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LUDWIGSHAFEN °/RHINE.

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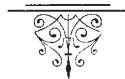
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Pocket Guide
to the
Application of the Dyestuffs
of the
Badische Anilin- & Soda-Fabrik,
Ludwigshafen °/Rhine.



The present little work is intended as a short and condensed guide to the properties and various methods of application of the coal-tar dyestuffs produced by the BADISCHE ANILIN- & SODA-FABRIK, LUDWIGSHAFEN oHRHINE; it is presented with the hope that it may render material assistance to those connected with the textile and various allied trades.

The limited space of this book and the extensive volume of the subject will readily account for the absence of many smaller details. Yet, we trust to have given many a useful hint to practical dyers and a good general survey of the matter to beginners. Customers, who would like further details on any points of particular importance to themselves, are invited to communicate with us or our representatives, when their enquiries will be immediately attended to. Inasmuch as technical difficulties should be encountered or new problems pursued, we shall always be pleased to render assistance, either through trials in our own various departments, specially adapted and equipped for such purposes, or — as far as possible — at the customers' own works.

The measures and weights, which are used throughout this volume, are those of the English system, the densities of liquids are given in degrees Twaddle and temperatures in degrees Fahrenheit.

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REMARKS

on the comparison of the fastness
of the various dyestuffs
for wool, cotton and silk.

With reference to the tables of the fastness of our dyestuffs given at the end of the various chapters on wool, cotton and silk, we would mention that the dyestuffs printed in heavy type should receive first consideration when choosing a product.

It must be borne in mind that a member of one class of dyestuff ought not of be compared with that of another class with respect to fastness. Only dyestuffs of the same group are to be compared with one another.

For example, it would be quite wrong to compare *Indanthrene Blue RS*, the leading representative of the Indanthrene group mentioned under cotton, as regards fastness to light with *Oxamine Blue B*, the fastest of the substantive dyestuffs to light at present known.

It must further be remembered that the demands on one and the same dyestuff as to fastness, as well as the methods of testing in the different branches of industry, are often so various that it is difficult, when classifying the fastnesses, to decide whether the fastness of a particular product is or is not sufficient. For this reason it will be easily understood that we cannot guarantee the fastnesses indicated.

It is always as well for the consumer, when choosing a dyestuff, to examine for himself by an actual test with the

aid of the tables of fastness, whether the product chosen is fast enough for his purposes or not.

At the same time we are always ready, within limits, to undertake tests on a small scale at our Works at the request of our customers, who should communicate with us for this purpose either directly or through our agents.

Certain dyestuffs for wool, which dye particularly fast, are often mentioned several times as possessing the same characteristics under different groups of dyestuffs, the reason for this being that the products in question can be dyed according to different methods. For example, *Alizarine Red S* can be dyed according to the single-bath processes Nos 5 and 7, as a single-bath after-chromed colour and also as an Alizarine dyestuff on a chrome or alumina mordant by processes 11 and 12.

Unless specially mentioned, it may be taken that the Alizarine dyestuffs for wool, classified in the various tables of fastness, are all dyed on chrome mordant.

An explanation of the abbreviations, occurring in the chapters on the "Fastness of Cotton Dyestuffs" and the "Fastness of Silk Dyestuffs," will be found at the beginning of the respective sections.

WOOL.

The preparation of wool before dyeing.

1. Washing and Scouring.
 2. Carbonising.
 3. Bleaching and Tinting.
-

The preparation of wool before dyeing.

1. Washing and Scouring.

Loose wool.—Wash the wool according to its quality and source of origin, e. g., treat wool that has already been washed 15—30 minutes in a bath containing 3—4 lbs. soda-ash (or 8—11 lbs. soda crystals) at a temperature of 100° F.

Treat unscoured, greasy wool in the same way with soda-ash up to 10 lbs., adding soap if necessary. Then wash out well, which is best done in a washing machine.

Slubbing.—Slubbing comes to the dyer as a rule in such a clean state that it is not necessary to cleanse it further.

Yarns.—Yarns, which readily felt or curl, such as weft yarn, fine worsted, etc., should simply be laid for 1—2 hours (or even overnight) in a loose bundle in boiling water.

Yarns which still contain grease from the spinning are scoured (unless they are to be “dyed in the grease,” as is usual with certain carpet yarns) with warm water containing 1—3 lbs. soda-ash. If necessary, add some ordinary soft soap to the soda bath and rinse.

Note. In the case of finer yarns, e. g. zephyrs, which are dyed in a soap bath and afterwards stoved (see dyeing process No 15, page 35), the scouring is often carried out at the same time as the dyeing.

Piece-goods.—Greasy piece-goods are scoured in the same way as woollen yarn with lukewarm water containing

1—3 lbs. soda-ash and a little soap. In order to completely remove the soap, add a little soda to the rinsing water, especially if the water be hard. If necessary use warm water with a little ammonia for washing.

— In each case the quantities are for 100 lbs. wool. —

2. Carbonising.

In order to remove vegetable impurities, such as pieces of straw, burrs, etc., the washed loose wool or piece-goods are carbonised either before or after dyeing with sulphuric acid, or piece-goods may be treated with aluminium chloride after dyeing, which process can only be briefly described.

Carbonising with sulphuric acid.

Soak the wool thoroughly in a lead-lined vessel with dilute, cold sulphuric acid (usually 6—9° Tw.), hydroextract or squeeze out any excess, and dry in drying stoves or in carbonising machines at a temperature of 170—190° F., with exclusion of light. After drying, wash out well, and remove the acid from the goods in a fresh cold bath containing soda.

Carbonising with aluminium chloride.

If the goods are to be carbonised after dyeing, it is most suitable to carbonise with a 7—10° Tw. solution of aluminium chloride. Having impregnated the goods, dry at a temperature of 230—250° F., rinse with clean water, and a second time using fuller's earth.

Shoddy is generally carbonised in a suitable apparatus with gaseous hydrochloric acid.

3. Bleaching and Tinting.

For white, or in preparing for very delicate shades, the washed woollen goods may be bleached as follows:

a) Bleaching with the aid of sodium bisulphite.

Prepare a cold bleaching bath with

4 gallons sodium bisulphite 71—77° Tw. (or a cold solution prepared from about 21½ lbs. bisulphite powder and 3 gallons water),

2½ pints sulphuric acid 168° Tw., and

500 gallons pure, cold water (free from iron).

Work the wool, which has been previously well washed or rinsed, for some time and then leave it for 3—4 hours (or over night) in the bath. Next morning take it out and work for ¼ hour at about 100° F. in a second bath (tinting bath), containing 500 gallons pure water and ⅓ oz. *Alkali Violet 6 B* or *4 BN*, or, according to the shade of white desired, ⅓ oz. *Acid Violet 6 BN* or *4 BL*. Then rinse, and dry at ordinary temperature.

— For 100 lbs. woollen material. —

- Notes.*
- a) The dyestuff is dissolved before use in about 2 gallons of hot water and the solution added to the liquor through a woollen cloth.
 - b) If pure water, free from iron, is not at hand, the water should be prepared beforehand by boiling up with bran, skimming off, and then letting cool.
 - c) The best and surest results are secured by working, as above, with two baths, but, if necessary, the goods can be tinted (with Acid Violet) in the bleaching bath by working very carefully.
 - d) If the white has to be fast to milling, the goods can be dyed or tinted after bleaching, either by dyeing with Indigo pure in a very weak vat, or by dyeing with Alizarine dyestuffs, e. g. *Anthracene Blue WR paste*,

WGG paste or *SWR powder*, *SWG powder* in one bath, using oxalic acid and alum. Useful results can be obtained in some cases (e. g. to stand neutral milling) by dyeing with *Cyananthrol R* in very pale shades according to process No 1, page 9.

b) Bleaching with potassium permanganate and sulphurous acid.

Enter the wool, which has been well washed, into a cold, concentrated bath of 200—300 gallons containing 1—3 lbs. potassium permanganate, and let it remain in for about ½—1 hour; hydroextract, squeeze, and then steep in a cold, freshly prepared bath of the same volume set with

2—3 gallons sodium bisulphite 71—77° Tw. (or a cold solution of about 11—16 lbs. bisulphite powder in 1½—2½ gallons water) and

5—7 pints sulphuric acid 168° Tw.

Treat in this bath for a few hours, throw out and wash.

— For 100 lbs. woollen material. —

- Notes.* a) A saving may be effected by replenishing the used permanganate and bisulphite baths, and employing them for further lots. Epsom salts are occasionally added to the permanganate bath to protect the material.
- b) Tinting is effected in the same way as given under *a*, page 5, with *Alkali Violet 6B*, *4BN* or *Acid Violet 6BN*, *4BL*.

c) Bleaching with Blankit.

Heat 200—300 gallons of pure water in a clean wooden vessel to 100—110° F. and dissolve by carefully and slowly stirring in, according to the quality of the wool, from 1 to 3 lbs. Blankit; enter the wool, which has been well washed, and leave it in the bleaching liquor over night. Next morning rinse and tint, if desired, with *Alkali Violet* etc., as given under *a*, page 5.

— For 100 lbs. woollen goods. —

Note. The bleaching bath may be replenished and used for further lots.

d) Bleaching with sodium peroxide or hydrogen peroxide
(chiefly used for yarn or piece-goods).

Example of a strong bleaching bath
of 10 gallons.

1. With sodium peroxide.

Prepare a bath with 10 gallons cold water and 1 lb. 5 oz. sulphuric acid 168° Tw. Sift in carefully, whilst slowly stirring and cooling, 1 lb. sodium peroxide (in small portions at a time), and make the solution, which is now acid, slightly alkaline with a little ammonia. Enter the scoured goods, heat very slowly to about 120° F., and allow to remain in for a few hours or overnight. Rinse and acidify.

2. With hydrogen peroxide.

Having scoured the goods thoroughly, enter them into a cold bleaching bath, prepared with 8—10 pints hydrogen peroxide (the commercial article of 10—12 volumes) and a little ammonia (till the reaction is slightly alkaline), then proceed as given above under 1.

- Notes.*
- a) After adding the sulphuric acid, about 3 lbs. Epsom salts are often given to the bath before the sodium peroxide is stirred in.
 - b) The baths described above may be replenished and used for further lots and made weaker or stronger according to the nature of the goods and the degree of bleaching desired. If the baths are used only now and again, it is well after use to make them slightly acid, in order that they may keep better, adding again a slight excess of alkali (ammonia or silicate of soda) before further use.
 - c) The white thus produced is fast to milling, washing and storing.

Processes for dyeing wool

with acid, basic, Eosine- and substantive dyestuffs, with certain of the Alizarine dyestuffs and with the Alkali Violet and Alkali Blue brands.

1. Dyeing in an acid bath.

Chiefly used for acid dyestuffs.

2. Dyeing in a slightly acid bath.

For Eosine, basic and substantive dyestuffs.

3. Dyeing from a neutral bath.

For the Alkali Violets and certain basic and substantive dyestuffs.

4. Dyeing in a slightly alkaline bath.

For the Alkali Blues.

Dyeing wool in an acid bath.

This process is chiefly used for acid dyestuffs.

Process N° 1.

Work at the boil for 1—2 hours with the addition of
10—20 lbs. Glauber's salt crystals (or half as much
calcined Glauber's salt) and

1—4 » sulphuric acid 168° Tw. (or 5—12 lbs.
sodium bisulphate), to the bath.

— For 100 lbs. wool. —

- Notes.* a) If necessary, 5—10 lbs. common salt may be used instead of Glauber's salt, and for certain dyestuffs, instead of sulphuric acid, a sufficient quantity of acetic acid 9° Tw. (30%) to exhaust the bath may be used (3—10 lbs.).
- b) The use of bright copper vessels must be avoided, if possible, when dyeing bright shades, but if no other vessels are available, 3 oz. ammonium sulphocyanide must be added per 100 gallons (cf. page 32, note c).

The following are suitable dyestuffs:

Yellow.

Quinoline Yellow, extra.
Tartrazine, H.
Naphthol Yellow S, SE,
SII, SO.
Fast Yellow G, Y, extra.

New Fast Yellow R.
Azoflavine 3 G extra, S,
SGR, SGR extra, FF,
RS, RR, 3R, II.
Metanil Yellow, extra, PL.

Orange.

Orange N, PN, IV, G, II, IIPL, IIP, R, RS, GR, X.

Brown.

Naphthylamine Brown. | *Fast Brown N.*

These Browns are not suitable for fashionable shades, for which combinations of other colouring matters should be employed (see pages 58, 60 and 62).

Scarlet.

Scarlet G, R, RR, 3R, 3RF, 3R superfine, 6R.
 Wool Scarlet G, R, RR, 3R, 4R, RS, RRS, 3RS, RW, RRW.
 Palatine Scarlet A, 3R, 4R. Brilliant Carmine L.
 Cochineal Red A. Erythrine X, RR, P, 7B.

Red. Crimson. Claret.

Silk Red N. Wool Red G, R.
 Fast Scarlet B, G, GGN. Mars Red G.
 Crystal Scarlet. Naphthol Red S, G, GR.
 ** Thiazine Red G, R. Azocarmine G paste, B, BX,
 Sorbine Red G, BB. BB.
 Palatine Red A. New Claret R.
 Fast Red AV, C, B. Acid Rhodamine R, RR, 3R.
 Acid Magenta S, SN, SS, ST, Naphthylamine Red G, BB,
 SIII. 3B.

Violet.

Acid Violet 4RN, BN, 3BN, 4BS, 4BL, 4BC, 5BN,
 6BN, 7B, PW.
 Ethyl Acid Violet S 4B.
 † Anthraquinone Violet.

Blue.

Wool Blue S, SL, SL extra, Indigotine.
 SNL, R. * Victoria Blue B, BS, 4R.
 Wool Marine Blue BN. * Victoria Pure Blue B.
 Soluble Blues, e. g. TR, HA, † Anthraquinone Blue SR extra
 TB, 3376, HB, PP, LS, paste, SR extra powder.
 IN, Pure Blue I. † Brilliant Anthrazurol.
 † Cyananthrol R, RB. Brilliant Anthrazurol G.
 Cyananthrol BGA, BA, RA. † Anthracene Blue
 Fast Blue K, R, RR, greenish, SWG extra.
 extra greenish, B, 5B. Neptune Blue BG, R, B.
 Indigo Carmine. Ethyl Blue B.

Green.

Neptune Green SBN, SB, Light Green S, SF blue shade,
 S, SG. SF yellow shade.
 Wool Green S. Acid Green GB.
 † Anthraquinone Green GXN Agalma Green B.
 (for yarn and loose wool).

Grey.

Nigrosine W. Induline NN.

For the production of fashionable shades combinations of other dyestuffs are used (see pages 58, 60 and 62).

Black.

Brilliant Black 3 B, B, M, E.

*Palatine Black MZ, B, 4 B, 4 B C, 3 G, S, S S, S F, 5 B A,
8 B, W, 5 B N, 4 B S.*

Burl Black.

Ethyl Black 3 B, 3 B N, T.

Agalma Black 10 B, 4 B, 4 B T, B.

* Basic dyestuffs.

** Substantive dyestuffs.

† Alizarine dyestuffs, i. e. those members of this group which can be dyed in an acid bath.

Those not marked are acid dyestuffs.

Dyeing wool in a slightly acid bath.

This method is chiefly used for basic and substantive dyestuffs and for members of the Eosine group.

Process N° 2.

Work at the boil for 45—60 minutes, adding to the bath

2—4 lbs. acetic acid 9° Tw. (30%) and
10—15 » Glauber's salt crystals.

— For 100 lbs. wool. —

- Notes.* a) See note b, process N° 1.
b) When dyeing with **Diamond Magenta*, **Methyl Violet*, **Crystal Violet*, as soft water as possible should be used, and the amount of acetic acid taken reduced to one-half to two-thirds of the above mentioned quantity.
c) With the greater number of the substantive colouring matters, the acetic acid is not added until the bath is nearly exhausted. The same holds good for *Alkali Violet*. The members of the Eosine group give the brightest shades according to process N° 14, page 35.

The following are suitable dyestuffs:

Yellow.

* <i>Auramine O</i> , <i>O E</i> , <i>OO</i> , <i>I</i> , <i>II</i> , <i>II E</i> .		<i>Cotton Yellow GI</i> , <i>GR</i> , <i>R</i> . <i>Pyramine Yellow G</i> , <i>R</i> .
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Orange.

<i>Cotton Orange G</i> , <i>R</i> .		<i>Pyramine Orange 3 G</i> , <i>R</i> , <i>RR</i> .
-------------------------------------	--	---

Brown.

<i>Thiazine Brown G</i> , <i>R</i> . <i>Cotton Brown RN</i> . <i>Copper Brown</i> .		<i>Oxamine Brown G</i> , <i>GR</i> , <i>R</i> , <i>B</i> , <i>3 G</i> . * <i>Vesuvine B</i> .
---	--	---

Pink.

- | | |
|--|---|
| * <i>Rhodamine B, B extra, G, G extra, 3B, 3B extra.</i> | ** <i>Erythrosines, e. g. IN.</i> |
| ** <i>Eosines, e. g. A, BN.</i> | ** <i>Phloxines, e. g. GN, BBN.</i> |
| | ** <i>Rose Bengal brands, e. g. NT.</i> |

Red.

- | | |
|--|---|
| <i>Cotton Red 4B, 4B extra, 4BX, 5B.</i> | * <i>Diamond Magenta I small needles, I large crystals.</i> |
| <i>Oxamine Red.</i> | * <i>Magenta VI.</i> |
| <i>Oxamine Fast Red F.</i> | * <i>Magenta powder A.</i> |
| <i>Cotton Rubine.</i> | * <i>Cerise DN, DIV, DII.</i> |
| | * <i>Rubine N.</i> |

Violet.

- | | |
|----------------------------------|------------------------------------|
| <i>Alkali Violet R, 4BN, 6B.</i> | * <i>Methyl Violets, e. g. BB.</i> |
| * <i>Crystal Violet.</i> | <i>Oxamine Violet.</i> |
| * <i>Ethyl Purple.</i> | |

Blue.

- Oxamine Blue A, B, BG, 3B, 3R, 4R.*
* *Victoria Blue R.*

Green.

- | | |
|------------------------------|-------------------------|
| * <i>Diamond Green B, G.</i> | <i>Oxamine Green B.</i> |
|------------------------------|-------------------------|

Black Blue.

- | | |
|--------------------------------|----------------------|
| <i>Oxamine Black N, A, BH.</i> | <i>Violet Black.</i> |
|--------------------------------|----------------------|

- * Basic dyestuffs.
** Eosine dyestuffs.
The dyestuffs not marked, with the exception of Alkali Violet, are substantive dyestuffs.

Dyeing wool in a neutral bath.

This method is specially suited for the Alkali Violet brands and also for certain basic and substantive dyestuffs.

Process N° 3.

Enter the goods, which have been well scoured and freed from fatty matter, into the warm dye-bath containing 10 lbs. Glauber's salt crystals, and dye at the boil for 45 minutes (or in certain cases at about 160° F.).

— For 100 lbs. wool. —

- Notes.* a) The dyestuffs should be dissolved in clean condensed water, or, excepting the *Alkali Violet* brands, in ordinary water corrected with acetic acid, if condensed water is not at hand. Also the water used for setting the bath should receive an addition (according to its hardness) of $\frac{1}{2}$ —1 pint acetic acid 9° Tw. (30%) per 100 gallons. It is advisable to add a little soda to assist the solution of Alkali Violet in hard or impure water.
- b) **Auramine* and **Diamond Magenta* must be dyed at a temperature of 155—165° F. and not at the boil. Auramine should be dissolved only in hot (not boiling) water, and then used at once for dyeing.

The following are suitable dyestuffs:

Yellow. * *Auramines*.

Red. * *Diamond Magentas* (see page 13).

Violet.	* <i>Methyl Violets</i> .	* <i>Ethyl Purple</i> .
	* <i>Crystal Violet</i> .	<i>Alkali Violet R, 4 B N, 6 B.</i>

Besides these products, the dyestuffs given on page 273 for dyeing half-wool unions, by the one-bath method can, if desired, be made use of.

