *milling.*

The following combinations are mostly employed:—

Primuline diazotised and developed with β-Naphtol,
Zambesi Black D or V diazotised and developed with Toluylene Diamine.

Fastness of the Silk Dyes to Acids and Stoving:—

as on wool; see pages 63 and 65.

The diazotised and developed dyeings (see page 81) are fast to acids and stoving.

Cotton.

SUBSTANTIVE COTTON DYES ON COTTON.

The substantive cotton dyes, i. e. those which exhaust direct without a previous mordant (also called Direct, Benzidine, Benzo, Diamine, Dianil, Oxamine, etc. dyes) form the most important class of dyestuffs for cotton and other vegetable fibres. They owe this chiefly to their simple and cheap manner of dyeing, their level-dyeing properties, their good penetrating power, as well as to their property of leaving the dyed material its original character (softness, gloss, good spinning properties, etc.).*

Solution:—

The dyes can without exception be readily dissolved by pouring boiling hot water upon them. It is advisable to use the softest water it is possible to obtain (distilled or condense water).

Hard water, before it can be employed for dissolving, must previously be boiled up with a little soda.

It is preferable in all cases to add the dyestuff to the dyebath not in the solid state, but in solution.

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* The *first* substantive cotton dye, *viz.*, Congo, was placed on the market in 1885 by us.

Recipe 17:— (for Substantive Dyes on Cotton).

As a rule the dyeing is carried out in a neutral or weakly alkaline boiling bath with an addition of

Glaubersalt and soda (or soap).

For

Yarns, Loose Cotton, Hose, etc.

the following quantities are usually employed with a proportion of 1 part material to 20 parts liquor.

For light shades:—

3—5 % soap (and, if desired, 1 % soda ash)
5—10 % Glaubersalt cryst.

For medium shades:—

2 % soda ash (or 3—5 % soap)
10—30 % Glaubersalt cryst.

For dark shades:—

2 % soda ash
30—50 % Glaubersalt cryst.

For reasons of economy *common salt* is often employed in the place of Glaubersalt (*viz.* one-half the quantities given for crystallised Glaubersalt); the latter however in almost all cases yields better results.

For dark shades the dyebath should be made up as concentrated — *i. e.* the liquor should be as short — as possible.

Enter at about 100—120° F., raise to the boil and keep at or near the boil on an average for 1 hour.

With dyes which exhaust less readily it is occasionally advisable, in order to employ the dyebath to better advantage, to dye boiling hot for only about ¾ hour and then to continue dyeing for 15—25 minutes in the cooling bath (see also Rps. 18 and 19).

When

dyeing continuously in the same bath

the dye-liquor need not first be cooled down; the material can be entered direct into the boiling bath. The additions of Glaubersalt and soda must be replenished in proportion to the loss resulting from the dyeing of the first lot; only about ⅕—⅓ of the quantities originally employed will be required. An excessive amount of salt in the bath will cause the dyestuff to precipitate and uneven dyeings will consequently result.

The salt contained in the liquor is best measured by means of the hydrometer. With medium shades the liquor should measure about 2° Tw., with darker shades not more than 4½—6° Tw. (at 60° F.).

In order to obtain fuller and more brilliant *Red* shades, the yarn, after dyeing, may be passed through a bath containing 5—10% Turkey Red Oil solution. This Turkey Red Oil solution is prepared by dissolving 5 parts soda in 75 parts water and then adding 25 parts neutral Turkey Red Oil during continual stirring.

The shade of *Black* dyeings may be considerably improved by a subsequent passage through a tepid soap bath containing olive oil. This bath is prepared by dissolving about 1 lb. Marseilles soap in 2 gallons water; ½ lb. olive oil is added and the whole diluted to 20 gallons.

For the dyeing of

Loose Cotton, Yarn in Hanks, Cops, Bobbins, etc.

in Mechanical Apparatuses,

which generally require to be worked with *short* liquors, easily soluble dyes are given the preference. Almost all substantive cotton dyes (except Congo 4R, Congo Corinth, Chrysamine, Azo Blue, Azo Violet) are suitable for this purpose.

The somewhat less readily soluble products, such as Zambesi Black R and BR, are best only employed in such apparatuses as permit of a working with somewhat longer liquors.

The dyeing of substantive dyestuffs on

Cotton Piece-Goods

is generally carried out according to three different methods, *viz.*

in the **Jigger,**

in the **Open Vat,**

in the **Padding Machine.**

The **Dyeing in the Jigger** is probably the method most generally employed, because the liquor, which is very concentrated in proportion to the weight of the material to be dyed, is used to the best advantage.

For *light* shades prepare the dye-bath, which must *not* be *too dilute,* with one-half the necessary quantity of dye and $\frac{1}{3}$—$\frac{1}{2}$ oz. soap per gallon of liquor. After

the first end add the remainder of the dyestuff (previously dissolved in water) and after the third or fourth end about $\frac{5}{8}$ oz. Glaubersalt crysts. per gallon. For completing the process 6 ends altogether generally suffice. The temperature, which at the commencement should be about 160—180° F., must be gradually raised to the boil.

For *dark* shades the liquor should be as *concentrated* as possible. Add the requisite quantity of dye and 1—2 oz. Glaubersalt crysts. and if necessary $\frac{1}{8}$—$\frac{1}{3}$ oz. soda ash per gallon (which latter should be added in two portions) and dye to pattern at the boil in 8 to 12 ends. Since with dark shades the baths do not completely exhaust, it is for economical reasons advisable to preserve them for further lots. For continuous dyeing an addition of $\frac{1}{4}$ the quantities of Glaubersalt and soda used in the first bath will suffice.

Whilst for full shades it is advisable to *rinse* — best *after some time,* not immediately after the conclusion of the dyeing process — for light shades this may be altogether dispensed with.

Heavy and *closely-woven* fabrics which are difficult to penetrate, are treated similarly, only with the difference that for light as well as dark shades the addition of Glaubersalt must be made after having dyed for some time with the dyestuff alone.

The **Dyeing in the Open Piece Vat** with a winch in "chain"-form is usually only carried out with light and thin fabrics. Contrary to jigger dyeing, the material remains in contact with the hot liquor with only very short interruptions, thus producing brighter and more

beautiful shades. The baths, which must of course be kept more dilute than in the jigger, are — even for moderately dark shades — best preserved for further lots.

For *light shades* add 2—3 lbs. soap and 5—7 lbs. Glaubersalt crysts. per 100 gallons liquor besides the necessary quantity of dye; enter fairly hot and dye boiling hot for ¾ to 1 hour.

For *dark shades* use about 15 lbs. Glaubersalt crysts. and if necessary ½—1 lb. soda ash per 100 gallons; dye boiling hot for about ¾ hours, then turn off steam and continue dyeing for a further 15 to 25 minutes.

The **Dyeing in the Padding Machine** occurs under similar conditions as in the jigger, only the liquor is considerably shorter, and the goods, after running through the dye-bath, are, for the sake of quicker penetration, passed through a squeezing arrangement consisting of two or three rollers.

The padding machine is chiefly employed for light or medium shades. The dyeing is carried out with an addition of ⅛—⅓ oz. soda ash and 1—2 oz. Glaubersalt crysts. per gallon at 140° F., darker shades at 180° F. The dyeing is generally completed in one to three passages; the goods are usually not rinsed.

Occasionally, especially when the dyeings are to be finished after a single passage, only slight requirements being made as to the fastness of the dyeings to washing and rubbing, a little thickening (such as Tragacath-water, Dextrine, etc.) is added to the dye-bath and the goods are run into the trough in a dry state.

Substantive Dyes for Cotton.

Red:—

Congo

Congo 4R

Brilliant Congo G, R

Benzopurpurine 10B, 6B, 4B, 4BG, B

Brilliant Purpurine R, 10B

Diamine Red, B, 3B

Rosazurine G, B

Congo Corinth G, B

Congo Rubine

Columbia Fast Scarlet 4B

Erica B extra, G extra, 2GN, etc.

Salmon Red

Bordeaux COV

Primuline developed with β-Naphtol (Rp. 21)
see foot-note on page 100

Orange:—

Congo Orange R, G

Columbia Orange R

Brilliant Orange G

Toluylene Orange G
(see also Rps. 24 and 25)

Orange TA

Mikado Orange GO, 4RO

Yellow:—

Chrysamine G, R
(see also Rps. 24 and 25)

Chrysophenine G
(see also Rp. 23)

Columbia Yellow
(see also Rps. 21 and 23)

Curcumine S
(see also Rp. 21)

Thiazol Yellow

Mikado Yellow

Mikado Golden Yellow 8G

Yellow:—

* Primuline (see also Rp. 21)

Green:—

Columbia Green

Columbia Black-Green D

Blue:—

Chicago Blue 6B, 4B, B, RW (see also Rp. 23)

Chicago Blue R, 2R, 4R

Columbia Blue G, R

Congo Sky Blue

Congo Blue BX

Erie Blue BX

Benzoazurine R, G, 3G (see also Rp. 23)

Brilliant Azurine 5G (see also Rp. 23)

Brilliant Azurine B

Azo Blue

Congo Blue 2B (see Rp. 23)

Solamine Blue B, R, FF

Congo Fast Blue B, R

Congo Fast Blue HW (for union dyeing, see Rp. 41)

Columbia Fast Blue 2G

Columbia Black-Blue G

Zambesi Pure Blue 4B, R (see Rps. 21 and 22; diazotising and developing.)

Zambesi Indigo Blue R (see Rps. 21 and 22; diazotising and developing.)

Naphtogene Blue 2R (see Rps. 21 and 22; diazotising and developing.)

Naphtogene Blue 4R (see Rps. 21 and 22; diazotising and developing.)

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* Primuline scarcely at all finds employment as a direct yellow on account of its slight fastness. The dyeings can however be made considerably faster to washing, milling and light by an after-treatment with *chloride of lime*. This after-treatment, which at the same time yields redder shades of yellow, is carried out by treating the direct dyeing in a cold chloride of lime bath of $\frac{1}{2}^{0}$ Tw. for about $\frac{1}{4}$ hour, rinsing, acidulating with hydrochloric acid, and finally again rinsing well.

Violet:—

Columbia Violet R

Azo Violet

Heliotrop 2B

Brown:—

Congo Brown G, R
(see also Rps. 23, 24 and 25)

Columbia Brown R
to be employed direct as well as diazotised and developed. (Rp. 21)

Chromanil Brown R, 2G
Direct dyeings of no interest. To be after-treated according to Rp. 24.

Catechu Brown DX, 2DX, 3DX
to be employed both direct and according to Rps. 23 and 24.

Catechu Brown GK, FK, FDK
to be employed both direct and according to Rp. 23.

Zambesi Brown G, 2G
in *direct* dyeings:—
G:— corinth brown
2G:— dull violet.
Chiefly employed diazotised and developed with Toluylene Diamine according to Rp. 21.

Grey and Black:—

Neutral Grey G

Nyanza Black B

Grey and Black:—

Columbia Black R, B

Columbia Black FB, F2B, FF extra

Columbia Black 2BX, 2BW

Columbia Black 3B, 4B

Columbia Black EA extra, WA extra, EAW extra, etc.

Zambesi Black D, to be employed both direct and developed according to Rp. 21. See also Rps. 18, 19, 25, 26 and 41.

Zambesi Black NA, to be developed with β-Naphtol according to Rp. 21.

Zambesi Black V, 2G, to be developed with Toluylene Diamine or Nerogene D according to Rp. 21.

Zambesi Black R (see also Rp. 25)

Zambesi Black F

Zambesi Black BR

see also Rps. 23 and 24.

In direct dyeings Grey, Navy Blue, to Blue-Black or Violet-Black. *Diazotised and developed with β-Naphtol according to* **Rp. 21:**— fuller Blue-Black; *developed with Toluylene Diamine or Nerogene D:*— Dead Black.

Chromanil Black 3BF, 2BF, BF

Chromanil Black RF, 2RF

Employed less in direct dyeings (Violet-Black) than after-treated according to **Rp. 24.**

Recipe 18:—

It is worthy of notice that a series of substantive cotton dyes, especially *those which exhaust with difficulty,* are absorbed *more advantageously* by the fibre by

Dyeing at a lower Temperature (100—120° F.)

than if dyed boiling.

These dyes are:—

Erica BN, 2GN
Brilliant Purpurine R
Congo Rubine
Columbia Fast Scarlet 4B
Orange TA
Brilliant Orange G
Chrysamine G
Chrysophenine G
Curcumine S
Chicago Blue 6B, 4B
Chicago Blue 2R, 4R
Columbia Blue G, R
Columbia Fast Blue HW
Heliotrope 2B
Zambesi Brown G
Zambesi Black D.

Dye at 100—120° F. with an addition of

5—15 lbs. Glaubersalt cryst.

per 100 gallons liquor.

For very light shades all the above-mentioned dyestuffs can be dyed cold.

Recipe 19:—

Cold Dyeing of the Substantive Cotton Dyes.

A number of substantive cotton dyes will also dye **cold,** *i. e.,* at the ordinary temperature without its being necessary to heat the dye-bath; these are chiefly:—

Erica BN, 2GN	Chicago Blue 6B
Brilliant Purpurine R	Columbia Blue G, R
Congo Rubine	Heliotrope 2B
Brilliant Orange G	Columbia Black HWD
Curcumine S	Columbia Black HWDB
Chrysophenine G	Zambesi Black D.

Dyeing Recipe:—

The dyestuff must be dissolved in hot water and then added to the cold dye-bath.

Additions to the dye-bath per gallon:—

for light shades:— $\frac{1}{3}$—$\frac{3}{4}$ oz. Glaubersalt cryst. and $\frac{3}{4}$ „ soap.

for dark shades:— $\frac{3}{4}$—$2\frac{1}{2}$ oz. Glaubersalt cryst. abt. $\frac{1}{4}$ „ Turkey Red Oil and a little soda.

Enter the material (which does not require to be previously wetted out) into the cold concentrated dye-bath, work for ¾—1½ hours (according to the depth of the dyeing), rinse slightly and dry.

The dyestuffs are exhausted from the bath almost as well as when dyed hot.

The process is less suitable for mixtures than for self-colors.

Recipe 20:—

Topping Substantive Cotton Dyes with Basic Dyes.

All *substantive cotton dyes* may be *topped with basic dyes;* according to the depth of the substantive dyeing ¼—½ % basic dye is fixed fast to washing.

The *topping* is carried out in a *fresh* cold or tepid bath (advantageously in the washing-mashine or in the rinsing bath), either without addition, or with a little acetic acid. All basic dyes are suitable for this purpose.

The Object of Topping:— For producing brighter shades, shading, and in some cases for increasing the fastness to washing and light.

All dyeings of substantive colors on cotton bleed more or less into white. In order to obtain dyeings which are faster to washing, several

Methods of After-Treating Substantive Dyeings

are in use, which partly also have the effect of increasing the resistance against light.

These methods are:—

I. Diazotising and Developing.
II. After-treatment with Bluestone.
III. After-treatment with Bichromate of Potash and Bluestone.
IV. After-treatment with Diazotised Paranitraniline and Bluestone.

Recipe 21:—

I. Diazotising and Developing.

Dyes suitable for this purpose:— *All Zambesi Colors,* thus

Zambesi Pure Blue 4B, R
Zambesi Indigo Blue R
Zambesi Brown G, 2G
Zambesi Black D, F, BR, R, V, 2G, NA

further

Naphtogene Blue 2R, 4R
Columbia Brown R
Primuline.

For shading purposes

Curcumine S
Columbia Yellow

are of service, and, although they are not diazotisable, in small quantities they do not affect the good fastness to washing of the above-mentioned dyes.

After well rinsing (best in acidulated bath), first enter the dyeings produced according to Rp. 17 into the *cold*

Diazotising Bath, containing

for 10 lbs. cotton:—

5 oz. nitrite of soda (previously dissolved in water)
* 12 „ sulfuric acid 168° Tw.
(or 1 lb. 4 „ hydrochloric acid 32° Tw.).

On further employment of the diazotising bath about ½ the quantities of nitrite and acid indicated will suffice for every additional 10 lbs. cotton.

Work about for 15 minutes, rinse and enter immediately into the *cold*

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* When diazotising in **copper** vessels or apparatuses with copper fittings, **sulfuric acid** should under all circumstances be employed, and never hydrochloric acid, as the presence of both copper and hydrochloric acid in the diazotising bath frequently causes patchy dyeings.

Developing Bath, containing according to the desired effect

for 10 lbs. cotton:—

Solution of the Developers:—

1½ oz. β-Naphtol
1½ „ caustic soda 76° Tw.

or 1⅙ oz. Resorcine
2⅓ „ caustic soda 76° Tw.

or ⅚ oz. Phenol
⅚ „ caustic soda 76° Tw.

Stir with the caustic soda and dissolve by pouring boiling hot water upon them.

or 1¼ oz. Toluylene Diamine Base
1⅞ „ soda ash.

dissolve in boiling hot water.

or 1½ oz. Nerogene D (only for Zambesi Black D and V)
1½ „ hydrochloric acid 32° Tw.

5 oz. soda ash.

Stir
1½ oz. Nerogene D with
5 „ water at the ordinary temperature, add
1½ „ hydrochloric acid 32° Tw.
and stir until complete solution takes place. Then pour this solution into the developing bath and only then add
5 oz. soda ash.

or suitable mixtures (see page 112).

On further employment of the developing bath about ¾ the quantities mentioned will suffice for every additional 10 lbs. cotton.

Work in the developing bath for about 15 minutes, rinse, soap, if necessary boiling hot (as for example with Naphtogene Blue), and dry.

The *quantities of the developers* mentioned are calculated upon *5—6% dyeings*. If less dye is employed, proportionately less developer may be used. An excess of developer has no deteriorating influence upon the resulting dyeings, but is rather of advantage than otherwise.

Advantages of the Developing Process.

The process considerably *intensifies the shades* (change from light Blue to dark Blue, from Blue and Grey to Black, etc.).

The *fastness to washing* is extraordinarily *increased*.

The dyeings are distinguished by their not altering their shade on *warehousing*.

The following Table permits of a survey of those developments of diazotisable dyes which principally come into question.

The following Combinations of Dyes

	Phenol	β-Naphtol
Primuline	Yellow	**Red**
Zambesi Pure Blue 4B		**Greenish Sky Blue** (fast to light)
Zambesi Pure Blue R		**Sky Blue** (fast to light)
Naphtogene Blue 2R		**Navy Blue** (very fast to light)
Naphtogene Blue 4R		**Reddish Blue** (very fast to light)
Zambesi Indigo Blue R		Dark Blue
Zambesi Brown G		
Zambesi Brown 2G		
Columbia Brown R		
Zambesi Black D		Black-Blue
Zambesi Black NA		Black
Zambesi Black F		Black-Blue
Zambesi Black BR	Blue (alone of no interest) in mixture with Primuline:— Green	Black-Blue
Zambesi Black R		Black-Blue
Zambesi Black V		Black-Blue
Zambesi Black 2G		

ith Developers are of most Interest:—

Resorcine	Toluylene Diamine	Nerogene D
Orange	dull Blueish Red (only used for shading purposes)	Brownish Red
	Reddish Brown	
	Yellowish Brown	
	Deep Brown	
Greenish Black	Dead Black	**Dead Black** (with blueish tone) particularly fast to light
	Black	
Russian Green	Black	
	Black (with brownish tone)	
	Black (with blue-violet tone) } particularly fast to light	Black (with blue-violet tone)
	Dead Black (with greenish tone) especially for piece-goods } particularly fast to light	

Combinations with Mixed Developers.

For the production of mixed shades it is not only possible to dye the dyestuffs of the preceding table mixed with one another, but combinations with mixtures of the developers indicated can also be made.

The mixing occurs by dissolving each developer separately, and then adding the solutions to the developing bath.

As a rule additions of β-Naphtol yield bluer shades, whilst with additions of Resorcine more greenish shades are produced. It must however be observed that developments with Resorcine are not quite so fast to washing as those obtained with the others developers.

Thus for example, *Zambesi Black D* or *R* developed with

1 oz.	β-Naphtol	for
½ „	Resorcine	10 lbs.
1⅔ „	caustic soda 76° Tw.	cotton

yields a more blueish Jet Black than the development with Toluylene Diamine, though it is somewhat less fast to washing.

Recipe 22:—

Topping Developed Dyeings with Basic Dyes.

For the production of brighter shades, the developed dyeings may be topped with basic dyes in the same way as the direct dyeings.

In some cases the process can be simplified by adding the basic dyes to the diazotising bath and thus saving one operation.

Thus for example, pure Indigo shades are obtained with Naphtogene Blue 2R by adding Methylene Blue to the diazotising bath. The cotton is first worked in the diazotising bath (Rp. 21) about 4 times, then Methylene Blue ($\frac{1}{2}$ % to $\frac{1}{4}$ % Methylene Blue 2B new for dyeings with 1—6% Naphtogene Blue 2R) is added, the material treated for about $\frac{1}{2}$ hour and then developed as usual with β-Naphtol.

Recipe 23:—

II. After-treatment with Bluestone.

Dyes suitable for this purpose:—

Chicago Blue 6B, 4B, B, RW
Benzoazurine G, 3G
Brilliant Azurine 5G
Congo Blue 2B
Congo Brown G, R
Catechu Brown DX, 2DX, 3DX
Catechu Brown GK, FK, FDK
Zambesi Black F, BR.

Suitable for shading the above:—

Chrysophenine G
Columbia Yellow.

After rinsing, treat the dyeings in a fresh boiling hot bath for about 30 minutes with

1—3% bluestone
$\frac{1}{2}$—1% acetic acid 30% } of the weight of the material.

Advantages of the After-treatment:—

Extraordinary increase in fastness to light.

The fastness to washing in somewhat improved, especially in the case of Congo Brown and Catechu Brown.

Recipe 24:—

III. After-treatment with Bichromate of Potash and Bluestone.

Dyes suitable for this purpose:—

Toluylene Orange G
Chrysamine G
Columbia Black-Blue G
Congo Brown G, R
Catechu Brown DX, 2DX, 3DX
Chromanil Brown 2G, R
Chromanil Black 3BF, 2BF, BF
Chromanil Black RF, 2RF
Zambesi Black F, BR.

After rinsing, the dyeings are treated in a boiling bath for about 30 minutes with

$\frac{1}{2}$—1 % bichromate of potash
1$\frac{1}{2}$—3 % bluestone
$\frac{1}{2}$—1 % acetic acid 30 %

} of the weight of the material.

Advantages of the After-treatment:—

Extreme fastness to light and washing.

Recipe 25:—

IV. After-treatment with Diazotised Paranitraniline and Bluestone.

Dyes suitable for this purpose:—

Toluylene Orange G
Chrysamine G*
Chicago Blue B*, R
Chromanil Brown 2G*, R*
Congo Brown G*
Columbia Brown R
Zambesi Black BR*, D, R
Columbia Black B.

Developing Bath for 10 lbs. Cotton.

Dissolve 1⅞ oz. Paranitraniline in
10 „ boiling water and
4¾ „ hydrochloric acid 36° Tw. and pour into a bath containing about
20 gallons cold water. Quickly add a cold solution of
1 oz. nitrite of soda during continual stirring and allow to stand for 10 to 15 minutes.

Then add

4⅓ oz. acetate of soda
5 „ bluestone
} previously dissolved in water.

Enter the rinsed dyeings into the above bath, work in the cold for 30 minutes and rinse.

* With the dyes marked thus * the after-treatment, besides increasing the fastness to washing, also considerably improves the fastness to light.

Recipe 25a:—

When dyeing several lots it is preferable to keep a standard

Diazo-Solution of Paranitraniline,

which can be prepared in the following manner:—

Dissolve 1 lb. Paranitraniline in
2½ quarts boiling water and
2¼ pints hydrochloric acid 36° Tw. and pour into about 3 gallons cold water. The hydrochloride precipitates in the form of a yellow paste. Allow to cool down to 70° F., and quickly add a cold solution of
10½ oz. nitrite of soda. After about 5 minutes a clear solution of diazo-paranitraniline results, which must be diluted to
10 gallons.

The diazo-solution will keep for some time (about 10 days) if preserved in a cool place in wooden vessels or carboys.

Developing Bath for 10 lbs. Cotton.

About 20 galls. cold water
1 „ diazo-solution of Paranitraniline (see above)
4⅛ oz. acetate of soda } previously dissolved
5 „ bluestone } in water.

Enter the rinsed dyeings, as in Recipe 25, into the cold bath, work for 30 minutes and rinse.

Advantages of the After-treatment:—

Excellent fastness to washing. — Those dyes marked thus * are besides considerably improved as regards fastness to light.

Recipe 26:—

For

Topping with One-Bath Aniline Black

the black substantive cotton dyes

Columbia Black B, FB and Zambesi Black D

are particularly well suited.

Topping
Columbia Black B and FB with Aniline Black.

Dye the raw cotton yarn with

3% Columbia Black B or FB

according to Recipe 17.

Then rinse slightly and

for 10 lbs. cotton prepare the following bath:—

8 oz. Aniline salt
24 „ hydrochloric acid 36° Tw.

or

6 oz. Aniline oil
30 „ hydrochloric acid 36° Tw.

are dissolved in

about 1 quart water,
12 oz. bichromate of potash (previously dissolved in water), added, and the whole diluted to
20 gallons.

Work the hanks in this solution in the cold for one hour, then slowly raise to the boil during 30 minutes, boil for about 5 minutes, rinse and soap with about ½ oz. soap per gallon.

Topping Zambesi Black D with Aniline Black.

First dye the raw cotton yarn with

3—5% Zambesi Black D

or, for an especially intense Black, with

3% Zambesi Black D
1% Columbia Green

according to Rp. 17.

Then rinse slightly and
for 10 lbs. cotton prepare the following bath:—

6⅔ oz. Aniline salt or { 4⅔ oz. Aniline oil and / 4½ „ hydrochloric acid 36° Tw.
8⅓ oz. bichromate of potash
10 „ sulfuric acid 140° Tw.

Each is dissolved separately and added to the dye-bath in the above order.

The dyeing is carried out as mentioned on page 117 for Columbia Black.

The Blacks obtained according to Recipe 26 are distinguished by their depth of shade, beauty of tone and by their excellent fastness to washing.

SULFUR DYES
ON COTTON.

The Sulfur Dyes

Sulfur Black T extra, TB extra, TG extra, 2B extra, etc.
Sulfur Brown G, 2G
Sulfur Catechu R, G
Sulfur Corinth B
Sulfur Blue L extra
Sulfur Indigo B

are substantive cotton dyestuffs which dye with the addition of sodium sulfide and satisfy the most exacting requirements as to all the more important properties, such as fastness to washing, acids, light, storing und rubbing.