Processes N° 2 and 3 are very similar, so that many colouring matters dye as well by the one method as the other. Of the substantive colouring matters mentioned on pages 12—13, the following are the most suitable for dyeing in a neutral bath:

<i>Pyramine Yellow G.</i>	<i>Oxamine Blue B, 3 R, 4 R.</i>
<i>Pyramine Orange 3 G, RR.</i>	<i>Oxamine Brown G, GR, R,</i>
<i>Cotton Red 4 B, 4 B extra,</i>	<i>B, 3 G.</i>
<i>4 BX, 5 B.</i>	<i>Cotton Brown RN.</i>
<i>Oxamine Red.</i>	<i>Copper Brown.</i>
<i>Cotton Rubine.</i>	<i>Also</i>
<i>Oxamine Green B.</i>	<i>Cotton Blacks.</i>
<i>Oxamine Violet.</i>	

* Basic dyestuffs. The dyestuffs not marked, with the exception of Alkali Violet, are substantive dyestuffs.

Dyeing wool
in a slightly alkaline bath.

(For Alkali Blue brands.)

Process N° 4.

Dye at the boil for 15 minutes to 1 hour, adding to the bath

- 2—3 lbs. borax,
- or 1—2 » soda crystals,
- or 2—3 » ordinary commercial ammonia,
- or 5 » sodium silicate.

Rinse well and develop for 15 minutes in a fresh, hot bath with the addition of 1—4 lbs. sulphuric acid 168° Tw.

— For 100 lbs. wool. —

- Notes.* a) When developing, sufficient sulphuric acid is added to give the bath a distinct acid reaction (easily recognised by tasting). If necessary, some other acid may be used.
- b) *Alkali Blue* can be brightened in the developing bath, for example, with *Victoria Blue B*. By this means colours faster to milling are obtained.

Suitable Blue dyestuffs:

Alkali Blue 5R, 4R, 3R, RR, R, 40, B, B extra, BB, 3B, 5B, 6B.

Methyl Alkali Blue.

Processes for dyeing wool

with dyestuffs

suitable for use by the single-bath method.

(After-chromed colours and certain Aniline dyestuffs.)

A. Method of working with potassium or sodium
bichromate

(the process chiefly used).

B. Method of working with chromium fluoride

(for *Anthracene Blue SWX*, *SWX extra*).

C. Method of working with alum

(for *Alizarine Red S*).

D. Method of working with ferrous sulphate and
copper sulphate

(for Aniline dyestuffs in combination with
wood colours).

E. Method of working with copper sulphate

(for *Thiazine Red*).

Appendix: Dyestuffs useful for shading in the chrome
bath.

Dyeing in an acid bath with
subsequent addition of metallic salts.
Single-bath after-chromed dyestuffs and certain
Aniline dyestuffs.
Single-bath process.

A. After-treatment with potassium (or sodium) bichromate.

Process N° 5.

Work according to process N° 1, adding, after sufficiently exhausting the bath and cooling down somewhat, 1½ oz. to 3 lbs. of potassium (or sodium) bichromate, according to the depth of shade, and boil for ½ to ¾ hour to fully develop the colour.

— For 100 lbs. wool. —

- Notes.*
- a) The dyestuffs mentioned below are much improved in fastness, and, in most cases, the shade considerably changed by treatment with potassium bichromate.
 - b) It is important to use the correct quantities of sulphuric acid and potassium bichromate for dyeing and developing. If difficulties in levelling are met with, acetic acid should first of all be added to the bath, and then, in small portions at a time, the sulphuric acid.
More exact details are given in our special recipes and pattern-cards.
 - c) To produce bright shades with *Alizarine Red S*, acetic acid only should be used, while for darker shades (more than 1½ % dyestuff) the addition of sulphuric or oxalic acid is to be recommended. *Palatine Chrome Black SR* can only be dyed with acetic acid.

The brands *Alizarine Red WB paste*, *WR paste*, *Alizarine Orange W paste* and *SW powder*, *Anthracene Blue*, *Mordant Yellow* and *Fast Mordant Yellow* exhaust the bath sufficiently, even in dark shades, when only acetic acid is used.

Diamond Black F, NG, Alizarine Black WR and *WX extra, Brilliant Alizarine Black, Alizarine Blue Black WB extra* and *W extra* produce the brightest shades with acetic acid, but, if necessary, a small quantity of sulphuric acid, say about 1 lb. per 100 lbs. goods, may also be added later.

Palatine Chrome Brown G must be dyed for some time in a neutral bath, i. e., must be worked longer than usual at the **boil before the addition of acid.**

When dyeing with *Palatine Chrome Black F, FN, FT* and *Palatine Chrome Blue WB* and *WBB*, the water must be corrected with crystalline ammonium oxalate, before commencing operations.

For soft water (3.5—7 ° hardness) take 2 oz. ammonium oxalate
for medium hard water (7—10.5 ° hardness) take 5 oz. ammonium oxalate
for hard water (10.5—14 ° hardness) take 6½ oz. ammonium oxalate
per 100 gallons dye-liquor.

Palatine Chrome Black FL and *FRL* only need the addition of ammonium oxalate when the water is very hard.

When dyeing in machines with *Palatine Chrome Black S, ST, STN* and *SR* add to the liquor 2 lbs. acetic acid 9 ° Tw. (30 %) per 100 lbs. goods, bring to the boil and then add the dyestuff solution.

- d) *Palatine Chrome Blue WB* and *WBB* are only used for loose wool. The use of *Alizarine Orange, Anthraquinone Blue SR extra paste, Palatine Chrome Red R, Palatine Chrome Violet, Fast Mordant Yellow, Anthraquinone Green GXN* demands care, especially when dyeing piece-goods, in order to secure a satisfactory evenness of shade (for example, boiling first with acetic acid, the addition of the acid in small portions at a time, etc.).
- e) When working with *Chrome Blue*, good dyeings are more easily obtained, and at the same time the fastness to milling is increased by adding lactic acid with the potassium bichromate.

For instance, a dark shade with 4 lbs. *Chrome Blue A* or *R* (per 100 lbs. material) requires 10 to 20 lbs. Glauber's salt cryst., 3 lbs. sulphuric acid 168° Tw., and the after-addition of 2½ lbs. bichromate of potash together with 4 lbs. lactic acid 50 %.

- f) 1—4 lbs. sulphuric acid 168° Tw. can be replaced by
about 3—10 lbs. acetic acid 9° Tw. (30 %)
or ½—2½ » formic acid (80 %)
or 2—5 » oxalic acid.

The following are suitable single-bath chrome dyestuffs:

Yellow.

Fast Mordant Yellow G, GI.

* *Mordant Yellow G, GT, GGT.*

Mordant Yellow GR, R, 3R.

(Also ***Cotton Yellow GI, R.*)

Brown.

*Alizarine Orange W paste,
SW powder.*

* *Palatine Chrome Brown A, W.*

*Palatine Chrome Brown WN,
G, R, WG.*

Red.

* *Palatine Chrome Red B.*

Palatine Chrome Red R.

* *Alizarine Red S*

Alizarine Red 3S, SP

} chiefly for yarn and piece-goods.

Palatine Chrome Claret.

Alizarine Red WB paste, WR paste, WG paste, WGG paste
(chiefly for loose wool).

** *Oxamine Fast Red F.*

(Also ** *Oxamine Red.*)

Violet.

Antraquinone Violet.

Palatine Chrome Violet.

Blue.

* *Cyananthrol R.*

Cyananthrol RB.

Chrome Blue A, R.

Antraquinone Blue

SR extra paste,

SR extra powder.

* *Anthracene Blue SWG,*

SWG G, SWGG extra.

* *Anthracene Blue WG paste,*

WGG paste,

WGG extra paste.

Palatine Chrome Blue B, WB,

BB, WBB, R.

Green.

Antraquinone Green GXN.

Alizarine Dark Green W powder (especially for piece-goods).

Black.

* *Alizarine Black WR paste, WR 40%₀, WR powder, WX extra paste, WX extra single.*

* *Brilliant Alizarine Black paste.*

Alizarine Blue Black WB extra, WA.

Palatine Chrome Black A, 3B (chiefly for piece-goods and yarn), F, FN, FT paste, F, FN, FT powder, S, ST, STN, SR, FL, FRL, L, LN, 6B.

Corvan Black B, BG, T.

Diamond Black F, NG.

The dyestuffs marked with an asterisk (*) possess an excellent levelling power, and can therefore (when small quantities are used for shading) also be added to the chroming bath after it has cooled to about 140—160° F. For other colouring matters suited for shading, see page 24. Those marked ** are substantive dyestuffs.

B. After-treatment with chromium fluoride.

For *Anthracene Blue SWX* and *SWX extra powder.*

Medium and dark blue shades, chiefly for piece-goods.

Process N° 6.

Dissolve 1½—4 lbs. of the dyestuff (according to the shade required) in about ten times the quantity of hot water, and add this solution through a fine sieve to the bath, which has been prepared with

20 lbs. Glauber's salt and
4 » oxalic acid.

Enter the goods, which have been well cleansed, into the bath and run for about half an hour in the cold, raise to the boil in about 45 minutes, and maintain this temperature for 1 hour. Then shut off steam, add (in small portions at a time) 2—4 lbs. chromium fluoride dissolved in warm water, bring once more to the boil, and maintain ½—1 hour. Finally rinse with water.

— For 100 lbs. material. —

- Notes.*
- a) 1 gallon ammonium acetate per 1000 gallons liquor may be taken in place of Glauber's salt, and 3—4 lbs. sulphuric acid 168° Tw. may be used instead of oxalic acid.
 - b) When the goods are heavily milled, the acid should be added to the bath in only small portions at a time.
 - c) By the use of more chromium fluoride, or by boiling longer with the ordinary quantity, greener shades are obtained; the use of more acid produces redder shades.
 - d) *Oxamine Fast Red F*, as a self-shade, is also suitable for after-treatment with chromium fluoride. Dye as shown in process N° 2, and treat with chromium fluoride as given above.
 - e) The following are suitable dyestuffs for shading in the same bath: *Alizarine Black WR* and *WX extra*, *Alizarine Dark Green W*, *Cyananthrol R*, *Anthracene Blue SWGG extra*, *Alizarine Red S*, *Alizarine Orange SW powder*, *W paste*, etc.

C. After-treatment with alum.

For an especially bright red with *Alizarine Red S*.

Process N° 7.

Prepare the bath, which should have a temperature of 85° F., with

20 lbs. Glauber's salt

3—4 » oxalic acid

and about 4 lbs. of the dyestuff thoroughly dissolved in hot water. Enter the well scoured goods, treat for 15 minutes in the cold, raise to the boil in 45 minutes, and boil for 1 hour. Then add 10 lbs. alum, dissolved in hot water, and boil for another 1/2—1 hour. Finally rinse well.

— For 100 lbs. wool. —

- Notes.*
- a) If the water is hard, the quantity of oxalic acid must be correspondingly increased (up to 5 lbs.).
 - b) The dyeing should be carried out in wooden vats or in tinned copper vessels.
 - c) For shading in the same bath, the following dyestuffs, among others, are useful: *Rhodamine B*, *B extra*, *Thiazine Red R*, *Anthraquinone Violet*, *Acid Violet 4RN*, *4BL*, *4BC*, *Palatine Scarlet A* and *Orange II*.

The following dyestuffs may be applied by the foregoing method:

Orange.

Alizarine Orange W paste, S W powder.

Red.

Alizarine Red WB paste, WR paste, WG paste, WGG paste
(chiefly for loose wool).

Alizarine Red S, 3S (chiefly for yarn and piece-goods).

**D. After-treatment with ferrous sulphate (copperas)
and copper sulphate (blue stone).**

Combination Black.

— For piece-goods only. —

Process N^o 8

(in which vegetable (wood) dyestuffs and Aniline dyestuffs
may be used together).

Example for black:

Prepare the bath with

2½ lbs. oxalic acid

3 » *Palatine Black 4B* and a decoction from

35 » logwood (rasped and aged). Boil up well,
enter the wetted-out goods, and dye for 1 hour
at the boil, then add to the liquor, which has
turned pure yellow,

8 » ferrous sulphate and

2 » copper sulphate,

and work for 1 hour at the boil. The liquor is then clear.

— For 100 lbs. wool. —

- Notes.** a) Instead of 35 lbs. of logwood, about 10 lbs. logwood extract can be used.
- b) The above process can be shortened by adding all the ingredients at once to the bath and dyeing for 1½ hours at the boil; the shades, however, are less fast to rubbing. In this case the liquor need not be run off, but may be used for further lots.
- c) When using *Alkali Violet*, the oxalic acid must be added with the metallic salts after boiling for 45 minutes.

Suitable dyestuffs are:

Blue.

<i>Fast Blue K, RR, 5B.</i>		<i>Acid Violet 3BN.</i>
<i>Alkali Violet 6B, 4BN, R.</i>		<i>Soluble Blue HA, 3376, S V.</i>

Green.

<i>Light Green SF yellow shade,</i>		<i>Acid Green GB.</i>
<i>SF blue shade.</i>		

Black.

<i>Brilliant Black B.</i>		<i>Agalma Black brands.</i>
<i>Palatine Black brands.</i>		

E. After-treatment with copper sulphate (blue stone).

(For special purposes, e. g. Fezzes, hat bodies, etc.)

Process N° 9.

Dye as given in process N° 1, and when the bath is sufficiently exhausted, add 3—5 lbs. copper sulphate; boil for a further 30—45 minutes and rinse.

— For 100 lbs. woollen material. —

Thiazine Red G and *R* produce by this process claret shades, which are very fast to light.

24 Wool. After-shading dyestuffs in the after-chroming bath.

In connection with the single-bath process we mention here those **Aniline dyestuffs** whose shades are but little affected by **after-chroming** and can therefore be used for **shading** (especially for after-shading) in the **single-bath process**:

Yellow.

<i>Tartrazine, H.</i>	† <i>Metanil Yellow, extra, PL.</i>
† <i>Azoflavine brands.</i>	† <i>New Fast Yellow R.</i>
† <i>Fast Yellow Y.</i>	† <i>Naphthol Yellow S.</i>

Orange.

† *Orange N.*

Pink. Red.

<i>Rhodamine B, B extra.</i>	<i>Azocarmine brands.</i>
<i>Thiazine Red R.</i>	† <i>Acid Magenta S.</i>
	† <i>Sorbine Red.</i>

Violet.

Acid Violet 4RN, 4BL, 4BC.

Blue.

† <i>Cyananthrol BGA.</i>	<i>Neptune Blue BG, B.</i>
<i>Cyananthrol BA, RA, R, RB.</i>	

Green.

† <i>Wool Green S.</i>	<i>Neptune Green SG.</i>
† <i>Light Green S and SF brands.</i>	<i>Agalma Green B.</i>

Notes. a) When only small quantities of the above dyestuffs are used for shading, the fastness obtained is generally sufficient for all practical purposes, but in most cases not quite that of the single-bath chrome colours used without addition.

Those dyestuffs marked † are only for use with piece-goods.

b) See page 21, note *c*, for dyestuffs which can be used for shading, when after-treating with alum.

Processes for dyeing wool
on a
bichromate-formic-acid mordant
with
Alizarine and other mordant dyestuffs.

Mordanting and dyeing in
the same bath.

Mordanting and dyeing wool with Mordant dyestuffs in the same bath.

(Potassium bichromate and formic acid.)

Process N^o 10.

Mordant the wool for 1½—2 hours with

1½ lbs. potassium bichromate and
2 » formic acid 80 0/0,

and slightly cool the bath with water, when it has become quite colourless, to 140—160° F. Then add the dyestuff, either well dissolved or made into a paste with water, and, as in process N^o 11, page 27, dye for about 2 hours with the further addition of 2 lbs. formic acid 80 0/0.

— For 100 lbs. wool. —

Notes. a) The usual precaution must be observed, viz. that the initial temperature of the mordanting bath is not above 85° F. Raise to the boil in about 45 minutes, and continue boiling for 1½—2 hours till the liquor is completely exhausted.

Dye in the mordanting bath, raise to the boil within 45 minutes, and continue boiling for about 1 hour. If necessary, add the acid in small portions at a time and after all has been added boil for a further ½ hour.

- b) Instead of formic acid, the necessary quantity of acetic acid (about 8—10 lbs.) may be used in the dye-bath.
- c) The products mentioned on page 24 as well as the following may be used for shading: *Anthraquinone Violet, Anthraquinone Blue SR extra paste, Cyananthrol, Anthraquinone Green GXN.*

- d) Besides the mordant dyestuffs given below, the other Alizarine dyestuffs mentioned on pages 30—31, as well as the *Palatine Chrome Blue brands* are suitable, although in a less degree.
- e) The potassium bichromate and formic acid mordant, given above, may also be used when dyeing according to the two-bath process in place of the strong chrome mordant (cf. pages 27—28, notes *a* and *b*).

The following dyestuffs are specially suited for use by this process:

Yellow.

Fast Mordant Yellow G, G I.
Mordant Yellow G, G T, R, G R, G G T.
Resoflavine W paste, W powder.

Orange.

Mordant Yellow 3 R.

Brown.

Alizarine Orange W paste, S W powder.
Anthracene Brown W paste, S W powder.

Crimson. Claret.

Alizarine Red S, 3 S, W B paste, W R paste, W G paste,
W G G paste.
Alizarine Maroon W paste, W powder.

Blue. Bluish Green.

Alizarine Blue S W paste, S W powder, W X paste, W C paste.
Anthracene Blue W R paste, S W R powder, W G G paste,
S W G G powder, W G paste, S W G powder.
Alizarine Green W X paste.

Dark Blue.

Anthracene Dark Blue W paste, S W powder.

Green.

Coeruleine W paste, S W powder.

Black.

Alizarine Black W X extra paste, W X extra single, W R paste,
W R 40 %/o, W R powder.
Brilliant Alizarine Black paste.

Processes for dyeing wool
on a
mordant (two-baths process)
with
Alizarine and other mordant dyestuffs,
also with certain Aniline and
after-chrome dyestuffs.

- A. Chrome mordant.
 - B. Aluminium mordant.
 - C. Chrome-copper mordant.
-

Dyeing mordanted wool
with Mordant dyestuffs and
certain Aniline dyestuffs.

Two-baths process.

A. Chrome mordant.

Process N° 11.

Mordant the wool with

3 lbs. potassium (or sodium) bichromate and
2½ » tartar

for 1½ hours at the boil, and then rinse well. Afterwards
dye at the boil for 2—3 hours in a fresh bath with addition
of

1—3 gallons acetic acid 9° Tw. (30 %)

per 1000 gallons liquor.

— For 100 lbs. wool. —

Notes. a) For dark shades, increase this so-called medium or ordinary chrome mordant to 4 lbs. potassium bichromate and 3 lbs. tartar (forming thus a strong chrome mordant); for pale shades reduce to 1 lb. potassium bichromate, and an equal amount of tartar (weak chrome mordant).

The mordanting baths can be used for further lots, and should be replenished with about $\frac{2}{3}$ of the quantities of potassium bichromate and tartar taken at first.

Care must be taken to dissolve and add the potassium bichromate and tartar separately.

- b) Other products are often used as substitutes for tartar in chrome mordanting, but the results obtained are really no better.

For the sake of completeness, however, the following mordants may be mentioned which can be used, for example, in place of the medium and strong bichromate-tartar mordant:

- | | |
|---|--|
| 1) 3—4 lbs. potassium bichromate
1½—2 » sulphuric acid 168 ° Tw. | } Better suited for dark shades, such as dark brown, dark olive, black, etc. |
| 2) 3—4 » potassium bichromate
1½—2 » oxalic acid | |
| 3) 4—6 » chromium fluoride
2—3 » oxalic acid | } Chiefly for piece-goods when special fastness to milling is not demanded. |

Besides these, the preparations known in commerce as Lactoline, Lignorosine, etc. are offered as cheap substitutes for tartar. The Lactoline mordant, for example, should be prepared as follows, corresponding to the medium and strong mordants given above.

- 4) 3—4 lbs. potassium bichromate
1½—2 » Lactoline.

For the use of a chrome mordant with lactic acid and acetic or sulphuric acid, as a substitute for tartar, see note *d* below, and for the use of formic acid, see page 26, note *e*.

- c) Care must be taken that the dye-bath contains sufficient acetic acid, according to the hardness of the water up to 8 lbs. or even more.

The dyeing is commenced in the cold, the temperature raised gradually to 212 ° F. and maintained at the boil for 1—2 hours, according to the depth of shade desired. When dyeing with the soluble *Alizarine Blue brands SW, SWR paste and powder, Alizarine Dark Blue SW paste and powder, Alizarine Indigo Blue SW paste, Alizarine Green SW paste and Coeruleine SW paste and powder*, the bath is heated slowly to 140 ° F., this temperature being maintained till the liquor appears to be completely exhausted. The goods are then finished at the boil as directed above.

The fastness of the Alizarine dyestuffs in dark shades to milling alongside white wool may be increased by adding $\frac{1}{4}$ —1 % potassium bichromate after dyeing, and boiling for $\frac{1}{2}$ hour longer.

- d) To secure the greatest fastness of dark shades to milling, especially when using the greener *Anthracene Blue brands* and the *Alizarine Blue, Alizarine Red, Alizarine Orange* and *Mordant Yellow brands*, the following mordant should be used:

3 lbs. potassium bichromate,
5 » lactic acid 50 %,
3 » acetic acid (or 1 lb. sulphuric acid).

The wool is entered into the cold bath, brought to the boil in 45 minutes and maintained at the boil for 1—2 hours until the liquor is colourless.

The actual dyeing is then carried out either in a fresh bath according to the two-baths method given above, or even in the mordanting bath as in process N° 10, page 25.

- e) When working with piece-goods or hats, which do not easily dye through, the acetic acid at the beginning of the dyeing operation is replaced by 3 gallons (or more if necessary) ammonium acetate B. A. S. F. per 1000 gallons. The goods are boiled for 1 hour and then 3 gallons acetic acid 9° Tw. (30 %) diluted with water are added in small portions, and the boiling continued 1—2 hours longer.
- f) The Alizarine dyestuffs in powder given below and also on page 32 require a certain amount of care when being dissolved or made into a paste. They should be first made into a uniform paste with cold water and then dissolved in hot water, but the following must only be dissolved in cold water: *Alizarine Blue SW* and *SRW, Alizarine Dark Blue SW powder, Alizarine Black SW powder, SRW powder, Alizarine Blue Black SW powder* and *Coeruleine SW powder*.
- g) See also note *b*, page 9.

The following dyestuffs are suitable for use in the two-baths process:

Yellow.

Galloflavine W paste, W powder.
Resoflavine W paste, W powder.
Mordant Yellow G, 3 R, G R, R, G T, G G T.
Fast Mordant Yellow G, G I.

Brown.

Anthracene Brown W paste, S W powder, W R paste,
W G paste.
Alizarine Orange W paste, S W powder.

Claret.

Alizarine Red S, 3 S, P S, W B paste, W R paste, W G paste,
W G G paste.
Alizarine Maroon paste, W powder.

Violet.

Galleine W paste, W powder, S W powder.
Gallocyanine D paste, F paste.
Anthraquinone Violet.

Blue.

Alizarine Blue S W paste, S W powder, W C paste, S R W paste,
S R W powder, X A, W X paste, W R paste, W N double new.
Alizarine Dark Blue S W paste, S W powder, W W paste.
Alizarine Indigo Blue S W paste, S W powder, S M W paste,
S M W powder.
Anthracene Blue W G G paste, S W G G powder, W G paste,
S W G powder, W G G extra paste, S W G G extra powder,
W R paste, S W R powder, W G new paste, S W G new powder,
W G extra paste, S W G extra powder, W N paste,
S W N powder, W B paste, S W B powder, W R R paste,
S W R R powder, W R R extra paste, S W R R extra powder,
W R X paste, S W R X powder.
Anthracene Dark Blue W paste, S W powder.
Cyananthrol R, R B.
Anthraquinone Blue S R extra paste, S R extra powder.
Palatine Chrome Blue B, B B.

Note. Both the Palatine Chrome Blues require the addition of acid (sulphuric acid) as in the single-bath process (see page 17) and are specially suitable for the potassium-bichromate-tartar mordant.

Green.

Alizarine Green S W paste, S W powder, W X paste.
Coeruleine W paste, S W paste, S W powder.
Anthraquinone Green G X N.

Black.

Alizarine Black S W paste, S W powder, S R W paste, S R W powder, W R paste, W R 40 %/o, W R powder, W X extra paste, W X extra single.
Brilliant Alizarine Black.
Diamond Black F, N G.
Alizarine Blue Black S W paste, S W powder, W paste, W B extra paste, W extra paste.
Palatine Chrome Black 6 B, L, L N.

Note. The Palatine Chrome Black brands require the addition of acid as in the single-bath process, page 17, and are generally dyed according to the method given there.

B. Aluminium mordant.

Process N° 12.

Mordant the wool at the boil for 1½ hours with

10 lbs. alum
3 » tartar and
2 » oxalic acid

for dark shades, or half these quantities for lighter shades, and rinse well. Dye for 2—3 hours, adding acetate of lime, soap and tannic acid to the bath for *Alizarine Red*, *Alizarine Orange* and *Alizarine Maroon*.

— For 100 lbs. wool. —

Notes. a) When using *Alizarine Red*, *Alizarine Orange* or *Alizarine Maroon*, for every

10 lbs. dyestuff in paste 20 %/o or
2½ » » » powder
add 2 lbs. acetate of lime (solid)
1 lb. Marseilles soap
½ » tannic acid,

each dissolved separately in water.

In dyeing piece-goods, and as a rule for yarn, no soap is added.

- b) When dyeing with the Alizarine Red S brands, after boiling for 1 hour, add 3 lbs. acetic acid 9° Tw. (30%), and boil for another 1/2 hour.
- c) Use tinned copper vessels or wooden vessels, and avoid dyeing in a copper bath, or, if this is impossible, add 3 oz. ammonium sulphocyanide per 100 gallons liquor, which minimises the harmful influence of the copper.
- d) Commence dyeing in the cold, bring slowly to the boil and boil for 1–2 hours according to the depth of shade required.
- e) The following dyestuffs, among others, may be used for shading: *Anthraquinone Violet*, *Thiazine Red R*, *Rhodamine B*, *Orange II*.

Dyestuffs which are suitable for this process:

Orange.

Alizarine Orange W paste, SW powder.

Red.

Alizarine Red S, PS, 3S (chiefly for yarn and piece-goods).

Alizarine Red WR paste, WB paste, WG paste, WGG paste
(chiefly for loose wool).

Alizarine Maroon W paste, W powder.

Blue.

Anthracene Blue WR paste, SWR powder, WB paste, SWB powder, WG paste, SWG powder, WGG paste, SWGG powder, WG extra paste, SWG extra powder.

Green.

Coeruleine W paste, SW paste, SW powder.

C. Chrome-copper mordant.

This method aims at securing dyeings, which are faster to milling than those produced by the dyeing processes generally adopted, and is chiefly used for the Aniline dyestuffs mentioned below, either alone or with vegetable (wood) dyestuffs.

Process N° 13.

(Used specially for shoddy.)

Boil the wool for 1 hour with

2 lbs. potassium (or sodium) bichromate,
3—5 » copper sulphate and
2 » sulphuric acid 168° Tw.,

and dye in a fresh bath without any further additions, although, if necessary, a small quantity of sulphuric acid may be added.

— For 100 lbs. wool. —

The following are suitable dyestuffs:

Yellow.	<i>Metanil Yellow, extra.</i>
Orange.	<i>Orange II.</i>
Red.	<i>Rhodamine B, B extra. Fast Red AV.</i>
Violet.	<i>Acid Violet 4BL, 4BC, 4RN, PW.</i>
Blue.	<i>Victoria Blue B, BS. Fast Blue (e. g. 5B, K). Neptune Blue B, BG.</i>

34 Wool. Mordant dyestuffs. Chrome-copper mordant.

Green. *Wool Green S.*
 Neptune Green SG.
 Agalma Green B.
 Diamond Green B, G.

Black. *Brilliant Black brands.*

Note. Shades produced by the above process are even cheaper than those given by the single-bath after-chromed dyestuffs.

Dyeing processes of minor importance.

Dyeing with tartar and alum from a bath weakly acidified with acetic acid.

Process N° 14.

Add to the lukewarm bath, besides the necessary quantity of dyestuff,

2 lbs. tartar
2 » alum
1—2 » acetic acid 9° Tw. (30 %),

then enter the cleansed, wetted-out goods, bring slowly to the boil, dye at the boil for 1/2 hour and rinse. To secure very bright shades, first boil the goods for 1/2 hour with the above alum mordant, cool the bath to 100° F., and then add the dyestuff. Bring slowly to the boil, maintain at the boil for 1/2 hour and rinse.

— For 100 lbs. wool. —

This process, in addition to process N° 2, page 12, is suitable for dyestuffs of the *Eosine group*.

Dyeing in a soap bath and afterwards stoving.

Process N° 15.

Dye in a lukewarm soap bath (containing about 1 oz. Marseilles soap per gallon soft water), hydroextract and stove in the sulphur chamber.

— For 100 lbs. wool. —

The following colouring matters, dyed by this process, give very bright delicate shades, which cannot be produced by any other method: *Auramine O, II, Quinoline Yellow, Rhodamine B, G, 3G, Acid Violet 4RN*, the *Methyl Violet* brands, *Crystal Violet, Victoria Blue B, Victoria Pure Blue B, Night Blue, Nile Blue B, Neptune Blue B, BG, Indigo Carmine, Indigotine, Light Green SF yellow shade, SF blue shade.*

**Dyeing with the addition of bisulphite of soda
to the bath.**

Process N° 16.

(For pale, delicate shades, chiefly for yarn.)

To prepare the bath, take

75 gallons water
1¹/₄ lbs. bisulphite of soda 71 ° Tw.
¹/₅—1 oz. dyestuff
2¹/₂ lbs. Glauber's salt calcined, and
¹/₂ lb. sulphuric acid 168 ° Tw.

Make the bath lukewarm, enter the goods, bring to the boil and finish dyeing quickly.

— For 25 lbs. wool. —

The same dyestuffs as for process N° 15 are on the whole suitable for use here. Full shades can also be obtained by this method, for instance, bright red with *Palatine Scarlet*, fiery yellow with *Tartrazine*, bright violet with *Acid Violet*, and so on.

Note. Too long boiling is injurious, the shades becoming duller.

**The production of pastel colours by dyeing
in a chalk bath.**

Process N° 17.

Pastel colours are best dyed in the rinsing machine on piece-goods, bleached with hydrogen peroxide, sodium peroxide or bisulphite.

Mix for this purpose about 6—9 lbs. pure whitening per piece of material, add it through a sieve to the washer, which is filled with just the necessary quantity of water, let the pieces run a few times, add the dyestuff in solution through a fine sieve in several portions, and allow to run in the cold for 15—30 minutes longer. Then rinse.

- Notes.*
- a) If the whitening is not pure enough, mix it with zinc white, taking, if necessary, up to its own weight of latter; the use of zinc white is especially necessary for pearl shades.
 - b) Special care must be taken to prevent the occurrence of rust spots, caused by drops falling from iron beams, supports, etc., overhead.

The following colouring matters are suitable for this process:

Yellow.	<i>Auramine O, II.</i> <i>Azoflavine S, RS.</i>
Orange.	<i>Orange II.</i>
Red.	<i>Rhodamine B, B extra, 3 G, 3 G extra.</i>
Violet.	<i>Anthraquinone Violet.</i> <i>Acid Violet 3 BN, 4 BC.</i>
Blue.	<i>Cyananthrol brands.</i> <i>Neptune Blue B, BG.</i>
Green.	<i>Neptune Green SG.</i>

**Dyeing pale shades in one bath with
Alizarine dyestuffs.**

(Only suitable for shades which do not require more than
5 % dyestuff in paste form.)

Process N° 18.

Prepare the bath at a temperature of 85 ° F.
for aluminium mordant with 3 lbs. alum (free from iron)
2 » oxalic acid;
for chrome mordant with 1 lb. chromium fluoride
1 » oxalic acid,
or 3 lbs. chromium acetate 32 ° Tw.
1 1/2 » oxalic acid.

Make the dyestuff into a thin paste with about ten times its weight of cold water and add it through a sieve; enter the goods cold, work in the cold for 15 minutes, bring slowly to the boil in 1 hour, and boil for 1 hour longer. Finally rinse.

— For 100 lbs. wool. —

Note. When dyeing loose wool in bright pearl, grey or fashionable shades, 1 0/0 chromium fluoride on the weight of the goods is added to the bath, the wool entered and the temperature maintained at 85 ° F. for 30 minutes. The goods are then taken out, the dyestuff added to the bath, the goods re-entered, brought to the boil and boiled 15 minutes. 1 lb. acetic acid 9 ° Tw. (30 0/0) per 100 gallons is then added, and the boiling continued for a further 3/4—1 hour. The goods are finally rinsed.

Suitable dyestuffs are:

For aluminium mordant: *Alizarine Red WB paste, WR paste, S powder.*

Alizarine Orange W paste.

Anthracene Blue paste brands

(especially the redder brands).

For chrome mordant: all the Alizarine dyes in paste given under process N° 11, page 27.

Processes for dyeing wool

with Indigo pure B. A. S. F.

1. Various forms of vat.
 2. Properties and relative strengths of the brands of Indigo.
 3. Hydrosulphite-ammonia vat, using Indigo Solution 20 %.
 4. Hydrosulphite-soda vat.
 5. Bisulphite-zinc vat (English vat).
 6. Hydrosulphite vat, using Indigo Vat B. A. S. F. 60 %.
 7. Fermentation vats. Indigo brands suitable for this kind of vat.
-

Dyeing in the vat with Indigo pure B.A.S.F.

Various forms of vat:

For dyeing wool, the

- a) hydrosulphite vats,
- b) warm fermentation vats

may be employed (in certain foreign countries also the cold fermentation vat).

The hydrosulphite vats are chiefly used where the rapid dyeing of large quantities and the ready production of shades of varying depths are demanded, or where dyeing is only irregularly carried on and the working of the vat is often interrupted. For regular work, the warm fermentation vat is found to be more advantageous, though, both with this and with the cold fermentation vat considerable experience is required.

The cold fermentation vat is very widely used in the East, where it is not considered necessary to have the vat ready so quickly, and where smaller quantities of goods are dyed at one time.

Properties of the brands of Indigo:

The *paste brands of Indigo* can be used at once, but the *powder brands* must previously be made into a paste with hot water. *Indigo in lumps* can be used by merely making into a paste, but in order to have the paste even it is better to grind it. *Indigo Solution* represents a stock vat which, when used in cotton dyeing, requires its alkalinity to be increased with lime or caustic soda, and also the addition

of hydrosulphite. *Indigo Vat 60 %* is Indigo already in the form of a vat, and only needs to be stirred up with vat liquor to be ready for use. *Indigo White* is intended for special purposes. *Indigo R paste* or *powder* and *Indigo Solution R* are intended specially for the production of reddish tones of blue. *Indigo RBN* gives brighter and faster shades than ordinary Indigo.

Relative strengths of the brands of Indigo.

Indigo paste 20 %, *Indigo Solution* and *Indigo White* have the same strength. *Indigo pure paste 30 %* is one and a half times as concentrated as the ordinary paste Indigo; the *40 % paste* is twice as strong, *Indigo Vat 60 %* is three times as concentrated, and *Indigo lumps* and *Indigo powder* including the brands *L*, *SL*, *RBN* and *R* are five times as concentrated as their respective 20 % paste qualities.

Process N° 19 (a—d).

A. The Hydrosulphite Vats.

Indigo brands.

The following brands of Indigo are used for the hydrosulphite vats:

Paste	<i>Indigo pure B. A. S. F. paste 20 %</i>
	» » » » <i>30 %</i>
	» » » » <i>40 % R</i>
Powder	<i>Indigo pure B. A. S. F. powder</i>
	» » » » <i>L</i>
	» » » » <i>R</i>
	» » » » <i>RBN</i>
Lumps	<i>Indigo pure B. A. S. F. small lumps</i>
Indigo solution	<i>Indigo Solution B. A. S. F. 20 %</i>
	» » » » <i>20 % R</i>
Indigo vat	<i>Indigo Vat B. A. S. F. 60 %.</i>

a) Hydrosulphite-ammonia vat, using Indigo Solution 20 %.

The hydrosulphite vat, set with the ready prepared stock-liquor known in commerce as *Indigo Solution B.A.S.F. 20%*, is simpler than the two succeeding ones.

Example of a vat of medium strength
containing about 1000 gallons.

Warm the vat to 120° F. and set it with

4 pints ammonia

2½ lbs. Hydrosulphite conc. B. A. S. F. powder

and add, after stirring well,

3 gallons glue solution (1 : 10)

19 pints Indigo Solution B. A. S. F. 20% (= 26 lbs.).

Stir the vat well again, and let it stand for 15 minutes, when the colour should be a clear greenish yellow.

Enter about 75 lbs. of the wool, dye for 20—30 minutes, pass through squeezing rollers immediately on leaving the vat, and allow to oxidise. Meantime enter another lot and dye the two lots, to save time, alternately. If the vat, while being worked, turns blue, blue-green or dull, stir in carefully ½—¾ lb. Hydrosulphite conc. B. A. S. F. in small portions at a time. When working regularly, replenish with Indigo Solution as required, adding daily 1¼—2½ pints ammonia, and besides this twice every week 1 gallon of glue solution (1 : 10).

Note. The maximum strength of the vat should be about 50 lbs. or 4½—5 gallons Indigo Solution per 1000 gallons.

b) Hydrosulphite-soda vat.

Recipe for a stock vat.

Mix

20 lbs. Indigo pure 20 % (or the corresponding quantity of Indigo pure powder or lumps) with 2 gallons of cold water, and stir in

4 » Hydrosulphite conc. B. A. S. F. powder.

After about 10 minutes add to the mixture

4 pints caustic soda 76° Tw., heat to 120° F., testing with a strip of glass (see page 146) till the solution is clear and yellow.

Dye vat (1000 gallons capacity).

Set the vat, which has previously been warmed to 120° F., with 9 oz. Hydrosulphite conc. B. A. S. F. powder. Add about 1/2 gallon ammonia, 3 1/2 gallons of a solution of glue (1 : 10), and a portion of the stock vat — according to the shade desired — and stir well.

The vat, which should be a clear yellowish-green, is at once ready for dyeing. Replenish with stock liquor, reducing occasionally, by the addition of 1/2 lb. Hydrosulphite conc. B. A. S. F. powder, whenever the liquor turns bluish green or dull. When working regularly, add 2 or 3 times daily 2 pints of ammonia, and once every week 3 gallons of a solution of glue (1 : 10).

Dye about 75 lbs. wool at a time, giving about 20 minutes for each dip.

- Notes.*
- a) Instead of caustic soda (in the stock vat), about 6 1/2 pints of milk of lime (20 %) can be used, if there be no objection to having a sediment in the vat.
 - b) When dyeing with Indigo pure RBN or R, the vat must be worked rather more alkaline, this also applying to the bisulphite-zinc vat.

c) Bisulphite-zinc vat (English vat).

Stock liquor:

- | | | |
|----------|---|--|
| 1. Mix | { | 20 lbs. Indigo pure B.A.S.F. paste 20 % (= 4 lbs. Indigo pure powder or lumps) with 1 gallon hot water and |
| | | 2 gallons milk of lime 20 % (prepared by slaking 4 lbs. quicklime, and making up with water to 2 gallons). |
| 2. Treat | { | 2½ gallons bisulphite 57° Tw. with |
| | | 2½ lbs. zinc dust, |

and let the mixture stand, stirring now and again, till it has turned grey and the smell of sulphurous acid has disappeared.

Now add 2 to 1, make up with hot water to about 12 gallons, and allow to stand again, stirring occasionally, till the mass has become yellow.

Dye vat (200 gallons capacity).

Set the bath (previously heated to 120° F.) with a mixture of

3 pints bisulphite 57° Tw. and
6½ oz. zinc dust,

prepared as given under 2, and add from 1/8 to, at the outside, 1/2 of the stock liquor* — according to the shade desired —. Stir the vat well, and let it stand.

The vat is in good condition when the liquor is yellowish green.

If it turns bluish green or dull, reduce as necessary with the above mixture of bisulphite, zinc dust and lime. The vat should contain just enough lime to turn a strip of phenolphthaleïn paper a faint pink. If the strip, on being dipped in, does not show any colour, stir in very carefully small portions of milk of lime, till the faint pink colour

* The rest is used to replenish the vat.

appears. If the paper turns decidedly pink, and the vat has a slippery feel, then there is too much lime present, and this must be neutralised by adding small quantities of bisulphite or acetic acid.

After dyeing, acidify with water, containing about 2 pints sulphuric acid 168° Tw. per 200 gallons, and rinse.

d) Hydrosulphite vat, using Indigo Vat B. A. S. F. 60 %.

Example of a vat of medium strength
containing 600 gallons.

Heat the vat to 120° F., and set it with

2½ pints ammonia and
1½ lbs. Hydrosulphite conc. B. A. S. F. powder.