Dye-Vessels for Sulfur Dyes.

On account of the destructive action of the sodium sulfide used for dissolving and dyeing Sulfur Dyes, copper, brass or bronze dye-vessels or appliances must under all circumstances be avoided; wooden, iron or nickel vessels should be employed. In machine dyeing lead-coated iron vessels have proved most durable.

Recipe 27 for:—

Sulfur Black T extra, TB extra, TG extra, 2B extra, etc.

Dye-Vessels: see page 119.

Proportion of Liquor. The proportion between the weight of the goods to be dyed and the amount of liquor plays a particularly important part in the dyeing of Sulfur Black. The shorter the liquor, the less dyestuff will be required for making up the dye-bath, and the better the latter will be exhausted. In machine dyeing the proportion is generally 1:5 to 1:10, when dyeing raw cotton in the kettle or yarn in the vat, the normal proportion is 1:20 to 1:30.

Solution of the Dye. Sulfur Black is insoluble in water, but is readily soluble in the presence of sodium sulfide. The dye is stirred to a paste with hot water and caustic soda in a larger wooden vessel, sodium sulfide is added, and an abundant quantity of boiling water or boiling liquor is poured upon the whole during continual stirring. It is very beneficial to again boil up this solution.

Making up Fresh Baths. After first adding the soda, the dye-bath is boiled up well, next the dyestuff, previously dissolved, is added, finally the Glaubersalt, and if desired, a little caustic soda. The whole is then again boiled up and if necessary skimmed. The following are approximately the quantities of the above-named additions:—

Soda Ash:— 5 lbs. per 100 gallons liquor

Dye:— 6—12 % according to the material and the liquor

Sodium Sulfide cryst.:— (a) for vessels permitting of the free access of air, such as vats, kettles, jiggers, 4 times as much as of dye.

(b) for apparatuses without or with only a limited access of air, 2½—4 times as much as of dye.

	proportion of liquor:—	*per 100 gallons liquor:—*
Glaubersalt cryst.:—	1:5	20— 25 lbs.
	1:10 to 1:15	20— 50 „
		20— 40 „ for machine dyeing
	1:20 to 1:30	100—120 „

Caustic Soda (76° Tw.):— $\frac{1}{10}$ as much as of dye.

In place of:—		*the following may be employed:-*
100 parts soda ash		270 parts soda crystals
100 „ sodium sulfide cryst.		abt. 50 „ molten sodium sulfide
100 „ Glaubersalt cryst.		44 „ Glaubersalt calc.
		or
		abt. 40 parts common salt.

The above-mentioned addition of caustic soda is advisable in order to prevent the development of noxious sulfuretted hydrogen. Larger quantities of caustic soda give the dyeings a brownish tone.

In order to wet out the goods better, especially in machine dyeing and for raw cotton, an additon of about 1½ gills Turkey Red Oil per 100 gallons liquor will prove beneficial.

Concentration and Temperature of the Liquor.

The liquor should be kept so that when measured with a hydrometer at 60° F., it shews 9—10° Tw. If it measures less than 9° Tw., too little dye will be exhausted from the bath; an excess of salt on the other hand may easily cause bronzing. In the first case the addition of salt must be increased accordingly; in the latter case the liquor must be proportionately diluted with water. For heating the baths, closed steam-pipes are best adapted (indirect steam), as with open steam-pipes (direct steam) the liquor — *e. g.* in jigger dyeing — becomes too strongly diluted.

During the dyeing process the temperature should not fall below 195° F.; it can be regulated by occasionally opening the steam valve. It is not advisable to boil uninterruptedly; this is unavoidable only where the liquor would cool down rapidly, as when dyeing in the jigger, or when dyeing raw cotton, which, being difficult to thoroughly wet out, would otherwise not be sufficiently well penetrated.

Dyeing.

Duration of the Dyeing Process.

It is not absolutely necessary to dye Sulfur Black below the surface of the liquor only (as for example is usual with yarn on bent rods), but it is decidedly beneficial, the best results being obtained by this means. An excessive access of air, as for example when the dyeings lie or hang for a length of time before being rinsed, has an unfavorable effect. A precipitation of unfixed dyestuff takes place, resulting in bronzy patches and causing the dyeings to rub off. The duration of the dyeing process in normal cases is about 1 hour; beyond this no increase in the intensity of the dyeings will be found to take place.

Rinsing. Soaping. Topping.

Immediately after completion of the dyeing operation and after a thorough removal of the excess of dye-liquor from the material, the latter must be rinsed several times, until the water flows off clear. For reasons of economy the first rinsing water may be employed for replenishing the dye-baths.

In order to improve the shade of the dyeings, one of the following methods of treatment may be recommended:—

	2—3 lbs. soap per 100 gallons	at 200° F. for ½ hour
or	2% soap 1% olive oil	„ 140° F. „ ½ „
or	2% soap 3% Turkey Red Oil	„ 140° F. „ ½ „
or	1% soda ash 1½% olive oil	„ 140° F. „ ½ „
or	1% starch 1% pressed lard	„ 120° F. „ ½ „

With very hard water it is absolutely necessary to first boil up the water with soap for some length of time and then to remove the lime soap formed; otherwise dusty greyish dyeings will result. Basic dyes are also adapted for improving the shade and are very efficaciously fixed by Sulfur Black. Quantities of not more than $\frac{1}{10}$—$\frac{1}{7}$% basic dyes (such as Methylene Blue) in no wise deteriorate the fastness of the dyeings. The topping is carried out in a tepid soap-bath.

After-treatment of the Dyeings.

Sulfur Black requires no after-treatment with metallic salts, etc. for increasing its fastness.

After having lain for a short time, the dyeings become a little bluer; contrary to similar products however, they do not alter their shade any further. If the bluer shade

is desired immediately, the dyeings may be after-treated for half an hour in a fresh bath at about 160° F. with

3% bichromate of potash
5% caustic soda.

This treatment has no injurious effect whatever on the fibre; on the contrary, it serves rather to protect it.

Continuous Dyeing in a Standing Bath.

(a) *Uninterrupted Dyeing.*

When dyeing continuously, the percentage of dyestuff used must be reduced proportionate to the amount of liquor and the quantity of dye taken for the first bath. Of sodium sulfide only double the weight of the dyestuff is necessary, of soda always ½ oz. for every gallon of water added to the dye-bath in order to bring the liquor to its original level.

Glaubersalt or common salt must only be added when the hydrometer shews a decrease in the concentration of the dye-bath.

(b) *Occasional Dyeing.*

If the liquor remains unused for some length of time, the sodium sulfide will be completely used up by the oxidation of the air. If therefore the baths are to be used again for the first time after several days, the amount of sodium sulfide must be increased to at least 3 times as much as of dye, after a longer pause to the same quantity as for a fresh bath, *i. e.* 4 times as much. An excess of sodium sulfide is in no case injurious.

Duration of the Dye-Liquor.

As the material to be dyed is very seldom perfectly clean, impurities gradually collect in the dye-bath; it is therefore advisable to renew the liquor after about 1—3 months' use. The dye remaining in a liquor to be let off is best exhausted by passing a new batch through it without making a fresh addition of dyestuff.

Mercerised material shews a strong affinity for all dyestuffs, thus also for Sulfur Black. Consequently, smaller percentages of dyestuff must be taken than when dyeing ordinary cotton, and considerably less salt (in many cases none at all); in general, also, somewhat longer dye-liquors are preferable. Mercerised material should always be wetted out before dyeing.

Mercerised Material.

The Dyeing of Cotton Yarn with Sulfur Black in the Vat.

Enter the boiled-off yarn into the liquor, quickly lift a few times at first and then allow the yarn to rest for about five minutes after each lifting.

After completion of the dyeing operation, the yarn is freed as far as possible from the excess of dye-liquor by means of a roller arrangement fixed to the vat, and rinsed immediately afterwards.

For the production of level dyeings it is desirable that the vat should offer sufficient room for convenient working, so that the yarn need not be hung too closely upon the rods.

The Dyeing of Raw Cotton with Sulfur Black in the Kettle.

As loose cotton comes in a raw state to be dyed, an addition of Turkey Red Oil considerably facilitates the wetting-out.

Enter boiling and boil for the first half hour, working the material continually. After 1 to 1¼ hours lay out the cotton in such a way that the liquor can flow back into the kettle. Then rinse well.

The Dyeing of Piece-Goods with Sulfur Black.

For dyeing piece-goods the jigger is usually employed, less frequently, for example for hosiery, the piece-vat. The pieces should previously be well boiled out, mercerised material should be well wetted out. The jiggers should be fitted with squeezing rollers, arranged in such a way that after the goods have been thoroughly sqeezed they can immediately be rinsed in a second jigger placed exactly parallel to the dye-jigger. Folds and curled lists must be smoothed out. Generally 8 to 12 ends are given; smaller lots require proportionately more. The dyeing operation lasts about 1 hour.

The pieces dyed with Sulfur Black are best dried by hanging; when drying on the cylinder drying-machine it is advisable to cover the first two cylinders with cloth.

Short liquors (1:5—1:10), indirect steam.

Dyeing with Sulfur Black in Apparatuses.

(Raw Cotton, Cotton Slubbing, Cops, Bobbins, Beamed Warps.)

Machine dyeing offers the advantage that the goods remain immovable during the dyeing process and that they do not come into contact with the air.

Mostly short liquors are employed. The greatest care must be taken on making up the baths, as only clear and filterable solutions warrant a satisfactory penetration of the goods; soft water, pure salt, etc. should therefore be employed.

An addition of Turkey Red Oil is of advantage for an even wetting out of the material.

The dyeing operation lasts $\frac{3}{4}$—1 hour.

Recipe 28 for:—

Sulfur Brown G, 2G

Dye-Vessels: see page 119.

Like Sulfur Black, Sulfur Brown G and 2G *without any after-treatment* yield dyeings of extreme *fastness* to *washing, milling, acids* and *light.* The products are particularly valuable as well for raw cotton as for yarns and piece-goods on account of their simple manner of application and especially for the *drab* and *khaki shades* which are obtainable in light dyeings.

Sulfur Brown G and 2G are readily soluble in boiling water and will even dye in the cold without any addition; the baths are however not exhausted.

The best method is to dye boiling hot for about 1 hour with an addition of

Soda Ash	:—	5%
Sulfide of Soda crysts.	:—	the same quantity as of dye, or 1½ times as much
Common Salt or Glaubersalt calc.	:—	10—30 lbs. per 100 gallons liquor.

First add the soda to the bath and boil up, dissolve the dyestuff in a portion of the boiling liquor together with the same weight of sulfide of soda, pour this solution into the bath and finally add the salt.

In order to save sulfide of soda and to produce more even dyeings it is advisable to dye on bent rods, so that the yarn remains immersed in the liquor. Lift

three times at the commencement, later every 15 minutes, finally squeeze and rinse thoroughly.

In many cases however, the results obtained when dyeing in the ordinary manner with straight rods, *i. e.* without immersing the material in the liquor, will be satisfactory, but it is then advisable to employ half as much sulfide of soda again and to work the material well. The shades in this way become somewhat deeper and fuller; if still darker dyeings are desired, the material, before rinsing, should be allowed to hang for about 1 hour, lifting occasionally, and then rinsed warm with an addition of 2—3% soda ash.

The same directions apply to the dyeing of piece-goods on the jigger. In machine dyeing it is advisable to make the liquor rather stronger and to use less salt.

An after-treatment of the dyeings is not necessary.

Sulfur Catechu R, G.

Sulfur Corinth B,

Shading dye for Sulfur Catechu.

Dye-Vessels: see page 119.

The application of these three dyestuffs enables the production in the simplest manner of the whole scale of brown shades from Catechu Brown to Dark Brown just as fast to washing as with natural Catechu; compared with the latter these products however, possess the considerable advantage of leaving the feel of the material soft.

The dyeing is carried out according to Recipe 28 in the same manner as with Sulfur Brown.

An *after-treatment of the dyeings* of

Sulfur Catechu R, G and
Sulfur Corinth B

is as a rule not necessary, but may however be carried out for the purpose of

Increasing the fastness to washing, (Rp. 28a) or
Increasing the fastness to both washing and light (Rp. 28b).

Recipe 28a:—

After-treatment of Sulfur Catechu and Sulfur Corinth with Sulfate of Zinc.

The dyeings are treated in a fresh bath for about ½ hour at the ordinary temperature with

3—5% sulfate of zinc (zinc vitriol)
3—5% acetate of soda.

The change of shade is inconsiderable.

The *fastness to washing* is *increased;* the remaining properties are not materially affected.

Recipe 28b:—

After-treatment of Sulfur Catechu and Sulfur Corinth with Bichromate of Potash and Bluestone.

The dyeings are treated in a fresh boiling bath for about ½ hour with

1—2% bichromate of potash
1—2% bluestone
3% acetic acid 30%.

The after-treatment renders the shades of the dyeings *duller,* but on the other hand considerably *increases* their *fastness to washing and light.*

Recipe 29 for:—

Sulfur Blue L extra.

Dye-Vessels: see page 119.

Whilst Sulfur Black and Sulfur Brown require no after-treatment, the direct grey shades produced with Sulphur Blue L extra are only developed to a Blue *by means of steaming* (oxidation with moist warm air).

The dyeings of Sulfur Blue L extra are extremely fast to washing, light and rubbing.

Solution. On making up a fresh bath, the dye is dissolved by boiling up in water together with three times its weight — for a standing bath with only double the amount — of crystallised sulfide of soda. It is besides advantageous to add 10% caustic soda of the weight of the dye.

Dyeing. The well-known apparatuses and appliances as recommended for Sulfur Black also serve for the dyeing of Sulfur Blue L extra.

Raise the dyebath to the boil, add 5 lbs. soda ash per 100 gallons, then the previously dissolved dye, and finally — proportionate to the amount of liquor — 5—30 lbs. common salt or Glaubersalt per 100 gallons. After boiling up again, turn off steam, enter the goods, and allow the temperature of the bath to fall to about 180° F. After ¾—1 hour the dyed goods must be freed from the greater part of the liquor they contain by allowing the latter to flow off or by squeezing; then hydroextract so that the material remains only slightly but *evenly moist.* Yarns are therefore preferably equalised by wringing well after hydroextracting, before the development is carried out.

Steam

The development of the dyeing occurs by a treatment with a mixture of steam and air at 180—200° F. For this purpose either the dyeing apparatus itself will serve or a specially arranged vat. The latter is fitted with a perforated false bottom and with of a roof-shaped lid covered on the inside with cloth. The above-mentioned form of lid is advisable in order to prevent the condense water from dropping on to the dyed goods. On the inside of the vat two ledges should be affixed lengthways about 4 in. from the top for the yarn sticks to rest upon. The steam-pipe is carried around the vat, underneath the cloth-covered perforated bottom, and should contain small holes in an oblique, downward direction. The steam power must not be too weak, so that the vat can be brought to a temperature of 180—200° F. The steam-pipe immediately before entering the vat is connected with an injector for the purpose of mixing the steam with air.

After the yarn has been spread on the rods and hung into the vat in such a manner as not to touch the bottom, the lid is laid on loosely and the steam turned on full. The development is completed after about half an hour. The material must then be rinsed hot, or, if desirable, soaped boiling in order to remove the unfixed dye, hydroextracted and dried.

If the steaming is to take place in the dyeing apparatus itself, the steaming appliances must be adapted to the apparatus in question. It is necessary that the steam passing through an injector should carry air along with it, and that this mixture of air and steam should penetrate the dyed goods as evenly as possible. At the same time the goods must be protected as much as possible from cooling down, in order to maintain a temperature of 180—200° F. Care must also be taken

to prevent the formation of condense water, as the dyeings will not develop where drops of water fall on to the material.

It is essential for the evenness of the development that the dye-liquor remaining in the goods should be perfectly evenly distributed.

Dyeings which have been completely washed out will only develop very moderately, even if the last rinsing bath contained caustic soda. The presence of caustic soda and sulfide of soda is under all circumstances necessary for the complete development of the dyeing by means of steaming. If therefore the dyeings are to be rinsed perfectly clear before steaming, an addition of about 80 grains caustic soda and about 1 oz. sulfide of soda per gallon to the last rinsing bath is necessary.

Continuous Dyeing.

When dyeing in an old bath, for medium shades about $\frac{4}{5}$ the quantity of dye first used will be required. When dyeing lighter shades, the bath will be exhausted more, with darker shades less, so that the quantity of dye to be added must be regulated accordingly.

Recipe 29a:—

Dyeings of *Sulfur Blue L extra* on *loose* material can also be developed to a bright Blue without steaming simply by allowing the material to lie covered up unrinsed for several hours (overnight) and only then rinsing (see also page 135).

Sulfur Blue L extra can also be after-treated with bichromate of potash and bluestone according to Recipe 30 and then yields dyeings which are faster to washing than those produced according to Recipe 29, though they are less bright in shade.

Recipe 30 for:—

Sulfur Indigo B.

Dye-Vessels: see page 119.

The dyeings of Sulfur Indigo B possess the greenish tone of Indigo dyeings and like the latter do not appear redder in yellow light than in daylight.

Sulfur Indigo B *yields even dyeings with an ease and certainty equal to that of our Sulfur Blacks;* the dyeings possess *excellent fastness to light* and *washing,* and are fast to *rubbing* both in a wet and in a dry state.

Contrary to Indigo and many of its substitutes, dyeings of Sulfur Indigo B, even when repeatedly washed by hand, do not become lighter, but retain their depth of shade and even gain in clearness and brilliancy.

Its *ready solubility* and *slight tendency to oxidise* make the dyestuff especially adapted for *machine dyeing.*

Sulfur Indigo B is chiefly of interest for *fancy weaving;* for piece-dyeing it comes less into question.

The dyeing is carried out with an addition of sulfide of soda in the manner usual for Sulfur Dyes. The rinsed dyeings are after-treated in an acetic acid bath with bichromate of potash and bluestone, and then passed through an alkaline bath or soaped.

Sulfur Indigo B can be employed in mixture with *Sulfur Blue L extra*, not only according to this Recipe, but also according to Rps. 29 and 29a, whereby the production of a whole series of blue shades fast to washing and light is possible.

The fastest dyeings are produced according to the following

Dyeing Recipe:—

For a full medium Blue on yarn the following quantities will be required when dyeing in the vat (proportion of material to liquor 1:20).

For the first bath:—

10% Sulfur Indigo B
1% caustic soda 76° Tw. = $\frac{1}{10}$ } the weight of the
30% sulfide of soda cryst. = 3 times } dye
5 lbs. soda ash }
60 „ Glaubersalt cryst. } per 100 gallons liquor

For the following baths:—

7% Sulfur Indigo B
0.7% caustic soda 76° Tw. = $\frac{1}{10}$ } the weight of the
10.5% sulfide of soda cryst. = 1½ times } dye

and, in case the liquor at 60° F. measures less than 7½° Tw., a little Glaubersalt.

Stir the dye together with the caustic soda and some hot water, add the sulphide of soda and boil until all is dissolved. After boiling up the bath with soda, the solution is then added.

For light shades less Glaubersalt, for dark shades more (up to 100 lbs. per 100 gallons) may be taken.

Dye for one hour at 200—205° F. Then free the dyed yarn from the superfluous liquor by squeezing and rinse

immediately 2 to 3 times in cold water until the rinsing bath remains almost colorless.

After-treatment:—

For medium and dark shades employ

5% acetic acid
1% bichromate of potash
3% bluestone.

It is advantageous to make up the bath with acetic acid and bichromate of potash first, to work for a few times and only then to add the bluestone.

Work the yarn for ½ hour at the boil, rinse twice, adding to the last rinsing bath

3% soda.

Finally hydroextract and dry.

By treatment of the after-treated and rinsed dyeings in a boiling soap bath containing about 2 lbs. soda and 5 lbs. soap per 100 gallons, still brighter, though at the same time rather more sensitive shades to acids are produced.

After soaping the dyeings are hydroextracted and dried, but *not rinsed.*

Development of the Dyeings of Sulfur Indigo B by Oxidation with Air.

(Suitable for Raw Material.)

As already mentioned, Sulfur Indigo B can also, like Sulfur Blue L extra, be developed according to Rp. 29a to a bright blue without the after-treatment described above, by allowing the dyed raw material to lie covered up in a heap — unrinsed — for several hours (say overnight) and only then rinsing.

In this simple way a very fine Blue is produced which in fastness is somewhat inferior to the after-treated dyeing, on the other hand however, leaves the cotton its original softness of feel.

BASIC DYES.

ON COTTON.

(Recipes 31 to 34.)

Red:—

Rubine
- Iso Rubine
- Cardinal
- Russian Leather Red
- Camelia
- Cerise

Brilliant Safranine

Safranine

Rhodamine
(see also Rps. 33 and 34)

Orange:—

Chrysoidine

Yellow:—

Phosphine

Brilliant Phosphine

Aurophosphine 4G, G

Philadelphia Yellow

Auramine (see Rp. 34)

Green:—

Malachite Green

Ethyl Green

Leaf Green

Blue:—

Methylene Blue
Fast Blue for Cotton
Diphene Blue B, R
* Diphene Blue Base B, R
Victoria Blue B, R, 4R

Violet:—

Methyl Violet

Brown:—

Bismarck Brown.

Through the introduction of the substantive cotton dyestuffs, the basic dyes have lost in importance for cotton dyeing, though they still find employment whenever a greater brilliancy of shade is required than is obtainable with substantive dyes.

Regarding the employment of basic dyes for topping substantive dyeings, see pages 105 and 112.

Solution of the Basic Dyes:— see page 2.

Victoria Blue B, R, 4R, before pouring boiling water upon them, must be stirred with acetic acid,

Fast Blue for Cotton with acetic or hydrochloric acid.

Auramine must not be dissolved boiling; the temperature should not exceed 160—170° F.

Basic dyes are generally dyed on cotton according to

---

* In strength
80 parts Diphene Blue B & R Base = 100 parts Diphene Blue B & R.
The dissolving is carried out in the following manner:—
Stir to a paste
1 part Diphene Blue Base with
2 „ boiling water, add
2 „ acetic acid (30%), allow to stand for a short time and then dissolve in
25 „ boiling water.

Recipe 31:—

The Dyeing of Basic Dyes on Tannin and Antimony Mordant.

A. The *Mordanting Liquor* is made up, according to the depth of the dyeing to be produced, with

2—5% Tannin (of weight of the material to be dyed)

or a proportionate quantity of other materials containing tannic acid; as a rule instead of

1 part tannin about 4 parts leaf sumach or
2—3 „ sumach extract

are taken.

Enter the cotton into the boiling hot bath (at about 200° F.) work a few times until the bath has cooled down to about 120° F. and allow to lie in the liquor — for dark shades — for about 6 to 12 hours, generally overnight. For light shades 1 to 2 hours are sufficient.

Then hydroextract or wring well and without rinsing enter into the *cold*

B. *Fixing Bath,* containing about one-half as much by weight of

Tartar Emetic

as the amount of tannin employed. Treat for about ½ hour and rinse well. The mordanting and fixing baths, after being suitably replenished, can be employed repeatedly. In order to neutralise the acid which collects on continuous employment, a soda solution should be carefully added to the tartar emetic bath until a milkiness appears.

In place of tartar emetic, one of the following antimony salts recommended as tartar emetic substitutes can be employed:—

Antimony Salt (E. de Haën),
Patent Salt (R. Koepp & Co.),
Antimonin (C. H. Böhringer Sohn),

etc.

In their effect

100 parts tartar emetic (containing 43 % antimony oxide) correspond to

about 91 „ Antimony Salt („ 47 % „ „)
or about 65,8 „ Patent Salt („ 66 % „ „)

Antimonin, whilst containing only 15 % antimony oxide, has — according to the firm C. H. Böhringer Sohn — the same effect as tartar emetic, since the whole of the antimony oxide it contains comes into action. When employing it, about 1½ pints acetic acid must be added for 100 gallons of the fixing bath.

C. *Dyeing.*

Enter the material into the cold bath containing 1—3 % acetic acid or alum, add the dyestuff in several portions whilst working well and raise the temperature gradually to 160° F. until the bath is exhausted.

A subsequent passage through the mordanting bath A and the fixing bath B increases the fastness to rubbing and washing.

Recipe 32:—

The Dyeing of Basic Dyes on Tannin and Iron Mordant.

As a darkener for full shades, in place of the antimony mordants mentioned in Recipe 31 under B, the following iron salts are in some cases employed:—

pyrolignite of iron (20—30° Tw.)

or so-called

nitrate of iron (ferric sulfate) 90° Tw.

or, more seldom,

green vitriol (ferrous sulfate).

Mordant with tannin exactly as described under Recipe 31, A, wring or hydroextract and work in the cold diluted solution of one of the iron mordants mentioned, according to the degree in which the intended darkening is desired, rinse well and dye as stated under Recipe 31, C.

Occasionally, for a better fixation of the dye Recipes 31 and 32 are combined *viz.,* by either first fixing with antimony salts after the tanning and then darkening with iron-mordant, or first treating with iron-mordant and then fixing with antimony salts.

Recipe 33: (Special Recipe for *Rhodamine.*)

Dyeing on Turkey Red Oil and Alumina Mordant.

Whilst Rhodamine yields bluish red shades on tannin and antimony mordant (Recipe 31), the well-known brilliant pink shades are produced according to the following process:—

Impregnate the cotton with a solution of

1 part Turkey Red Oil in 9 parts water,

then wring out evenly and dry. The dry material is next passed several times through a solution of aluminium acetate ($7\frac{1}{2}$—9 Tw.), thereby thoroughly impregnating the material, after which it is again wrung out or squeezed and dried. Both operations are repeated in exactly the same manner, the dyeing being subsequently carried out in a tepid bath with Rhodamine without any further addition.

Latterly the following still simpler method for dyeing *Rhodamine* on cotton yarn has been recommended:—

Recipe 34: (for *Rhodamine* and *Auramine.*)

Dyeing on Turkey Red Oil Mordant.

Mordant the yarn in quantities of about 1 lb. at a time in about $2\frac{1}{2}$ to 3 gallons of a solution of

1 part Turkey Red Oil in 2 parts water,

wring well and evenly, dry thoroughly and repeat this operation 2 or 3 times. For every fresh 1 lb. lot add about 1 pint fresh mordanting liquid.

The dyeing with *Rhodamine* occurs in a short cold liquor by adding the dye solution in several portions — if desirable with an addition of a little acetic acid.