Stir well and add

15 pints of a solution of glue (1 : 10) and
7 lbs. Indigo Vat B. A. S. F. 60 %.

The latter can either be added directly to the vat, or previously carefully dissolved in a small vessel by stirring with about 1 gallon of the vat liquor.

After stirring, the colour of the vat should be clear greenish yellow. Otherwise, the remarks on page 41 apply here also.

Note. The liquor should not contain more than 1¼ lbs. Indigo Vat 60 % per 100 gallons.

Hydrosulphite conc. B. A. S. F. powder and Indigo Vat B. A. S. F. 60 % must be preserved from damp in air-tight vessels, and the use of damp spoons, scoops, etc. must be carefully avoided.

B. The Fermentation Vats.

Brands of Indigo:

The following brands may be employed for dyeing in the warm and cold fermentation vats:

Paste:

Indigo pure B. A. S. F. paste 20 % S
 » » » » 40 % S

Powder:

Indigo pure B. A. S. F. powder SL

Pieces:

Indigo pure B. A. S. F. small lumps S

Indigo solution, Indigo vats and Indigo white:

Indigo Solution B. A. S. F. 20 %
Indigo Vat » 60 %
Indigo White » 20 %

Various kinds of fermentation vat:

The following kinds of **warm vat**, used chiefly in Europe, may be mentioned:

- a) The **soda vat**, chiefly used in Middle Europe, is set with bran, syrup and madder as ferments, and is worked with bran, lime, soda and syrup.
- b) The **woad vat**, which is the oldest form of vat, is used nowadays in its original form, with few exceptions, in England only. It is set with woad, a little bran and madder as ferments, and is worked with bran and lime.
- c) The **bastard vat** is produced by a combination of these two forms. It is set as a woad vat and worked as a soda vat.

- d) The **wool-perspiration vat**, which is used in some of the Balkan countries, appears also to be a form of fermentation vat. The ferment used is the sweat of the wool itself, and a lye of wood ashes or potash and lime, or the ammonia which forms in the vat from the unwashed wool, is used as alkali. This vat washes and dyes the wool at the same time.

The various forms of **cold fermentation vat**, chiefly used in the East, etc., are all alike in principle. The ferments used are native fruits of the corresponding countries which contain sugar. Bran, bread, etc. are also used, and the alkalis are soda and lime together, or lime alone, or even wood ashes or potash.

The practical use of the above fermentation vats cannot be learnt from the mere description, and minute details cannot be given here, but all particulars can readily be had from us at any time.

Stripping and dyeing Shoddy.

1. Stripping processes:

- a) Treating in a solution of soda.
- b) Treatment with Acetate of Ammonia B. A. S. F.
- c) Use of Deeroline.
- d) Boiling with potassium bichromate and sulphuric acid.
- e) Treating with nitric acid in the cold.

2. Dyeing processes.

Stripping and dyeing shoddy.

(See also dyeing process No 13, page 33.)

Stripping processes (a — e).

Shoddy is generally sorted according to the original colour, and often also stripped according to the shade to be produced on the material; for this purpose one of the following processes should be selected.

Shoddy, which has originally been dyed, for example, with Aniline dyestuffs, is often stripped sufficiently

- a) by simply letting it lie for some time (say overnight) in a cold to lukewarm 1 % solution of soda (1 lb. soda-ash per 10 gallons);
- b) by boiling for half an hour with 2—5 lbs. acetate of ammonia B. A. S. F. per 100 gallons, which often produces a similar effect.
- c) The shoddy can be more effectively stripped by treating as follows with Decroline B. A. S. F. after having been steeped in soda.

Prepare the stripping bath with

3— 5 % Decroline and	} on the weight of material.
3— 5 % sulphuric acid 168° Tw., or	
1½— 2 % formic acid 80 %, or	
8— 10 % acetic acid 9° Tw. (30 %)	

Enter the goods, which have been cleansed with soda as above, into the warm bath, bring to the boil and maintain at this temperature for 15—30 minutes, taking care to keep the bath acid throughout.

Work in wooden vessels, wrapping uncovered steam-pipes with cloth, etc.

- d) Material dyed with fast colours, e. g. with after-chromed, Alizarine or wood dyes, can often be sufficiently stripped by boiling for $\frac{1}{2}$ —1 hour with

3—7 % potassium (or sodium) bichromate,

3—10 % sulphuric acid 168° Tw.

on the weight of material. The shoddy is at the same time mordanted and prepared for dyeing with suitable fast dyestuffs (Alizarines) in cases where fastness to washing and milling is demanded.

If piece-goods have to be dyed, the *Soluble Blue brands* and also *Acid Violet PW*, which can be dyed in the chrome stripping bath, are recommended for Navy blue. See page 24 for other suitable shading dyestuffs.

- e) Another method of stripping wool, dyed with fast colours, in the cold is provided by the method described in our Special process No 20 by the aid of nitric acid. Particulars of this process may be had on application.

For dyeing shoddy, acid, basic, substantive, after-chromed and Alizarine dyestuffs can be employed as desired.

Methods and dyestuffs are on the whole the same as those given above under processes Nos 1—3, 5 and 11 for wool (cf. also page 48, *d* and process No 13, page 33). It must, however, be noted, that when dyeing carbonised shoddy, which contains acid, it must, for certain colouring matters and shades, be neutralised beforehand with soda.

Selection of dyestuffs

for the production of typical shades
on the various forms of wool.

1. Dyeing of loose wool, slubbing, woollen cops, weaving and knitting yarns, wool and fur hats :
 - a) dyeing on mordanted wool or in the vat,
 - b) dyeing with colours suited for the single-bath process,
 - c) dyeing with Aniline colours and certain Alizarine colours which dye in an acid bath without mordant.
 2. Dyeing of piece-goods, men's suitings, cloth.
Dyeing as given under 1 (a, b and c).
 3. Dyeing of carpet yarns, fancy yarns, etc.
Dyeing in an acid, neutral, or slightly alkaline bath.
 4. Dyeing of ladies' dress goods, felts, plush, ladies' hats, etc.
Dyeing as given under 3.
 5. Dyeing of fezzes.
-

Dyeing loose wool,
slubbing, cops, weaving and knitting yarns,
wool and fur hats (men's hats).

(Shoddy see page 47.)

A. Dyeing wool, previously mordanted; dyeing in the vat.

The following dyestuffs are the most suitable, being in a very high degree fast to milling and light:

1. All the Alizarine colouring matters mentioned under process 11, page 27, which dye on a chrome mordant.
2. All the Alizarine colouring matters mentioned under process 12, page 31, which dye on an aluminium mordant, except the *Anthracene Blue* and *Coeruleine brands*.
3. *Indigo pure B.A.S.F.* dyed in the vat, process 19, page 40.

Selection of dyestuffs suitable for the production of very fast shades with the colouring matters of the foregoing groups.

Fashionable colours.

- * *Mordant Yellow G, GT, GGT.*
- * *Anthracene Blue WB paste, SWB powder, WR paste, SWR powder, WG paste, SWG powder, WGG paste, SWGG powder, WGG extra paste, SWGG extra powder.*
- * *Anthraquinone Blue SR extra paste, SR extra powder.*
- * *Alizarine Red S.*

Green. Olive.

- Antraquinone Green GXN.*
- * *Mordant Yellow G, GT, GGT.*
- * *Fast Mordant Yellow G, GI.*
- * *Anthracene Blue WG paste, SWG powder, WGG paste, SWGG powder, WGG extra paste, SWGG extra powder, WG extra paste, SWG extra powder.*
- * *Antraquinone Blue SR extra paste, SR extra powder, shaded with Anthracene Brown W paste and * SW powder, On white or vat bottom.*

Orange. Brown.

- | | |
|--|--|
| <i>Alizarine Orange W paste.</i> | * <i>Anthracene Brown SW powder, shaded with</i> |
| * <i>Alizarine Orange SW powder, on aluminium mordant.</i> | * <i>Mordant Yellow G, GT, GGT,</i> |
| * <i>Mordant Yellow 3R, on chrome mordant.</i> | * <i>Fast Mordant Yellow G, GI.</i> |
| <i>Anthracene Brown W paste.</i> | * <i>Alizarine Red S or Alizarine Orange W paste and</i> |
| * <i>Alizarine Black WX extra can be used for darkening the shade.</i> | * <i>Alizarine Orange SW powd.</i> |

Red.

- * *Alizarine Red S*
 - Alizarine Red WR paste, WB paste* } (on aluminium or chrome mordant).
 - * *Alizarine Red S, shaded with*
 - * *Antraquinone Violet or * Cyananthrol brands.*
- Claret shades can also be produced with *Alizarine Red* on a mixed mordant of alum and potassium bichromate.

Blue. Violet.

- Palatine Chrome Blue B, BB (potassium bichromate tartar mordant).*
- * *Indigo pure B.A.S.F. in the vat.*
- Anthracene Dark Blue W paste, SW powder.*
- * *Anthracene Blue WR paste, SWR powder, WB paste, SWB powder, WG paste, SWG powder, WGG paste, SWGG powder, WGG extra paste, SWGG extra powder, WG extra paste, SWG extra powder.*
- Alizarine Dark Blue W paste, SW powder.*
- * *Alizarine Dark Blue SW paste.*
- Alizarine Blue WN double new, WC, WX.*

Blue. Violet.

- * *Alizarine Blue SW.*
- * *Anthraquinone Blue SR extra paste, SR extra powder.*
- * *Cyananthrol R, RB.*
- * *Anthraquinone Violet.*
- * *Galleine SW.*
- * *Gallocyanine F,*
shaded with
 - * *Coeruleine SW paste, SW powder.*
 - * *Alizarine Red S.*
 - * *Alizarine Black WX extra* can be used for darkening the shade.
Blue can also be dyed on a vat bottom.

Black.

- * *Palatine Chrome Black 6B, L, LN.*
- * *Alizarine Black WX extra paste.*
- * *Brilliant Alizarine Black paste.*
Alizarine Blue Black W extra paste, W paste.
- * *Alizarine Blue Black WB extra paste,*
shaded with * *Alizarine Red S, * Mordant Yellow G, GT, GGT.*

Note. The dyestuffs marked with an asterisk can also be used for machine dyeing. See page 91 for those dyestuffs which bleed little, or not at all, into cotton in the milling process.

B. Dyeing according to the single-bath process.

The colouring matters for use in this case are given under processes Nos 5 and 7, pages 19 and 22, and the shades produced are sufficiently fast for most practical requirements.

Selection of dyestuffs suitable
for the production of compound shades with
single-bath after-chromed colours.

Fashionable colours.

- | | |
|---------------------------------------|---------------------------|
| † * <i>Fast Mordant Yellow G, GI.</i> | * <i>Anthracene Blue</i> |
| † * <i>Mordant Yellow brands.</i> | <i>WGG extra paste,</i> |
| † * <i>Palatine Chrome Brown W,</i> | <i>SWGG extra powder,</i> |
| <i>WN.</i> | <i>WGG paste,</i> |
| † * <i>Palatine Chrome Red B.</i> | <i>SWGG powder,</i> |
| † * <i>Alizarine Red S.</i> | <i>WG paste,</i> |
| * <i>Cyananthrol brands.</i> | <i>SWG powder.</i> |

Green. Olive.

- † Anthraquinone Blue SR extra paste, SR extra powder.
 - † * Anthraquinone Green GXN.
 - † * Fast Mordant Yellow G, GI.
 - † * Mordant Yellow brands.
 - * Anthracene Blue SWGG, SWGG extra and the other brands given under Fashionable colours, shaded with
 - † * Palatine Chrome Brown W, WG, R, WN.
 - † * Palatine Chrome Red B or † * Alizarine Red S.
- Alizarine Dark Green W powder.
(Work, if desired, on an Indigo bottom.)

Brown. Orange.

- | | |
|--|--|
| <ul style="list-style-type: none"> † * Palatine Chrome Brown brands, shaded with † * Fast Mordant Yellow G, GI or † * Mordant Yellow brands. * Anthracene Blue SWGG, SWGG extra or | <ul style="list-style-type: none"> Cyananthrol brands and † * Palatine Chrome Red B or † * Palatine Chrome Claret or † * Alizarine Red S Alizarine Orange W paste, SW powder. <p>(Processes No 5 and No 7.)</p> |
|--|--|

Also cheap combinations of Palatine Chrome Violet and Corvan Black or Alizarine Black.

Red.

- | | |
|--|---|
| <ul style="list-style-type: none"> Palatine Chrome Red R. † * Palatine Chrome Red B. † * Alizarine Red S. † * Palatine Chrome Claret. Alizarine Red WB paste, WR paste. | <ul style="list-style-type: none"> Alizarine Orange W paste, SW powder. Oxamine Fast Red F (after-chromed). |
|--|---|

Violet.

- | | |
|---|---|
| <ul style="list-style-type: none"> † * Palatine Chrome Violet. | <ul style="list-style-type: none"> † * Anthraquinone Violet. |
|---|---|

Blue.

- | | |
|---|---|
| <ul style="list-style-type: none"> * Cyananthrol brands. * Chrome Blue A, R. * Palatine Chrome Blue brands. † Anthraquinone Blue SR extra paste, SR extra powder. | <ul style="list-style-type: none"> * Anthracene Blue SWGG, SWGG extra. † Alizarine Black WX extra, shaded with Alkali Violet brands. |
|---|---|

On a vat bottom, if desired.

Black.

- | | |
|---|-----------------------------------|
| • <i>Alizarine Black WX extra.</i> | <i>Palatine Chrome Black</i> |
| <i>Alizarine Black WR paste,</i> | <i>brands (e. g. the * S</i> |
| <i>WR powder.</i> | <i>and the * L brands).</i> |
| • <i>Brilliant Alizarine Black paste.</i> | <i>* Diamond Black F, NG.</i> |
| <i>Alizarine Blue Black</i> | <i>† * Corvan Black B, BG, T.</i> |
| <i>WB extra paste.</i> | |

Notes. The dyes marked † do not bleed into cotton in milling.
The dyes marked with an asterisk can be employed in dyeing wool cops in the machine.

Cf. page 24 for dyestuffs unaffected by chroming, and which may be used for shading.

C. Working in an acid or weakly acid bath, with the most suitable Aniline dyestuffs, or with such Alizarine dyestuffs as can be used without previously mordanting or after-treatment.

Shades produced by this method are less fast than those dyed on a chrome mordant, in the vat or according to the one-bath process.

Selection of colouring matters for dyeing in an acid bath according to process 1, page 9.

Yellow.

Tartrazine.

Orange.

Orange R.

Red.

Brilliant Carmine L.
Fast Scarlet B.

Thiazine Red R.
Wool Red G, R.

54 Loose wool, etc. Aniline colours for cheap shades.

Violet.

Acid Violet 4RN.
Anthraquinone Violet.

Acid Violet 3BN, 4BL,
4BC, 6BN.

Blue.

Cyananthrol BGA.
Victoria Blue 4R, B.
Victoria Pure Blue B.
Anthraquinone Blue
SR extra paste.

Anthracene Blue
WGG extra paste,
SWG extra powder.
Neptune Blue B, BG.

Green.

Neptune Green brands.
Wool Green S.

Agalma Green B.
Anthraquinone Green GXN.

Selection of colouring matters for dyeing in a weakly acid bath according to process N^o 2, page 12.

Yellow.

Pyramine Yellow G, R.

Orange.

Pyramine Orange 3G, R, RR.

Red.

Rhodamine B and G.
Cotton Red 4B, 4BX,
4B extra, 5B.

Oxamine Red.

Violet.

Alkali Violet brands.
Methyl Violet brands.

Crystal Violet.
Oxamine Violet.

Blue.

Victoria Blue R.

Note. Particular attention is drawn here to the fact that certain substantive dyestuffs, such as *Cotton Red 4B*, etc., are affected by acid, and the remarks under process N^o 2, page 12, note *c*, should be noted.

Dyeing piece-goods (men's suitings, etc.)

A. Dyeing on mordanted wool.

The Alizarine dyestuffs given under process No 11, page 27, are mostly used for this purpose, and satisfy the most exacting demands.

Selection of dyestuffs for the production of very fast shades on a chrome mordant, or aluminium mordant for red and claret.

Fashionable colours.

Mordant Yellow brands.

Anthracene Brown W paste, SW powder.

Alizarine Red S.

Anthracene Blue WR paste, SWR powder, WB paste, SWB powder, WG paste, SWG powder, WGG paste, SWGG powder, WGG extra paste, SWGG extra powder.

Green. Olive.

Coeruleine SW paste, SW powder.

Anthracene Blue WGG, SWGG powder, WGG extra paste, SWGG extra powder, shaded with Mordant Yellow and Anthracene Brown W paste, SW powder.

If desired, on a vat bottom.

Orange. Brown.

Anthracene Brown W paste, SW powder, shaded with

Mordant Yellow brands,

Alizarine Red S,

Alizarine Orange W paste, SW powder.

Red. Claret.

Alizarine Red S, WR paste, WB paste (chrome or aluminium mordant) shaded with
Cyananthrol brands,
Mordant Yellow brands,
Alizarine Orange W paste, SW powder.

Blue. Violet.

<p><i>Indigo pure B. A. S. F.</i> dyed in the vat. <i>Anthracene Dark Blue W, SW.</i> <i>Anthracene Blue brands.</i> <i>Alizarine Dark Blue W.</i> <i>Alizarine Blue WN double</i> <i>new, SW, SRW.</i> <i>Palatine Chrome Blue BB</i> on potassium bichromate- tartar mordant,</p>	<p>shaded with <i>Cyananthrol R, RB.</i> <i>Anthraquinone Violet.</i> <i>Alizarine Red.</i> <i>Galleine W paste,</i> <i>SW powder.</i> For darkening purposes <i>Alizarine Black brands.</i></p>
---	--

If desired, on a vat bottom.

Black.

<p><i>Alizarine Black brands.</i> <i>Palatine Chrome Black 6B.</i></p>	<p><i>Diamond Black F.</i></p>
--	--------------------------------

Note. All the above are fast to steaming (decatizing).

B. Working by the single-bath process.

The colouring matters are given under process 5, page 17, and on page 51, under B.

Selection of colouring matters suitable for the production of compound shades with single-bath after-chromed dyestuffs.

Fashionable colours.

<p>† <i>Mordant Yellow G, R, GT,</i> <i>GGT.</i> <i>Mordant Yellow GR, 3R.</i> <i>Palatine Chrome Brown W,</i> <i>WN.</i> † <i>Palatine Chrome Red B.</i></p>	<p><i>Alizarine Red S.</i> * <i>Anthracene Blue SWGG,</i> <i>SWGG extra.</i> † <i>Cyananthrol R, RB.</i></p>
---	--

Green. Olive.

Mordant Yellow brands.

* *Anthracene Blue SWGG, SWGG extra,*
shaded with

† *Palatine Chrome Red B.*

Palatine Chrome Brown W, WN.

If desired, on a vat bottom.

Orange. Brown.

Palatine Chrome Brown W.

† *Palatine Chrome Brown WG, R,*

shaded with

Mordant Yellow brands.

Alizarine Orange W

paste, SW powder.

† *Palatine Chrome Red B.*

Palatine Chrome Claret.

* *Anthracene Blue SWGG,*
SWGG extra, or

† *Cyananthrol brands.*

Alizarine Black WX extra.

Also cheap combinations with

† *Palatine Chrome Violet and*

† *Corvan Black or*

Diamond Black.

Red. Claret.

Alizarine Red S.

† *Palatine Chrome Red B.*

† *Palatine Chrome Violet.*

Palatine Chrome Claret,

shaded with

Mordant Yellow brands and

Cyananthrol brands.

* *Anthracene Blue*

WGG paste,

SWGG powder,

WGG extra paste,

SWGG extra powder.

Oxamine Fast Red F

(after-chromed).

Blue. Violet.

† *Cyananthrol brands.*

* *Chrome Blue A, R,* if desired

* *Palatine Chrome Blue BB.*

* *Anthracene Blue SWGG,*
SWGG extra, SWX,
SWX extra.

* *Palatine Chrome Violet.*

Alizarine Black WX extra

for darkening purposes.

If desired, on a vat bottom.

Black.

† *Palatine Chrome Black S.*

Palatine Chrome Black ST,

SR, STN, 6B, L, LN.

† *Corvan Black brands.*

Diamond Black F, NG.

Alizarine Blue Black

WB extra.

Alizarine Black

WX extra paste.

Brilliant Alizarine Black.