Auramine can also be dyed according to this Recipe.

ACID DYES
ON COTTON.

Recipe 35:—

The *Weakly Acid Dyes*

Eosine
Methyl Eosine
Erythrosine
Phloxine
Rose Bengale

are generally dyed in a strong salt bath.

Dye tepid for ½—¾ hour with an addition of about 8 oz. common salt per gallon liquor, wring or squeeze *without rinsing* and dry. The dyebaths are preserved for further use.

The dyestuffs can also be dyed on Turkey Red Oil and alumina mordant according to Recipe 33.

Recipe 36:—

The following *Acid Dyes*

Ponceau G, R—4R
Scarlet GR
Ponceau 6RB—4RB—4GB
Coccine 2B,
Ponceau BO extra
Ponceau 3RB
Quinoline Yellow
Metanil Yellow extra

are only to a limited extent employed on cotton, and only then for bright shades fast to light on materials which when in use do not come into contact with water, *e. g.*, yarn for trimmings, bookbinders' cloth, materials for decorative purposes, etc.

Yarn is dyed in a very short liquor at about 120° F. with an addition of

5—10 % alum and
20—40 % common salt or Glaubersalt calc.,

allowing to cool in the bath. Then wring evenly *without rinsing* and dry.

Piece goods are dyed on the padding machine or in the size with an addition of a little alum and a thickener.

The dyestuffs

Water Blue 6B—BR
Methyl Blue
Light Blue (for Silk)

are also dyed according to Recipe 36 or on tannin and antimony mordant (Recipe 31).

The Dyeing of Mercerised Cotton.

In general the same Recipes (17—36) serve for the dyeing of mercerised cotton as for ordinary cotton, only it must observed that mercerised cotton shews more affinity for the dyes. For this reason it may be accepted as a general rule that the dyeing must be commenced at a *lower temperature,* and that the addition of salts, mordants and dyestuff must be proportionately reduced.

When dyeing with
Substantive Dyes, about 25% less dyestuff will be required. Of salt only about $\frac{1}{3}$—$\frac{1}{2}$ the quantities mentioned in Recipe 17 need be taken. For light shades an addition of a little Turkey Red Oil or Monopole Soap (Stockhausen & Traiser, Crefeld, Germany) is to be recommended.

When dyeing with
Sulfur Dyes the addition of dyestuff can also be diminished by about 25%. Of Glaubersalt or common salt only about $\frac{1}{4}$ the quantities stated in Recipes 27—30 need be taken for yarn; when dyeing piece-goods in a short liquor the addition of salt is best omitted altogether.

Basic Dyes are dyed according to Recipe 31; the tannin and antimony baths can however be made up somewhat weaker.

The Mercerisation of Dyed Goods.

If the mercerising is to take place *after* the dyeing, such dyestuffs must be selected as withstand the action of strong alkalies.

The following *Substantive Dyes* are particularly fast to alkalies:—

Red:—

Congo
Brilliant Congo R, G
Benzopurpurine, all brands
Brilliant Purpurine R, 10B
Diamine Red B, 3B
Congo Rubine
Columbia Fast Scarlet 4B
Erica, all brands
Salmon Red

Orange:—

Congo Orange G, R
Mikado Orange GO, 4RO

Yellow:—

Chrysophenine G
Columbia Yellow
Mikado Yellow
Mikado Golden Yellow 8G

Green:— Columbia Green

Blue:—

Chicago Blue 6B, 4B, B, RW, R
Solamine Blue B, R, FF
Congo Fast Blue B, R
Columbia Fast Blue 2G

Brown:—

Congo Brown G, R
Catechu Brown DX, 2DX, 3DX
Zambesi Brown G, 2G

Grey and Black:—

Neutral Grey G
Columbia Black, all brands, except WA extra, EAW extra, EA extra
Zambesi Black
Chromanil Black
} all brands

Further all diazotised and developed dyeings (Rp. 21), including Primuline after-treated with chloride of lime (see page 100).

Sulfur Dyes.

All Sulfur Dyes (Rps. 27—30) are fast against the influence of strong alkalies.

Cotton Dyes

grouped

according to their

Most Important Properties.

The Behaviour of the Substantive Cotton Dyes in the Dyebath.

1. The Attraction of the Fibre for the Dye and the Exhaustion of the Bath.

When dyed under equal conditions, at the same temperature, and with equal additions of salt, all substantive dyes do not exhaust in the same degree. On dyeing mixtures of dyestuffs it is therefore advisable only to employ such dyes together which exhaust to an equal, or almost equal, degree, and of which approximately the same percentage of the amount originally employed remains in the bath.

From this point of view* the substantive dyes may be divided into the following groups:—

(a) Dyes which exhaust almost completely (except about $\frac{1}{20}$ of the quantity employed):—

Red:—

Benzopurpurine 4B, 4BG, 6B, 10B

Brilliant Purpurine 10B

Yellow:—

Columbia Yellow

Blue:—

Chicago Blue 4B, B, RW, R, 2R, 4R

Columbia Blue G, R

Columbia Black-Blue G

Brown:—

Chromanil Brown R, 2G

---

* For arriving at the results given in the tables (a), (b), (c), and (d), 3 g dyeings were employed.

Grey and Black:—

Neutral Grey G
Columbia Black R, 2BX, 2BW, FB, F2B, FF extra, WA extra, EA extra, EAW extra
Zambesi Black R, F, BR
Nyanza Black B

(b) Dyes of which about $\frac{1}{10}$—$\frac{1}{6}$ of the quantity employed remains in the bath:—

Red:—

Rosazurine G
Congo Corinth G, B

Orange:—

Columbia Orange R
Orange TA

Yellow:—

Thiazol Yellow
Primuline

Green:—

Columbia Green

Blue:—

Chicago Blue 6B
Congo Sky Blue
Congo Blue BX
Erie Blue BX
Benzoazurine R, G, 3G
Solamine Blue FF
Congo Fast Blue B, R
Columbia Fast Blue 2G
Naphtogene Blue 2R, 4R
Zambesi Indigo Blue R

Violet:—

Azo Violet

Brown:—

Congo Brown G, R
Columbia Brown R
Catechu Brown, all brands
Zambesi Brown G, 2G

Black:—

Columbia Black 3B, 4B
Sambesi Black D, NA
Chromanil Black, all brands.

(c) Dyes of which about $\frac{1}{5}$—$\frac{1}{4}$ of the quantity employed remains in the bath:—

Red:—

Congo
Congo 4R
Brilliant Congo R, G
Benzopurpurine B
Brilliant Purpurine R
Diamine Red B, 3B
Rosazurine B
Congo Rubine
Erica, all brands
Salmon Red
Bordeaux COV

Orange:—

Brilliant Orange G
Toluylene Orange G
Mikado Orange GO, 4RO

Yellow:—

Chrysamine G, R
Curcumine S
Mikado Yellow
Mikado Golden Yellow 8G

Green:—

Columbia Black-Green D

Blue:—

Brilliant Azurine 5G, B
Azo Blue
Congo Blue 2B
Solamine Blue B, R

Violet:—

Columbia Violet R

Black:—

Zambesi Black V, 2G

(d) Dyes of which about $\frac{1}{3}$ and more remains in the bath:—

Red:—

Columbia Fast Scarlet 4B

Orange:—

Congo Orange G, R

Yellow:—

Chrysophenine G

Blue:—

Zambesi Pure Blue 4B, R

Violet:—

Heliotrope 2B

2. The "Boiling Over" of the already fixed Dye on to Undyed Material.

The "boiling over" of the substantive dyestuffs from dyed on to undyed material chiefly comes into question when on dyeing to pattern the necessity arises of making smaller or larger *additions of dye during the dyeing process.* Small quantities of dye are usually absorbed extremely quickly by those parts of the material which first come into contact with it, but during the further boiling, wander from the portions originally dyed darker to the lighter parts and become diffused over the whole material in such a way that finally quite level dyeings result. The quicker this occurs, the better the dyestuff in question is adapted for shading purposes, whilst dyes which do not possess this property are not suitable for adding subsequently to the dyebath, although when dyed alone they easily dye level.

In order to determine how the substantive cotton dyes behave in this respect, a pattern of cotton cloth, dyed with 3% of the dyestuff to be tested, was boiled together with an undyed cutting of the same size in the completely exhausted dyebath, without any further addition of dye.

Treated in this way

the following dyes boiled over on to the undyed material, i. e. spread evenly over both cuttings:—

(a) *in about ½ hour:-*	*(b)* *in ¾—1 hour:-*	*(c)* *in 1—1½ hours:-*
Red:—		
Columbia Fast Scarlet 4B	Brill. Purpurine R	Congo
Erica, all brands	Bordeaux COV	Congo 4R
Salmon Red		Brill. Congo G, R
		Benzopurpurine B, 10B
		Diamine Red B, 3B
		Rosazurine B, G
		Congo Corinth B, G
Orange:—		
Brill. Orange G	Congo Orange G, R	Toluylene Orange G
		Orange TA
Yellow:—		
Chrysophenine G		Thiazol Yellow
		Mikado Yellow
		Primuline
Green:—		
	Columbia Green	Columbia Black-Green D

(a) *in about ½ hour:-*	*(b)* *in ¾—1 hour:-*	*(c)* *in 1—1½ hours:-*
Blue:—		
Chicago Blue 6B	Brill. Azurine 5G, B	Chicago Blue 4B RW, 2R, 4R
Congo Sky Blue	Azo Blue	Columbia Blue G, R
Zambesi Pure Blue 4B, R	Solamine Blue B, R, FF	Congo Blue BX
		Congo Blue 2B
		Erie Blue BX
		Benzoazurine R, G, 3G
		Congo Fast Blue B, R
		Columbia Fast Blue 2G
		Zambesi Indigo Blue R
		Naphtogene Blue 2R, 4R
Violet:—		
Heliotrope 2B		Columbia Violet R
		Azo Violet
Brown:—		
	Zambesi Brown G, 2G	Congo Brown G, R
Grey and Black:—		
	Neutral Grey G	Nyanza Black B
	Zambesi Black D	Columbia Black, all brands
	Zambesi Black V, 2G	Zambesi Black F
		Zambesi Black NA
		Chromanil Black, all brands

(d) *The following did not spread evenly over both cuttings:—*

Red:—

Benzopurpurine 4B, 4BG 6B

Brilliant Purpurine 10B

Orange:—

Columbia Orange R

Mikado Orange GO, 4RO

Yellow:—

Chrysamine G, R
Columbia Yellow

Curcumine S
Mikado Golden Yellow 8G

Blue:—

Chicago Blue B, R

Columbia Black-Blue G

Brown:—

Columbia Brown R

Catechu Brown } all
Chromanil Brown } brands

Black:—

Zambesi Black R, BR.

The dyestuffs of the groups (a), (b) and (c) can be considered as good shading dyes.

The dyestuffs of the group (d), although they possess good levelling powers both when dyed alone and in mixture, are less adapted for adding subsequently, or, in other words, for shading during the dyeing process.

Sensitiveness of the Cotton Dyes to Metals.

Substantive Dyes (Rp. 17).

The following are sensitive to metals:—

Red:—

Benzopurpurine 10B
on copper and brass bluer.

Salmon Red
on copper, brass and tin lighter.

Orange:—

Brilliant Orange G
sensitive to tin only.

Toluylene Orange G
on copper, brass and tin lighter.

Columbia Orange R
on copper and tin somewhat yellower.

Yellow:—

Chrysamine G, R
on copper and brass redder.

Chrysophenine G
on tin somewhat lighter.

Curcumine S
sensitive to copper and brass.

Thiazol Yellow
sensitive to copper and brass.

Green:—

Columbia Green
on copper, brass and tin duller.

Columbia Black-Green D
on copper, brass and tin duller.

Blue:—

Chicago Blue 6B, 4R
sensitive to tin only.

Benzoazurine R, G, 3G
Congo Blue 2B
Azo Blue
Congo Fast Blue R, B
} on copper, brass and tin somewhat duller.

Columbia Fast Blue 2G
on copper. brass and tin somewhat duller.

Zambesi Pure Blue 4B, R
sensitive to copper and brass.

Naphtogene Blue 2R, 4R
sensitive to copper and brass.

(Sensitiveness of the Cotton Dyes to Metals).

Violet:—

Heliotrope 2B
dyes redder in metal vessels.

Brown:—

Congo Brown G, R
on copper and brass redder, on tin lighter.

Catechu Brown, (all brands)
on copper and brass redder, on tin lighter.

Columbia Brown R
on copper duller.

Grey and Black:—

Neutral Grey G
sensitive to tin only.

Columbia Black, (all brands)
on copper and brass redder.

Zambesi Black R, F
only on tin lighter.

Zambesi Black BR
only on copper lighter.

Chromanil Black (all brands)
on copper and tin lighter.

Sulfur Dyes (Rps. 27—30).

The Sulfur Dyes must only be dyed in wooden, iron or nickel vessels. Dye-vessels consisting of copper, brass or bronze must under no circumstances be employed (see page 119).

The

Basic Dyes (Rps. 31—34) and

Acid Dyes (Rps. 35 and 36)

are not sensitive to metals.

Fastness to Light of the Cotton Dyes.

Substantive Dyes.

(a) in *direct* dyeings (Rp. 17) the fastest to light of the dyes mentioned on pages 99—102 are the following:—

Red:—

Columbia Fast Scarlet 4B
Erica, all brands
Salmon Red

Orange:—

Congo Orange R
Brilliant Orange G
Mikado Orange GO, 4RO

Yellow:—

Chrysamine G, R
Chrysophenine G
Columbia Yellow
Mikado Yellow
Mikado Golden Yellow 8G

Green:—

Columbia Green
(moderate, but the fastest to light of their kind.)
Columbia Black-Green D

Blue:—

Solamine Blue B, R, FF
Congo Fast Blue B, R
Columbia Fast Blue 2G
Naphtogene Blue 2R, 4R

Violet:—

Columbia Violet R

Brown:—

Congo Brown G, R
Zambesi Brown G, 2G
(see page 101.)

Grey and Black:—

Neutral Gre G
Zambesi Black D

(Fastness to Light of the Cotton Dyes).

(b) in *diazotised* and *developed* dyeings (Rp. 21) the following are *particularly fast to light:—*

Blue:—

Zambesi Pure Blue 4B, R developed with β-Naphtol.

Naphtogene Blue 2R, 4R developed with β-Naphtol.

Black:—

Zambesi Black D developed with Nerogene D.

Zambesi Black V, Zambesi Black 2G } developed with Toluylene Diamine.

(see page 110.)

(c) in *after-treated* dyeings (Rps. 23—25) the following are *extremely fast to light:—*

Orange:—

Toluylene Orange G according to Rp. 24.

Yellow:—

Chrysamine G according to Rps. 24 & 25.

Chrysophenine G, Columbia Yellow } according to Rp. 23 (for shading purposes).

Primuline after-treated with chloride of lime, see page 100.

Green:—

Mixtures of Chicago Blue 6B and Chrysophenine G } according to Rp. 23.

Blue:—

Chicago Blue 6B, 4B, R, RW; Benzoazurine G, 3G; Brillt. Azurine 5G } according to Rp. 23.

Chicago Blue B according to Rp. 25.

Columbia Black-Blue G according to Rp. 24.

(Fastness to Light of the Cotton Dyes).

Brown:—

Congo Brown G, R
according to Rps. 23, 24 & 25.

Catechu Brown DX, 2DX, 3DX
according to Rps. 23 & 24.

Catechu Brown GK, FK, FDK
according to Rp. 23.

Chromanil Brown 2G, R
according to Rps. 24 & 25.

Black:—

Zambesi Black F
according to Rps. 23 & 24.

Zambesi Black BR
according to Rps. 23, 24 & 25.

Chromanil Black, all brands
according to Rp. 24.

Sulfur Dyes.

Sulfur Black, all brands, according to Rp. 27.
Sulfur Brown G, 2G, according to Rp. 28.
Sulfur Catechu R, G — only according to Rp. 28 b.
Sulfur Corinth B — (without this after-treatment less good.)
Sulfur Blue L extra — according to Rp. 29, 29 a and 30.
Sulfur Indigo B — according to Rp. 29, 29 a and 30.

} extremely fast to light.

Basic Dyes.

The basic dyes which are fastest to light on cotton are the following:—

Brilliant Safranine
Safranine
Rhodamine
Methylene Blue (the greener brands)
Fast Blue for Cotton
Diphene Blue

Acid Dyes.

The dyestuffs Ponceau to Metanil Yellow mentioned under Recipe 36 are very fast to light.

Cotton Dyes fast to Water.

Substantive Dyes.

On lying for 24 hours in *cold* distilled water the following do not bleed into white cotton:—

Red:—

Primuline, diazotised and developed with β-Naphtol (Rp. 21).

Orange:—

Primuline, diazoted and developed with Resorcine (Rp. 21).

Toluylene Orange G according to Rp. 24 or 25.

Yellow:—

Chrysamine G, R according to Rp. 24 or 25.

Primuline after-treated with chloride of lime (page 100).

Blue:—

Chicago Blue 6B, 4B, B, RW
Benzoazurine G, 3G
Brill. Azurine 5G
} according to Rp. 23.

Columbia Black-Blue G according to Rp. 24.

Zambesi Pure Blue 4B, R
Naphtogene Blue 2R, 4R
} diazotised and developed with β-Naphtol. (Rp. 21).

Chicago Blue B, R according to Rp. 25.

Brown:—

Congo Brown G, R according to Rp. 23, 24 or 25.

Catechu Brown according to Rp. 23 or 24.

Zambesi Brown G, 2G according to Rp. 21.

Columbia Brown R according to Rp. 21 or 25.

Chromanil Brown R, 2G, according to Rp. 24 or 25.

Grey and Black:—

Zambesi Black D, R according to Rp. 25
Zambesi Black F „ „ 23 or 24
Zambesi Black BR „ „ 23, 24 or 25
} or diazotised and developed according to Rp. 21.

Zambesi Black V „ „ 21 (see page 110).

Columbia Black B „ „ 25.

Chromanil Black, all brands, according to Rp. 24.

---

* The substantive cotton dyes do not bleed into *wool*.

(Cotton Dyes fast to Water).

Sulfur Dyes.

The Sulfur Dyes are all fast to water (Rps. 27—30).

Basic Dyes (Rp. 31—34).

On lying for 24 hours in *cold* distilled water

the following bleed neither into wool nor into cotton:-	the following bleed a little into wool but not into cotton:-
Aurophosphine	Rhodamine
Phosphine	Auramine
Brilliant Phosphine	Victoria Blue 4R.
Methylene Blue	
Diphene Blue	
Victoria Blue B	
Methyl Violet	

Cotton Dyes fast to Alkalies.

Substantive Dyes.

The dyeings of substantive dyes produced according to Rps. 17—25 are fast against dilute alkalies, with the exception of

Orange TA	Azo Blue
Chrysamine G, R according to Rp. 17.	Congo Blue 2B
Thiazol Yellow	Heliotrope 2B
Benzoazurine } according to Rp. 17	Azo Violet.
Brilliant Azurine }	

The dyestuffs mentioned on page 146 are particularly fast to alkalies, *i. e.* they resist the action of strong alkalies, such as are for example employed when *mercerising dyed goods.*

(Cotton Dyes fast to Alkalies).

Sulfur Dyes (Rps. 27–30).

All Sulfur Dyes are fast to alkalies.

Basic Dyes (Rps. 31–34).

The following are fast to alkalies:—

Brilliant Safranine
Safranine
Rhodamine
Aurophosphine
Auramine
Diphene Blue
Victoria Blue
Methylene Blue
Methyl Violet.

Acid Dyes.

Of the weakly acid dyes mentioned under Rp. 35 the following are fast to alkalies:—

Erythrosine
Rose Bengale.

The dyestuffs Ponceau to Metanil Yellow mentioned under Rp. 36 are fast to alkalies.

Cotton Dyes fast to Washing and Milling.

Substantive Dyes.

In **direct dyeings** (Rp. 17) the substantive cotton dyes on washing bleed more or less into white cotton. In light to medium shades the following are comparatively *fast to washing:—*

Red:—

Erica in light shades

Orange:—

Mikado Orange GO, 4RO

(Cotton Dyes fast to Washing and Milling).

Yellow:—

Columbia Yellow

Curcumine S

Blue:—

Chicago Blue 6B
in light shades

Chicago Blue R

Congo Fast Blue B, R

Columbia Fast Blue 2G

Naphtogene Blue 2R

Violet:—

Columbia Violet R

Grey:—

Neutral Grey G

Zambesi Black D
in light shades.

Zambesi Black F, R

In **after-treated dyeings** (see page 106) the dyestuffs mentioned under Rps. 21—25 are *fast to washing* (with soap and soda) and — where specially observed — also *fast to milling*:—

Red:—

Primuline, according to Rp. 21 developed with β-Naphtol (fast to milling).

Orange:—

Primuline
developed with Resorcine
according to Rp. 21.

Toluylene Orange G
according to Rp. 24 or 25
(fast to milling).

Yellow:—

Chrysamine G
according to Rp. 24 or 25
(fast to milling).

Primuline
according to Rp. on page 100
after-treated with chloride
of lime (fast to milling).

Green:—

Mixtures of

Primuline and
Zambesi Black BR
} developed with Phenol according to Rp. 21.

Zambesi Black BR developed with Resorcine according to Rp. 21 (see page 110).

(Cotton Dyes fast to Washing and Milling).

Blue:—

Zambesi Pure Blue 4B, R
Zambesi Indigo Blue R
Naphtogene Blue 2R, 4R
Zambesi Black D, F, BR, R, V
} developed with β-Naphtol according to Rp. 21 (fast to milling).

Chicago Blue 6B, 4B, B, RW
Benzoazurine G, 3G
Brilliant Azurine 5G
} according to Rp. 23.

Columbia Black-Blue G according to Rp. 24.

Chicago Blue B, R according to Rp. 25.

Brown:—

Zambesi Brown G, 2G
Columbia Brown R
} developed with Toluylene Diamine according to Rp. 21 (fast to milling).

Columbia Brown R according to Rp. 25.

Congo Brown according to Rp. 23, 24 or 25.

Catechu Brown according to Rp. 23 or 24.

Chromanil Brown according to Rp. 24 (fast to milling).

Grey and Black:—

Zambesi Black D, R
Zambesi Black F, BR
Zambesi Black V, 2G
} developed with Toluylene Diamine or Nerogene D (see page 110).

Zambesi Black NA developed with β-Naphtol.

Zambesi Black F, BR
Chromanil Black, all brands
} according to Rp. 24.

} fast to milling.

Zambesi Black F, BR according to Rp. 23.

Zambesi Black BR, D, R
Columbia Black B
} according to Rp. 25.

Sulfur Dyes.

Sulfur Black, all brands, according to Rp. 27.

Sulfur Brown G, 2G according to Rp. 28.

Sulfur Catechu R, G
Sulfur Corinth B
} according to Rps. 28a and 28b.

Sulfur Blue L extra
Sulfur Indigo B
} according to Rps. 29—30.

} fast to washing and milling.

(Cotton Dyes fast to Washing and Milling).

Basic Dyes (Rps. 31—34).

Fast to washing with soda and soap:—

Diphene Blue

The following are fast to washing with soap:—

Rubine
Safranine
Brilliant Safranine
Auramine
Aurophosphine
Ethyl Green
Malachite Green
Leaf Green
Methylene Blue
Fast Blue for Cotton
Victoria Blue
Methyl Violet

Fastness of the Cotton Dyes to Acids.

(Fastness to acetic acid, see page 12.)

Substantive Dyes.

The dyeings of substantive dyes produced according to Rps. 17—25 are fast against acetic acid, with the exception of:—

Red:—

Congo
Congo 4R
Benzopurpurine 4B, 4BG
Benzopurpurine 6B, 10B
Brilliant Purpurine 10B
Congo Corinth G, B
Congo Rubine

Orange:—

Congo Orange G, R
Orange TA

Yellow:—

Chrysamine G, R
according to Rp. 17.
Thiazol Yellow

(The Fastness of the Cotton Dyes to Acids).

Grey and Black:—

Sambesi-Schwarz D according to Rp. 17.

Columbia Black the EA, WA and EAW brands.

(N.B. The remaining Columbia Black brands are fast to acids.)

The dyeings of the preceding dyestuffs are affected more or less in shade by acetic acid; alkaline washing however restores the original shade.

Sulfur Dyes (Rps. 27—30).

The dyeings of the Sulfur Dyes resist the action of acetic acid — with the exception of Sulfur Indigo B, which becomes more reddish in tone; alkaline washing however restores the original shade.

Basic Dyes.

The dyeings of all basic dyestuffs produced according to Rps. 31—34 are fast against acetic acid.

Acid Dyes.

The dyes mentioned under Rp. 35 are *not* fast to acetic acid.

The dyes mentioned under Rp. 36 — with the exception of Metanil Yellow — are fast to acetic acid.

Cotton Dyes fast to Cross-Dyeing.

The following dyestuffs when dyed according to the recipes indicated, yield dyeings which withstand cross-dyeing in a boiling acid bath *(see page 12)* *and which do not then bleed into, or only slightly bleed into, white wool and cotton.*

Substantive Dyes.

Red:—

Primuline, developed with β-Naphtol according to Rp. 21.

Orange:—

Primuline, developed with Resorcine according to Rp. 21.

Yellow:—

Primuline, after-treated with chloride of lime, see page 100.
Chrysamine G, R according to Rp. 25.
Columbia Yellow, for the purpose of shading diazotised and developed dyeings, according to Rp. 21.

Blue:—

Zambesi Pure Blue 4B, R
Naphtogene Blue 2R, 4R
Zambesi Black D, F, R
Zambesi Black BR, V
} diazotised and developed with β-Naphtol according to Rp. 21.

Chicago Blue B, R according to Rp. 25.

Brown:—

Toluylene Orange G
Congo Brown G, R
Chromanil Brown 2G, R
Columbia Brown R
} according to Rp. 25.

(*Cotton Dyes fast to Cross-Dyeing*).

Grey and Black:—

Columbia Black, all brands with the exception of the EA, WA and EAW brands.

Zambesi Black D, F, R } diazotised and developed with
Zambesi Black BR, V, 2G } Toluylene Diamine or Nerogene according to Rp. 21 (see page 110).

Sulfur Dyes.

Sulfur Black
all brands, according to Rp. 27.

Sulfur Brown G, 2G
according to Rp. 28.

Sulfur Catechu R, G } according to Rp. 28 b.
Sulfur Corinth B }

Sulfur Blue L extra
according to Rps. 29, 29 a, 30.

Sulfur Indigo B (Rp. 30)
is fast to cross-dyeing inasmuch as is does not stain white material, though it is reddened in shade (see page 166).

Basic Dyes.

Red:—

Brilliant Safranine
Safranine
Rhodamine
} according to Rp. 31.

Blue:—

Methylene Blue (2 B brands) } according to Rp. 31.
Diphene Blue }

Victoria Blue B
(fast to cross-dyeing, though it bleeds into white wool).

Green:—

Dye with
Primuline, after-treat with chloride of lime (page 100),
then top with
Methylene Blue 2B
and fix with tannin and tartar emetic (see Rp. 31).

Sensitiveness of the Cotton Dyes to Heat. (Ironing or Calendering).

Substantive Dyes (Rps. 17–25).

(a). *The dyeings of the following dyestuffs are considerably changed in shade by hot ironing and calendering; the original shade however returns on cooling.*

Red:—

Congo Corinth G, B — Congo Rubine

Blue:—

Benzoazurine R, G, 3G; Brilliant Azurine 5G, B — according to Rp. 17. — Congo Blue 2B; Azo Blue

Violet:—

Azo Violet — Heliotrope 2B

(b). *The following dyes are only slightly changed in shade by hot ironing and calendering; the original shade returns on cooling.*

Red:—

Congo — Brilliant Purpurine 10B
Congo 4R — Rosazurine G, B
Benzopurpurine, all brands. — Bordeaux COV

Orange:—

Toluylene Orange G according to Rp. 17. — Orange TA

Sensitiveness of the Cotton Dyes to Heat (Ironing or Calendering).

Yellow:—

Thiazol Yellow

Green:—

Columbia Black-Green D

Blue:—

Chicago Blue B according to Rp. 17.
Chicago Blue R, 2R, 4R
Congo Blue BX
Congo Fast Blue B, R, HW
Columbia Fast Blue 2G

Violet:—

Columbia Violet R

Brown:—

Catechu Brown, all brands according to Rp. 17.
Zambesi Brown G, 2G according to Rp. 17 (see page 101).

Grey and Black:—

Columbia Black, the EA, WA and EAW brands.
Zambesi Black D, R, F, BR, according to Rp. 17.

Sulfur Dyes (Rps. 27—30).

The dyeings of the Sulfur Dyes are fast against hot ironing and calendering.

Basic Dyes (Rps. 31—34).

The following are only temporarily shanged in shade:—

Red:—

Rubine
Rhodamine

Sensitiveness of the Cotton Dyes to Heat (Ironing or Calendering).

Yellow:—

Auramine

Green:—

Malachite Green — Leaf Green

Acid Dyes (Rps. 35 and 36).

The following are temporarily reddened:—

Water Blue 6B—BR — Light Blue for Silk
Methyl Blue

Fastness of the Cotton Dyes to Bleaching.

Substantive Dyes (Rps. 17—25).

The following are *fast to bleaching:*—

Orange:—

Mikado Orange GO, 4RO

Yellow:—

Chrysophenine G — Mikado Golden Yellow 8G
Columbia Yellow — Primuline after-treated with chloride of lime (see page 100).
Curcumine S
Mikado Yellow

The remaining substantive cotton dyes are *not fast to bleaching;* the following will however withstand a *slight bleaching:*—

Red:—

Erica — Primuline developed with β-Naphtol according to Rp. 21.
Columbia Fast Scarlet 4B

(Fastness of the Cotton Dyes to Bleaching).

Orange:—

Congo Orange R, G

Blue:—

Congo Fast Blue B, R, HW
Columbia Fast Blue 2G
Solamine Blue B, R, F F

Zambesi Pure Blue 4B, R
Zambesi Indigo Blue R
Naphtogene Blue 2R, 4R
} developed with β-Naphtol according to Rp. 21.

Grey and Black:—

Zambesi Black D, NA
Zambesi Black V, 2G
Zambesi Black R, F, BR
} according to Rps. 17 or 21, 23, 24 or 25.

Sulfur Dyes (Rps. 27—30).

All Sulfur Dyes are destroyed by bleaching; Sulfur Indigo B alone will withstand a very *slight* bleaching.

Basic Dyes (Rps. 31—34).

Only
Methylene Blue (the 2B brands)
is moderately fast to bleaching.

Linen, Half-Linen,

China Grass, Hemp.

The Dyeing of Linen, Half-Linen, China Grass, Hemp.

All the dyestuffs and dyeing recipes (Rps. 17—36) recommended for cotton will serve for the dyeing of linen, half-linen, China grass and hemp.

A thorough boiling out of the material with an addition of about 10% soda (of the weight of the goods) should precede the dyeing of linen, half-linen and hemp. For lighter shades, a bleach is necessary. As the above-mentioned materials possess a harder fibre and are more difficult to penetrate than cotton, it is necessary to retard the exhaustion of the dyes.

When working with

Substantive Cotton Dyes this is attained by reducing the quantities of Glaubersalt or common salt, by the addition of a little more soda or also of soap or Turkey Red Oil.

Of Columbia Black the EA, WA, EAW brands are preferably employed.

When dyeing with

Sulfur Dyes the quantities of Glaubersalt or common salt must likewise be reduced. An addition of Turkey Red Oil usually exerts a favorable influence.

When employing

Basic Dyes (Rp. 31) it is advisable to employ the tannin mordanting liquor very hot.

Jute, Cocoanut Fibre.

Jute, Coconut Fibre.

The Dyeing of Jute and Cocoanut Fibre.

For the dyeing of jute and cocoanut fibre certain acid dyes and the basic dyes chiefly find employment. Of the

Acid Dyes

the following come into account:—

Red:—

Jute Scarlet, all brands	Fast Red A
Ponceau 3RB, 4RB, 6RB	Eosine
Ponceau BO extra	Erythrosine

Orange:—

Mandarine G extra	Ponceau 4GB

Yellow:—

Quinoline Yellow	Curcumeine extra
Azo Acid Yellow	

Green:—

Guinea Green, all brands

Blue:—

Water Blue 6B—R	Wool Blue, all brands

Violet:—

Guinea Violet 4B

Rp. 37:—

Dye boiling hot with an addition of about
2½% alum and
2½% oxalic acid.

Basic Dyes.

All the dyes mentioned on pages 136—137 are applicable, further

Jute Black KB, KG, B extra, 2B extra, etc.

Rp. 38:—

On account of the tannin contained in jute and in cocoanut fibre, the basic dyestuffs dye *without* a previous mordanting. Dye boiling either with an addition of 2½ % alum or 3 % acetic acid, or *without* any addition.

Further, all

Substantive Cotton Dyes (pages 99—102) can be employed for jute and cocoanut fibre; the dyeings are distinguished by good fastness to water and rubbing. Of Columbia Black the brands EA extra, EAW extra and WA extra are most advantageously employed.

Dye as on cotton (Rp. 17) for about ¼ hour boiling with an addition of 15—20 % Glaubersalt cryst. and ½ % soda ash, turn off steam and work for a further ½ hour.

If particularly high requirements are made as to fastness, the

Sulfur Dyes (page 119) can also be employed. Dye as on cotton (Rps. 27—30), though smaller quantities of dyestuff will suffice.

Artificial Silk.

The Dyeing of Artificial Silk.

For the dyeing of artificial silk (Chardonnet Silk, Viscose Silk, etc.) the

Substantive Cotton Dyes (pages 99—102) are chiefly to be recommended.

Rp. 39:—

Dye for about 1 hour at about 100° F. with an addition of 5—10% Glaubersalt cryst., rinse and dry at as moderate temperature as possible.

The topping with basic dyes as well as the methods of after-treatment (Rps. 20—25) recommended for substantive dyes can also be carried out with dyeings on artificial silk.

Further, the

Basic Dyes ((pages 136—137) are also adapted.

Rp. 40:—

Dye in a bath slightly acidulated with acetic acid, enter cold and heat gradually to about 120° F.

If the heating occurs too quickly or the dyeing is done too hot, the basic dyes will easily fall on to the fibre unevenly.

In case greater requirements as to fastness are made, the basic dyes may also, like in cotton dyeing, be fixed on a tannin and antimony mordant according to Rp. 31.

HALF-WOOL.

(Wool & Cotton.)

HALF-WOOL.

(Wool & Cotton.)

The Dyeing of Half-Wool.

(Wool and Cotton.)

By the introduction of the Substantive Cotton Dyes into union dyeing and the *one-bath dyeing process* which thereby becomes possible, the older and more complicated dyeing-methods have gradually been forced more into the background.

In the following therefore, that branch of union dyeing which is of most importance, *viz.*,

the Dyeing of Union Materials in One Bath,

shall be treated principally.

In conjunction herewith are

the Two-Bath Processes

with the employment of Substantive Cotton Dyes:—

(1) First dyeing the cotton with a Substantive Black and subsequently dyeing the wool in an acid bath;

(2) First dyeing the wool with Acid Dyes and subsequently dyeing the cotton with Substantive Dyes of little affinity for the wool;

and finally the process generally in use before the introduction of the Substantive Cotton Dyes:—

First dyeing the wool with Acid Dyes, mordanting the cotton with tannin and an antimony mordant and finally dyeing with Basic Dyes; or

First dyeing the wool with Acid Dyes and darkening the cotton with tannin (sumach) and iron salts.

For the dyeing of union piece-goods according to the one-bath process as well as according to the two-bath processes mentioned on page 187, the most suitable dye-vessels are the well-known piece-vats with a perforated inner partition, dividing the vat into a larger and a smaller space. The steam-pipe opens into the latter, and here the additions of dye and salt may be made, without the necessity of lifting the material out of the bath. Either direct or indirect steam may be used, though the latter is preferable in order to prevent an excessive dilution of the bath by condense water.

The jigger (except for mordanting and dyeing the cotton according to the several-bath process with the use of basic dyes or iron salts) seldom comes into question for union piece-goods.

The Dyeing of Union Material in *One* Bath.

Recipe 41:—

This process is based upon the property of the Substantive Cotton Dyes of dyeing both cotton and wool in a boiling neutral bath. The affinity, however, of each individual substantive dye for the vegetable and animal fibres differs considerably. As a rule such dyestuff as dye the cotton darker than the wool are to be preferred.

The *Substantive Cotton Dyes* suitable for union dyeing may be classified as follows according to their behaviour in a *boiling* neutral salt bath:—

I. Colors which dye the cotton darker than the wool.

II. Colors which dye both fibres approximately alike.

III. Colors which dye the wool darker than the cotton.

As auxiliary dyes the following may be mentioned:—

IV. Such *Acid Dyes* as dye the wool well in a boiling neutral bath, but leave the cotton quite or nearly undyed.

The following table gives a clear representation of the dyes at disposal:—

	I	II	III	IV
	Substantive Cotton Dyes which dye			Acid Dyes (or Weakly Acid Dyes) which dye the wool only:—
	the cotton darker than the wool:—	both fibres approximately alike:—	the wool darker than the cotton:—	
Red:—		Brill. Congo R Benzo-purpurine 4B, 6B Brill. Purpurine R, 10B Diamine Red B Congo Corinth G, B	Erica, all brands Congo Rubine	Ponceau 3RB Fast Red A Cloth Red BA Rhodamine B
Orange:—	Mikado-Orange GO, 4RO	Brill. Orange G Orange TA	Congo Orange R, G Columbia Orange R	Mandarine G extra
Yellow:—	Curcumine S Mikado Yellow Mikado Golden Yellow 8G Columbia Yellow	Thiazol Yellow Chrysophenine G Chrysamine G		Curcumeïne extra Azo Acid Yellow Martius Yellow
Green:—	Columbia Green			Guinea Green B

	I	II	III	IV
	Substantive Cotton Dyes which dye			Acid Dyes (or Weakly Acid Dyes) which dye the wool only:—
	the cotton darker than the wool:—	both fibres approximately alike:—	the wool darker than the cotton:—	
Blue:—	Congo Fast Blue HW Columbia Fast Blue 2G Solamine Blue FF Columbia Blue G, R * Zambesi Black BR, R	Chicago Blue 6B, 4B, B Congo Sky Blue Columbia Black-Blue G * Zambesi Black F * Chromanil Black 2BF	Chicago Blue RW Congo Blue BX	Wool Blue 5B, 2B, R, G extra Indocyanine B Patent Blue A Alkali Blue
Violet:—	Heliotrope 2B	Columbia Violet R		Wool Violet 10B, 6B Guinea Violet 4B
Brown:—	Zambesi Brown G, 2G Columbia Brown R	Congo Brown G, R Chromanil Brown 2G, R	Wool Brown R, G	
Grey and Black:—	Zambesi Black BR, R	Zambesi Black D, F Columbia Black FB, F2B, FBW Chromanil Black 2BF	Nyanza Black B	Wool Black 6B, 4BF etc. Wool Black GR Wool Jet Black 2B, 3B

* Zambesi Black R, F, BR and Chromanil Black dyed *direct* yield dark Blues; diazotised and developed or after-treated, Blacks (see Rps. 21—24).

The Temperature of the Dyebath.

The above statements regarding the behaviour of the dyestuffs refer to boiling dyebaths or at least temperatures near the boiling-point. By means of a suitable reduction of the temperature, it is possible to obtain solid shades with dyestuffs which otherwise dye the wool darker.

The most important means of obtaining solid shades is the maintenance of the proper temperature of the dyebath whilst observing the affinity of the dyestuffs for the vegetable and animal fibre as demonstrated in the preceding table.

The *Substantive Cotton Dyes,* at temperatures *below* the boiling-point, tend to dye the cotton more than the wool. On reducing the temperature, their affinity for the wool fibre decreases to such an extent that even those dyestuffs which in a boiling bath dye the wool more than the cotton (Group III), in a cold bath leave the wool nearly undyed and almost exclusively dye the cotton (see pages 103 & 104).

The *Acid Dyes* used in union dyeing, on the other hand, work best in a *boiling* bath; additions of acid dyes should therefore, as a matter of necessity, be made at or near the boiling-point.

The difficulty therefore lies in the regulation of the temperature during the dyeing process in such a manner as to meet the requirements of both the cotton and the wool dyes. By a correct selection of dyestuffs it is not only easy to overcome this difficulty, but it is frequently possible to match off satisfactorily even in a boiling bath.

Occasionally, after boiling, the cotton will not possess the desired depth of shade; in this case the steam must be turned off and the goods left in the cooling bath for a short time, or a subsequent shading with suitable dyes may be carried out. For shading the cotton after the dyebath has cooled down, those substantive dyestuffs mentioned on page 104 are especially adapted which dye cotton in the *cold*.

The Concentration o the Dyebath

Besides the temperature, the concentration of the dyebath plays an important part. The more concentrated the liquor, the more easily will it be possible to produce the desired depth of shade on the cotton. As a rule, 20 to 30 times the quantity of water (of the weight of the goods), containing 5 to 20 lbs. Glaubersalt crysts. per 100 gallons of liquor (according to the depth of shade required), represents the most advantageous proportion. For Blacks the larger addition, for light fancy shades the smaller addition of salt will be required. Generally, when dyeing with direct steam a larger addition of salt will be necessary than when dyeing with indirect steam; the amount of salt, however, must only in exceptional cases exceed the quantities stated.

Crystallised Glaubersalt can be substituted by about one-half the quantity of the *calcined* product (see page 18). In some places common salt is employed for reasons of economy; however, under certain circumstances, this may cause the colors to dye the fibre too quickly.

The Addition of Alkalies and Acids.

The addition of a little (*i. e.* about $\frac{1}{2}\%$) borax or soda will *lessen* the affinity of the dyestuffs for the wool. In certain cases such an addition, if made in moderation, may be of advantage.

An addition of a little acetic acid will *increase* the affinity of the dyes for the wool, and may be employed when the wool, in spite of prolonged boiling with suitable dyestuffs, is not sufficiently capable of attracting the dye.

Influence of the Composition of the Union Material.

The union fabrics which are to be found in the market are of extremely varied composition. Wool and cotton are mixed in all possible proportions; sometimes the one fibre, sometimes the other predominates. Since, however, the cotton always requires a certain proportion of liquor (*i. e.,* saturation of the dyebath with the dyestuff intended for it) in order to become sufficiently dyed, the bath must be prepared with almost as much cotton dye for goods containing comparatively little cotton as for material with a much larger percentage of this fibre.

When dyeing *cotton* with substantive dyestuffs the most *advantageous* proportion of liquor is about 1:25. For union material consisting of about equal parts of wool and cotton — taking for granted that the quantity of liquor equals 25 times the weight of the materials — we have a proportion of 1:50 for the cotton contained in the material, or, if the latter contains even less cotton, the proportion is still more unfavorable. In order to counterbalance the comparatively excessive quantity of liquor for the weight of the cotton, a much larger quantity of dye will be required to obtain a sufficiently deep shade. It follows therefore, as explained above, that even a very small percentage of cotton in the goods will necessitate a comparatively large excess of substantive cotton dyes.

Preliminary Treatment of the Piece-Goods.

Many materials require a preliminary clearing or stripping which cannot well be avoided if even dyeings are to result.

The *Clearing* will have to take place chiefly when the material still contains soap or grease from the manufacture, as is often the case with low qualities of

goods. These residues may cause an uneven dyeing or may even prevent the acid colors in particular from dyeing, so that even after prolonged boiling they will not dye the wool sufficiently. Soap residues can easily be removed by a treatment with boiling water, grease by washing at 100° F. with an addition of a little soda and ammonia.

The *Stripping* of union piece-goods is only carried out with material containing shoddy, and has the object of giving the raw material a lighter tone, in order to produce lighter shades thereon. Stripping is carried out by boiling for 30 minutes with 10% sulfuric acid alone or together with 3% bichromate of potash. For light shodddy, boiling with sulfuric acid alone will suffice; dark shoddy must be stripped with an addition of bichromate of potash.

Prolonged boiling must be avoided, as otherwise a part of the stripped dyes might again boil on to the wool. After stripping, the material must be rinsed in water containing a little soda, or preferably ammonia, in order to remove the acid contained in the material. This is necessary for two reasons. On the one hand the material might suffer from an excess of acid remaining in it, on the other hand the affinity of the cotton for substantive dyes might be diminished, so that it may happen that on completion of the manipulation the cotton will appear insufficiently dyed.

General Dyeing Recipe for Union Piece-Goods.

Prepare the vat with the necessary quantity of water (about 25 to 30 times the weight of the material) and heat to 160—180° F., then add the dyestuff to the dyebath in a thoroughly dissolved state besides the necessary quantity of salt (5—20 lbs. Glaubersalt crysts. per 100 gallons) and enter the material. As soon as

the latter is well wetted out, bring the bath to the boil. After boiling for about one hour both cotton and wool, under normal conditions, should be dyed evenly to the right shade. If this is not the case, as will frequently happen when dyeing a shade for the first time, a further matching-off of course becomes necessary.

Matching off.

When matching-off union goods which have been dyed according to the one-bath method, special attention must be paid to the following points:—

The *Acid Dyes* almost all dye the *wool* only, and independently of the temperature of the bath; they stain the *cotton* so little both in a hot and in a cold bath, that this may be altogether disregarded.

The *Substantive Cotton Dyes* shew more affinity for the wool or the cotton according to the temperature of the bath; the lower the temperature, the less will go on to the wool; a longer boiling will tend to boil them from the cotton on to the wool — even if already fixed on the cotton.

From this it follows as a rule that superfluous boiling must be avoided, as otherwise there is a risk of boiling the cotton dyes on to the wool, whereby the shade of the latter will become considerably changed, the cotton at the same time appearing too light. This is especially the case with both stripped and unstripped shoddy material, which as a rule, attracts the dyes more eagerly than pure wool. Consequently, also, for this purpose cotton dyes which stain the wool least should be chosen. When boiling for a length of time, therefore, there is scarcely any risk of unfavorably influencing

the shade of the wool — a matter of greatest importance in dyeing fancy shades, with which matching-off is the most difficult. This also explains why in some cases a larger number of dyestuffs must be employed for certain shades than at first sight appears necessary.

If the shade of the pattern to be matched is nearly approached, and only the *wool* appears a little *too light*, a short boiling will generally suffice to produce the right shade. If the wool is not only too light but also deviates considerably in shade, a further boiling as well as an addition of the requisite wool dye will be necessary.

If the *wool* on the other hand is *too dark,* the batch is best reserved to dye to a darker pattern; if this is not possible, the goods must be stripped in a fresh bath.

Should the wool be right in shade but the *cotton* appear *too light,* turn of steam and allow the material to run for some time in the cooling bath, making a further addition of cotton dye if the deviation is large (see pages 192 and 193).

If neither wool nor cotton match the pattern, first bring the wool up to shade in a boiling bath and then dye the cotton below the boil.

The matching-off of union goods should always be carried out after drying the sample, since the actual shade of the cotton can only be properly seen in this way.

Continuous Dyeing in an Old Bath.

When dyeing dark shades it is advisable to preserve the dyebaths, which are not exhausted, in order to turn the dye contained therein to account for the next lot; besides this a saving of steam and time results from the employment of the already hot liquor. As a rule about ¼ less dyestuff may be taken for a standing bath than when making up a fresh one. It is only necessary to replace the amount of salt contained in the liquor taken out of the bath by the wet pieces: as a rule an addition of $\frac{1}{8}$ to $\frac{1}{10}$ of the amount of salt first employed will suffice for a standing bath.

Under no circumstances should an excess of Glauber-salt or common salt be used, as thereby the dye is easily precipitated, in consequence of which too light, clouded or bronzy dyeings will result. If for example, bronzy dyeings are produced when using Columbia Black, the cause is almost invariably the presence of too large a quantity of salt in the dyebath.

The amount of salt contained in the liquor can easily be determined by means of the hydrometer; the liquor must not measure more than 3° Tw.

After-treatment of the Dyed Goods.

In order to increase the fastness to light or washing and the resistance against potting and crabbing, a subsequent treatment of the dyed goods with bluestone and bichromate of potash is occasionally carried out (see Rps. 23 and 24).

Tho following dyes are adapted for an after-treatment with bluestone:—

Chicago Blue 6B, 4B, B, RW	Congo Brown G, R
	Zambesi Black F, BR

for an after-treatment with bluestone and bichromate of potash:—

Chrysamine G	Zambesi Black F, BR
Congo Brown, G, R	Chromanil Black 2BF.
Chromanil Brown 2G, R	

The after-treatment is carried out by treating the rinsed goods for 25 minutes in a fresh boiling-hot bath with

1—3 % bluestone
½—1 % acetic acid

or with

1½—3 % bluestone
½—1 % bichromate of potash
½—1 % acetic acid.

Topping with Basic Dyes.

The topping of the dyeings with basic dyestuffs becomes necessary when the combination of the substantive dyes with wool dyes alone will not yield a sufficiently brilliant shade. Top in a fresh cold or tepid bath, if possible in the rinsing bath, either without any addition or with a little acetic acid. As a rule not more than about ½ % basic dye should be used, as otherwise the dyeings will tend to rub off. As regards the temperature, it must be observed that basic dyestuffs dye the cotton more in the cold and are only attracted by the wool on heating. The temperature must therefore be regulated according as the one or the other fibre is to be shaded. Contrary to substantive dyes, however, the basic dye once fixed on the cotton will not bleed on to the wool even by prolonged boiling.

The Dyeing of Union Material in *Two* Baths.

Recipe 42:—

Bottoming the Cotton with Columbia Black and then Dyeing the Wool in an Acid Bath.

An important part of two-bath dyeing is the process introduced several years ago, of bottoming the cotton with Columbia Black and then dyeing the wool in a fresh bath. This method is based on the remarkable fastness of Columbia Black towards acids, and particularly towards dilute mineral acids, even at a boiling temperature, and is specially adapted for such shoddy materials as do not require the cotton warp to be dyed exactly the same shade as the wool, so long as it is covered in such a manner that its presence cannot be readily detected.

The bottoming with Columbia Black is carried out in a short alkaline bath which must not be too hot. The comparatively low temperature and the addition of alkali are intended to prevent the Columbia Black from dyeing the wool. Make up the bath, which must be as concentrated as possible and not hotter than 140—160° F., with 6% Columbia Black, 20% Glaubersalt crysts. and 3% soda ash, and allow the goods to run in the bath

at this temperature until the cotton is sufficiently covered. Then rinse and dye the wool in a fresh bath with acid dyestuffs and an addition of 10% Glaubersalt crysts. and 5—10% sulfuric acid.

Enter at a low temperature into the acidulated bath and gradually raise to the boil within about 20 minutes. The object of this precaution is to first completely fix the Columbia Black on the cotton, otherwise the wool might easily become stained. The acid bath at the same time strips the wool, so that it is in this way possible to obtain comparatively light shades.

The Columbia Black bath is not exhausted and should therefore be preserved for further use. If the addition of salt is properly regulated, the dyebath will keep for a considerable length of time. As a rule the additions for continuous dyeing amount to

not more than 1% Glaubersalt crysts.
„ „ „ ½% soda ash
„ „ „ 4% Columbia Black, *e. g.,* FB.

The above process has the following advantages over the older dyeing-methods, according to which the cotton was covered with sumach and iron after the wool had been dyed with acid dyes:—

The process requires far less time, the bottoming operation taking place much quicker, and the usual extremely troublesome washing after dyeing is altogether obviated.

The material has a softer handle and does not dust.

There is no risk, as is the case with the older process, of obtaining patchy or clouded dyeings.

Matching-off is very much easier; whilst the subsequent covering of the cotton with sumach and iron darkens the wool at the same time, this objection is altogether overcome by covering the the cotton with Columbia Black before the wool is dyed.

The *Stripping* of shoddy materials (see page 195) may also be carried out *after* having covered the cotton with Columbia Black and before the dyeing of the wool in an acid bath; the shade of the Columbia Black, however, is somewhat impaired. The brand best suited for this purpose is Columbia Black B.

With Acid Dyes which are fast to the action of chrome, *e. g.*,

Ponceau R-4G	Mandarine	Guinea Green
Victoria Scarlet	Naphtol Yellow	Water Blue RC
Guinea Red 4R	Azo Acid Yellow	Wool Blue 5B, 2B
Acid Magenta S	Curcumeïne	Guinea Violet 4B

the stripping and dyeing of the wool can be carried out at one and the same time by adding the dye and bichromate of potash together to the acid bath after bottoming the cotton with Columbia Black.

Recipe 42a:

Dyeing the Cotton with Columbia Black FBW during the Milling Process, and then Dyeing the Wool in an Acid Bath.

Latterly a convenient and time-saving process, the dyeing of the cotton during the milling in *one* operation, has found much favor, especially for cheap shoddy materials.