Notes. The dyes marked with an asterisk, like all the others,
are fast to decatising, but the shade turns a trifle greener
under severe treatment.

The dyes marked † do not, or only slightly, stain
effect threads consisting of vegetable fibres.

C. Dyeing in an acid bath with the most suitable Aniline dyestuffs, or with such Alizarine dyestuffs as can be used without previously mordanting or after-treatment.

The shades produced satisfy most ordinary requirements.

Selection of suitable colouring matters.

(Dyeing process see page 9.)

Fashionable colours:

- | | |
|------------------------------|---------------------------------|
| * <i>Tartrazine, H.</i> | * <i>Cyananthrol BA, BGA.</i> |
| * <i>Azoflavine FF, RS.</i> | * <i>Neptune Blue BG.</i> |
| * <i>New Fast Yellow R.</i> | * <i>Indigotine.</i> |
| * <i>Fast Yellow brands.</i> | * <i>Indigo Carmine brands.</i> |
| * <i>Sorbine Red, G.</i> | * <i>Wool Green S.</i> |
| * <i>Sorbine Red BB.</i> | * <i>Neptune Green SG.</i> |
| * <i>Azocarmine brands.</i> | |

Green. Olive.

- | | |
|--------------------------------------|---------------------------------|
| * <i>Wool Green S.</i> | * <i>Tartrazine, H.</i> |
| * <i>Neptune Green SG, SBN.</i> | * <i>Azoflavine brands.</i> |
| * <i>Anthracene Blue SWGG extra.</i> | * <i>Metanil Yellow, extra.</i> |
| * <i>Cyananthrol BA, BGA.</i> | * <i>Orange N, II.</i> |
| * <i>Brilliant Anthrazurol, G.</i> | * <i>Sorbine Red.</i> |
| * <i>Neptune Blue BG.</i> | * <i>Sorbine Red BB.</i> |

Brown.

- | | |
|---------------------------------|-------------------------------|
| * <i>Tartrazine, H.</i> | * <i>Sorbine Red G.</i> |
| * <i>Azoflavine brands.</i> | * <i>Sorbine Red BB.</i> |
| * <i>Orange N.</i> | * <i>Cyananthrol BA, BGA.</i> |
| * <i>Metanil Yellow, extra.</i> | * <i>Wool Green S.</i> |
| * <i>Orange II.</i> | * <i>Neptune Green SG.</i> |
| * <i>Naphthol Red S, G, GR.</i> | * <i>Neptune Blue BG.</i> |

Red. Claret.

- | | |
|---------------------------------|-------------------------------|
| <i>Palatine Scarlet brands.</i> | <i>* Acid Violet 4RN,</i> |
| <i>* Wool Scarlet brands.</i> | shaded with |
| <i>Scarlet brands.</i> | <i>* Wool Green S.</i> |
| <i>Sorbine Red, G.</i> | <i>* Cyananthrol BA, BGA.</i> |
| <i>* Sorbine Red BB.</i> | <i>Indigo Carmine brands.</i> |
| <i>Mars Red G.</i> | <i>Indigotine brands.</i> |
| <i>* Naphthol Red S, G, GR.</i> | <i>* Neptune Blue BG.</i> |
| <i>Fast Red AV, C.</i> | |

Blue. Violet.

- | | |
|---------------------------------|-----------------------------------|
| <i>* Brilliant Black B,</i> | <i>* Cyananthrol BA, BGA.</i> |
| shaded with | <i>* Brilliant Anthrazuol, G.</i> |
| <i>Acid Violet 6BN,</i> | <i>Anthracene Blue</i> |
| <i>* Acid Violet 4BL, 4BC,</i> | <i>SWG extra.</i> |
| <i>* Ethyl Acid Violet S4B.</i> | <i>Fast Blue K.</i> |

Black.

- | | |
|-------------------------------|--------------------------------|
| <i>Palatine Black brands.</i> | <i>Brilliant Black brands.</i> |
| <i>Agalma Black brands.</i> | |

Note. The dyes marked * do not, or only slightly, stain effect threads consisting of vegetable fibres.

Dyeing carpet yarns, fancy yarns, etc.

Working in an acid, neutral, or weakly alkaline bath.

(Dyeing processes are given on pages 9—16.)

The following Aniline dyestuffs are commonly used for the above purpose:

Fashionable colours.

- | | |
|--|---|
| <ul style="list-style-type: none"> * <i>Quinoline Yellow, extra.</i> * <i>Tartrazine, H.</i> * <i>Naphthol Yellow.</i> <li style="padding-left: 20px;"><i>Azoflavine brands.</i> ** <i>Fast Yellow brands.</i> * <i>New Fast Yellow R.</i> ** <i>Orange N.</i> ** <i>Metanil Yellow, extra.</i> * <i>Azocarmine brands.</i> | <ul style="list-style-type: none"> * <i>Sorbine Red, BB, G.</i> * <i>Cyananthrol BGA.</i> * <i>Wool Green S.</i> ** <i>Neptune Green SG.</i> <li style="padding-left: 20px;"><i>Agalma Green B.</i> * <i>Indigo Carmine brands.</i> * <i>Indigotine brands.</i> ** <i>Neptune Blue B, BG.</i> |
|--|---|

Green. Olive.

- | | |
|--|--|
| <ul style="list-style-type: none"> <li style="padding-left: 20px;"><i>Light Green brands.</i> ** <i>Neptune Green brands.</i> <li style="padding-left: 20px;"><i>Agalma Green B.</i> * <i>Wool Green S.</i> ** <i>Acid Green GB.</i> * <i>Cyananthrol BA, BGA.</i> ** <i>Neptune Blue BG, B.</i> * <i>Indigo Carmine brands.</i> | <ul style="list-style-type: none"> * <i>Indigotine brands.</i> * <i>Tartrazine, H.</i> <li style="padding-left: 20px;"><i>Azoflavine brands.</i> ** <i>Metanil Yellow, extra.</i> ** <i>Orange N.</i> <li style="padding-left: 20px;"><i>Orange II.</i> * <i>Sorbine Red, BB.</i> |
|--|--|

Orange. Brown.

- | | |
|---|--|
| <ul style="list-style-type: none"> * <i>Tartrazine, H.</i> <li style="padding-left: 20px;"><i>Azoflavine FF, RS.</i> ** <i>Metanil Yellow, extra.</i> ** <i>Orange N.</i> <li style="padding-left: 20px;"><i>Orange II.</i> * <i>Sorbine Red, BB.</i> | <ul style="list-style-type: none"> * <i>Wool Green S.</i> * <i>Cyananthrol BA.</i> ** <i>Cyananthrol BGA.</i> * <i>Indigo Carmine brands.</i> * <i>Indigotine brands.</i> |
|---|--|

Red. Claret.

- | | |
|--|---|
| <ul style="list-style-type: none"> * <i>Rhodamine B, G.</i> * <i>Scarlet brands.</i> <li style="padding-left: 2em;"><i>Wool Scarlet brands.</i> * <i>Palatine Scarlet brands.</i> <li style="padding-left: 2em;"><i>Mars Red G.</i> <li style="padding-left: 2em;"><i>Naphthol Red S, G, GR.</i> <li style="padding-left: 2em;"><i>Fast Red AV, C.</i> <li style="padding-left: 2em;"><i>Acid Magenta S.</i> | <ul style="list-style-type: none"> ** <i>Acid Violet 4RN,</i> <li style="padding-left: 2em;"><i>shaded with</i> <li style="padding-left: 2em;"><i>Orange II.</i> * <i>Wool Green S.</i> * <i>Cyananthrol BA.</i> ** <i>Cyananthrol BGA.</i> * <i>Indigo Carmine brands.</i> * <i>Indigotine brands.</i> |
|--|---|

Blue. Violet.

- | | |
|--|---|
| <ul style="list-style-type: none"> * <i>Victoria Blue brands.</i> ** <i>Alkali Blue brands.</i> * <i>Cyananthrol BA.</i> ** <i>Cyananthrol BGA.</i> ** <i>Brilliant Anthrazurol G.</i> <li style="padding-left: 2em;"><i>Wool Blue brands.</i> <li style="padding-left: 2em;"><i>Wool Marine Blue brands.</i> ** <i>Neptune Blue B, BG.</i> <li style="padding-left: 2em;"><i>Ethyl Blue B.</i> | <ul style="list-style-type: none"> * <i>Wool Green S.</i> ** <i>Neptune Green brands.</i> ** <i>Acid Violet 3BN, 4BL,</i> <li style="padding-left: 2em;"><i>4BC, 6BN, 4RN,</i> <li style="padding-left: 2em;"><i>shaded with</i> <li style="padding-left: 2em;"><i>Orange II.</i> ** <i>Orange N.</i> * <i>Sorbine Red, BB.</i> |
|--|---|

Black.

- | | |
|---|---|
| <ul style="list-style-type: none"> <i>Brilliant Black brands.</i> <i>Palatine Black brands.</i> | <ul style="list-style-type: none"> <i>Agalma Black brands.</i> <i>Ethyl Black brands.</i> |
|---|---|

- Notes.* a) The dyestuffs marked * are fast to stoving, those marked ** being sufficiently fast to stoving for most purposes.
- b) If greater fastness is required, the mordant or single-bath dyestuffs given on pp. 49 and 51 are employed. The yarns are also often dyed in the Indigo vat, or previously vatted yarns are topped with single-bath dyestuffs.

Dyeing ladies' dress goods, felts,
plushes, ladies' hats, etc.

Dyeing in an acid, slightly acid or slightly alkaline bath.

(Dyeing processes, see pages 9—16.)

Aniline dyestuffs commonly used for this purpose:

Fashionable colours.

Quinoline Yellow, extra.
Azoflavine FF, RS.
Fast Yellow brands.
New Fast Yellow R.
Tartrazine, H.
Metanil Yellow, extra.
Azocarmine brands.

Sorbine Red, BB.
Neptune Blue B, BG.
Wool Green S.
Neptune Green brands.
Agalma Green B.
Indigo Carmine brands.
Indigotine brands.

Orange. Brown.

Azoflavine brands.
Orange N, II.
Tartrazine, H.
Metanil Yellow, extra.
Sorbine Red, BB.

Neptune Green SG.
Cyananthrol BA, BGA.
Indigo Carmine brands.
Indigotine brands.

Green. Olive.

Light Green brands.
Agalma Green B.
Neptune Green brands.
Wool Green S.
Acid Green GB.
Neptune Blue BG, B.
Cyananthrol BA, BGA,

shaded with
Azoflavine FF, RS.
Tartrazine, H.
Metanil Yellow, extra.
Orange N, II.
Sorbine Red, BB.

Red.

<i>Rhodamine B, G.</i>	<i>Acid Violet 4RN,</i>
<i>Scarlet brands.</i>	shaded with
<i>Wool Scarlet brands.</i>	<i>Orange II.</i>
<i>Palatine Scarlet brands.</i>	<i>Wool Green S.</i>
<i>Mars Red G.</i>	<i>Cyananthrol BA, BGA.</i>
<i>Naphthol Red S, G, GR.</i>	<i>Indigo Carmine brands.</i>
<i>Fast Red AV, C.</i>	<i>Indigotine brands.</i>
<i>Acid Magenta S.</i>	

Blue. Violet.

<i>Victoria Blue B, R, 4R.</i>	<i>Ethyl Blue B.</i>
<i>Victoria Pure Blue B.</i>	<i>Neptune Green brands.</i>
<i>Alkali Blue brands.</i>	<i>Acid Violet 3BN, 4BL,</i>
<i>Cyananthrol BA, BGA.</i>	<i>6BN, 4RN,</i>
<i>Brilliant Anthrazurol G.</i>	for Blue shaded with
<i>Wool Blue and Wool Marine</i>	<i>Wool Green S.</i>
<i>Blue brands.</i>	<i>Orange II, or N.</i>
<i>Neptune Blue BG.</i>	

Black.

<i>Brilliant Black brands.</i>	<i>Ethyl Black brands.</i>
<i>Palatine Black brands.</i>	<i>Agalma Black brands.</i>

Note. Greater fastness than that obtained with ordinary acid Aniline dyestuffs is very seldom required, but in such a case (fastness to washing comes chiefly into question) the single-bath after-chromed dyestuffs can be used, viz., those given on pages 56—57 for piece-goods.

Dyeing of Fezzes, etc.

For this purpose the following dyestuffs are generally made use of:

Red. Claret.

1. Dyeing in an acid or slightly acid bath.

See dyeing processes Nos 1 and 2, pages 9 and 12.

Palatine Scarlet brands.
Mars Red G.
Naphthol Red brands.
Fast Red AV.

Acid Violet 4 RN.
Thiazine Red R, G.
Oxamine Fast Red F.

2. Dyeing by the one-bath process.

See dyeing processes Nos 5, 7, 9, pages 17, 21 and 23.

Thiazine Red R, G.
Oxamine Fast Red F.
Alizarine Red S.

Alizarine Orange W paste,
SW powder.

3. Dyeing goods, previously mordanted with chrome or alumina.

See dyeing processes Nos 11 and 12, pages 27 and 31.

Alizarine Red WR paste,
WB paste.
Alizarine Red S, SWR,
SWB powder.

Alizarine Orange W paste,
SW powder.

The following are useful for shading:

Azoflavine brands.
Orange II.
Rhodamine B.
Neptune Blue BG.

Cyananthrol BGA.
Brilliant Anthrazurol G.
Wool Green S.

Classification
of the
Wool dyestuffs
according to their fastness.

(See notes on page 1.)

Level-dyeing properties.

Fastness to milling.

Fastness to light.

Fastness to water.

Fastness to carbonising.

Fastness to stoving.

Fastness to washing.

Fastness to potting.

Behaviour towards white cotton in
milling.

Behaviour towards white cotton effect
threads when dyed in an acid bath.

Fastness to decatizing (fastness to
ironing).

Behaviour of the dyeings when spotted
with nitric acid (Indigo test).

Level-dyeing properties.

The following dyestuffs rank highest with regard to level-dyeing.

Yellow.

Acid	dyestuffs: * <i>Naphthol Yellow S.</i>	<i>Metanil Yellow brands.</i>
	<i>New Fast Yellow R.</i>	* <i>Quinoline Yellow.</i>
	* <i>Fast Yellow G, Y, extra.</i>	* <i>Tartrazine.</i>
	<i>Azoflavine brands</i>	
	(especially the brand <i>FF</i>).	
Substantive	dyestuffs: <i>Cotton Yellow G I.</i>	<i>Pyramine Yellow G, R.</i>
One-bath		
chrome	dyestuffs: <i>Mordant Yellow G, G T,</i>	
	<i>GGT.</i>	
Alizarine	dyestuffs: <i>Mordant Yellow G, G T,</i>	<i>Galloflavine.</i>
	<i>GGT.</i>	

Orange.

Acid	dyestuffs: <i>Orange N.</i>	* <i>Orange G, II.</i>
Substantive	dyestuffs: <i>Pyramine Orange 3 G,</i>	<i>Cotton Orange G, R.</i>
	» » <i>RR.</i>	

Brown.

Substantive	dyestuffs: <i>Oxamine Brown 3 G.</i>	<i>Thiazine Brown R, G.</i>
	<i>Oxamine Brown G, GR.</i>	<i>Oxamine Dark Brown G,</i>
	<i>Cotton Brown RN.</i>	» » » <i>R.</i>
One-bath		
chrome	dyestuffs: <i>Palatine Chrome Brown</i>	<i>Palatine Chrome Brown R</i>
	<i>W, WN.</i>	(for brown shades).
		<i>Palatine Chrome Brown</i>
		<i>WG.</i>
Alizarine	dyestuffs: <i>Anthracene Brown.</i>	

Red.

- Acid dyestuffs: *Sorbine Red, B B.* * *Acid Magenta brands.*
Sorbine Red G. * *Fast Red AV, E.*
Asocarmine brands. * *Mars Red G.*
Acid Rhodamine brands. * *Naphthol Red S, GR, G.*
 (* *Scarlet, * Wool Scarlet brands, * Palatine Scarlet*
 and *Fast Scarlet brands*; these dye very level only in scarlet
 or red shades.)
- Substantive
 dyestuffs: *Cotton Red 4B, 4BX,* *Oxamine Fast Red F.*
4B extra, 5B. *Thiazine Red R, G.*
Oxamine Red. *Oxamine Claret M.*
- Basic
 dyestuffs: *Rhodamine G, G extra,* *Diamond Magenta brands.*
B, B extra
 (process No 2, page 12).
- One-bath
 chrome
 dyestuffs: *Palatine Chrome Claret.* *Palatine Chrome Red B.*
Alizarine Red S
 (process No 5, page 17).
- Alizarine
 dyestuffs: *Alizarine Red* (chrome or aluminium mordant).

Violet.

- Acid dyestuffs: **Acid Violet brands.* *Alkali Violet brands.*
- Basic
 dyestuffs: *Methyl Violet brands.* *Crystal Violet.*
- Alizarine
 dyestuffs: *Galleine.* *Gallocyanine.*

Blue.

- Acid dyestuffs: **Neptune Blue B, B G.* *Wool Blue brands.*
Neptune Blue R. *Wool Marine Blue brands.*
Cyananthrol B G A. *Neptune Marine Blue*
Brilliant Anthrazurol G. *brands.*
Indigo Carmine brands. *Acid Violet 4BL.*
Indigotine brands. *Ethyl Acid Violet S4B.*
Ethyl Blue B.

Substantive

dyestuffs: *Oxamine Blue B, 3B, BG.*

Basic

dyestuffs: *Victoria Blue B.* *Victoria Pure Blue B.*

(These dye level as self-shades when dyed according to process No 1, page 9.)

One-bath

chrome

dyestuffs: **Chrome Blue A, R* *Anthracene Blue*
(for navy blue shades). *SWG extra.*

Alizarine

dyestuffs: *Anthracene Blue brands.*

Green.

Acid dyestuffs: *Wool Green S.* ** Neptune Green brands.*

** Agalma Green B.* ** Light Green brands.*

Substantive

dyestuffs: *Oxamine Green B.*

Black.

Acid dyestuffs: ** Ethyl Black 3B, T, 3BN* ** Palatine Black SS, SF, and*
(only for black shades). *Agalma Black brands*

** Brilliant Black 3B, B, M.* (possess good level dyeing properties only when used for blacks).

Substantive

dyestuffs: *Violet Black.*

One-bath

chrome

dyestuffs: *Alizarine Black* *Palatine Chrome Black*
WX extra paste. *S brands.*

Corvoan Black brands. *Palatine Chrome Black*

Diamond Black F. *6B, L, LN.*

Alizarine

dyestuffs: *Alizarine Black brands.* *Diamond Black F.*

Notes: a The acid dyestuffs *printed in thick type* are first-class level-dyeing colours and produce the most even dyeings even in light shades whether dyed alone or with other dyestuffs.

b The dyestuffs marked with an asterisk can be dissolved without much difficulty in a hot, acid bath; the Acid Violet dyestuffs which best fulfil this condition are *Acid Violet 4RN* and *BN*, and of the *Scarlets* the brands *G, R, RR, 3R*.

c The best results are generally obtained with substantive dyestuffs when they are dyed in a neutral bath.

In order to obtain good level dyeings with Alizarine dyestuffs it is, of course, necessary that the goods should be evenly mordanted beforehand.

Fastness to milling.*)

The following are the fastest to milling of the various classes of dyestuffs.

Yellow.

Acid dyestuffs:	** <i>Tartrazine, H.</i>	** <i>Fast Yellow Y.</i>
Substantive dyestuffs:	<i>Pyramine Yellow brands.</i>	<i>Cotton Yellow brands</i> (chiefly after-chromed).
Basic dyestuffs:	<i>Auramine brands.</i>	
One-bath chrome dyestuffs:	<i>Mordant Yellow brands.</i>	<i>Fast Mordant Yellow G, GI.</i>
Alizarine dyestuffs:	<i>Galloflavine.</i> <i>Reso flavine.</i>	<i>Fast Mordant Yellow G, GI.</i>
		* <i>Mordant Yellow brands.</i>

Orange.

Acid dyestuffs:	** <i>Orange R, X.</i>	
Substantive dyestuffs:	<i>Pyramine Orange 3G.</i> <i>Pyramine Orange RR</i> (also after-chromed).	<i>Cotton Orange G, R.</i>
One-bath chrome dyestuffs:	<i>Alizarine Orange</i> (processes No 5 or No 7, pages 17 and 21).	
Alizarine dyestuffs:	<i>Alizarine Orange</i> (aluminium or chrome mordant).	