Columbia Black FBW, which is very readily soluble, has proved particularly adapted for this purpose, and besides possesses the advantage, when employed in this manner, of leaving the wool almost undyed.

The manipulation is carried out as follows:—

Add to the milling liquor, according to the amount of cotton contained in the material,

3—5 % Columbia Black FBW
(of the weight of the goods),

well dissolved in hot water, and mill in the usual manner. As there is generally no more liquor present than the pieces are capable of absorbing, only a very slight loss of dye is possible. Shortly before conclusion of the milling process a little Glaubersalt cryst. (about 1½ oz. per gallon of milling liquor) may be added.

The pieces are then well rinsed and dyed in an acid bath with Acid Dyes. It must be observed that this bath is made sufficiently acid before entering the goods; if this is not done, the dye will tend to boil down from the cotton and become fixed on the wool.

Recipe 43:--

Dyeing the Wool with Acid Dyes, Subsequently Covering the Cotton with Substantive Dyes; Burl-Dyeing.

This method is generally employed when the wool of the union material will not bear a longer boiling in a neutral bath, as in usual with the one-bath process. It is also preferred when it is required to give the wool a firmer feel.

First dye the wool with Acid Dyes (Rp. 1), rinse well and cover the cotton in a fresh bath, which must be as short as possible (best in the washing-machine), with such Substantive Dyestuffs which will dye from a tepid or cold bath (see pages 103 and 104). It is advisable to preserve the baths intended for subsequently dyeing the cotton for further use.

For the so-called "*burl dyeing*" this method has attained considerable importance.

For this purpose such Substantive Cotton Dyes as dye cotton readily in the *cold* must be employed (see page 104).

After dyeing with Acid Dyestuffs, rinse with the addition of a little ammonia or soda and cover the cotton in a fresh cold bath with one (or a mixture of several) of the dyes mentioned on page 104 with an addition of 10 lbs. Glaubersalt cryst. per 100 gallons liquor. Both dye and salt are first dissolved boiling, though each separately, and then added to the cold

dyebath. If it is not necessary that the cotton burls should be dyed in the same shade as the wool (*e. g.*, when they occur on the back), a number of pieces of different shades may be burl-dyed with

Columbia Black HWD or HWDB

at one and the same time.

The covering of the cotton may also be carried out according to the *one-bath method, i.e.,* by dyeing in a neutral instead of in an acid bath, by choosing such acid dyestuffs as dye from a neutral bath and adding the necessary quantity of substantive cotton dyes. Since however, in this way a large addition of dye is necessary in proportion to the small amount of cotton present, the *covering* of the cotton or the burls in a fresh cold bath is in almost all cases preferable.

The Production of two-colored Effects.

For the production of two-colored effects by means of substantive cotton dyes, the wool is first dyed in an acid bath and then the cotton in a fresh cold bath with such substantive dyestuffs as dye well from a cold or tepid bath (see pages 103 and 104). It is advisable to rinse the goods between the dyeing of the wool and the cotton with an addition of a little ammonia. Less brilliant effects are obtainable in *one* bath by combining such acid dyes as dye in a neutral bath with substantive cotton dyes which leave the wool quite or nearly undyed. The effects become somewhat clearer if the acid dyes are first added alone to the boiling bath, and only then the cotton colors after the wool is sufficiently dyed, turning off the steam at the same time.

Recipe 44:—

Dyeing the Wool with Acid Dyes, Mordanting the Cotton with Tannin and Antimony Mordant and Dyeing with Basic Dyes or Covering with Iron Salts.

Dyeing of the Wool:—

Dye with Acid Dyes (Rp. 1) and rinse.

Subsequent Dyeing of the Cotton:—

Next mordant *cold* with tannin, sumach etc. and then

either treat the cotton in an antimony or iron bath and dye *cold* with Basic Dyes,

or darken with iron salts (so-called nitrate of iron or pyrolignite of iron).

The process is carried out according to Rps. 31 and 32 (pages 138—140) with the exception that the cotton is mordanted and dyed **cold.**

HALF-SILK.

(Silk & Cotton.)

The Dyeing of Half-Silk.

(Silk and Cotton.)

Recipe 45:—

The Dyeing of Half-Silk with the Use of Substantive Cotton Dyes.

Like in half-wool dyeing, the Substantive Dyes have quickly attained considerable importance for the dyeing of half-silk. Here too the *"One-Bath"* method (see Rp. 41) is applicable, as well for solid shades as for shot effects.

Since however the number of those Substantive Dyestuffs which dye cotton and silk simultaneously in exactly the same shade is comparatively small, the method generally employed is to dye the cotton to the desired shade, *i.e.* somewhat darker than the silk, and then to bring the latter to the right shade in a fresh bath with Acid or Basic Dyes. From this it follows that for half-silk those Substantive Cotton Dyes first come into question which dye the silk less than the cotton, though as nearly as possible in the same tone. Those dyestuffs which leave the silk white or almost unstained are equally important, whilst those which dye the silk darker than, or in a different shade to the cotton, scarcely find any employment for half-silk.

Dyeing Recipe:—

The dyeing occurs either on the winch or — particularly for darker shades — on the jigger.

Dye with an addition of

½—1 oz. soap
1—2½ „ Glaubersalt cryst. } per gallon liquor

for medium and dark shades.

Light shades may also be dyed without the addition of Glaubersalt.

Enter tepid, raise near to the boil and dye for about ¾—1 hour at 180—200° F.

The subsequent dyeing of the silk with Basic or Acid Dyes is carried out in a fresh bath at 120° F. with the addition of a little acetic acid, whereby it must be observed that the Basic Dyes, contrary to the Acid Dyes, dye the cotton as well (see page 105, Rp. 20).

After rinsing, the goods, in order to produce a better feel, are brightened in a weakly acid bath (with acetic or tartaric acid) at about 80° F.

Substantive Cotton Dyes which at 180—205° F. leave the silk almost undyed.

Red:—

Columbia Fast Scarlet 4B
Erica, all brands } silk almost undyed.

Orange:—

Mikado Orange GO, 4RO silk not stained.

Yellow:—

Curcumine S	silk almost undyed.
Mikado Yellow Mikado Golden Yellow 8G	silk not stained.

Blue:—

Chicago Blue 6B Congo Sky Blue Columbia Blue G, R	silk in light shades almost undyed,
Columbia Fast Blue 2G Congo Fast Blue HW Solamine Blue FF	in dark shades only slightly stained.
Solamine Blue B, R	silk only stained slightly grey.
Columbia Black HWD, HWDB	silk stained slightly reddish-grey.

Grey and Black:—

Zambesi Black BR (see also Rp. 45a).	silk only slightly stained.

Substantive Cotton Dyes which at 180—205° F. dye the cotton darker than the silk.

Red:—

Brilliant Congo G, R	silk somewhat clearer and bluer than the cotton.
Brilliant Purpurine R	silk and cotton in the same tone.
Benzopurpurine 10B	silk somewhat yellower than the cotton.

Orange:—

Brilliant Orange G	silk yellower than the cotton.

Yellow:—

Columbia Yellow	silk and cotton in the same tone.

Green:—	
Columbia Green	silk and cotton in almost the same tone.
Blue:—	
Chicago Blue 4B, B, R, RW	
Brilliant Azurine 5G	
Brilliant Azurine B	silk only slightly stained, but in a redder tone.
Benzoazurine R	silk redder than the cotton.
Benzoazurine G, 3G	silk dyed less than with the brand R and in about the same tone as the cotton.
Congo Blue BX	silk redder but considerably lighter than the cotton.
Congo Fast Blue B, R	silk only stained slightly reddish-grey.
Naphtogene Blue 2R, 4R (see Rp. 45 a)	silk and cotton in the same tone.
Columbia Black-Blue G	silk considerably lighter than the cotton, tone of both fibres approximately alike.
Violet:—	
Heliotrope 2B	in light shades both fibres approximately alike, in darker shades the silk somewhat redder than the cotton.
Columbia Violet R	silk and cotton in the same tone.
Brown:—	
Zambesi Brown G, 2G (shade, see page 101)	silk considerably lighter, but in about the same tone than the cotton.
Congo Brown G, R	silk lighter and yellower than the cotton.
Columbia Brown R	silk a little redder than the cotton.
Catechu Brown DX, 2DX, 3DX	silk somewhat yellower than the cotton.

Grey and Black:—

Neutral Grey G	silk and cotton in the same tone.
Zambesi Black D, V, 2G, F, R (see also Rp. 45a)	both fibres approximately alike, silk somewhat lighter than the cotton.
Columbia Black B	silk considerably lighter than the cotton.
Columbia Black FB, FF extra	silk considerably lighter than the cotton.
Columbia Black R	Brownish Black; silk considerably lighter than the cotton.

Substantive Cotton Dyes which at 180—205° F. dye the cotton and silk approximately alike.

Red:—

Salmon Red	both fibres almost alike.
Diamine Red B	
Benzopurpurine 4B, 6B	
Congo Rubine	
Brilliant Purpurine 10B	
Congo Corinth G, B	

Orange:—

Congo Orange R, G	both fibres almost alike.
Columbia Orange R	
Toluylene Orange G	
Orange TA	

Yellow:—

Chrysophenine G	both fibres alike.
Chrysamine G, R	
Thiazol Yellow	

Green:—

Columbia Black-Green D	silk somewhat bluer than the cotton.

Blue:—

Chicago Blue 2R, 4R	silk somewhat redder than the cotton.

Grey and Black:—

Columbia Black 2BW Columbia Black EA-, WA- and EAW brands	silk greener than the cotton.

Recipe 45a:—

Diazotising and Developing of the Substantive Dyes on Half-Silk.

The following Substantive Cotton Dyes can, in the same way as on cotton (see Bp. 21), be diazotised and developed on half-silk.

Red:—

Primuline + β-Naphtol	both fibres alike.

Blue:—

Zambesi Indigo Blue R + β-Naphtol	both fibres alike.
Naphtogene Blue 2R + β-Naphtol Naphtogene Blue 4R + β-Naphtol	silk lighter than the cotton.

Brown:—

Zambesi Brown G, 2G + Toluylene Diamine	silk and cotton in the same tone; silk lighter than the cotton.
Columbia Brown R + Toluylene Diamine	silk lighter and yellower than the cotton.

Brown:—

Zambesi Black D + Toluylene Diamine	are the most important Black-developments for half-silk.
Zambesi Black D + Nerogene D	both fibres almost alike.
Zambesi Black V + Toluylene Diamine	D: silk somewhat browner than the cotton; can be advantageously corrected by topping with Methylene Blue.
Zambesi Black 2G + Toluylene Diamine	

Zambesi Black F and R, as well as Zambesi Black BR (which only slightly stains the silk, see page 211), developed with Toluylene Diamine, are also suitable for half-silk.

The developments of the Zambesi Blacks with β-Naphtol and Resorcine (see page 110) can also by employed.

If a subsequent dyeing of the silk is necessary, this must be carried out according to Recipe 45, page 210.

Recipe 46:—

Dyeing the Silk first with Acid Dyes and then the Cotton with Basic Dyes.

This method, formerly in general use, has been almost completely superseded by the introduction of the Substantive Cotton Dyes, and is now only seldom employed. The silk is first dyed with Acid Dyes (Rp. 13), then the cotton is mordanted with tannin and antimony mordant (Rp. 31), and dyed cold with Basic Dyes.

Gloria.

(*Silk & Wool.*)

The Dyeing of Gloria.

(Silk and Wool.)

For the selection of suitable dyestuffs for dyeing fabrics consisting of silk and wool, the question must first be considered whether solid shades or shot effects are to be produced.

A large number of dyes possess an equal affinity for wool and silk; the wool however shews the greatest attraction at the boil, whilst the silk is dyed strongest at about 140—160° F.

For the dyeing of gloria

Acid Dyes

are chiefly employed. Latterly also the

Substantive Cotton Dyes

have found much favor, especially for solid shades.

Basic Dyes

are almost exclusively employed for shot effects.

Recipe 47:—

Acid Dyes on Gloria.

Dye from a boiling-hot bath with the addition of acetic or sulfuric acid. Additions of salt are not to be recommended, as on boiling the silk then easily becomes dull and loses its gloss.

Enter at a low temperature, raise slowly to the boil, and boil until the wool has approximately the desired

shade and depth, then turn off the steam and dye the silk by continuing the dyeing operation at about 140—160° F., if required with an addition of dyestuff.

In this way both solid shades and shot effects can be produced.

For the production of shot effects the wool may also be advantageously first dyed in a boiling bath with such dyestuffs as only stain the silk very slightly (see page 222), then soaping slightly and finally dyeing the silk in a fresh tepid bath with Basic Dyes (see page 224) with the addition of a little acetic acid.

If on the other hand *pure white silk effects* are to be produced, likewise dye with dyestuffs which leave the silk unstained (see page 222, left column), rinse, treat for a short time in a fresh boiling-hot bath with 1—2½ % acetate of ammonia and rinse again.

Acid Dyes which in a boiling-hot acid bath dye the silk and wool approximately alike.

Red:—

Ponceau 3RB	Rhodamine although a basic dye, also according to Rp. 47.
Azo Coccine 2R	
Double Brillt. Scarlet G	Emin Red
Fast Red A, AB	Cloth Red 3GA
Azo Cardinal G	Phloxine

Orange:—

Mandarine G extra	Ponceau 4GB

Yellow:—

Quinoline Yellow
Metanil Yellow
Azo Acid Yellow
Curcumeine extra
Martius Yellow

Green:—

Guinea Green B, G

Blue:—

Light Blue for Silk
Brilliant Silk Blue 10B, 7B
Fast Blue B, R for Wool
Fast Blue 2B for Silk
Patent Blue A, V
Wool Blue, all brands
Victoria Blue B
although a basic dye, also according to Rp 47.
Indocyanine B
Alkali Blue, all brands

Violet:—

Acid Violet 6B
Guinea Violet 4B
Wool Violet 10B, 6B

Brown:—

Fast Brown G, GR
Resorcine Brown

Black:—

Wool Black GR
Silk Black 4BF extra

Acid Dyes which

in a boiling-hot acid bath only *slightly* stain the silk.	at 120° F. in an acid bath almost only dye the silk.
Red:—	
New Coccine	Ponceau 10RB, 6RB, 4RB
Azo Rubine SG	
Bordeaux S	Ponceau 2RB—2GB
Guinea Red 4R	Bordeaux S
Eosamine B	Fast Red extra
Orange:—	
Orange G	Mandarine G extra
	Ponceau 4GB
Yellow: —	
Acid Yellow G	Azo Acid Yellow
Naphtol Yellow	Curcumeine extra
Green:—	
	Guinea Green B
Blue:—	
Indigotine	Fast Blue B, R for Wool
	Wool Blue, all brands
Violet:—	
	Guinea Violet 4B

Recipe 48:—

Substantive Cotton Dyes on Gloria.

Dye in a boiling-hot bath with an addition of 1—4 oz. Glaubersalt cryst. and, if desired, for a better exhaustion of the bath, $\frac{1}{12}$—$\frac{1}{8}$ oz. acetic acid (see page 165) per gallon, and, in order to sufficiently cover the silk, continue dyeing without steam.

Substantive Cotton Dyes which in a boiling-hot bath or at 180° F. dye the silk and wool approximately alike.

Red:—

Benzopurpurine 4B
Brilliant Purpurine R
Diamine Red B

Orange:—

Congo Orange G, R

Yellow:—

Chrysophenine G

Blue:—

Chicago Blue 6B, B, RW
Chicago Blue R, 2R, 4R
Congo Sky Blue
Congo Blue BX

Brown:—

Congo Brown G, R

Grey and Black:—

Zambesi Black D

Substantive Cotton Dyes which in neutral boiling bath (without acetic acid) only slightly stain the silk.

Red:—

Erica BN, 2GN

Blue:—

Columbia Blue G, R

Violet:—

Columbia Violet R
Heliotrope 2B

Recipe 49:—

Basic Dyes on Gloria.

The Basic Dyes serve almost exclusively for dyeing or shading the silk when producing shot effects (see page 220). Dye with the addition of a little acetic acid at about 85—120° F.; the wool is then scarcely or not at all stained.

Of Basic Dyes those which come into question are all brands of

Red:—

Rubine
Camelia
Cerise, etc.
Brilliant Safranine
Safranine
Rhodamine (see page 220)

Yellow:—

Auramine

Green:—

Malachite Green
Ethyl Green

Blue:—

Methylene Blue
Victoria Blue (see page 221)

Violet:—

Methyl Violet

Brown:—

Bismarck Brown.

TABLES

shewing

the Properties of the Dyestuffs

in their Application

on the Various Fibres.

Abbreviations.

Rp. = Recipe	J = Jute	Solubility:—
W = Wool	U = Union Material	I: readily soluble, 1:5 to 1:50
S = Silk	HS = Half-Silk	II: 1:50 to 1:100
C = Cotton	SW = Gloria (Silk and Wool).	III: 1:100 to 1:200
L = Linen		IV: with difficulty sol., 1:200 to 1:250

Should the property of a dyestuff be indicated in a column only once, this statement refers to all the fibres for which the dye is adapted; if, however, its behavior towards the different fibres varies, special mention is made to this effect.

Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Ponceau 4R, 3R, 2R, R, G Scarlet GR	I	W	1	fairly good	good	good	moderate
		S	13				
		C	36				C: not good
Ponceau 10RB	I	W	1	fairly good	very good	good	sufficient
		S	13				
		SW	47				
Ponceau 6RB, 4RB, 2RB, RB, 2GB	I	W	1	fairly good	very good	good	sufficient
		S	13				
		C	36				C: not good
		J	37				
		SW	47				
Ponceau BO extra	I	W	1	fairly good	very good	good	sufficient
		S	13, 13a				
		C	36				C: not good
		J	37				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	very good	—	very good	Important dyestuffs in general use for wool and silk dyeing; they are also largely employed in the manufacture of lake colors and in leather and paper staining. Application for C: see page 144. " " U: " " 202.
—	good	good	—	not good	Ponceau 10RB—BO extra are employed for dyeings on wool and silk which are to be particularly fast to light. The cotton dyeings exceed those produced with substantive dyes in brilliancy, fastness to light and to acids, but, like those of the above-mentioned Ponceaux, can only be employed for materials which in use do not come into contact with water, such as yarns, trimmings, bookbinders' cloth, materials for decorative purposes, etc.
—	good	moderate	—	6RB: not good 4RB—2GB: moderate	
—	good	moderate	—	good	These dyes are largely employed in leather and paper staining as well as in the manufacture of pigments. 6RB—2GB, BO extra are also adapted for jute.

Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Ponceau 3RB	I	W	1	fairly good	good	good	sufficient
		S	13, 13a				
		C	36				C: not good
		J	37				
		U	41				
		SW	47				
Ponceau S, 2S	I	W	1	fairly good	fairly good	moderate	moderate
Crystal Ponceau	I	W	1	fairly good	good	good	moderate
		S	13				
Coccine 2B	I	W	1	fairly good	good	good	moderate
		S	13				
		C	36				C: not good

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	good	—	not good	Besides for wool and silk, Ponceau 3RB is also employed for cotton, jute and in union dyeing as a neutral-dyeing wool color. Very important dyestuff leather, paper and pigments.
—	good	moderate	—	very good	Blueish Wool-Ponceaux, chiefly employed in fez dyeing.
—	good	not good	—	very good	Important wool and silk dyestuffs.
—	good	not good	—	fairly good	

Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
New Coccine	I	W	1	fairly good	very good	good	moderate
Victoria Scarlet 4R—G		S	13				
		SW	47				
Azo Coccine 2R	IV	W	1	fairly good	very good	good	moderate
		S	13, 13a				S: fast to water
		SW	47				
Scarlet for Jute 3R, R, RX	I	J	37	good	good	good	—
Double BrilliantScarlet 4R—G	II	W	1	fairly good	good	good	not good
		S	13, 13a				
BrilliantScarlet 4R—G		SW	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	not good	—	good	Important wool and silk dyestuffs. Application for Union materials see page 202.
—	good	not good	—	good	Particularly valued as a silk dye on account of its excellent fastness to water.
—	good	—	—	—	Employed solely in Jute dyeing.
—	good	4R: good the other brands somewhat inferior	—	good	Important wool and silk dyes the G brands on silk are very fast to water.

Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Fast Red extra	II	W	1	fairly good	good	good	fairly good
		S	13				
		SW	47				
Fast Red A, AB	III	W	1	moderate	very good	good	good
		S	13, 13a				S: fast to water
		J	37				
		U	41				
		SW	47				
Azo Rubine S, SG	I	W	1	fairly good	very good	good	moderate
		S	13				
Bordeaux B, R	II	W	1	moderate	good	good	not good
		S	13				
Bordeaux S, SF	I	W	1	fairly good	good	good	not good
		S	13		very good		
		SW	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	fairly good	—	very good	Important wool and silk dyes. Fast Red A is also employed for Jute as well as in Union dyeing as a neutral-dyeing wool color.
fast against slight milling	good	good	—	very good	
—	good	fairly good	—	good	Important for wool and silk, universally employed.
—	good	not good	—	good	Besides for wool and silk, also employed in the lake making industry.
—	good	not good	—	good	Well-known wool and silk dyes; the brand SF possesses somewhat better levelling powers than the brand S.

Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Brilliant Bordeaux S	I	W	1	good for darker shades	good	good	not good
		S	13				
Eosamine B	II	W	1	very good	excellent	good	moderate
		S	13				
		SW	47				
Guinea Red 4R	I	W	1	excellent	very good	good	not good
		SW	47				
Guinea Carmine B	I must only be dissolved in a portion of the acid liquor	W	1	excellent	very good	good	not good
Guinea Bordeaux B, G	I must only be dissolved in a portion of the acid liquor	W	1	very good	very good	good	not good

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	good	—	good	Levelling dye for darker shades; possesses great coloring power.
—	good	very good	—	fairly good	Belongs to the fastest red acid dyes (to light), yields brilliant blueish red shades and may be employed for delicate pinks as a substitute for the fugitive Eosines.
—	good	very good	—	good	Belongs to the best level dyeing dyestuffs. Application for Union materials see page 202.
—	good	good	—	good	Belongs to the best levelling dyes; is distinguished by its pure bright blueish-red tone.
—	good	good	—	fairly good	Good levelling dyes.

Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Azo Cardinal G	III	W	1	very good	fairly good	good	moderate
		S	13		S: very good		S: fast to water
		SW	47				
Azo Orchil R	I	W	1	very good	good	good	not good
		S	13		S: very good		
Acid Magenta S	I	W	1	very good	not good	not good	not good
		S	13				
Emin Red	IV	W	1	fairly good	moderate	good	very good
			6 & 9				
		S	13				S: fast to water and washing
		SW	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	fairly good	—	not good	Good levelling dye; also valued as a silk dye on account of its fastness to water.
—	good	good	—	good	Possesses good levelling powers. Contrary to natural Orchil, the shade is not altered in the finishing and drying processes.
—	good	not good	—	very good	A level dyeing dyestuff of brilliant shade, universally introduced. Application in Union dyeing: see page 202.
f'rly good good S: good	good	good	—	very good	Employed in wool and silk dyeing for Reds fast to water, washing and milling.

Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Cloth Red BA	II	W	1	moderate	very good	good	very good
			6 & 9				
		U	41				
Cloth Red GA	IV	W	1	moderate	very good	good	very good
			6 & 9				
		S	13				S: fast to water
Cloth Red 3GA	IV	W	1	moderate	good	good	very good
			6 & 9				
		S	13				S: fast to water
		SW	47				
Chrome Fast Red B, R, G	II	W	6 & 9	good	good	good	good

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
f'rly good good	good	moderate	—	good	The most important method of application is on chrome mordant (Rp. 9) in cloth dyeing are also much employed in silk dyeing.
f'rly good good S: good	good	good	—	moderate	Cloth Red is a good substitute for Sandal Wood, as it can be readily dyed together with other dye-woods.
good very good S: very good	good	good	—	very good	
good	good	not good	—	good	Wool dyes fast to milling; they however bleed a little into cotton.

Weakly Acid Dyes.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Eosine	I	W	4	good	not good	good	not good
Methyl Eosine		S	15 & 13a				
Erythrosine							
Phloxine							
Rose Bengale		C	35				
		J	37				
		S W	47 (see page 220)				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	moderate	very good	—	good	Are universally employed in textile industry on account of their extraordinarily brilliant shades, further in paper staining and in the manufacture of inks, pigment colors (Vermilionette), etc.
			not good		

Acid Dyes.

Orange	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Mandarine G extra	II	W	1	excellent	very good	good	not good
		S	13				
		J	37				
		U	41				
		S W	47				
Orange G, R	I	W	1	excellent	very good	good	not good
		S	13				
		S W	47				
Ponceau 4GB	II	W	1	very good	very good	good	not good
		S	13, 13a				
		C	36				
		J	37				
		S W	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	not good	—	good	The most largely employed Orange in wool dyeing. Possesses excellent levelling powers. Equally important for Silk. Important in Union dyeing as it dyes the Wool in a neutral bath (see page 202). Much employed in paper and leather staining and for pigment colors.
—	good	good	—	good	Excellent level dyeing color. Also important for wool printing.
—	good	moderate	—	fairly good	Universally introduced in textile dyeing on account of their brilliant shade and great fastness to light; important for paper staining and pigment colors.

Acid Dyes.

Yellow	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Quinoline Yellow	II	W	1	very good	very good	good	not good
		S	13, 13a				
		C	36				
		J	37				
		SW	47				
Acid Yellow G, R	I	W	1	excellent	excellent	very good	good
		SW	47				
Acid Yellow D extra	II	W	1	very good	very good	good	moderate
		S	13				
Metanil Yellow extra	II	W	1	very good	very good	good	moderate
		S	13				
		C	36				
		SW	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	good	—	good	Greenest acid Yellow. Has found especial favor and is much employed on account of its extremely pure and bright shade. Is an important *Silk dye*, also for pigments and paper staining.
fast against slight milling	fairly good	not good	—	moderate	Extraordinarily fast Yellow possessing excellent levelling powers.
—	not good	not good	—	not good	Very intense reddish Yellow, much employed as a levelling dye.
—	not good	not good	—	not good	Besides its application in textile dyeing, most important color for paper staining.

Acid Dyes.