Brown.

Substantive dyestuffs:	<i>Thiazine Brown G, R.</i> <i>Cotton Brown RN.</i>	<i>Copper Brown.</i> <i>Oxamine Brown B, R.</i>
One-bath chrome dyestuffs:	<i>Palatine Chrome Brown brands.</i>	
Alizarine dyestuffs:	<i>Anthracene Brown brands.</i>	

*) See also page 91.

Red.

Acid dyestuffs:	<i>Wool Red G, R.</i>	** Fast Scarlet B.
	<i>Brilliant Carmine L.</i>	** Scarlet R, 3 R.
	<i>Acid Rhodamine brands.</i>	
Substantive dyestuffs:	<i>Oxamine Fast Red F</i> (also after-chromed). <i>Cotton Red brands.</i> <i>Oxamine Red</i> (also after-chromed).	<i>Thiazine Red R, G.</i> <i>Oxamine Garnet M.</i> <i>Oxamine Claret M</i> (also after-chromed). <i>Cotton Rubine.</i>
Basic dyestuffs:	** Rhodamine G, B. <i>Rhodamine 3B.</i>	** Diamond Magenta brands.
Eosine dyestuffs:	** Eosine brands.	** Rose Bengal brands. <i>Phloxine brands.</i>
One-bath chrome dyestuffs:	<i>Alizarine Red S</i> (processes No 5 or No 7, pages 17 and 21). <i>Palatine Chrome Red R, B.</i> <i>Palatine Chrome Claret.</i>	
Alizarine dyestuffs:	* <i>Alizarine Red WB paste,</i> * <i>Alizarine Red S.</i> <i>WR paste</i> ** <i>Alizarine Maroon.</i> (aluminium or chrome mordant).	

Violet.

Acid dyestuffs:	** <i>Acid Violet 3BN, BN,</i> <i>4BN, 4BL, 4BC.</i> <i>Alkali Violet brands</i> (process No 3, page 14).	<i>Anthraquinone Violet.</i>
Basic dyestuffs:	** Methyl Violet brands.	
One-bath chrome dyestuffs:	<i>Palatine Chrome Violet.</i>	<i>Anthraquinone Violet.</i>
Alizarine dyestuffs:	<i>Galleine.</i>	<i>Gallocyanine.</i>

Black Blue. Black.

Substantive
dyestuffs: *Oxamine Black A, N, BH, RN* (for light shades).

One-bath
chrome
dyestuffs: *Alizarine Black.* *Palatine Chrome Black*
Diamond Black. *brands* with exception of
Coroan Black. *Palatine Chrome Black*
Brilliant Alizarine Black. *A, 3B.*
Alizarine Blue Black
WB extra.

Alizarine
dyestuffs: *Alizarine Black.* * *Alizarine Blue Black W,*
Diamond Black. *W extra, WB extra.*
Brilliant Alizarine
Black paste.

- Notes:* a) The products *printed in heavy type* satisfy all the requirements of a severe milling. If fastness to white wool is required, the Alizarine dyestuffs marked with an asterisk, when dyed in high percentages on a chrome mordant, must be after-chromed (cf. page 28, note c).
- b) The dyestuffs printed in ordinary type do not withstand a severe milling, but light milling, e. g. a flannel milling, does not affect them. In milling of this kind under normal conditions the acid dyestuffs marked ** do not bleed into white wool, but the substantive dyestuffs are considerably better in this respect.
- c) It must always be borne in mind, that if the milled goods are allowed to lie damp for an unnecessarily long time with the milling liquor in them, even those dyestuffs, which withstand a severe milling most successfully, may be inclined to bleed into white. It is advisable, therefore, to rinse at once with water and finish the goods.

Fastness to light.

The following may be considered the fastest to light of the various classes of dyestuffs:

Yellow.

Acid dyestuffs:	<i>Tartrazine, H.</i> <i>Fast Yellow, G, Y, extra.</i> <i>Quinoline Yellow, extra.</i>	<i>Metanil Yellow brands.</i> <i>Azoflavine brands.</i>
Substantive dyestuffs:	<i>Pyramine Yellow G.</i> <i>Pyramine Yellow R.</i>	<i>Cotton Yellow G I</i> (also after-chromed).
One-bath chrome dyestuffs:	<i>Mordant Yellow G, R,</i> <i>3 R, G T, G G T.</i>	<i>Fast Mordant Yellow G, G I.</i> <i>Mordant Yellow G R.</i>
Alizarine dyestuffs:	<i>Resoflavine</i> (also in light shades). <i>Mordant Yellow G, R,</i> <i>3 R, G T, G G T.</i>	<i>Fast Mordant Yellow G, G I.</i> <i>Galloflavine.</i> <i>Mordant Yellow G R.</i>

Orange.

Acid dyestuffs:	<i>Orange G, II.</i>	<i>Orange R.</i>
Substantive dyestuffs:	<i>Pyramine Orange RR</i> (after-chromed).	<i>Pyramine Orange R,</i> <i>RR, 3 G.</i>
One-bath chrome dyestuffs:	<i>Alizarine Orange</i> (processes No 5 or No 7, pages 17 and 21).	
Alizarine dyestuffs:	<i>Alizarine Orange</i> (aluminium or chrome mordant).	

Brown.

One-bath chrome dyestuffs:	<i>Palatine Chrome Brown W, W G, R, W N.</i>	<i>Palatine Chrome Brown G.</i>
Alizarine dyestuffs:	<i>Anthracene Brown.</i>	

Red.

Acid dyestuffs:	<i>Palatine Scarlet brands.</i> <i>Wool Scarlet brands.</i> <i>Fast Scarlet B.</i> <i>Fast Red C.</i> <i>Sorbine Red.</i> <i>Sorbine Red BB, G.</i>	<i>Wool Red G.</i> <i>Brilliant Carmine L.</i> <i>Scarlet brands.</i> <i>Crystal Scarlet.</i> <i>Naphthol Red G, S.</i> <i>Mars Red G.</i>
Substantive dyestuffs:	<i>Oxamine Fast Red F</i> (direct and after-chromed) (processes No 2 and No 5, pages 12 and 17).	<i>Thiazine Red R</i> after-coppered (process No 9, page 23). <i>Thiazine Red R.</i>
Basic dyestuffs:	<i>Rhodamine G, 3G, B, 3B,</i> also the extra brands.	
One-bath chrome dyestuffs:	<i>Alizarine Red S</i> (process No 5, page 17). <i>Palatine Chrome Red B.</i>	<i>Palatine Chrome Claret.</i> <i>Palatine Chrome Red R.</i> <i>Alizarine Red WR, WB.</i>
Alizarine dyestuffs:	<i>Alizarine Red S, WR, WB</i> (aluminium or chrome mordant).	

Violet.

Acid dyestuffs:	<i>Anthraquinone Violet.</i>	<i>Acid Violet 4 RN.</i>
One-bath chrome dyestuffs:	<i>Palatine Chrome Violet.</i>	<i>Anthraquinone Violet.</i>
Alizarine dyestuffs:	<i>Anthraquinone Violet.</i>	

Blue.

Acid dyestuffs:	<i>Cyananthrol BA, BGA,</i> <i>R, RB.</i> <i>Anthraquinone Blue</i> <i>SR extra paste.</i>	<i>Anthracene Blue</i> <i>SWG G extra.</i> <i>Brilliant Anthrasurol, G.</i> <i>Neptune Blue B, BG.</i>
One-bath chrome dyestuffs:	<i>Cyananthrol R, RB.</i> <i>Anthraquinone Blue</i> <i>SR extra paste.</i> <i>Chrome Blue A, R.</i>	<i>Palatine Chrome Blue</i> <i>brands.</i> <i>Anthracene Blue SWG G</i> <i>SWG G extra.</i>

Alizarine
 dyestuffs: *Alizarine Blue.* *Alizarine Dark Blue.*
Anthracene Blue. *Alizarine Indigo Blue.*
Anthracene Dark Blue. *Cyananthrol R, R B.*
Anthraquinone Blue SR
extra paste, SR extra powder.

Indigo: *Indigo pure B. A. S. F. brands for wool.*

Green. Olive.

Acid dyestuffs: *Anthraquinone Green GXN.* *Light Green brands.*
Wool Green S. *Acid Green GB.*
Neptune Green brands. *Agalma Green B.*

Substantive
 dyestuffs: *Oxamine Green B, G.*

One-bath
 chrome
 dyestuffs: *Anthraquinone Green GXN.*

Alizarine
 dyestuffs: *Coeruleine.* *Anthraquinone Green*
Alizarine Green. *GXN.*
Alizarine Dark Green W.

Black Blue. Black.

Acid dyestuffs: *Brilliant Black brands.* *Agalma Black brands.*
Ethyl Black brands. *Palatine Black brands.*

One-bath
 chrome
 dyestuffs: *Palatine Chrome Black* *Diamond Black brands.*
brands. *Alizarine Blue Black*
Alizarine Black *WB extra.*
WX extra.
Brilliant Alizarine Black.

Alizarine
 dyestuffs: *Alizarine Black brands.* *Diamond Black brands.*
Brilliant Alizarine Black. *Alizarine Blue Black W,*
W extra, WB extra.

Fastness to water; fastness against bleeding into white wool.

The following are the fastest of the various classes of
dyestuffs in this respect:

Yellow.

Acid dyestuffs: *Tartrazine.*

Substantive
dyestuffs: *Cotton Yellow R, GI* *Pyramine Yellow R, G.*
(after-chromed).

One-bath
chrome
dyestuffs: *Mordant Yellow G, GR,* *Fast Mordant Yellow*
R, GT, GGT. *G, GI.*

Alizarine
dyestuffs: *Mordant Yellow G, GR,* *Resoflavine.*
R, GT, GGT. *Galloflavine.*

Orange.

Acid dyestuffs: *Orange G, R* (are only moderately fast, but are still the
best of the Orange group).

Substantive
dyestuffs: *Pyramine Orange RR* *Pyramine Orange 3G, R.*
(also after-chromed). *Cotton Orange R.*

One-bath
chrome
dyestuffs: *Alizarine Orange* (processes No 5 or No 7, pages 17 and 21).

Alizarine
dyestuffs: *Alizarine Orange* (aluminium or chrome mordant).

Brown.

Substantive dyestuffs:	<i>Oxamine Brown R, B, MNI. Oxamine Dark Brown G, R.</i>	<i>Cotton Brown RVN. Thiazine Brown G, R. Oxamine Brown G, GR. Copper Brown.</i>
One-bath chrome dyestuffs:	<i>Palatine Chrome Brown brands.</i>	
Alizarine dyestuffs:	<i>Anthracene Brown.</i>	

Red.

Acid dyestuffs:	<i>Wool Scarlet 4 R. Wool Red G, R. Brilliant Carmine L. Fast Scarlet B. Fast Red C, B. Mars Red G.</i>	<i>Scarlet RR, 3R. Naphthol Red S, G, GR. Erythrine X, P. Wool Scarlet RR, 3R. Crystal Scarlet. Fast Red AV.</i>
Eosine dyestuffs:	<i>Eosine BN. Rose Bengal brands.</i>	<i>Erythrosine brands.</i>
Substantive dyestuffs:	<i>Cotton Red 4 B, 4 B X, 4B extra, 5 B. Oxamine Fast Red F (also after-chromed). Oxamine Fast Claret G.</i>	<i>Thiazine Red G, R (after-coppered). Oxamine Red (after-chromed). Oxamine Garnet (after chromed).</i>
One-bath chrome dyestuffs:	<i>Palatine Chrome Red R, B.</i>	<i>Palatine Chrome Claret.</i>
Alizarine dyestuffs:	<i>Alizarine Red S (aluminium mordant).</i>	<i>Alizarine Red WR paste (aluminium or chrome mordant).</i>

Violet.

Acid dyestuffs:	<i>Acid Violet 3 BN, 7 B, 4 BL, 4 BC (are only moderately fast).</i>
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Substantive dyestuffs:	<i>Oxamine Violet.</i>	
One-bath chrome dyestuffs:	<i>Palatine Chrome Violet.</i>	
Alizarine dyestuffs:	<i>Galleine.</i>	<i>Gallocyanine.</i>

Blue.

Acid dyestuffs:	<i>Soluble Blue brands.</i> <i>Pure Blue brands.</i> <i>Alkali Blue 6 B</i> (and the other greenish brands).	<i>Neptune Blue B, B G.</i> <i>Indigo Carmine brands.</i> <i>Indigotine brands.</i>
Substantive dyestuffs:	<i>Oxamine Blue B, 3 B, B G.</i>	<i>Oxamine Blue 3 R, A.</i>
One-bath chrome dyestuffs:	<i>Anthracene Blue SW G G,</i> <i>SW G G extra.</i> <i>Palatine Chrome Blue</i> <i>W B, B.</i>	<i>Chrome Blue A, R.</i> <i>Anthraquinone Blue</i> <i>SR extra paste.</i>
Alizarine dyestuffs:	<i>Alizarine Blue brands.</i> <i>Anthracene Blue</i> (especially the reddish brands, e. g. <i>WR paste, SW R powder</i>). (process No 10, page 25, with formic acid or lactic acid).	<i>Alizarine Indigo Blue.</i>
Indigo:	<i>Indigo pure B. A. S. F. brands for wool.</i>	

Green. Olive.

Acid dyestuffs:	<i>Neptune Green S, S G.</i> <i>Agalma Green B.</i> <i>Wool Green S.</i>	<i>Light Green S,</i> <i>SF yellow shade,</i> <i>SF blue shade.</i> <i>Acid Green G B.</i>
Substantive dyestuffs:	<i>Oxamine Green B, G.</i>	
One-bath chrome dyestuffs:	<i>Anthraquinone Green</i> <i>G X N.</i>	<i>Alizarine Dark Green W.</i>
Alizarine dyestuffs:	<i>Alizarine Green.</i>	<i>Coeruleine.</i>

Black Blue. Black.

Acid dyestuffs:	<i>Blue Black B.</i> <i>Brilliant Black</i> (if after-treated with chrome alum).	<i>Brilliant Black brands.</i> <i>Palatine Black brands.</i> <i>Agalma Black brands.</i> <i>Ethyl Black brands.</i>
Substantive dyestuffs:	<i>Oxamine Black RN.</i>	
One-bath chrome dyestuffs:	<i>Palatine Chrome Black brands.</i> <i>Corvan Black brands.</i> <i>Diamond Black brands.</i>	<i>Alizarine Black WX extra paste.</i> <i>Brilliant Alizarine Black paste.</i> <i>Alizarine Blue Black WB extra.</i>
Alizarine dyestuffs:	<i>Alizarine Black WX extra paste.</i> <i>Brilliant Alizarine Black paste.</i>	<i>Diamond Black brands.</i> <i>Alizarine Blue Black W, W extra, WB extra.</i>

Fastness to carbonising (sulphuric acid*).

The following are the fastest of the various classes of dyestuffs to carbonising:

Yellow.

Acid dyestuffs: *Quinoline Yellow, extra.* *New Fast Yellow R.*
Naphthol Yellow brands. *Metanil Yellow.*
Tartrazine, H. *Azoflavine brands.*
Fast Yellow G, Y.

Substantive dyestuffs: *Pyramine Yellow G, R.*

One-bath chrome dyestuffs: *Fast Mordant Yellow G, G I.* *Mordant Yellow G T, G G T.*

Alizarine dyestuffs: *Fast Mordant Yellow G, G I.* *Galloflavine.*
Mordant Yellow G T, G G T. *Resoflavine.*

Orange.

Acid dyestuffs: *Orange G, II, R.* *Orange N.*

Substantive dyestuffs: *Pyramine Orange R.* *Cotton Orange R.*

One-bath chrome dyestuffs: *Alizarine Orange*
 (process No 5, page 17).

Alizarine dyestuffs: *Alizarine Orange* (aluminium mordant)
 (process No 12, page 31).

* The carbonising here refers to the treatment with sulphuric acid of 6° Tw. If the dyed goods are to be carbonised in the piece with aluminium chloride, many other dyestuffs can be made use of which are not contained in the following list.

Brown.

Substantive dyestuffs:	<i>Thiazine Brown G.</i>	<i>Oxamine Brown R.</i>
One-bath chrome dyestuffs:	<i>Palatine Chrome Brown WN, R, WG, W</i> (the latter brand, if dyed with sulphuric acid).	<i>Palatine Chrome Brown G.</i>

Red. Scarlet. Claret.

Acid dyestuffs:	<i>Silk Red N.</i> <i>Scarlet brands.</i> <i>Wool Scarlet brands.</i> <i>Wool Red G, R.</i> <i>Cochineal Red A.</i> <i>Fast Scarlet B.</i> <i>Crystal Scarlet.</i> <i>Fast Red AV, E, B.</i>	<i>Marş Red G.</i> <i>Naphthol Red S, G, GR.</i> <i>Palatine Red A.</i> <i>Asocarmine.</i> <i>Magenta brands.</i> <i>Sorbine Red, BB, G.</i> <i>Acid Violet 4 RN.</i>
Eosine dyestuffs:	<i>Eosine brands.</i> <i>Erythrosine brands.</i> <i>Rose Bengal brands.</i>	<i>Phloxine brands</i> (these brands are used in exceptional cases only).
Substantive dyestuffs:	<i>Thiazine Red R, G.</i>	<i>Oxamine Fast Red F.</i>
Basic dyestuffs:	<i>Rhodamine B, G, 3 G</i> (also the "extra" brands).	
One-bath chrome dyestuffs:	<i>Palatine Chrome Red R, B.</i>	<i>Palatine Chrome Claret.</i>

Violet.

Acid dyestuffs:	<i>Acid Violet 3 BN, 4 BN, 6 BN, 4 BL, 4 BC, 7 B, P W.</i>	<i>Anthraquinone Violet.</i> <i>Alkali Violet 6 B</i> (process No 3, page 14).
Substantive dyestuffs:	<i>Oxamine Violet.</i>	
Basic dyestuffs:	<i>Methyl Violet brands.</i>	<i>Crystal Violet.</i>

One-bath
chrome
dyestuffs: *Palatine Chrome Violet.* *Anthraquinone Violet.*

Alizarine
dyestuffs: *Gallocyanine F, D.* *Anthraquinone Violet.*

Blue.

Acid dyestuffs: *Soluble Blue brands.* *Cyananthrol B G A,*
Neptune Blue brands. *R, E A.*
Indigo Carmine brands. *Brilliant Anthrasuroil, G.*
Indigotine brands. *Anthraquinone Blue*
Wool Blue brands. *SR extra paste,*
Fast Blue brands. *SR extra powder.*
Anthracene Blue SWG G, *Alkali Blue*
SWG G extra. (process No 3, page 14).

Substantive
dyestuffs: *Oxamine Blue 3B, 3R, 4R.*

One-bath
chrome
dyestuffs: *Anthraquinone Blue* *Chrome Blue A, R.*
SR extra paste, *Cyananthrol R, RB.*
SR extra powder.
Palatine Chrome Blue
brands.

Alizarine
dyestuffs: *Alizarine Blue.* *Anthraquinone Blue*
Alizarine Indigo Blue. *SR extra paste,*
Alizarine Dark Blue. *SR extra powder.*

Indigo: *Indigo pure B. A. S. F. brands for wool.*

Green. Olive.

Acid dyestuffs: *Neptune Green S G.* *Light Green S,*
Wool Green S. *SF yellow shade,*
Agalma Green B. *SF blue shade.*
Anthraquinone Green *Acid Green G B.*
G X N.

Substantive
dyestuffs: *Oxamine Green B, G.*

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One-bath
chrome
dyestuffs: *Anthraquinone Green
GXN.* *Alizarine Dark Green
W powder.*

Alizarine
dyestuffs: *Alizarine Green.* *Coeruleine.*
*Anthraquinone Green
GXN.*

Black.

Acid dyestuffs: *Brilliant Black brands.* *Agalma Black brands.*
Palatine Black brands.

One-bath
chrome
dyestuffs: *Palatine Chrome Black
brands.* *Corvan Black brands.*
Diamond Black brands. *Brilliant Alizarine
Black.*
Alizarine Black brands.

Alizarine
dyestuffs: *Diamond Black brands.* *Brilliant Alizarine
Black.*
Alizarine Black brands.

Fastness to stoving.

The following are the fastest to stoving of the various classes of dyestuffs:

Yellow.

Acid dyestuffs:	<i>Quinoline Yellow, extra.</i> <i>Tartrazine, H.</i> <i>New Fast Yellow R.</i> <i>Naphthol Yellow S.</i>	<i>Metanil Yellow.</i> <i>Azoflavine brands.</i> <i>Fast Yellow G, Y.</i>
Substantive dyestuffs:	<i>Pyramine Yellow G, R.</i>	<i>Cotton Yellow brands.</i>
Basic dyestuffs:	<i>Auramine G, II.</i>	
One-bath chrome dyestuffs:	<i>Fast Mordant Yellow G, GI.</i>	<i>Mordant Yellow brands.</i>
Alizarine dyestuffs:	<i>Reso flavine.</i> <i>Fast Mordant Yellow G, GI.</i>	<i>Gallo flavine.</i> <i>Mordant Yellow brands.</i>

Orange.

Acid dyestuffs:	<i>Orange G, II, R, N.</i>	
Substantive dyestuffs:	<i>Pyramine Orange 2 R.</i> <i>Pyramine Orange 3 G, R.</i>	<i>Cotton Orange G, R.</i>
One-bath chrome dyestuffs:	<i>Alizarine Orange</i> (processes No 5 or No 7, pages 17 and 21).	
Alizarine dyestuffs:	<i>Alizarine Orange</i> (aluminium or chrome mordant).	

Brown.

Substantive dyestuffs:	<i>Copper Brown.</i> <i>Oxamine Brown B, R.</i> <i>Cotton Brown RN, RVN.</i>	<i>Oxamine Dark Brown</i> <i>G, R.</i>
One-bath chrome dyestuffs:	<i>Palatine Chrome Brown brands.</i>	
Alizarine dyestuffs:	<i>Anthracene Brown.</i>	

Red.

Acid dyestuffs:	<i>Palatine Scarlet brands.</i> <i>Scarlet 3 RF, R,</i> <i>RR, 3 R.</i> <i>Sorbine Red, BB, G.</i> <i>Azocarmine brands.</i> <i>Palatine Red A.</i> <i>Wool Scarlet RS,</i> <i>RRS, 3 RS.</i>	<i>Wool Red G, R.</i> <i>Brilliant Carmine L.</i> <i>Mars Red G.</i> <i>Fast Red E.</i> <i>Acid Magenta brands.</i> <i>Acid Violet 4 RN.</i>
Basic dyestuffs:	<i>Rhodamine B, G, 3 G</i> (also the "extra" brands).	<i>Diamond Magenta</i> <i>brands.</i>
Eosine dyestuffs:	<i>Eosine brands.</i> <i>Phloxine brands.</i>	<i>Erythrosine brands.</i> <i>Rose Bengal brands.</i>
Substantive dyestuffs:	<i>Thiazine Red R.</i> <i>Oxamine Fast Red F</i> (also after-chromed). <i>Cotton Red 4B, 4BX,</i> <i>4B extra, 5B.</i>	<i>Oxamine Red.</i> <i>Cotton Rubine.</i> <i>Oxamine Claret M.</i>
One-bath chrome dyestuffs:	<i>Alizarine Red S</i> (process No 5, page 17).	<i>Palatine Chrome Red</i> <i>B, R.</i> <i>Palatine Chrome Claret.</i>

Alizarine
dyestuffs: *Alizarine Red S.* *Alizarine Maroon*
Alizarine Red WB, (aluminium or
WR paste chrome mordant).
(aluminium mordant).

Blue. Dark Blue.

Acid dyestuffs: *Fast Blue greenish, RR.* *Cyananthrol BGA, BA,*
Indigo Carmine brands. *R, RB.*
Indigotine brands. *Anthracene Blue*
Ethyl Blue B. *SWG extra.*
Neptune Blue brands. *Brilliant Anthrazurol, G.*
Neptune Marine Blue *Anthraquinone Blue*
brands. *SR extra paste,*
SR extra powder.

Substantive
dyestuffs: *Oxamine Blue B, BG,*
3B, 3R, 4R, A.

Basic
dyestuffs: *Victoria Blue B, 4R, R.* *Victoria Pure Blue B.*
Night Blue.

One-bath
chrome
dyestuffs: *Cyananthrol R, RB.* *Palatine Chrome Blue*
Anthraquinone Blue *brands.*
SR extra paste, *Chrome Blue A, R.*
SR extra powder.

Alizarine
dyestuffs: *Alizarine Blue.* *Alizarine Dark Blue.*
Alizarine Indigo Blue. *Anthracene Dark Blue.*
Anthracene Blue. *Cyananthrol R, RB, G.*
Anthraquinone Blue SR extra paste, SR extra powder.

Indigo: *Indigo pure B. A. S. F. brands for wool.*

Violet.

Acid dyestuffs: *Anthraquinone Violet.* *Acid Violet brands.*

Substantive
dyestuffs: *Oxamine Violet.*

Basic
dyestuffs: *Methyl Violet brands.* *Crystal Violet.*

One-bath
chrome
dyestuffs: *Palatine Chrome Violet.* *Anthraquinone Violet.*

Alizarine
dyestuffs: *Galleine.* *Gallocyanine.*

Green. Olive.

Acid dyestuffs: *Wool Green S.* *Anthraquinone Green*
Agalma Green B. *G X N.*
Neptune Green S G.

Substantive
dyestuffs: *Oxamine Green B.*

One-bath
chrome
dyestuffs: *Anthraquinone Green G X N.*

Alizarine
dyestuffs: *Alizarine Green.* *Coeruleine.*
Anthraquinone Green
G X N.

Black.

Acid dyestuffs: *Induline N N.* *Nigrosine W.*
Ethyl Black brands.

Substantive
dyestuffs: *Oxamine Black A, N, R, R N, B H.*

One-bath
chrome
dyestuffs: *Palatine Chrome Black* *Corvan Black brands.*
brands. *Diamond Black brands.*

Alizarine
dyestuffs: *Diamond Black brands.*

Fastness to washing.

The fastest colouring matters in this respect are the single-bath chrome dyestuffs and Alizarine dyestuffs, given on page 68 under "Fastness to milling," as well as the brands of Indigo suitable for wool. In addition to these products, the following are the fastest of the classes to which they belong:

Yellow.

Acid dyestuffs: *Asoflavine brands.* *Quinoline Yellow, extra.*
 Substantive
 dyestuffs: * *Cotton Yellow G I.* *Pyramine Yellow G, R.*

Orange.

Acid dyestuffs: *Orange R.*
 Substantive
 dyestuffs: * *Pyramine Orange RR* *Cotton Orange G, R.*
 (also after-chromed). *Pyramine Orange 3 G, R.*

Brown.

Substantive
 dyestuffs: *Cotton Brown RN.* *Oxamine Brown B, R.*

Rose. Red. Crimson. Claret.

Acid dyestuffs: *Wool Red G, R.* *Fast Red AV.*
Brilliant Carmine L. *Fast Scarlet B.*
 Substantive
 dyestuffs: *Cotton Red 4 B, 4 B X,* * *Oxamine Red.*
4 B extra, 5 B. * *Oxamine Garnet M.*
 * *Oxamine Fast Red F.* * *Oxamine Fast Claret*
 * *Oxamine Claret M.* *B, G.*

Basic
dyestuffs: *Rhodamine G, B* *Diamond Magenta*
(also the "extra" brands). *brands.*

Eosine
dyestuffs: *Eosine brands.* *Rose Bengal brands.*
Erythrosine brands. *Phloxine brands.*

Violet.

Acid dyestuffs: *Acid Violet 4RN.* *Acid Violet 4BN, 4BL,*
Alkali Violet brands *4BC.*
(process No 3, page 14).

Basic
dyestuffs: *Methyl Violet brands.* *Crystal Violet.*

Blue.

Acid dyestuffs: *Neptune Blue B.* *Cyananthrol BA, BGA.*
Cyananthrol RA. *Neptune Blue BG.*
Brilliant Anthrazurol, G.

Substantive
dyestuffs: *Oxamine Blue B.*

Basic
dyestuffs: *Victoria Blue B, 4R, R.* *Victoria Pure Blue B.*

Green.

Acid dyestuffs: *Agalma Green B.* *Neptune Green SG.*

Substantive
dyestuffs: *Oxamine Green B.*

Note: The fastness to washing of the dyestuffs marked * can be increased by chroming after dyeing.

Fastness to potting.

The following are the fastest of their kind in this respect:

Yellow.

One-bath chrome dyestuffs:	Fast Mordant Yellow <i>G, GI.</i>	<i>Mordant Yellow brands.</i>
Alizarine dyestuffs:	Resofovine.	Gallofovine.

Orange. Brown.

One-bath chrome dyestuffs:	Palatine Chrome Brown <i>W, R, WG, WN.</i>	<i>Alizarine Orange</i> (process No 5, page 17).
Alizarine dyestuffs:	Alizarine Orange.	

Red. Claret.

One-bath chrome dyestuffs:	<i>Alizarine Red S</i> (process No 5, page 17).	
Alizarine dyestuffs:	Alizarine Red S on chrome mordant (after-chromed).	<i>Alizarine Red brands</i> on chrome mordant (after-chromed, page 17).

Bluish Green. Dark Blue.

One-bath chrome dyestuffs:	<i>Anthracene Blue SWGG, SWGG extra.</i>	
Alizarine dyestuffs:	* Alizarine Blue. * Alizarine Dark Blue.	<i>Anthracene Blue</i> on chrome mordant (after-chromed).
Indigo:	Indigo pure B. A. S. F. brands for wool.	

Green. Olive.

Alizarine
dyestuffs: * *Coeruleine.* * *Alizarine Green.*

Violet.

Alizarine
dyestuffs: * *Galleine.* *Gallocyanine.*

Black Blue. Black.

One-bath chrome
dyestuffs: *Alizarine Blue Black W,* *Alizarine Blue Black*
W extra. *WB extra.*
* *Corvan Black brands.* *Alizarine Black WX*
* *Brilliant Alizarine* *extra.*
Black.

Alizarine
dyestuffs: * *Alizarine Black.* *Palatine Chrome Black*
* *Brilliant Alizarine* *brands.*
Black.

Note. The dyestuffs marked with an asterisk do not stain white wool, and of these *Alizarine Black* and *Brilliant Alizarine Black* are particularly good.

Behaviour of the wool dyestuffs towards white cotton in milling.

The following are the dyestuffs which are least inclined to bleed into white cotton in milling:

Yellow. Orange.

One-bath
chrome

dyestuffs:	<i>Fast Mordant Yellow G, G I. Mordant Yellow brands.</i>	<i>Alizarine Orange (orange brown) (process No 7, page 21).</i>
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Alizarine

dyestuffs:	<i>Galloflavine.</i>	<i>Resoflavine.</i>
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Brown.

One-bath
chrome

dyestuffs:	<i>Palatine Chrome Brown W, G, R, WG, WN.</i>
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Red.

Acid dyestuffs:	<i>Brilliant Carmine L.</i>
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One-bath
chrome

dyestuffs:	<i>Palatine Chrome Red B.</i>	<i>Alizarine Red S (process No 5, page 17).</i>
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Violet.

Acid dyestuffs:	<i>Acid Violet 3BN, 4BL, 4BC, 4RN, 6BN.</i>
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One-bath
chrome

dyestuffs:	<i>Anthraquinone Violet.</i>	<i>Palatine Chrome Violet.</i>
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Alizarine

dyestuffs:	<i>Galleine. Anthraquinone Violet.</i>	<i>Gallocyanine.</i>
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Blue.

Acid dyestuffs: *Neptune Blue B.*

One-bath
chrome
dyestuffs: *Palatine Chrome Blue brands.* *Anthraquinone Blue SR extra paste, SR extra powder.*

Alizarine
dyestuffs: *Alizarine Blue.* *Alizarine Indigo Blue.*

Indigo: *Indigo pure B. A. S. F. brands for wool.*

Green.

Acid dyestuffs: *Neptune Green S G.* *Agalma Green B.*
Wool Green S.

One-bath
chrome
dyestuffs: *Anthraquinone Green G X N.*

Alizarine
dyestuffs: *Alizarine Green.* *Coeruleine.*
Anthraquinone Green G X N.

Black Blue. Black.

One-bath
chrome
dyestuffs: *Coroan Black brands.* *Alizarine Blue Black WB extra.*
Alizarine Black WX extra. *Palatine Chrome Black brands.*
Brilliant Alizarine Black. *Diamond Black F, N G.*

Alizarine
dyestuffs: *Alizarine Black WX extra.* *Brilliant Alizarine Black.*

Behaviour of the wool dyestuffs towards white cotton effect threads when dyed in an acid bath.

The following dyestuffs have the least staining effect on cotton fancy threads in woollen piece-goods:

Yellow.

Acid dyestuffs:	<i>Naphthol Yellow S.</i> <i>Fast Yellow G, Y.</i> <i>Tartrazine.</i>	<i>New Fast Yellow R.</i> <i>Metanil Yellow.</i>
One-bath chrome dyestuffs:	<i>Mordant Yellow G, R,</i> <i>G T, G G T.</i> <i>Fast Mordant Yellow G,</i> <i>G I.</i>	<i>Mordant Yellow 3 R.</i>
Alizarine dyestuffs:	<i>Reso flavine.</i> <i>Gallo flavine.</i> <i>Fast Mordant Yellow G,</i> <i>G I.</i>	<i>Mordant Yellow G, R,</i> <i>G T.</i> <i>Mordant Yellow G R, 3 R.</i>

Orange.

Acid dyestuffs:	<i>Orange G.</i>	<i>Orange II, N.</i>
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Brown.

One-bath chrome dyestuffs:	<i>Palatine Chrome Brown R, W G.</i>
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Red.

Acid dyestuffs:	<i>Acid Magenta S.</i> <i>Acid Rhodamine brands.</i> <i>Mars Red G.</i> <i>Azocarmine B X.</i> <i>Palatine Scarlet A.</i> <i>Scarlet 6 R.</i> <i>Scarlet brands.</i>	<i>Wool Scarlet brands.</i> <i>Naphthol Red brands.</i> <i>Fast Red B.</i> <i>Palatine Red A.</i> <i>Cochineal Red A.</i> <i>Crystal Scarlet.</i> <i>Sorbine Red B B.</i>
One-bath chrome dyestuffs:	<i>Palatine Chrome Red B.</i> <i>Alizarine Red S</i> (processes No 5 and No 7, pages 17 and 21).	
Alizarine dyestuffs:	<i>Alizarine Red S</i> on aluminium or chrome mordant.	

Violet.

Acid dyestuffs: *Acid Violet BN, 3BN, 4BL, 4BC, 4BS, PW, 4RN.*
Ethyl Acid Violet S4B.

One-bath
chrome
dyestuffs: *Palatine Chrome Violet. Anthraquinone Violet.*

Blue.

Acid dyestuffs: *Cyananthrol BGA, Wool Blue R, SL,*
BA, RA, RB. SL extra.
Brilliant Anthrazurol G. Wool Marine Blue BN.
Neptune Blue BG, B. Neptune Blue R.

One-bath
chrome
dyestuffs: *Cyananthrol G, RB, R. Palatine Chrome Blue B,*
Chrome Blue A, R. BB, R (in not too dark
shades).

Alizarine
dyestuffs: *Anthracene Blue brands*
(only in light shades).

Green.

Acid dyestuffs: *Light Green brands. Wool Green S.*
Acid Green GB. Neptune Green SG,
Agalma Green B. SBN.

One-bath
chrome
dyestuffs: *Anthraquinone Green GXN*
(process No 5, page 17).

Black.

Acid dyestuffs: *Palatine Black S, Ethyl Black 3B, T, 3BN.*
SS, SF. Agalma Black brands.
Brilliant Black B.

One-bath
chrome
dyestuffs: *Palatine Chrome Black Corvan Black brands.*
S, SR, ST, STN.

- Notes.**
- a) The purest white is obtained as a rule by dyeing, when possible, in a strongly acid bath.
 - b) The result depends also, to a certain extent, on whether the dyestuffs are used for light or dark shades. In the latter case, there is some danger that the white may be slightly tinged.

Fastness to decatizing (fastness to ironing).

The following are the fastest dyestuffs to normal decatizing (dry decatizing):

Besides the brands of *Indigo pure B. A. S. F.* for wool, mentioned on pages 40 and 45, all the *One-bath chrome* and *Alizarine dyestuffs* given on pages 19 and 30.

With regard to the two latter classes it must be noted that the

Anthracene Blue, Chrome Blue and
Palatine Chrome Blue brands

turn greener when strongly decatized, and that

Palatine Chrome Brown W

turns slightly yellower; but they fully satisfy all the usual requirements.

Of the Aniline dyestuffs, all those acid and basic dyestuffs given on page 9, as well as the substantive dyestuffs suitable for wool, withstand the normal treatment. The following, however, are less suitable:

Acid Magenta brands, Alkali Blue brands,
Auramine brands and *Diamond Green brands,*

and care is necessary, when they have been used.

With regard to the fastness of the dyestuffs to hot ironing, it may be said that all those which are fast to decatizing are, in general, satisfactory in this respect also.

Colouring matters for wool, the dyeings of which give the Indigo test when spotted with nitric acid.

Besides *Indigo pure B.A.S.F.* dyeings produced with the following dyestuffs also give a yellow spot with concentrated *nitric acid*:

Yellow.

Acid dyestuffs: *Tartrazine, H* (the shade remains almost unchanged).

Orange.

Alizarine dyestuffs: *Alizarine Red S, PS, Alizarine Orange*
(all on an alumina mordant).

Red.

Acid dyestuffs: *Sorbine Red G.* *Cochineal Red A.*
Mars Red G. *Palatine Scarlet A.*

Eosine dyestuffs: *Naphthol Red S, G.* *Acid Magenta S.*

Rose Bengal AT. *Erythrosine IN.*
Phloxine BB.

Alizarine dyestuffs: *Alizarine Red PS, S* *Alizarine Orange SW*
(chrome mordant). (chrome mordant).

Blue.

Acid dyestuffs: *Neptune Blue BG, B* *Soluble Blue*
(with a greenish rim). (greenish spot, which slowly
turns yellow).

Basic dyestuffs: *Victoria Blue R, B*
(with a greenish rim).

Alizarine dyestuffs: *Alizarine Blue SW, WX, XA.*

Violet.

Acid dyestuffs: *Acid Violet 4BL.*
Alkali Violet 6BN (with a greenish rim)
(process No 3, page 14).

Black.

One-bath
chrome
dyestuffs: *Palatine Chrome Black L, 6B.*

Cotton

COTTON.

The preparation of cotton before dyeing.

1. Boiling out and washing.

Boil out the **yarn**, in the form of $\frac{1}{2}$ —1 lb. hanks or bundles, or warps of 2, 5 or 10 lbs., in water to which has been added 1 lb. soda-ash, using open wooden vessels or, as is usual on the large scale, under pressure. Then wash with clean water.

— For 100 lbs. yarn. —

Boil **piece-goods** with water and soda as above either under pressure, or (on the small scale) in the jigger, or even on the winch. Then rinse thoroughly.

Loose cotton is dyed just as it comes from the bale.*)

2. Bleaching.

Having thoroughly boiled out and rinsed the cotton, bleach it, as given below, previous to dyeing delicate, bright shades.

*) Loose cotton must be boiled out in the same way as yarn when Indanthrene dyestuffs are used.

Bleaching with chlorine (bleaching powder).

Example of the method of working on the
small scale.

Make 5½—9 lbs. good bleaching powder ("chloride of lime") into a thin paste in an earthenware vessel, or in a wooden tub, or, preferably, use a wet grinding mill. Thin the paste gradually by slowly stirring in more water, let it stand for a time and run off, by means of cocks, the supernatant liquor, which is now clear and yellowish. Treat the thick paste left behind with more water as before, run off the clear liquor again, add it to the first lot, and make up the whole with water to about 160 gallons in a wooden beck.

Then enter the damp yarn, which has previously been boiled out, into this cold bleaching bath, turn a few times and leave it in overnight. Next morning, let the yarn drain off and neutralise it by passing five or six times through a fresh bath containing about 9—10 lbs. (= 4—4½ pints) sulphuric acid 168° Tw. per 175—200 gallons water. Finally rinse well.

If the goods are not yet as white as desired, repeat the whole process.

Then prepare a fresh bath (the so-called "antichlor bath") with 175—200 gallons water, and dissolve in it about 2¼ lbs. hyposulphite of soda (sodium thiosulphate), also called "antichlor". Turn the yarn about six times and then rinse.

— For 100 lbs. cotton yarn. —

Notes. a) In many dye-houses, it may be mentioned, the third (antichlor) bath is omitted, but this often has an unfavourable effect on the strength of the yarn.