Yellow	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Resorcine Yellow	I	W	1	good	good	good	moderate
		S	13				
Azo Acid Yellow	III	W	1	very good	good	good	good
		S	13, 13a				S: fast to water
		J	37				
		U	41, 42				
		SW	47				
Curcumeïne extra	III	W	1	very good	very good	good	good
		S	13, 13a				S: fast to water
		J	37				
		U	41, 42				
		SW	47				
Naphtol Yellow	II	W	1	very good	not good	good	not good
		S	13				
		SW	47				
Chrome Fast Yellow R, 2G	II	W	6, 9	good	very good	very good	very goo

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	not good	—	not good	Much employed in Wool and Silk dyeing on account of its fastnesss to acids and its ready solubility.
fast against slight milling	good	good	—	not good	Azo Acid Yellow and Curcumeïne are much used in Wool and Silk dyeing on account of their pure yellow shades and excellent properties. In Union dyeing they serve both as neutral dyeing wool dyes according to the one-bath method, and on account of their resistance against chromic acid when at the same time stripping and dyeing shoddy materials (see page 202).
fast against slight milling	good	good	—	good	
—	fairly good	moderate	—	not good	Besides for Wool and Silk dyeing also employed for paper staining and pigment manufacture. Application for U: see page 202.
very good	good	good 2G better than R	—	good	Much employed as a milling Yellow (fustic substitute) and in combination with other chrome colors. Important for Cotton printing.

Weakly Acid Dyes.

Yellow	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Uranine	I	W S	4 15, 13a	good	not good	not good	not good
Martius Yellow	III	W U	4 41	good	not good	good	not good

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	not good	fairly good	—	fairly good	Only little used in textile dyeing, chiefly for shading Eosines. Occasionally employed on silk on account of its strong greenish flourescence. Also serves for dyeing soap, foodstuffs, etc.
—	not good	not good	—	moderate	Is employed for Union dyeing as a neutral-dyeing wool color, otherwise almost obsolete in textile dyeing.

Acid Dyes.

Green	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Guinea Green B, G, etc.	I	W	1	very good	sufficient	moderate	not good
		S	13				
		J	37				
		U	41 (see also page 202)				
		S W	47				
Cyprus Green B	II	W	7	good	excellent	good	good
			6, 10		good		very good

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	not good	—	good	Is distinguished by its excellent levelling power; is universally introduced. Also important for Union dyeing as a neutral-dyeing wool color (see also pages 190 and 202).
fairly good very good	good	moderate	—	Rp. 6 & 7 f'rly good Rp. 10 very good	Wool dye for dark green shades of extraordinary fastness to light (see pages 34 & 35). Can also be employed in combination with Chrome Colors according to Rp. 6 page 33. Shading color for Metachrome Colors (Page 39).

Acid Dyes.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Water Blue 6B, 5B, 4B, 3B, 2B, B, BR	I	C	36, 31	good	not good	not good	not good
		S	13		good		on S fastness
China Blue, Brilliant Blue Methyl Blue 0 0		J	37				to water good
Water Blue 3BA, 2BN, BNW, R, RC, S2K, 4RW, 5RW	I	W	1	moderate	not good	not good	not good
		S	13	good	good		fast to water
Light Blue for Silk 1001, 1010, etc.	I	S	13, 13a	good	good	not good	not good fastness to water good
Brilliant Silk Blue 10 B powder and liquid	powder III	S	13	good	not good	moderate	not good
Brilliant Silk Blue 7B	III	S	13, 13a	good	not good	moderate	not good

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	— fairly good	not good	temporarily reddened	In spite of the moderate fastness of the Water Blues they are universally employed in the dyeing of Silk Wool and Cotton as well as for paper, leather and pigments, on account of their brilliancy. Application for U: see page 202.
—	good	fairly good	—	good	Methyl Blue O O is also adapted for weighted silk according to Recipe 13a.
—	good	fairly good	—	good	Especially adapted for Silk; retain their shade in artificial light.
—	good	good	—	good	Silk Blues of unexcelled purity of shade. When employing the powder quality the dye must be stirred to a paste with *cold* water and, if desired acetic acid, allowed to stand for some hours, only then dissolved in hot water and the solution strained.
—	good	good	—	good	The brand 7B is also adapted for weighted silk according to Rp. 13a.

Acid Dyes.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Fast Blue for Wool 3B, B, etc.	II	W	1	moderate	good	not good	not good
		S	13, 13a				
		SW	47				
Fast Blue for Silk 2B	II	S	13, 13a	good	good	not good	not good fastness to water good
Indigotine	I	W	1	excellent	moderate	good	not good
		S	13				
		SW	47				
Patent Blue A	I	W	1	very good	fairly good	good	good
			7 for shading purposes				
		S	13				
		U	41				
		SW	47				
Patent Blue V	I	W	1	excellent	fairly good	good	moderat
		S	13				
		SW	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	good	—	fairly good	Employed for dark Blue on wool also im combination with Water Blue, Guinea Violet or Wool Black. Important for wool and silk printing.
—	good	good	—	fairly good	Chiefly employed for silk dyeing for shading purposes.
—	good	good	—	good	Indigotine (or Indigo Carmine) is universally valued as an excellent levelling dye.
fairly good	good	good	—	good	Patent Blue A and V are bright greenish-blue wool and silk dyes, which are chiefly employed for shading purposes; **Patent Blue A**, being faster to milling, more for yarns, loose wool, slubbing also as a neutral-dyeing color in Union dyeing, **Patent Blue V**, which possesses excellent levelling powers, also in piece-dyeing. Patent Blue is further largely employed in paper staining, lake making, etc.
—	good	good	—	good	

Acid Dyes.

Blue	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Wool Blue 5B, 2B, R, G extra	II	W	page 24 footnote	in a neutral bathgood, in an acid bath moderate	moderate	good	very goo
		S	13, 13a				
		J	37				
		U	41				
		SW	47				
Indocyanine B	I	W	3 9, 10	good	excellent	very good	good
		S	15				
		U	41				
		SW	47				
Alkali Blue, all brands	III	W	5	good	moderate, somewhat better than Water Blue	decolorised by alkalies; shade returns on acidulating	good; only in alka line washin lighter, shade return on acidulating
		S	14		S: very good		
		U	41				
		SW	47				
Cyprus Blue R	II	W	7	good	excellent	good	good
			6		good		very goo

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
fast gainst slight nilling	good	good	—	good	Brilliant blue wool dyes fast to washing, dyeing best from a neutral or only very slightly acid bath. Of special interest for **Union dyeing** (see pages 189—191 and 202); do not stain cotton. Can also be dyed on a chrome mordant according to Rp. 9.
fast gainst slight nilling	good	fairly good	—	very good	Blue wool and silk dye of excellent properties. Regarding its many-sided applicability, see pages 29—31. Shading dye for Metachrome Colors. Very important for wool printing (Vigoureux Printing).
—	good	good	—	good	Universally employed in textile dyeing; important for paper staining and pigment making (Ultramarine substitute).
y good y good	good	moderate	—	very good, as long as the goods do not cool on the cylinders	Wool dye for dark blue shades of extraordinary fastness to light (see pages 34 and 35). Can also be employed in combination with Chrome Colors according to Rp. 6 page 33.

Acid Dyes.

Violet	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Acid Violet 6B	I	W	1	very good	moderate	not good	not goo
		S	13				S: fast t water
		SW	47				
Acid Violet 4B extra	I (see page 21)	W	1	good	moderate	good	good
Guinea Violet 4B	I	W	1 7 & 9 for shading purposes	in a neutral bathgood, in an acid bath f'rly good	moderate	good	good
		S	13, 13a				S: fast wate
		J	37				
		U	41				
		SW	47				
Wool Violet 10B, 6B	I	W	page 24 footnote	in a neutral bathgood, in an acid bath moderate	moderate	good	good
		S	13, 13a				S: fast wate
		U	41				
		SW	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	not good	—	very good	Dye of good levelling properties, useful for shading purposes.
fairly good	good	good	—	good	Acid Violet of great coloring power and good levelling properties, fast to alkalies.
lly good; cording o Rp. 9 good	good	good	—	good	Much employed on account of its coloring power and itfastness to washing, scouring, milling and alkalies. Also adapted for dyeing on chrome mordant (Rp. 9). Chiefly employed in union dyeing (Rp. 41) as a neutral-dyeing wool dye; see also page 202.
fairly good	good	good	—	good	Dyestuffs of the same character as Wool Blue, (see page 256). Chiefly employed in Union dyeing, (see page 189—191).

Acid Dyes.

Brown	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Fast Brown G, GR, 3 B	II	W	1	sufficient	moderate	moderate	not good
		S	13, 13a				S: fast t water
		SW	47				
Resorcine Brown	II	W	1	sufficient	moderate	good	moderat
		S	13, 13a		very good		S: fast t water

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	G: fr'ly good GR: moderate 3B: not good	—	G: good GR } fr'ly 3B } good	Find comparatively little application in textile dyeing and are chiefly used for leather and in the lake-making industry.
—	good	not good	—	fairly good	Used more for leather than in textile dyeing. The good fastness of the silk dyeings to light and water are remarkable.

Acid Dyes.

Grey & Black	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Nigrosine	I	W	1	not good	good	not good	fr'ly goo
Aniline Grey		S	13, 13a				S: fast t
Silver Grey							water
Steel Grey							
Acid Black B	I	W	1	good	excellent	good	moderat
Hat Black B, T							
Amido Acid Black 6B, 4B, B	I	W	1	good	very good	good	moderat
Wool Black 474	I	W	1	moderate	very good	good	good

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	fairly good	—	fairly good	Only find a very limited application in textile dyeing; serve chiefly for the preparation of leather polishes, inks, pigment colors, etc.
—	good	moderate	—	very good	Distinguished by their extreme fastness to light. Also readily penetrate closely woven materials, hat bodies, etc. Acid Black B does not stain cotton selvedges and fancy threads.
—	good	good	—	very good	Very readily soluble wool dyes, which leave cotton, linen, China grass, artificial silk, etc. fancy effects completely unstained. The B-brand is also suitable for wool printing.
fairly good	good	not good	—	fairly good	Yields a Violet-Black fast to milling; must be shaded with Yellow and Green for Jet Black. Is best dyed from a weakly acid bath or with oxalate of ammonia. In combination with Wool Blue produces Navy Blues fast to milling. Well suited for wool printing. (Vigoureux Printing).

Acid Dyes.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Wool Black 6B, 4B, 4BF, B, etc.	II	W	page 25	good, penetrate well	good; the L-brands: very good	good	good
		6B: S	13				
Wool Black N5B—NB, NG		U	41				
Wool Jet Black 3B, 2B			page 191				
Wool Black 4BL, 4BFL							
Wool Black 6BW, 4BW W, WB, etc.							
Wool Black GR	I	W	page 25	very good	extremely good	good	good
		S	13				
		SW	47				
Silk Black 4BF extra, 6B extra	I	S	13	good	good	good	good
		SW	47				

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
—	good	not good	—	very good	Belong to the most generally employed Acid Blacks for Wool. Substitute for logwood Black, distinguished by beauty of shade, which shews no change in artificial light, excellent fastness to steaming, rubbing, etc. The L-brands are the fastest of this group of dyes to light. The N-brands are suitable for cheap Blacks, Wool Jet Black for less bloomy but intense cheap Dead Blacks. The W-brands are chiefly intended for piece-goods; they leave cotton fancy threads and selvedges unstained.
—	good	not good	—	very good	Distinguished by its extreme fastness to light, dyes very evenly and readily penetrates closely woven materials, hat bodies, etc. Wool Black GR is further an excellent *silk dye;* is largely employed for wool and silk printing on account of its ready solubility.
—	good	not good	—	good	Yields bloomier Blacks on silk than Wool Black GR.

Acid Dyes.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
Nerol B, 2B, 4B, 2BG, 4BG, A, etc.	II	W	2	good	good	good	excellen
Chrome Fast Black B	II	W	6 a	good	good	good	very goo
Chromat Black 6B, 4B, T, TB	II	W	8	good; penetrates even heavy goods well	excellent	good	excellen

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
fast against slight to moderate milling	good	fairly good	—	fairly good	See page 26. Wool Black of excellent fastness to washing; neither previous nor subsequent to dyeing is a mordanting necessary. Most advantageous substitute for Logwood Black in the dyeing of woolen yarns. Very largely employed for goods which have to withstand severe washing or even a slight milling, such as knitting yarns, hosiery, worsted yarns, slubbing, etc.
good	good	good	—	good	Wool dye which when chromed yields dyeings of good fastness to milling and light.
excellent	good	fairly good	—	good	See page 36. Wool dyes, which when after-treated with bichromate of potash and bluestone, satisfy the *highest requirements as to fastness* and are adapted for the production of Fast Colors on wool.

Metachrome Dyes.

Brown Bordeaux, Yellow Orange	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see p. 40)			
Metachrome Brown B Paste	II	W	10	good	excellent	very good	excellent
Metachrome Bordeaux B, R Paste	II	W	10	good	good	good	excellent
Metachrome Yellow R Paste	II	W	10	good	very good	very good	excellent
Metachrome Yellow D, RD, 2RD Powder	III	W	10 6 & 9	good	excellent	very good	excellent
		S	page 75				S: fast to water
Metachrome Orange R double Paste	II	W	10	good	very good	good	excellent

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
xcellent	good	moderate	—	excellent	See page 39.
xcellent	good	moderate	—	excellent	The Metachrome Colors, when dyed in *one* bath according to the process patented to us (Rp. 10), yield dyeings which satisfy the *highest requirements as to fastness;* they are suitable for the dyeing of Fast Colors on woolen materials, such as loose wool, slubbing, weaving yarns, gentlemens' suitings, military cloths, hat bodies, etc.
ery good	good	moderate	—	excellent	
xcellent	good	moderate	—	excellent	
xcellent	good	moderate	—	excellent	

Basic Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to Light	Fastness to Alkalies	Fastness to Washing
	(see p. 2)						
Rubine **Isorubine** **Cardinal** **Russian Leather Red** **Camelia** **Cerise**	I	C, L	31	good	not good	not good	fairly good
		J	38				
		W	11				good
		S	15, 15a, 13a		on Silk weighted with tin good		S: good, according to Rp. 15a also fast to water
		SW	49				
Brilliant Safranine **Safranine**	I	C, L	31	good	fairly good	good	fairly good
		J	38				
		S	15, 15a, 13a				S: good, according to Rp. 15a also fast to water
		SW	49				

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and fo

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
—	fast against acetic acid	—	not good	fairly good	Largely employed in the whole of the textile industry; of much importance in the dyeing of jute, cocoanut fibre, straw, as well as in paper and leather staining.
		not good		good	Also largely used in the manufacture of pigments, inks, etc.
—	good; also fast to cross-dyeing	—	not good	good	Much employed as a Cotton Red fast to washing, also in combination with Auramine for Scarlet. Important silk dye. Also for linen, jute, China grass, etc.

Half-Silk (Rp. 46, page 216).

Basic Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
	(see p. 2)						
Rhodamine B, G	I	W	1, 4 or 11 (see page 23)	good	fairly good; the fastest product in this tone	good	fairly good
		S	15, 13a				
		C, L	31, 33 or 34				
		J	38				
		U	41				
		S W	47 or 49				

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and fo

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
—	good	good (see p. 65)	—	fairly good	Largely employed on account of their pure and brilliant shades in the whole textile industry and cloth printing; are also adapted for the dyeing of paper, straw, artifical flowers, leather, spirit varnishes, foodstuffs, etc.
	C: according to Rp. 31 also fast to cross-dyeing		not good		

alf-Silk (Rp. 46, page 216).

Basic Dyes*.

Orange & Yellow	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
	(see p. 2)						
Chrysoïdine	I	C	31	good	not good	moderate	not good
		J	38				
		S	15				
Phosphine	II	C	31	good	moderate	moderate	not good
Brilliant Phosphine		S	15, 15a 13a				
Philadelphia Yellow							
Aurophosphine 4G	II	C	31	good	moderate	good	f'rly good (see p. 16
		S	15, 15a 13a				
Aurophosphine G	II	C	31	good	moderate	moderate	f'rly good (see p. 16

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
—	fast to acetic acid	—	not good	good	Basic Orange universally introduced; employed for shading other Basic Dyes. Much used for jute.
—	moderate	—	moderate	good	In the first place important leather dyes; universally employed. Used in textile dyeing for the production of cream shades, also in cotton printing.
—	good	— S: good	not good	good	Aurophosphine 4 G and G are in the first place excellent *leather dyes.* In textile dyeing they are employed on cotton for shading purposes; the brand 4 G is also adapted for silk.
—	fairly good	—	not good	good	

alf-Silk (Rp. 46, page 216).

Basic Dyes*.

Yellow	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washin
	(see p. 2)						
Auramine	I (see p. 137)	C, L	31, also 34	good	moderate	moderate	fairly good
	Dissolve and dye at not more than 170° F.	J	38				
		W	11				
		S	15, 15a 13a				
		SW	49				

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
—	moderate	—	not good	fairly good	Employed chiefly for cotton and jute as a pure greenish yellow, also for shading Rubine, Safranine, Ethyl Green, etc. Used on wool on account of its fastness to stoving (see p. 65). Frequently used in paper and leather staining, for pigment colors, etc.
		good (see p. 65)		not good	

Half-Silk (Rp. 46, page 216).

Basic Dyes*.

Green & Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
	(seep. 2)						
Malachite Green **Ethyl Green** **Leaf Green**	I	C, L	31, 32	good	moderate	not good	fairly good
		J	38				
		S	15, 15a 13a		S: (see p. 87)		
		W	(see page 42)				
		SW	49				
Methylene Blue **2B powder ext., 2B new, B, R, 2R, etc.**	II	C, L	31, 32	good	good	good	good
		J	38				
2B powd. ext. D, 2B new D, BD, RD, etc. (the D-brands are intended for printing)	I	S	15, 15a 13a		S: moderate according to Rp. 15a good		
		SW	49				

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and f

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
—	fairly good	—	not good	good	Universally introduced in textile dyeing and printing. Largely employed in leather and pape staining and for pigment manufacture (for Greens fast against the action of lime).
		good			
—	good, also fast to cross-dyeing	—	the 2B brands: fairly good	good	Universally introduced in cotton dyeing and printing on account of their fastness to light, washing, bleaching and purity of shade. Important for linen, jute, etc. Largely employed in leather and paper staining and for pigment making.
		moderate			

Half-Silk (Rp. 46, page 216).

Basic Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
	(see p. 2)						
Fast Blue for Cotton R cryst. B, 2B	III (see p. 137)	C, L	31, 32	fairly good	very good	not good	moderate
		J	38				
Diphene Blue B, R	I	C, L	31, 32	good	good	good	good
Diphene Blue Base B, R (see page 137 for strengh and solution).		J	38				S: fast to water
		S	15, 15a 13a				

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and for

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
—	good	—	not good	good	Much employed on account of their excellent fastness to light; also employed in leather staining.
—	good, also fast to cross-dyeing	—	not good	good	Important dyes for *cloth printing*. For dyeing, the brands marked "Base" are best adapted; valued as Indigo substitutes for bright dark blue shades.

Half-Silk (Rp. 46, page 216).

Basic Dyes*.

Blue & Violet	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
	(seep.2)						
Victoria Blue B, R, 4R	II Before dissolving stir with acetic acid (p. 137)	W	1 (see p. 24)	good	not good	B & 4R moderate R: fairly good	very good on S also fast to water
		S	13, 13a				
		C, L	31				C: good
		J	38				
		U	41				
		SW	47				
Methyl Violet all brands	I	C, L	31	good	not good	good	fairly good
		J	38				
		W	11				good
		S	15, 15a 13a		S: (see p. 88)		S: 6B–2B fast to water
		SW	49				

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and fo

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
good	good	good (see p. 65)	—	good	Important for *all textile fibres* on account of their beautiful pure blue shades. Are remarkable for the good fastness of the wool dyeings to milling and stoving.
	C: also fast to cross-dyeing (see p. 168)		not good		
—	fast to acetic acid	—	not good	good	Universally employed, not only in textile dyeing and printing, but also in leather and paper staining, for pigment manufacture, etc.
fairly good		good			

Half-Silk (Rp. 46, page 216).

Basic Dyes*.

Brown & Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
	(seep.2)						
Bismarck Brown all brands	II	C, L	31, 32	good	moderate	not good	not good
		J	38				
		S	15, 15a 13a				
Jute Black all brands	III	J	38	good	moderate	not good	not good

* All the Basic Dyes are adapted for Artificial Silk (see page 183) and fo

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
	(see pages 12 and 166)				
—	good	—	not good	good	Universally employed for cotton, jute and cocoanut fibre; also serves for topping Catechu. Important for paper, leather, pigments, etc.
—	not good	—	not good	good	Much employed for dyeing jute, cocoanut fibre, straw, paper, etc.

Half-Silk (Rp. 46, page 216).

Substantive Cotton Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Congo **Congo 4R**	II	C	17	good	not good	very good	moderate
Brilliant Congo R, G	II	C	17	good	moderate	very good	moderate
		W	12		good		good
		S	16				
		U	41				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hemp

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 51 and 90)	*(see pages 12 and 165)*				
—	not good	—	not good	good	The first Substantive Cotton Dye brought into the market; very largely used.
—	fairly good	—	not good	very good	Frequently preferred to Congo on account of its greater fastness. It is remarkable for the fastness of its wool dyeings; therefore largely employed on wool, union materials, etc.
fairly good		good		good	

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183.)

Substantive Cotton Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162*
Benzopurpurine B	II	C	17	good	moderate	very good	moderat
Benzopurpurine 4B, 4BG	II	C	17	good	moderate	very good	f'rly goo
		W	12		good		good
		S	16				
		U	41				
		HS	45				
		SW	48				
Benzopurpurine 6B	II	C	17	good	moderate	very good	moderat
		W	12		f'rly good		good
		U	41				
		HS	45				
Benzopurpurine 10B	I	C	17	good	moderate	very good	moderat
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	moderate	—	not good	good	
—	not good	—	not good	good	
rly good		moderate			**Benzopurpurine 4B** is the most important brand of this group; it is very largely employed for Turkey Red imitations and is also much used on wool, silk, union material, half-silk, etc. The brand 6B is employed for crimson shades, 10B for claret and for shading purposes.
—	not good	—	not good	good	
fairly good		moderate		good	
—	not good	—	not good	good	

ıge 175), Jute Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Brilliant Purpurine R	I	C	17 18, 19	good	somewhat better than Benzo-purpurine 4B	very good	moderate
		W	12		good		good
		S	16				
		U	41, 43				
		HS	45				
		SW	48				
Brilliant Purpurine 10 B	II	C	17	good	moderate	very good	moderat
		W	12		fairly good		good
		S	16				
		U	41				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	moderate	—	not good	good	Well adapted for *machine dyeing* on account of its ready solubility and its slow dyeing, (also at a low temperature), therefore preferable to Benzopurpurine 4B.
rly good		good		good	Distinguished by its fastness to storing. Also well suited for union and half-silk dyeing.
—	moderate; better than Benzopurpurine 10B	—	not good	good	Dye of great coloring power; for intense claret shades.
rly good		good		good	Also very suitable for union materials and half-silk; dyes the vegetable and animal fibres in the same shade.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 61 and 146)*	*(see p. 162*
Diamine Red B	II	C	17	good	moderate	very good	moderat
Delta-purpurine 5B		W	12		good		good
		S	16				
		U	41				
		HS	45				
		SW	48				
Diamine Red 3B	II	C	17	good	moderate	very good	moderat
Delta-purpurine 7B		W	12		good		good
Rosazurine G, B	II	C	17	good	not good	good	moderat
Congo Corinth G, B	G: III B: II	C	17	good	not good	good	modera
		W	12		moderate		good
		S	16		f'rly good		
		U	41				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Her

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	f'rly good	—	not good	good	Distinguished by their comparatively good fastness to acids; employed in wool dyeing on account of their fastness to milling and stoving.
f'rly good		good		good	
—	f'rly good	—	not good	good	
f'rly good		good		good	
—	moderate	—	not good	f'rly good	For dull pink shades.
—	moderate	—	not good	moderate	Employed for dark claret shades and for shading purposes.
f'rly good		moderate		moderate	

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162*
Congo Rubine	II	C	17 18, 19	good	not good	very good	moderat
		W	12		moderate		good
		S	16		fairly good		
		U	41, 43				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hen

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	moderate	—	not good	moderate	For pure crimson shades; cheap dye of great intensity.
f'rly good		mo-derate		moderate	

(page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Columbia Fast Scarlet 4B	I	C	17, 18	good	good	very good	moderate
		W	12		very good		good
		S	16				
		U	43				
		HS	45				
Erica B extra, G extra, 2 GN, etc.	II	C	17 18, 19	good	good	very good	fairly good
		W	12		very good		good
		S	16				S: fast to water
		U	41, 43				
		HS	45				
		SW	48				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hemp

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 51 and 90)	*(see pages 12 and 166)*				
—	good	—	fairly good	good	*For bright scarlet shades fast to acids.*
rly good		good		good	As the dye exhausts slower and with greater difficulty than the other red Substantive Dyes, larger quantities of salt (about 90 g Glaubersalt cryst. and 1 g soda ash) should be taken for full shades. The deepest dyeings are obtained by dyeing at 160° F. and then allowing the material to remain for some time longer in the cooling bath (see p. 93).
—	good	—	fairly good	very good	A substantive Pink for cotton especially distinguished by its purity of shade, as well as by its comparative fastness to light, bleaching, and acids. Is of interest for all the remaining textile fibres on account of its excellent fastness, as well as for mixed materials, such as unions, half-silk, etc.
good		good		good	

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183.)

Substantive Cotton Dyes*.

Red	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*:
Salmon Red	II	C	17	good	good	very good	f'rly goo
		S	16		very good		S: fast t water
		HS	45				
Bordeaux COV	II	C	17	good	not good	good	moderat
		W	12		moderate		good
Primuline diazotised and developed with β-Naphtol (see page 110)	I	C	21	good	not good	very good	very goo on S als
		S	16a		fairly good		fast to water
		HS	45a				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Her

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 51 and 90)	*(see pages 12 and 165)*				
—	good	— fairly good	not good	good	Distinguished by its pure yellowish red shade (salmon shade); extremely well adapted for half-silk.
— fairly good	fairly good	— moderate	not good	f'rly good f'rly good	Employed for blueish claret shades and for shading purposes.
good	very good, also fast to cross-dyeing (page 167)	— good	fairly good	very good	The development with β-Naphtol according to Rp. 21 is the most important manner of application for Primuline; it serves for the production on cotton and silk of red shades fast to washing, milling, acids, and cross-dyeing. As regards the employment of Primuline for Yellow, see under "Yellow Substantive Cotton Dyes" (page 308).

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Orange	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*)
Congo Orange R, G	II	C	17	good	good	very good	moderat
		W	12		very good		good
		S	16				
		U	41				
		HS	45				
		SW	48				
Columbia Orange R	II	C	17	good	moderate	good	moderat
		U	41				
		HS	45				
Brilliant Orange G	III	C	17 18, 19	good	good	fairly good	moderat
		W	12				good
		S	16				
		U	41, 43				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hen

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 61 and 90)	*(see pages 12 and 165)*				
—	moderate	—	fairly good	very good	Bright orange shades distinguished by their fastness to bleaching, largely employed on wool, silk, and mixed materials. The extreme fastness to light of the wool and silk dyeings is specially worthy of note.
'rly good		good		f'rly good	
—	fairly good	—	not good	very good	Full Cotton Orange, in shade between Congo Orange and Congo Brown.
—	fairly good	—	not good	very good	Full medium Orange; also well adapted for union material and half-silk. Is particularly well adapted for mixed shades and for shading purposes on account of its excellent levelling power.
'rly good		moderate		f'rly good	

)age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Orange	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Toluylene Orange G	III	C	17	good	moderate	f'rly good	moderate
			24		very good	good	very good
			25		moderate	good	very good
		W	12		good	f'rly good	good
		HS	45				
Orange T A	II	C	17, 18	good	moderate	not good	moderate
		U	41, 43				
		HS	45				
Mikado Orange 4R O—G O	I	C	17	good	very good	very good	good; on S fast to water
		S	16				
		U	41				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hemp

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	f'rly good	—	not good	good	Intense yellowish Orange; largely employed for cream and tan shades.
good	very good; according to Rp. 25 fast to cross-dyeing	—			By after-treating the dyeings according to Rp. 24 considerably higher degrees of fastness are obtained.
good		—			
'ly good	f'rly good	moderate	—	fairly good	Rp. 25 yields *brown* shades fast to washing. Is a good half-silk dye.
—	not good	—	not good	good	Cheap Orange, chiefly employed for union materials.
—	very good	— f'rly good	good	very good	Fast Cotton Oranges of clear shades, but less intense than the foregoing dyestuffs. Important union and half-silk dyes.

ıge 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Yellow	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162*
Chrysamine G, R	III	C	17, 18	good	very good	moderate	f'rly good
			24, 25			f'rly good	good
		W	12, 12b				good
		S	16			f'rly good	12b: very good
		U	41, 43 (see p. 199)				
		HS	45				
Chrysophenine G	II	C	17, 18 19 23 for shading purposes	good	very good	very good	moderat Rp. 19: fairly good
		W	12, 12a				good
		S	16				
		U	41, 43				
		HS	45				
		SW	48				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hen

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 1 and 90)	*(see pages 12 and 165)*				
—	moderate	—	moderate	very good	The first Substantive Cotton Yellow brought into the market; universally employed on account of its fastness to light.
	good; according to Rp 25 also fast to cross-dyeing				
good	fairly good	moderate		good	
—	good	—	good	very good	Distinguished by its purity and intensity of shade, fastness to light, bleaching, and levelling power; of interest for all textile fibres. Largely employed in union and half-silk dyeing.
good		good		good	

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Yellow	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162*
Columbia Yellow	I	C	17 21 & 23 for shading purposes	good	excellent	very good	good
		S	16				on S fas to wate
		U	41				
		HS	45				
Curcumine S	I	C	17, 18 19 21 for shading purposes	good	very good	fairly good	very goo
		S	16				on S fa to wate
		U	41, 43				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hen

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 51 and 90)	*(see pages 12 and 165)*				
—	very good	—	very good	very good	Is the fastest of the Substantive Cotton Yellows to light and bleaching.
		good			Also important for union and half-silk dyeing.
—	very good	—	very good	very good	Is an intense Yellow distinguished by its great fastness to light, washing and bleaching.
		good			Excellent union and half-silk dye, since in a neutral bath the animal fibre remains almost unstained.

ge 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Yellow	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Thiazol Yellow	II	C	17	good	not good	moderate	fairly good
		U	41				
		HS	45				
Mikado Yellow	I	C	17	good	very good	very good	fairly good
Mikado Gold Yellow 8 G		U	41				
		HS	45				
Primuline after-treated with chloride of lime (see also. p. 298)	I	C	page 100	good	very good	very good	very good

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	moderate	—	not good	good	Frequently employed on account of its pure greenish-yellow shade, also for shading purposes.
—	very good	—	good	very good	Good union and half-silk dyes.
good	very good also fast to cross-dyeing	—	very good	very good	For very fast Yellow on cotton. In *direct* dyeings Primuline is not employed on account of its poor fastness. Most important manner of application:— as a developing dye according to Rp. 21, especially with β-Naphtol for Red (see page 110). Combinations with the other developers are mostly only employed for shading purposes. Is also applicable as a shading dye for dyeings produced according to Rp. 25.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183.)

Substantive Cotton Dyes*.

Green	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Columbia Green	II	C	17	good	sufficient	very good	moderate
		W	12		fairly good		good
		S	16				
		U	41				
		HS	45				
Columbia Black-Green D	II	C	17	good	sufficient	good	moderate

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hemp

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	good	A cotton green of good fastness; it is remarkable for its excellent *fastness to alkalies.* Is also adapted for wool, silk, union material and half-silk.
rly good		moderate		moderate	
—	good	—	not good	good	Employed especially for shading purposes.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Chicago Blue 6 B	I	C	17, 18 19	good	moderate	very good	f'rly goo
			23		very good		good
		W	12		moderate		good
			12a		very good		
		S	16		moderate (see p. 86)		
		U	41, 43 (see p. 198)				
		HS	45				
		SW	48				
Chicago Blue 4 B	I	C	17, 18	good	moderate	very good	f'rly goo
			23		very good		good
		S	16		moderate (see p. 86)		good
		U	41, 43 (see p. 198)				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	very good	The *brightest* substantive Pure Blue. By after-treating the dyeing with bluestone (Rp. 23) more greenish shades of excellent fastness to light are produced. Also of importance for wool, silk and all mixed materials.
?'rly good		good		very good	
—	good	—	not good	very good	Is a full Blue with greenish tone; likewise yields shades of great fastness to light when after-treated with bluestone according to Rp. 23.
		good		—	

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Chicago Blue B	I	C	17	good	moderate	very good	f'rly good
			23, 25		very good		good
		S	16		moderate (see p. 86)		good
		U	41 (see p. 198)				
		HS	45				
		SW	48				
Chicago Blue RW	II	C	17	good	not good	very good	f'rly good
			23		very good		very good
		W	12		moderate		good
			12a		very good		very good
		S	16		moderate (see p. 86)		good
		U	41 (see p. 198)				
		HS	45				
		SW	48				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	good	Intense Medium Blue.
		fairly good		—	The fastness to light and washing can be considerably improved by an after-treatment according to Rp. 23 or 25.
—	good	—	not good	good	The *brightest* substantive Medium Blue.
-ly good		good			The dyeings after-treated with bluestone according to Rp. 23 are of great importance on account of their excellent fastness to light and washing.
good					Chicago Blue RW is of considerable interest for wool, silk and all mixed materials, especially unions.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Chicago Blue R	I	C	17. 25	good	moderate	very good	good
		S	16		moderate		on S als fast to water
		HS	45				
		SW	48				
Chicago Blue 2R, 4R	II	C	17, 18	good	not good	good	modera
		W	12		moderate		good
		S	16				
		HS	45				
		SW	48				
Columbia Blue G, R	II	C	17, 18 19	good	not good	good	modera
		U	41, 43				
		HS	45				
		SW	48				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	good	Possessess good fastness to washing on cotton even in *direct* dyeings; this fastness can be somewhat increased according to Rp. 25. Contrary to the beforementioned brands, Chicago Blue R can *not* be after-treated with bluestone. Also employed on silk on account of its fastness to water.
—	good	—	not good	f'rly good	Intense dyes for Navy Blues and reddish Blues.
'ly good		good		good	
—	good	—	not good	good	Bright Cotton Blues valued on account of their fastness to alkalies and ironing; they are remarkable for their exhausting from a cold bath (see page 104). Excellent union and half-silk dyes.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16.*
Congo Sky Blue	I	C	17	good	moderate	good	fairly good
		U	41				
		HS	45				
		SW	48				
Congo Blue BX	II	C	17	good	moderate	fairly good	moderat
		U	41				
		HS	45				
		SW	48				
Congo Blue 2B	II	C	17	good	not good	moderate	moderat
			23		very good		good
Erie Blue BX	II	C	17	good	moderate; somewhat better than Congo Blue BX	good	moderat

* All Substantive Cotton Dyes are also adapted for Linen, China Grass Hen

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	good	On cotton similar to Chicago Blue 6B but less bright, and is *not* capable of after-treatment with bluestone according to Rp. 23.
—	good	—	not good	fairly good	Very largely employed for Navy and Dark Blue.
—	good	—	not good	not good	Has been superseded by the faster Chicago Blue brands. Dyeings fast to light and washing can be produced according to Rp. 28 (after-treatment with bluestone).
—	good	—	not good	good	In shade similar to Congo Blue BX, only somewhat faster to light, alkalies and ironing.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162*)
Benzoazurine R, G, 3G	II	C	17	good	not good	not good	moderat
			G, 3G: 23		very good		good
		HS	45				
Brilliant Azurine 5G	III	C	17	good	moderate	not good	moderat
			23		very good		good
		HS	45				
Brilliant Azurine B	I	C	17	good	not good	not good	modera
		HS	45				
Azo Blue	II	C	17	good	not good	not good	modera

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	not good f'rly good	Are dyes which still find considerable employment in spite of their inferior fastness to alkalies and ironing, though they have lost much of their former importance through the introduction of the faster Chicago and Columbia Blues.
—	good	—	not good	not good f'rly good	
—	good	—	not good	not good	With the brands Benzoazurine G, 3 G, and Brilliant Azurine 5 G the fastness to light and washing can be considerably improved by after-treating the dyeings with bluestone (Rp. 23), the shades however then become greener and duller.
—	good	—	not good	not good	

age 175), Jute Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Solamine Blue B, R	II	C HS	17 45	good	very good	very good	moderat
Solamine Blue FF	II	C U HS	17 41 dye without soda 45	good	very good	very good	moderat

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hen

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	moderate	good	The Solamine Blue brands possess the great advantage of *yielding dyeings of extraordinary fastness to light without any after-treatment;* the fastness to alkalies, acids and ironing is likewise excellent. These dyes come into question for all vegetable materials and fabrics which require to be very fast to light, *e. g.* materials for curtains, upholstery, and decorative purposes, velvets, linen plushes, mercerised goods, artificial silks, etc. In mixture with other substantive dyes of good resistance against light, such as Columbia Yellow, Columbia Violet, Mikado Orange, etc., they are particularly adapted for the production of fancy shades fast to light. The brightest, clearest shades are obtained with the brand FF.
—	good	—	moderate	good	

(ge 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*)
Congo Fast Blue B, R	II	C, L	17	good	f'rly good	very good	f'rly goo
		HS	45				
Congo Fast Blue HW	II	C	17, 18	good	f'rly good	very good	f'rly goo
		U	41, 43				
		HS	45				
Columbia Fast Blue 2G	II	C	17	good	f'rly good	very good	f'rly goo
		U	41				
		HS	45				
Columbia Black-Blue G	II	C	17	good	moderate	good	moderat
			24		very good		very goo
		U	41				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	moderate	f'rly good	Cheap Cotton and Linen dyes, distinguished by their comparatively good fastness to light, washing and alkalies; for this reason largely employed as a bottoming for Indigo and as an Indigo Imitation..
—	good	—	moderate	f'rly good	Congo Fast Blue HW chiefly finds employment on union material, as it only slightly stains the wool (see pages 191 and 204).
—	good	—	moderate	f'rly good	Columbia Fast Blue 2 G is the most powerful dyestuff of this group, yields the bright est shades, and is likewise well adapted for union dyeing.
—	good	—	not good	good	For steel blue shades.

ge 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Blue	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Zambesi Pure Blue 4B, R developed with β-Naphtol	I	C	21	good	very good	very good	excelle
		4B: S	16a				
Naphtogene Blue 2R, 4R in *direct* dyeings	II	C	17	good	very good	good	f'rly go
		HS	45				
Naphtogene Blue 2R, 4R depeloped with β-Naphtol		C	21		excellent	very good	excelle
			22 (p. 113)				
		S	16a				
		HS	45a				
Zambesi Indigo Blue B developed with β-Naphtol	II	C	21	good	moderate	very good	very go
		S	16a				
		HS	45a				
For the other dyes which are developed to Blue with β-Naphtol, see under Zambesi Black D, F, BR, R, V (pages 346—355)							

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, He

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 1 and 90)	*(see pages 12 and 165)*				
good	good; also fast to cross-dyeing	—	moderate	very good	Are dyestuffs which, developed with β-Naphtol according to Recipe 21, yield the whole scale of blue shades from brilliant Greenish Blue, Navy Blue, Indigo Blue to Reddish Blue in dyeings of excellent **fastness to washing, rubbing and light**; in this respect they excel Indigo dyeings. They are adapted for Cotton, Linen and all vegetable fibres, not only in the form of yarns in hanks, cops, bobbins and raw material, but also for piece-goods. Of the greatest importance for fancy weaving. Naphtogene Blue 2 R and 4 R, on account of the fastness to light of their *direct* dyeings, can also be employed both alone and in combination with other substantive dyes of good fastness to light.
—	good	—	not good	good	
good	good; also fast to cross-dyeing	—	moderate	very good	
good	good	—	moderate	very good	For full Vat Blue shades very fast to washing, such as are much sought after in fancy weaving.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Violet	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Columbia Violet R	III	C	17	good	good	good	f'rly good
		W	12		very good		good
		S	16				
		U	41				
		HS	45				
		SW	48				
Heliotrope 2B	II	C	17 18, 19	good	moderate	not good	moderate
		U	41, 43				
		HS	45				
		SW	48				
Azo Violet	II	C	17	good	not good	not good	moderate

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	f'rly good	Belongs to the fastest Substantive Cotton Dyes to light. Reddish Violet; particularly well adapted for the production of Heliotrope and delicate fancy shades fast to light. Is remarkable for the excellent fastness to its wool and silk dyeings. Is of interest for *all* textile fibres and mixed fabrics.
rly good		good		good	
—	good	—	not good	not good	Employed for Heliotrope and fancy shades. Also dyes from a cold bath.
—	moderate	—	not good	not good	Employed as a self-color for Violet and for shading Blues

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Brown	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Congo Brown G, R	II	C	17	good	f'rly good	very good	moderat
			23, 24 G also 25		very good		good
		W	12		good		good
			12a, 12b		very good		very goo
		S	16		good		good
		U	41 (see p. 199)				
		HS	45				
		SW	48				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	good according to Rp. 25 also fast to cross-dyeing	—	not good	good	Generally introduced and adapted for all textile fibres. By an after-treatment with metallic salts dyeings of great fastness to light and washing are obtainable; extremely well adapted for the production of fancy shades fast to light (even in the lightest dyeings) in combination with other dyes capable of after-treatment with bluestone, *e. g.* Chicago Blue RW. Also very well adapted for union materials, half-silk, etc.
'rly good good		good		good	

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Brown	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Columbia Brown R		C	17	good	f'rly good	good	moderat
			25				good
		S	16		good		good
	II	U	41				
		HS	45				
Columbia Brown R developed with **Toluylene Diamine**		C	21		f'rly good	good	good
		S	16a				
		HS	45a				
Catechu Brown DX, 2DX, 3DX	II	C	17	good	f'rly good	very good	modera
			23, 24		very good		good
		HS	45				
Catechu Brown GK, FK, FDK	II	C	17	good	f'rly good	good	modera
			23		very good		good

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 51 and 90)	*(see pages 12 and 165)*				
—	good; according to Rp. 25 also fast to cross-dyeing	— f'rly good	not good	fairly good	Employed for intense dark brown shades both in direct dyeings and developed with Toluylene Diamine according to Recipe 21. The developed dyeings and those after-treated according to Recipe 25 possess good fastness to washing.
—	good	— S: f'rly good	not good	good	
—	good	—	not good	fairly good	In many cases well adapted as a Catechu substitute, especially on account of their good fastness to acids.
—	good	—	not good	fairly good	By an after-treatment with metallic salts the fastness to light and washing can be considerably increased.

age 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Brown	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Chromanil Brown R, 2G	II	C (see p. 101)	24 or 25	good	very good	very good	very goo
		U	41 (see p. 199)				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Her

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
good	good; according to Rp. 25 also fast to cross-dyeing	—	not good	good	Dyestuffs, which, after-treated with bichromate of potash and bluestone according to Recipe 24, yield intense reddish to reddish-brown dyeings of great fastness. For shading purposes Toluylene Orange G and Zambesi Black F are best adapted. By means of these dyestuffs a whole series from the deepest yellowish-brown to the darkest reddish-brown can be produced fast to light and washing; thus for example they are extremely well adapted for the production of the so called "leather shades" on hosiery. The Chromanil Browns, on acount of their ready solubility, are also well suited for cop-dyeing.

ge 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183.)

Substantive Cotton Dyes*.

Brown	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Zambesi Brown G, 2G in direct dyeings: G: corinth brown 2G: dull violet.	G: II 2G: I	C	17 G also 18	good	good	very good	modera
		S	16		very good		S: goo also fa
		U	41, 43				to wat
		HS	45				
Zambesi Brown G, 2G developed with **Toluylene Diamine**		C	21		f'rly good	very good	very go
		S	16a		very good		S: fast wate
		HS	45a				
Wool Brown G, R	II	W	12	fairly good	good	good	good
		U	41				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, He

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
ee pages 1 and 90)	*(see pages 12 and 165)*				
—	good	—	not good	good	Employed in *direct* dyeings for corinth-brown or dull violet shades as well as in mixtures with other colors for producing fancy shades fast to light. *Developed* according to Recipe 21 with *Toluylene Diamine* for dark browns of excellent fastness to washing. Both the direct and developed dyeings are remarkable for their fastness on silk.
		good			
good	good	—	not good	good	
		good			
ly good	good	f'rly good	—	fairly good	Brown for wool and union materials, dyeing from a neutral bath.

ge 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Grey & Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washi
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p.*
Neutral Grey G	III	C	17	good	good	very good	f'rly g
		S	16				
		HS	45				
Nyanza Black B	IV	C	17	good	moderate	f'rly good	moder
		W	12		f'rly good		goo
		U	41				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, H

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 1 and 90)	*(see pages 12 and 165)*				
—	good	— moderate	not good	good	Grey of good levelling power, fast to light.
— ly good	good	— good	not good	f'rly good moderate	Finds employment in Garment Dyeing. In its character as a developing dye (Rp. 21), superseded by Zambesi Black D.

ge 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washir
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 1*
Columbia Black R, 2BX, 3B, 4B	II	C	17	good	sufficient	very good	moder
		HS	45				
Columbia Black B, FB, F2B, FF extra, 2BW	II	C	17	good	sufficient	very good	moder
			B, FB see also 25,26				accord to Rp.
							gooc
		U	41, 42				
		HS	45				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, H

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 1 and 90)	*(see pages 12 and 165)*				
—	verygood; also fast to cross-dyeing	—	not good	good	Columbia Black is employed as an advantageous and convenient **Substitute for Logwood Black** on all textile fibres (except wool and silk) and on all materials, *e. g.* raw cotton, all kinds of yarns, sewing cotton, cotton linings, satteens, hose, merino yarns, and all union materials, half-silk, linen, jute, etc. Extremely well adapted for cop dyeing and machine dyeing. Also applicable as a bottom for Aniline Black according Rp. 26.
—	verygood; also fast to cross-dyeing	—	not good	good	Columbia Black R, the oldest brand, yields a brownish Black and can therefore be advantageously topped with Methylene Blue according to Rp. 20. This combination finds special favor in the dyeing of hose. The brands most largely employed are **FF** extra and **FB**. On account of their fastness to cross-dyeing, a number of the Columbia Black brands are excellently suited for union dyeing; of the brands recommended for this purpose, FB must be mentioned in the first place.

)age 175), Jute Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 161*
Columbia Black EA extra WA extra EAW extra	I	C L J HS	17 page 175 page 180 45	good	sufficient	fairly good	moderat
Columbia Black FBW	II	U	42a	good	sufficient	very good	moderat
Columbia Black HWD, HWDB	II	C U	19 43	good	fairly good	very good	moderat

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 1 and 90)	*(see pages 12 and 165)*				
—	moderate	—	not good	fairly good	Find the same employment as the brands enumerated on page 340; they receive the preference for linen and jute.
—	verygood; also fast to cross-dyeing	—	not good	good	Special brand for *union material* for dyeing the cotton during the milling process according to Rp. 42 a, page 203.
—	good	—	moderate	good	Special brands for *union material* for covering the cotton according to Rp. 43, page 204.

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16.*
Zambesi Black D see also page 346.	II	C	17 18, 19 25, 26	good	good; also in light shades	good	f'rly goo accordin Rp. 25: good
		W	12	good	good	good	good
		S	16				
		U	41, 43				
		HS	45				
		SW	48				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	moderate; according Rp. 25: good	—	moderate	good	A dyestuff applicable for many purposes and for all textile fibres.
fairly good	fairly good	not good	—	fairly good	Extremely well adapted in *direct* dyeings for Grey and Blue-Black fast to light, and, on account of its particularly good levelling power, for combining with other dyes to produce fancy shades. Its power of exhausting well from a *cold* bath (page 104) is remarkable. According to Rp. 25 (after-treatment with Diazo-Para-nitraniline) dyeings fast to washing are produced.
					Applicable as a bottom for Aniline Black, acccording to Rp. 26.
					Zambesi Black D is further *exceedingly well adapted for the dyeing of union materials.*
					For the employment of Zambesi Black D as a developing dye (Rp. 21), see next page.

(page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Zambesi Black D developed with **β-Naphtol**		C HS	21 45a	good	good	very good	very good
Zambesi Black D developed with **Toluylene Diamine**		C S HS	21 16a 45a		good	very good	very good S: fast to water
Zambesi Black D developed with **Nerogene D**		C S HS	21 16a 45a		very good	very good	very good S: fast to water

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hemp

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
good	verygood; also fast to cross-dyeing	—	moderate	very good	*Developed* according to Rp. 21 (see page 110), Zambesi Black D yields dyeings fast to washing and milling, *viz.*, with β-Naphtol: Black-Blue Toluylene Diamine: Dead Black Nerogene D: Dead Black with a blueish tone. The latter combination is particularly fast to light. The greenish-black developments with Resorcine are somewhat inferior to the other developments in fastness to washing (see page 112).
good	verygood; also fast to cross-dyeing	— S: moderate	moderate	very good	
good	verygood; also fast to cross-dyeing	— S: moderate	moderate	very good	

(page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Zambesi Black NA developed with **β-Naphtol**	II	C	21	good	good	very good	good
Zambesi Black V, 2G developed with **Toluylene Diamine** or **Nerogene D** (see page 110)	II	C	21	good	very good	very good	V: very good 2G: good V: on s also fas to wate
		S the V brand only	16a				
		HS	45a				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	very good	—	moderate	very good	Zambesi Black brand yielding a Black with β-Naphtol; specially suitable for piece-goods.
good	verygood; also fast to cross-dyeing	—	moderate	very good	Zambesi Black V developed yields a full bloomy black with a blue-violet tone. The brand 2 G yields a Dead-Black with a greenish tone, and is somewhat less fast to washing than the black produced with the V brand; is chiefly intended for piece-goods.
—		S: f'rly good			

(page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183.)

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162)*
Zambesi Black R	III	C	17	good	good	very good	f'rly good
			25				good
		U	41				
		HS	45				
Zambesi Black R developed with **β-Naphtol**		C	21		good	very good	very good
		HS	45a				
Zambesi Black R developed with **Toluylene Diamine**		C	21		good	very good	very good on S also fast to water
		S	16a				
		HS	45a				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hemp

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	f'rly good good	—	moderate	good	Dyes of *great coloring power*, of interest both in *direct* dyeings and *developed*. In *direct* dyeings for cheap Black-Blue or dark Navy Blue, also serving as a bottom for Basic Dyes, Indigo, etc. The fastness to washing can be increased by an after-treatment according to Rp. 25. *Developed* according to Rp. 21 (see page 110), Zambesi Black R yields dyeings fast to washing and milling, *viz.*, with β-Naphtol: Black-Blue Toluylene Diamine: Dead Black with a brownish tone. Resorcine: see page 112.
good	verygood; also fast to cross-dyeing	—	moderate	very good	
good	verygood; also fast to cross-dyeing	— S: moderate	moderate	very good	

(page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162*
Zambesi Black F	II	C	17	good	good	very good	f'rly good
			23		very good		good
			24				very good
		W	12		good		good
			12a, 12b		very good		very good
		U	41 (see p. 199)				
		HS	45				
Zambesi Black F developed with **β-Naphtol**		C	21		good	very good	very good
		HS	45a				
Zambesi Black F developed with **Tolulene Diamine**		C	21		good	very good	verygood on S also fast to water
		S	16a				
		HS	45a				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hemp

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 51 and 90)	*(see pages 12 and 165)*				
—	f'rly good	—	moderate	good	
good	good				Largely employed in *direct* dyeings for darkening and as a bottom for Basic Dyes and Indigo.
f'rly good	f'rly good	moderate	—	moderate	
good	good				Finds much favor as a shading dye on cotton, wool, and union material, also for such dyes as are capable of after-treatment with metallic salts. C: pages 113, 114; W: pages 45, 46; U: page 199.
good	verygood; also fast to cross-dyeing	—	moderate	very good	*Developed* according to Rp. 21 with β-Naphtol, Zambesi Black F yields Black-Blue, with Toluylene Diamine Black fast to washing and milling.
good	verygood; also fast to cross-dyeing	— S: moderate	moderate	very good	

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe for	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 16*
Zambesi Black BR	II	C	17	good	good	very good	moderat
			23		very good		good
			24				very goo
			25				good
		U	41 (see p. 199)				
		HS	45				
Zambesi Black BR developed with **β-Naphtol**		C	21		good	very good	very goo
		HS	45a				
Zambesi Black BR developed with **Toluylene Diamine**		C	21		good	very good	very goo
		HS	45a				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
(see pages 61 and 90)	*(see pages 12 and 165)*				
—	f'rly good	—	moderate	good	
good	good				Employed in *direct* dyeings for Blue or bright Black-Blue of good fastness to light. By an after-treatment with metallic salts (Rps. 23 and 24) or with Diazo-Paranitraniline (Rp. 25) extraordinarily fast dyeings are produced. For union materials and particularly for *half-silk*, it is also of interest, as the silk is only slightly stained.
good	verygood; also fast to cross-dyeing	—	moderate	very good	Developed according to Rp. 21, Zambesi Black BR yields with β-Naphtol: Black-Blue; Toluylene Diamine: Black; Resorcine: Russian Green; Zambesi Black BR and Primuline with Phenol: Green (see pages 110—112).
good	verygood; also fast to cross-dyeing	—	moderate	very good	

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183.)

Substantive Cotton Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
				(see pages 148—154)		*(see pages 161 and 146)*	*(see p. 162*
Zambesi Black BRF	II	C	17	good	good	very good	moderat
			23		very good		good
			24				very goo
Zambesi Black BRF developed with **Toluylene Diamine**		C	21		good	very good	very goo
Chromanil Black 3BF, 2BF, BF, RF, 2RF	II	C	24	good	very good	very good	very goo
		2BF: U	41 (see p. 199)				

* All Substantive Cotton Dyes are also adapted for Linen, China Grass, Hem

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
see pages 11 and 90)	*(see pages 12 and 165)*				
—	f'rly good	—	moderate	good	In *direct* dyeings for cheap Navy Blues, the fastness of which can be increased by an after-treatment with metallic salts, in *developed* dyeings for Black fast to washing.
good	good				
good	verygood; also fast to cross-dyeing	—	moderate	very good	
good	good	—	not good	very good	Cotton dyes yielding dyeings of excellent fastness when after-treated with bichromate of potash and bluestone according to Rp. 24. Also applicable for union shoddy (see pages 191 and 199).

page 175), Jute, Cocoanut Fibre (page 180) and Artificial Silk (page 183).

Sulfur Dyes*.

Blue & Brown	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
						(see p. 146)	
Sulfur Blue L extra	page 130	C	29	good	excellent	very good	good
			29a				good
			30				very good
Sulfur Indigo B	page 134	C	30	good	excellent	very good	very good
			29a				good
Sulfur Brown G, 2G	page 127	C	28	good	very good	very good	very good
Sulfur Catechu R, G	page 128	C	28	good	good	very good	good
Sulfur Corinth B			28a		good		very good
			28b		very good		very good

* The Sulfur Dyes are also adapted for Linen, Half-Linen, China Grass and

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
f'rly good	verygood; also fast to cross-dyeing	—	not good	very good	**The Sulfur Dyes** *(see pages 119—135)* with the exception of Sulfur Brown and Sultur Catechu, are insoluble in water and must be dissolved and dyed with the addition of sulfide of soda. (Dye vessels, see page 119).
good					
good f'rly good	moderate (see pages 166 & 168)	—	moderate; fast against slight bleaching	very good	Excepting their resistance against bleaching, they satisfy the highest requirements which can be made as to the fastness of their dyeings, and are applicable for all branches of fast dyeing on cotton.
good	verygood; also fast to cross-dyeing	—	not good	very good	**Sulfur Blue L extra:** for dark blue shades. The brightest are obtained according to Rps. 29 & 29a, the fastest according to Rp. 30. Also applicable in mixture with Sulfur Indigo B.
f'rly good good good	very good; according to Rp. 28b also fast to cross-dyeing	—	not good	very good	**Sulfur Indigo B:** For bright greenish blue shades, in the tone of Indigo dyeings; chiefly employed for fancy woven articles. When employed for piece dyeing, a storing of the dyed goods in an acid atmosphere must be avoided. **Sulfur Brown G, 2G:** Are chiefly employed in light shades for drabs and khakis. **Sulfur Catechu R, G** and **Sulfur Corinth B** for Catechu Brown to Dark Brown.

Hemp (page 175), further for Jute and Cocoanut Fibre (page 180).

Sulfur Dyes*.

Black	Solubility	Suitable for	Dyeing Recipe No.	Levelling Power	Fastness to		
					Light	Alkalies	Washing
						(see p. 146)	
Sulfur Black T extra, TG extra, TB extra, 2B extra, 4B extra, A extra, etc.	page 120	C	27	good	excellent	very good	very good

* The Sulfur Dyes are also adapted for Linen, Half-Linen, China Grass and

Fastness to					Observations
Milling	Acids	Stoving	Bleaching	Steaming or Ironing	
good	verygood; also fast to cross-dyeing	—	not good	very good	**Sulfur Black** *(see pages 119—126)*, exceeded by Aniline Black only in fastness to bleaching, is employed as fastest Black on cotton, linen, etc. in the form of loose material, yarn and piece goods to an extraordinary and constantly increasing extent. T-brands: for Dead Black; B-brands: for Black with a blueish tone. A extra approaches Aniline Oxydation Black most nearly in shade. For mercerised goods TG extra and A extra are given the preference. On linen Sulfur Black offers the advantage over Logwood Black in that it is possible to enter the dry goods without first boiling off, and that a finish with dextrine, etc. after dyeing is not necessary.

Hemp (page 175), further for Jute and Cocoanut Fibre (page 180).

The textile materials handed over to the dyer for a further treatment, and the requirements made of the dyed goods, are of such great variety that it appears advisable to give from this point of view a short exposé of

The Textile Materials in
Wool, Cotton, and Union Dyeing,

which are unusually numerous.

The object of the following synopsis, with the assistance of the preceding Tables, is to facilitate the choice of suitable dyes for a given purpose.

For the remaining textile materials such a selection can without difficulty be made from the preceding lists, *viz.*,

Silk	:	*pages 73—90*
Linen, Half-Linen *China Grass, Hemp*	:	*„ 175*
Jute, Cocoanut Fibre	:	*„ 179, 180*
Artificial Silk	:	*„ 183*
Half-Silk	:	*„ 209—216*
Gloria	:	*„ 219—224.*

The

Textile Materials

in

Wool, Cotton, and Union Dyeing.

Wool Dyeing	What are the chief requirements the dyeings must meet?
Loose Material.	
Loose Wool Slubbing	Fastness to { light milling steaming.
Carbonised Rags (Shoddy, Mungo, etc.)	Fastness to milling occasionally fastness to carbonising Cheapness The requirements as to fastness to ligh are often only moderate.
Yarns.	
Weaving Yarns (Worsted Yarns, Cheviot Yarns, Carded Yarns, etc.)	As with loose wool.

What groups of dyes therefore first come into consideration?	Observations
Metachrome Dyes and the other Chrome Dyes mentioned on page 62: *Chromate Black, etc.*	For dyeing in apparatuses, dyes of good solubility first come in consideration. (See the Tables).
In the second place:- The dyes mentioned on page 61 especially Indocyanine, Victoria Blue, Nerol. Of the *Substantive Cotton Dyes* especially the products fastest to light mentioned on page 56.	
The dyes mentioned on pages 61 and 62. *In the second place:-* Basic Dyes (page 41).	The Basic Dyes on wool will meet only moderate requirements as regards fastness to milling (except Victoria Blue). Besides their greater brilliancy they possess the advantage over the Substantive Cotton Dyes of not staining white cotton, though they are less fast to light. "Stripping" of dark dyed shoddy material, see pages 195 and 202.
As for loose wool.	As with loose wool.

Wool Dyeing	What are the chief requirements the dyeings must meet?
Yarns.	
Worsted Knitting Yarns Hosiery Yarns	Fastness to { washing acids (perspiration) rubbing (see page 14).
Yarns for Flannels, Rugs, Blankets, Plaids, etc.	Moderate fastness to milling Fastness to { acids (perspiration) rubbing for rugs, blankets, etc. frequently also fastness to stoving.
Carpet Yarns Tapestry Yarns Yarns for Gobelins, etc. Worsted Braids	Fastness to { light rubbing. The braids must be penetrated.
Berlin Wool All Kinds of Fancy Yarns	Fastness to stoving Brilliant shade.

What groups of dyes therefore first come into consideration?	Observations
The Acid Dyes and Substantive Cotton Dyes mentioned on page 61, with higher requirements the Metachrome Dyes and other Chrome Dyes mentioned on page 62. Dyes fast to stoving:— see pages 65 and 66.	For **Black** in the first place **Nerol**, see page 26. When combining dyes of less good levelling powers (such as Wool Blue) with level-dyeing colors (such as Acid Yellow) first dye neutral or only very slightly acid, and only gradually adding the requisite amount of acid.
Wool Dyes fast to light:— see pages 55 and 56.	If weight is laid on good levelling and penetration, attention must be paid to page 49 when making a choice of dyes.
Wool Dyes fast to stoving:— see pages 65 and 66.	Of Acid Dyes those of good levelling powers (page 49) are to be preferred.

Wool Dyeing	What are the chief requirements the dyeings must meet?
Piece-Goods.	
Gentlemen's Suitings (Worsted Coatings, Cheviots, Carded Woolen Cloths) All Kinds of Cloths Braidings for Army and Navy Cloths Billiard Cloths	Fastness to light (dyeings for militar and official clothing must be especially fast to light) Fastness to { steaming / rubbing (see page 14 / acids (perspiration) Occasionally fastness to carbonising The goods must be well penetrated.
All Kinds of Dress Goods Ladies' Cloths Cashmeres, Muslins	Fastness to { light / acids (perspiration) / alkalies (fastness against street dus / rubbing.

What groups of dyes therefore first come into consideration?	Observations
The Acid and Mordant Dyes mentioned under Rps. 1—10 on pages 23—40, especially the dyes fastest to light mentioned on page 55. Fastness to { steaming, see page 67 acids and carbonising see pages 63 and 64.	Dark shades, especially *Black*, *Blue* and *Brown* are of particular importance for all kinds of cloths and gentlemen's suitings. The degrees of fastness required vary greatly, therefore influencing the choice of the dyes suitable for the purpose. For *Black*, **Wool Black** is used very largely. For a selection of suitable brands see page 265. For Black woolen pieces with white cotton lists the W-brands and especially also **Amido Acid Black** come into consideration. A list of the Acid Dyes leaving Cotton, China Grass or Silk effects undyed is to be found on pages 50 and 51. If extraordinarily high requirements as to fastness are made upon the Black, **Chromate Black** (page 36) is to be recommended. For Blues of special fastness, **Indocyanine** (page 29) and **Cyprus Blue** (page 34) first come into question, for extraordinarily fast *Brown*, **Metachrome Brown** (page 39).
Acid Dyes (page 23) including Alkali Blue, Indocyanine, Cyprus Blue and Cyprus Green, especially the products fast to light (see page 55). Fastness to { acids, see page 63 alkalies, see page 60.	For the production of light and fancy shades, besides fastness to light, good levelling power is a primary requirement for the selection of the dyes to be employed. Materials with Cotton, China Grass or Silk fancy effects, see pages 50 and 51

Wool Dyeing	What are the chief requirements the dyeings must meet?
Piece-Goods.	
Flannels	Clear shades Fastness to { stoving / rubbing occasionally fastness to washing.
Velvets, Plushes Materials for Upholstery	Fastness to { light / rubbing.
Woolen Felt	The requirements as to fastne vary according to the mann of application. The felt mu as a rule be well penetrated.

What groups of dyes therefore first come into consideration?	Observations
All the Basic, Acid, and Substantive Cotton Dyes fast to stoving mentioned on pages 65 and 66, the fastness to washing of which suffices for this article.	Only dyes of bright shades come into question.
Acid Dyes. Fastness to light, see pages 55 and 56.	With Plushes and Velvets the warp (cotton) is usually contained in the material in the dyed state. It is therefore only a question of dyeing the pile in an acid bath.
The readily soluble Acid Dyes (see Tables), as well as the Substantive Dyes adapted for wool (page 44).	Wool Black and Wool Jet Black are largely employed for the production of Black. For fancy shades the Substantive Cotton Dyes are very well adapted.

Wool Dyeing	What are the chief requirements the dyeings must meet?

Piece-Goods.

Woolen and Hair Hats

Fastness to { light / steaming / rubbing (see page 1

Ladies' hat bodies must be we penetrated.

What groups of dyes therefore first come into consideration?	Observations
The wool dyes fast to light mentioned on page 55. NB. The Metachrome Dyes are best adapted for the dyeing of *loose* material).	For Black, according to the requirements made, **Wool Black, Wool Jet Black, Acid Black** or **Hat Black** (pages 263—265) come into question; if very high requirements as to fastness are made: **Chromate Black** (page 266). Bodies to be dyed with Acid Colors which have undergone an acid milling as a rule require no further addition of acid; on the contrary, especially when using dyes of less good penetrating power, they must be neutralised with a little ammonia. Gentlemen's hat bodies must be sufficiently penetrated, so that the undyed interior does not appear on finishing (polishing, etc.) Loose hair is usually dyed in apparatuses.
For fancy shades on ladies' hats all the Acid Dyes of good levelling powers mentioned on page 49 are well adapted.	
Fastness to steaming, see page 67.	

Cotton Dyeing	What are the chief requirements the dyeings must meet?

Loose Material.

Raw Cotton
Cotton Slubbing

The requirements as to fastnes are extremely varied, accordin to the use to which the dye material is to be put;

e. g.

with loose material

for union materials:—

Fastness to { milling / cross-dyeing

for fancy weaving articles:—

Fastness to { washing / light

for hosiery:—

Fastness to { light / rubbing / perspiration

etc.

What groups of dyes therefore first come into consideration?	Observations
Substantive Cotton Dyes (pages 93—116). (a) in direct dyeings (Rp. 17) (b) diazotised and developed (Rp. 21) (c) after-treated with metallic salts (Rps. 23 and 24) (d) after-treated with Diazo Paranitraniline (Rp. 25) (e) topped with Basic Dyes (Rps. 20 and 22). *Sulfur Dyes* pages 119—135 (Rps. 27—30). *Basic Dyes* pages 136—142 (Rps. 31—34). Properties of the Cotton Dyes:— pages 147—172.	The employment of the Substantive Cotton Dyes and the Sulfur Dyes, besides their simple manner of application, has the advantage that the cotton remains open and that its spinning properties in no wise suffer. As substitutes for Logwood Black both **Columbia Black** and **Sulfur Black** find extensive employment. For machine-dyeing those Substantive Cotton Dyes possessing a ready solubility and the Sulfur Dyes come into question; sensitiveness to metals, see page 155.

Cotton Dyeing	What are the chief requirements the dyeings must meet?
Yarns.	
Fancy Weaving Yarns	Fastness to { washing / light.
Cotton Warps Cotton Yarns for Union Worsteds	Fastness to { milling or washing / cross-dyeing.
Sewing Cotton	Fastness to { light / rubbing.
Mercerised Yarns (Embroidery Yarns, Yarns for Fancy Threads)	Fastness to { light / washing for fancy threads:— Fastness to { cross-dyeing / milling.

What groups of dyes therefore first come into consideration?	Observations
Cotton Dyes fast to washing, or fast to washing and milling:— pages 162—165.	The following are especially important for *Black:* **Zambesi Black D**, **Zambesi Black V** } diazotised and developed with Nerogene D or Toluylene Diamine. **Sulfur Black,** all brands; for Sewing Cotton and Cotton Warps for Union Materials also **Columbia Black.**
Cotton Dyes fast to light:— pages 157—159.	*Blue:* **Naphtogene Blue 2 R, 4 R**, **Zambesi Pure Blue 4 B, R** } developed with β-Naphtol **Sulfur Indigo B.**
Cotton Dyes fast to cross-dyeing:— page 167.	Weaving yarns and warps are frequently dyed in the form of cops or bobbins in mechanical apparatuses (see pages 96, 119 and 126); sensitiveness to metals: page 145. For Black in warp-dyeing (continue) machines, besides Columbia Black and developed Zambesi Black, **Sulfur Black** is also exceedingly well adapted. Dyeing of mercerised yarns: page 145.

Cotton Dyeing	What are the chief requirements the dyeings must meet?
Yarns.	
Yarns for Trimmings	Bright shades Fastness to light.
Knitting Yarns, Hose Hosiery Yarns, Hosiery	Fastness to { washing acids (perspiration) rubbing (see page 14) Occasionally fastness to light.

What groups of dyes therefore first come into consideration?	Observations
Cotton Dyes fast to light:— pages 157–179, especially Basic and Acid Dyes.	See page 144.
Cotton Dyes fast to washing:— pages 162—165. Cotton Dyes fast to acids:— pages 165–166. Cotton Dyes fast to light:— pages 157—159.	For bright shades a topping of substantive dyeings with Basic Dyes (see pages 105 and 112) is frequently preferred to dyeing Basic Dyes on tannin and antimony mordant (Rp. 31), especially if softness and good penetration (for raised material) is required. For *cheap* Black on hose, Columbia Black R topped with Methylene Blue (in the rinsing bath) is much employed.

Cotton Dyeing	What are the chief requirements the dyeings must meet?
Piece-Goods.	
Dress-Goods, Cotton Satteens, Damask Cotton Worsteds, Moleskins Velvets, Corduroys etc.	Fastness to { light; acids (perspiration); alkalies (fastness against street dust); rubbing; calendering.
Beavers, Fustians Flannelettes	Fastness to { washing; acids (perspiration); rubbing. Occasionally fastness to light.
Cotton Linings Bobbin-net	Fastness to { acids (perspiration); rubbing; calendering.
Tulle, Lace, Drapery	Fastness to { light; washing.
Bookbinders' Cloth	Fastness to light.

What groups of dyes therefore first come into consideration?	Observations
Substantive Cotton Dyes (pages 93–118). (Dyeing of piece-goods, see page 96) (a) in direct dyeings (Rp. 17) (b) diazotised and developed (Rp. 21) (c) after-treated with metallic salts (Rps. 23 and 24) (d) after-treated with Diazo Paranitraniline (Rp. 25) (e) topped with Basic Dyes (Rps. 20 and 22).	*Substantive Dyes.* When dyeing mixtures of *Substantive* Dyes, especially for the production of light and fancy shades, the *behaviour of the Substantive Cotton Dyes in the dyebath* (pages 141—154) is to be observed. As a **Black** for cheap articles, **Columbia Black** is very extensively employed; for articles which have to satisfy higher requirements, chiefly the diazotised and developed **Zambesi Blacks** come into question.
Sulfur Dyes (pages 119—135) Rps. 27—30.	*Sulfur Dyes.* As Blacks for all kinds of cotton goods the **Sulfur Blacks** find an extremely large and constantly increasing application. Sulfur Brown G and 2G find special favour for drab, khaki and fancy shades on piece-goods.
In the second place:- Basic Dyes (pages 136—142) Rps. 31—34.	
Fastness to light, see pages 157-159; acids, see pages 165-166; alkalies, see pages 161 and 146; calendering, see pages 169-171; washing, see pages 162-165,	*Mercerised goods*, see page 145; of Sulfur Blacks the brand A extra is especially well adapted.
Especially the Acid Dyes mentioned on page 144.	The dyeing frequently occurs in the **size.**

Union Dyeing	What are the chief requirements the dyeings must meet?

Loose Material.

Thread Waste, Shoddy
Mixtures of Cotton and
Woollen Waste
Rags

The requirements as to fastness are extremely varied, according to the use to which the dyed material is to be put;

e. g.

with loose material

for dress goods:—

Fastness to { washing or milling / light

for hosiery:—

Fastness to { washing / perspiration / rubbing

for rugs, etc.:—

Fastness to { water / light (occasionally)

etc.

Yarns, etc.

Union Yarns, Merino Yarns
Knitting Yarns, Hose
Hosiery Yarns, Hosiery

Fastness to { washing / acids (perspiration) / rubbing / light (occasionally).

Trimming Articles.

Braids, etc.

Occasionally fastness to light

For skirt bindings: fastness to alkalie

What groups of dyes therefore first come into consideration?	Observations
Dye according to the one-bath process with the application of the dyes mentioned on pages 190 and 191. Fastness of the dyes on wool : pages 55— 69 on cotton: „ 157—172 If higher requirements are made than can be fulfilled with direct dyeings, such dyes must be used the fastness of which can be increased by an after-treatment with metallic salts (page 198), or by diazotising and developing (Rp. 21).	Dark material before dyeing frequently requires stripping (page 195). For cheap **Black** Columbia Black in combination with Wool Black is frequently employed. For the production of Black fast to milling, Chromanil Black 2BF is employed in combination with a little Wool Black or Nerol and after-treated with bichromate of potash and bluestone (page 199).
As above. Only *direct* dyeings come into question.	As both the cotton and the wool are generally distinguishable in these materials, both fibres must be dyed as nearly as possible in the same shade; particularly the wool must not appear darker than the cotton. See page 192: the temperature of the dyebath.

Union Dyeing	What are the chief requirements the dyeings must meet?
Piece-Goods.	
Ladies' Dress Goods and Gentlemen's Suitings:— Worsteds, Cheviots, Witneys, Cashmeres, Alpaccas, Diagonals, Dress Goods with Mercerised Cotton, Ladies' Cloths, Presidents, Moscows, etc.	Fastness to { light; rubbing; acids (perspiration); alkalies. (fastness against street dust)
Materials for Upholstery	Fastness to { light; rubbing.

What groups of dyes therefore first come into consideration?	Observations
A) Such goods where the wool and cotton lie distinguishable beside one another, must be dyed according to the one-bath process (Rp. 41), using the dyes mentioned on pages 190—191.	Suitings consisting of *good, pure* wool and cotton play a comparatively unimportant part as compared with such containing shoddy. The tendency to manufacture the cheapest possible quality of goods has driven pure wool more and more from this field of employment.
B) Such goods in which the cotton lies hidden are frequently dyed according to the two-bath process (Rps. 41, 42a or 43). *Which process is to be preferred in each case is to be seen from the observations on pages 200 to 203.*	If the cotton is visible on the surface of the fabric, it must be observed that it becomes sufficiently covered; in no case must it be lighter, but rather fuller and darker than the wool, as otherwise the cotton will shew up through the wool, and the goods will be recognised at first sight to contain cotton.
C) The several-bath process (Rp. 44) with the application of Basic Dyes is almost only employed in case greater brilliancy of tone is desired than is obtainable with Substantive Dyes alone.	In general, if circumstances permit, it should be so arranged that for light shades raw material containing white wool or a light-colored shoddy should be chosen; if this is not possible, but on the contrary a material with dark shoddy is to be dyed in comparatively light or brilliant shades, the material must be stripped before dyeing (see page 195).
	For goods which contain *mercerised* cotton, or which for the production of crêpe effects have been mercerised, such Substantive Dyes should be chosen, (on account of the greater affinity of *mercerised* cotton for dyes) as also dye the wool well in a neutral boiling bath (pages 190 and 191).

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astness of the Dyes
on wool : pages 55— 69
on cotton: „ 157—172

Union Dyeing	What are the chief requirements the dyeings must meet?

Piece-Goods.

Linings Italian Cloth, Serges, etc.	Fastness to { acids (perspiration rubbing (page 14).

What groups of dyes therefore first come into consideration?	Observations
The dyeing is chiefly carried out according to the one-bath process (Rp. 41), using the dyes mentioned on pages 190 and 191; according to the several-bath process (Rp. 44), with the use of Basic Dyes, only in case greater brilliancy of shade is desired than is obtainable with Substantive Dyes.	In the dyeing of union linings, the shade which chiefly comes into question is **Black**, and here the one-bath process, with the application of our **Columbia Black** in conjunction with **Wool Black**, has been successfully introduced in place of the logwood process hitherto employed, on account of the advantages it offers over the latter, *viz.* Saving of time, steam, and labor, Guarantee for regularity of the dyed lots, Perfect fastness to perspiration, Superior fastness to storing.
Fastness to acids of the dyes on wool : page 63 on cotton : „ 165	When dyeing brown and grey fancy shades or other colors on linings, the older method (Rp. 44) has also been to a large extent abandoned in favor of the more convenient one-bath process. Besides the advantages mentioned for the one-bath Black, the resistance of the Substantive Dyes against alkalies and consequently better fastness of the goods against street dust, as well as superior fastness to rubbing, here also comes into account.

Union Dyeing	What are the chief requirements the dyeings must meet?
Piece-Goods.	
Cotton Warp Flannels	Clear shades Fastness to { rubbing acids (perspiration) washing.
Union Felt	The requirements as to fastnes vary according to the qualit of the material.

What groups of dyes therefore first come into consideration?	Observations
The dyeing is chiefly carried out according to the one-bath process (Rp. 41), using the dyes mentioned on pages 190 and 191.	For this class of goods the application of the Substantive Cotton Dyes has proved particularly advantageous; dyeings fast to rubbing and washing may be produced in a simple manner, whilst at the same time retaining the soft handle and woolly character of the flannel.
With this article chief importance is attached to the agreement in shade between the wool and cotton fibres.	When dyeing *union felts*, the constitution of the felt is decisive for the choice of the dyes. As a rule two different kinds of union felts are distinguished:—
For producing particularly bright shades the dyeings can be topped with Basic Dyes (see page 199).	In the one quality the cotton is covered by the wool; small deviations in shade are therefore of minor importance, as long as the cotton is dyed to a sufficient depth. For dyeing, almost all Substantive Cotton Dyes are suitable.
Fastness to acids of the dyes on wool : page 63 on cotton: „ 165	In the other quality, on the other hand, the wool and cotton are felted together so that both fibres lie beside one another. The necessity therefore arises of dyeing the cotton in the exact shade of the wool, only slightly darker, and, as this class of union felt is more sensitive and less resistant to lengthy boiling, the dyeing operation must be completed as quickly as possible. Such dyes are therefore best chosen as have only little affinity for wool; the latter fibre can then be brought up to shade with suitable wool dyes. It is by this means possible to match off even in a boiling bath.

Union Dyeing	What are the chief requirements the dyeings must meet?
Piece-Goods.	
Cotton Warp Astrachans, Imitation Lambskin, etc.	Fastness to { light rubbing.

What groups of dyes therefore first come into consideration?	Observations
'he dyeing is chiefly carried out according to the one-bath process (Rp. 41), using the dyes mentioned on pages 190 and 191. 'astness to light of the dyes on wool : pages 55 and 56 on cotton: .. 157—159 ' the cotton warp is already dyed, only a dyeing of the wool with Acid Dyes will be necessary.	In this article the cotton very rarely appears on the face; an exact correspondence between the shades of the cotton and wool is therefore seldom required. As a rule it is advisable to rinse the goods in water acidulated with acetic acid, in order to improve the brilliancy of some of the effects, and to give the wool an increased gloss.

INDEX.

The pages indicated opposite the names of the dyes refer to the "Tables" only; these again form an index for themselves, and contain directions at which places in the book the dyestuff in question is further mentioned.

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