- b) Chloride of lime can be converted into sodium hypochlorite (Eau de Javelle) by the process given on page 321. The solution of sodium hypochlorite can be used with advantage in the bleaching process, as the yarn retains its soft feel.

Cotton can also be bleached with sodium superoxide, hydrogen peroxide or potassium permanganate, like wool, (see page 6), but these methods offer no special advantage.

3. Mercerising.

Cotton is mercerised in order to impart to it a lustre similar to that of silk. For this process Egyptian cotton is specially suitable. The process is briefly as follows, lack of space, however, preventing details being given.

The cotton is treated in a stretched condition for a short time in a strongly alkaline bath (caustic soda), observing certain precautions such as keeping the bath cool. The material is then rinsed, soured in a fresh cold bath and dried or dyed.

Note: By mercerising, the affinity of the cotton for colouring matters and mordants of all kinds is increased, that is, to produce a certain shade less dyestuff is required than for ordinary cotton.

The dyeing processes are, in general, the same as those for ordinary cotton.

Processes for dyeing cotton
with
substantive (direct) dyestuffs.

1. Dyeing in a hot bath.
2. Dyeing in a cold bath.
3. Dyeing in a strongly alkaline bath
(for Cotton Red S).
4. Diazotising and developing substantive
dyestuffs.
5. Coupling of substantive colours with Para-
nitraniline or Nitrosamine Red paste.
6. After-treatment of substantive colours with
metallic salts or formaldehyde.

Appendix: Suitable selection of substantive
dyestuffs for current shades.

Dyeing direct in a hot dye-bath
with substantive (direct)
colouring matters.

Process N° 20.

Enter the cotton into the bath, which should be as concentrated as possible, and work at the boil for 1—1½ hours, adding 5—30 lbs. cryst. Glauber's salt (or half as much calcined Glauber's salt) or 2½—10 lbs. common salt.

— For 100 lbs. cotton. —

Notes. a) Besides Glauber's salt and common salt, the addition of 2—7 lbs. soda-ash to the bath is generally of advantage, but in the case of the dyestuffs given below, marked *f*, this addition must not be made.

Thiazine Red G, R, Cotton Orange G and R, Sulphine A, N, NN, Thiazine Brown R, G are best dyed with addition of common salt.

Cotton Yellow GI, GR, GRR, Oxamine Green D, M, MN give the brightest and purest tones when dyed with 1—3 lbs. sodium phosphate in addition to salt or Glauber's salt.

b) If difficulties in levelling are met with, the quantity of Glauber's salt must be decreased or this addition entirely omitted. In this respect, the addition of soap, Turkey red oil, Monopole soap, etc., is often of assistance. By using old baths for further lots, some saving of dyestuff (up to about one-third) can be effected when dyeing dark shades.

c) The dyestuffs marked with an asterisk can be made much faster by after-treatment with copper sulphate, but the shade is always made duller by this treatment (process, see page 111).

d) Substantive dyestuffs are often topped with basic colouring matters in order to produce brighter shades. For the method of working see page 126.

The following are suitable substantive dyestuffs:

Yellow.

<i>Sulphine A, N, NN.</i>	<i>Pyramine Yellow G, R.</i>
* † <i>Cotton Yellow G, GI, GR,</i> <i>GRR.</i>	* <i>Cotton Yellow R.</i>

Orange.

<i>Pyramine Orange 3G, R, RR.</i>	† <i>Cotton Orange G, R.</i>
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Brown.

* <i>Thiazine Brown G, R.</i>	<i>Oxamine Brown MN, MNI,</i>
<i>Cotton Brown G, RN, RV,</i>	<i>G, GR, 3G.</i>
<i>RVN, GNI.</i>	<i>Oxamine Dark Brown G, R.</i>
* <i>Oxamine Brown B, R.</i>	<i>Copper Brown.</i>
	* <i>Oxamine Maroon.</i>

Red. Claret.

<i>Cotton Red 4B, 4BX,</i>	<i>Cosmos Red, extra.</i>
<i>4B extra, 5B.</i>	<i>Oxamine Claret M, B.</i>
<i>Thiazine Red G, R.</i>	<i>Cotton Corinth G.</i>
* <i>Oxamine Red.</i>	<i>Cotton Rubine.</i>
<i>Oxamine Red 3B.</i>	<i>Oxamine Garnet M.</i>
<i>Oxamine Fast Red F.</i>	
<i>Oxamine Fast Claret B, G.</i>	

Violet.

Oxamine Violet.

Blue.

Oxamine Blue 3R, 4R, *Phenamine Blue G.*
RXN, 3B, GN, AR. *Oxamine Dark Blue BG,*
** Oxamine Blue G, B, BG, A.* *R, BR, M, MN.*
Oxamine Pure Blue 5B, 5BX. ** Oxamine Copper Blue RR.*

Green.

*† * Oxamine Green D, M, MN.* *Oxamine Dark Green M.*
Oxamine Green B, G. ** Oxamine Dark Green MN.*

Black.

Cotton Black 3B, B, BN, BG, G, GG, 3G, C.
** Cotton Black R, E extra, RW extra, PF extra, BGN, BGNX.*
Oxamine Black A, N, R, RN, RR, BH.
Violet Black.
Grounding Black for Cotton.
Cotton Milling Black.

Dyeing in a cold dye-bath with substantive colouring matters.

Process N° 21.

Stir the dyestuff with an equal quantity by weight of caustic soda (70–76° Tw.) and dissolve the whole in boiling water. Enter the cotton into the bath when cold or lukewarm, and dye with the addition of a little soap, and, if necessary, Glauber's salt.

Suitable dyestuffs are:

- Yellow.** *Cotton Yellow G, GI, GRR, R.*
Pyramine Yellow G.
- Orange.** *Pyramine Orange 3G, RR, R.*
- Brown.** *Cotton Brown G, RV, RN (copper colour).*
Oxamine Brown G.
- Red.** *Cotton Red 4B, 4BX, 4B extra.*
Cosmos Red, extra.
Thiazine Red R.
Oxamine Red.
Oxamine Fast Red F.
Oxamine Claret M.
Oxamine Fast Claret B.
Cotton Rubine.
- Blue. Violet.** *Oxamine Blue 3R, 4R, BG, 3B, B, RX.*
- Bluish Grey.** *Oxamine Black brands*
(Oxamine Black RR is less suitable).
- Oxamine Dark Blue R.*

Substantive colouring matters which
dye from a strongly alkaline bath.

(Cotton Red S.)

Process N^o 22.

Mix the dyestuff with about twice as much caustic soda (76^o Tw.) and make the whole into a paste by stirring thoroughly with a little hot water. Then pour in boiling water till complete solution is effected.

Prepare the first bath, which should be as concentrated as possible (about 150 gallons), with the colouring matter dissolved as above, add 140 lbs. common salt and dye at the boil for $\frac{1}{2}$ —1 hour. Wring, or squeeze out, and rinse slightly.

— For 100 lbs. cotton yarn. —

- Notes.* a) When using the dye-bath for further lots, about three-quarters of the amount of colouring matter first used is necessary, and sufficient common salt must be added to replace the amount lost in taking out the yarn.
- b) Somewhat brighter shades are obtained by souring, after dyeing, in a fresh bath containing 6—10 lbs. of sulphuric acid 168^o Tw. in every 200—220 gallons.

Further development of substantive dyestuffs on the fibre.

The fastness to washing of many substantive dyeings, especially as regards bleeding into white, is considerably increased by this process.

A. Diazotisable Dyestuffs. — Developed Colours.

Process N^o 23.

Dye the cotton as directed in process 20, page 101, rinse, and then treat for about $\frac{1}{2}$ hour in a fresh, cold diazotising bath. For medium shades this bath should contain about 3 lbs. sodium nitrite and either $8\frac{1}{4}$ lbs. hydrochloric acid 32° Tw., or $5\frac{1}{2}$ lbs. sulphuric acid 168° Tw. Then rinse the cotton at once in cold water, acidified with hydrochloric or sulphuric acid, and enter it immediately into the cold developing bath. For medium to dark shades this bath should contain on the average 1— $1\frac{1}{2}$ lbs. developer.

— For 100 lbs. cotton yarn. —

Note. When carrying out the diazotising operation, direct sunlight must be avoided as it has an injurious effect.

When working further with old baths, only about $\frac{3}{4}$ of the original quantities need be taken.

Colouring matters which can be developed are :

Sulphine A, N, NN.

Oxamine Violet.

Oxamine Brown B, R.

Oxamine Blue 4R, 3R, BG.

Oxamine Black A, N, R, RN, RR, BH.

Cotton Black RW extra, E extra.

Developers are:

Alpha-Naphthol.
Beta-Naphthol.
Oxamine Developer B, R, M.

Further for *Sulphine*

Orange Developer R.
Phenol.
Resorcin.
Soda or bleaching powder. (Compare notes f and g.)

- Notes.*
- a) Oxamine Developer B dissolves in hot water without difficulty.
 - b) To dissolve Oxamine Developer R, the addition of a small quantity of hydrochloric acid ($\frac{1}{5}$ of the weight of the developer) is necessary.
 - c) To dissolve Alpha- and Beta-Naphthol, stir up with an equal weight of caustic soda (75° Tw.) and a little hot water. Phenol and Resorcin require about half their weight of caustic soda.
 - d) In working with Oxamine Developer M and Orange Developer R, 1—3 lbs. soda-ash may profitably be added to the developing bath.
 - e) The Oxamine Developers B, R, M, and Orange Developer R may be used in conjunction with Beta-Naphthol, in which case the developers should be dissolved separately and mixed shortly before use in the developing bath.
 - f) When developing with soda, the cotton is turned, after diazotising and allowing to drain, five or six times in a warm bath containing 1—2 lbs. soda-ash, and is then rinsed.
 - g) When developing with bleaching powder, the same method of working is adopted, using a cold chloride of lime bath ($\frac{1}{8}$ ° Tw.) instead of soda.
 - h) By after-treatment with copper sulphate, according to process 1, page 111), the fastness, especially to light, can be more or less increased, but the shade is always dulled thereby.

The following colours can be obtained :

Yellows :

- with *Sulphine* + Phenol.
- » *Sulphine* + soda development.
 - » *Sulphine* + bleaching powder development.
(See notes f and g.)

Oranges :

- with *Sulphine* + Orange Developer R.

Browns :

- with *Sulphine* + Resorcin.
- » *Sulphine* + Oxamine Developer M.
 - » *Oxamine Brown B* + Beta-Naphthol.
 - » *Oxamine Brown R* + Beta-Naphthol.
 - » *Oxamine Brown B* + Oxamine Developer M.
 - » *Oxamine Brown R* + Oxamine Developer M.

Reds :

- with *Sulphine* + Beta-Naphthol.

Clarets :

- with *Sulphine* + Oxamine Developer B.
- » *Sulphine* + Alpha-Naphthol.

Full blue shades :

- with *Oxamine Violet* + Beta-Naphthol.
- » *Oxamine Blue 4R* + Beta-Naphthol.
 - » *Oxamine Blue 3R* + Beta-Naphthol.
 - » *Oxamine Blue BG* + Beta-Naphthol.

Full shades of blue similar to indigo :

- with *Oxamine Violet* + Oxamine Developer B or R.
- » *Oxamine Blue 4R* + Oxamine Developer B or R.
 - » *Oxamine Blue 3R* + Oxamine Developer B or R.
 - » *Oxamine Blue BG* + Oxamine Developer R.
(The last combination gives Blues with a coppery lustre.)

Black Blues :

- with *Oxamine Black brands* + Beta-Naphthol.
» *Oxamine Black brands* + Oxamine Developer R.

Blacks :

- with *Oxamine Black brands* + Oxamine Developer M.
» *Cotton Black E extra* + Oxamine Developer M.
» *Cotton Black RW extra* + Oxamine Developer M.
» *Cotton Black E extra* + Beta-Naphthol.
» *Cotton Black RW extra* + Beta-Naphthol.

B. Coupled Colouring matters.

(After-treatment with Paranitraniline, etc.)

Process N^o 24.**1. Method of working with Paranitraniline.**

Example for medium shades.

Make 8½ oz. *Paranitraniline* (0.5—0.6 % on the weight of the cotton) into a paste with an equal quantity of hot water; after a short time add 1—1½ pints of cold water and 24½ oz. hydrochloric acid 32° Tw., and let the mixture stand, stirring occasionally, till a temperature of 68° F. is reached. Stir in 1½—2 lbs. of broken ice and then add immediately, all at once, 4½ oz. solid sodium nitrite, taking care that the temperature does not rise above 50° F.

Pour this diazo-solution into the bath, which has been filled with cold water, stir slowly and add a solution of 22 oz. crystallised sodium acetate. Then enter the cotton, which has previously been dyed with substantive colouring matters and rinsed, by process 20, page 101, develop by working for about ½ hour and rinse thoroughly.

— For 100 lbs. cotton yarn. —

2. Method of working with Nitrosamine Red paste.

Mix together 3¼ lbs. of *Nitrosamine Red paste* and 5½ gallons cold water, and pour in slowly, while stirring, 1 lb. 5 oz. hydrochloric acid 32° Tw. After allowing to stand for about ½ hour, pour the mixture into the cold coupling bath and add a solution of 1 lb. 5 oz. sodium acetate just before use. Enter the cotton, which has previously been dyed with direct colours, and finish as given under 1.

— For 100 lbs. cotton yarn. —

Notes to 1 and 2.

- a) When developing paler or darker shades, the amount of Paranitraniline used can be correspondingly decreased or increased, but it must be very carefully noted that the relative proportions of the chemicals used must remain constant.
- b) The fastness to light and washing can generally be increased by a treatment in the developing bath, after combination has taken place, or in a separate bath, with 1½—3¼ lbs. of copper sulphate for ½ hour in the cold.
- c) The following colouring matters may be used in the bath to alter the shade, but they do not themselves combine with the Paranitraniline, etc., nor is their shade altered to any marked extent:

Pyramine Yellow R, G, Cotton Yellow R, Pyramine Orange R, RR, Cotton Brown RN, Thiazine Brown G, R, Thiazine Red G, Cotton Corinth G.

The following colouring matters are suitable for the coupling processes 1 and 2:

Yellow.	<i>Cotton Yellow G, GI.</i>
Orange.	<i>Pyramine Orange 3G.</i>
Red.	<i>Oxamine Red.</i>
Brown.	<i>Oxamine Maroon.</i> <i>Oxamine Brown 3G, B, R.</i>
Grey. Green.	<i>Oxamine Blue BG.</i>
Black.	<i>Cotton Black brands.</i>

After-treatment of direct dyeings with metallic salts.

(By treatment of this kind many dyeings gain in fastness
to light and washing.)

1. After-treatment with copper sulphate. (After-coppering.)

Treat the cotton, which has been dyed and rinsed, for
15—30 minutes in a cold bath, or at a temperature of not
more than 140° F., with 2—4 lbs. copper sulphate, and rinse.

— For 100 lbs. cotton. —

Note. When using hard water, 2—3 lbs. acetic acid 9° Tw.
(30%), according to the hardness, should be added to
the bath.

The products mentioned below are suitable for this treat-
ment; those marked with an asterisk gain chiefly in fastness
to washing and the others in fastness to light.

Yellow.

* Cotton Yellow G, GI, GR, GRR, R.

Brown.

* Oxamine Brown B, R.

* Copper Brown.

* Oxamine Maroon.

Thiazine Brown G, R.

Oxamine Brown M.

Red. Claret.

* *Oxamine Red.* *Oxamine Garnet M.*
Oxamine Claret M.

Violet.

Oxamine Violet.

Blue. Dark Blue.

* *Oxamine Blue G.* *Oxamine Copper Blue RR.*
Oxamine Blue A, B, BG. *Oxamine Dark Blue BG, R,*
Phenamine Blue G. *BR, M, MN.*

Green. Dark Green.

* *Oxamine Green D, MN, M.* *Oxamine Dark Green M.*
* *Oxamine Dark Green MN.*

Black.

Cotton Black E extra, RW extra, BGN, BGNX, PF extra.
(The shade alters towards reddish brown through after-coppering).

**2. With potassium bichromate — copper sulphate —
acetic acid.**

(After-chroming.)

Work the cotton, which has previously been dyed and rinsed, for 15—30 minutes at about 140° F. in a bath, containing

2 lbs. copper sulphate
2 » potassium bichromate
3 » acetic acid 9° Tw. (30%),

and rinse.

— For 100 lbs. cotton. —

The following dyestuffs are specially suitable for after-chroming:

Yellow. *Cotton Yellow GI, R.*

Brown. *Oxamine Brown B, R. Oxamine Maroon.*

Red. *Oxamine Red.*

Blue. *Oxamine Blue B G.*

3. With chromium fluoride.

Treat the cotton, which has been dyed and rinsed, for about $\frac{1}{2}$ hour in a boiling bath containing

3—4 lbs. chromium fluoride

2—3 » acetic acid 9° Tw. (30%),

and rinse well.

— For 100 lbs. cotton. —

This treatment is to be recommended for:

Red. *Oxamine Fast Red F.*

After-treatment of direct dyeings with formaldehyde.

(The fastness to washing of direct dyeings is improved by this treatment.)

Method of working:

Treat the goods, which have been dyed with direct dyestuffs and rinsed, for $\frac{1}{2}$ hour at about 90° F. with

3 lbs. formaldehyde 30 %

2—3 » acetic acid 9° Tw. (30 %),

and rinse.

— For 100 lbs. cotton. —

The following are suitable dyestuffs:

Yellow. *Pyramine Yellow R.*

Brown. *Oxamine Brown B, R.*

Dark Blue. *Oxamine Black RR.*

Black. *Cotton Black E extra, RW extra, BGN X, PF extra
BGX (the best).*

Guide to the selection
of substantive (direct) dyestuffs for
shades generally in demand.

Fashionable colours.

Only those direct dyestuffs, which readily dye level either as self-colours or in combinations, come into consideration. They are:

<i>Pyramine Yellow R, G.</i>	<i>Oxamine Brown 3 G.</i>
<i>Cotton Orange G, R.</i>	<i>Cotton Brown RN.</i>
<i>Thiazine Red R, G.</i>	<i>Oxamine Black BH, R, RN,</i>
<i>Thiazine Brown R, G.</i>	<i>A, N.</i>

Sky-blue.

Oxamine Pure Blue 5 B, 5 BX, 6 B, or Oxamine Blue 3 B, in light shades, if desired, brightened in a fresh bath or in the rinsing water by topping with a basic blue (Methylene Blue or Victoria Pure Blue B or Victoria Blue B) or green (Diamond Green), according to process No 28, page 126.

Medium Blue. Dark Blue.

For medium blues the medium tones of the *Oxamine Blue* brands as self shades can be used; for instance, *Oxamine Blue B, A, 3 B, GN, BG, RXN, Oxamine Copper Blue RR.*

Oxamine Dark Blue BG, R, BR, MN, etc. are suitable for dark blues, and for darkening the shade either the *Oxamine Black* brands (e. g. *BH, R, RN, A, N*) or the *Cotton Black* brands (e. g. *E extra, RW extra, BGNX*).

Dyeings faster to washing than are obtained with the foregoing brands can be produced, with *Oxamine Blue 3 R, 4 R, B G, Oxamine Violet, etc.*, diazotised and developed

with Beta-Naphthol or Oxamine Developer B or R, and also with the *Oxamine Black* brands, e. g. *BH, R, RN, A, N*, diazotised and developed with Beta-Naphthol (see page 108).

Pink. Red. Scarlet. Crimson.

Pink is obtained from: *Thiazine Red R* (brightened, if desired, in the same bath with *Rhodamine S, 3G* or *6G* with the addition of 1 part acetic acid 9° Tw. (30%) to 1000 parts of liquor), or pale shades of *Oxamine Red* (cf. also process No 46, page 176).

Red and Crimson from: *Cotton Red 4B, 4BX, 4B extra, 5B, Cosmos Red, extra, Oxamine Fast Red F, Thiazine Red G, R, Oxamine Red, 3B, Cotton Rubine.*

Scarlet from: *Cotton Red 4B, 4BX, 4B extra* in combination with *Pyramine Orange RR, R.*

A red faster to washing is the one produced from *Sulphine A, N, NN* diazotized and developed with Beta-Naphthol (see page 108), or *Para Red* obtained from *Nitrosamine Red paste* or diazotised *Paranitraniline*, using processes Nos 38 and 39, pages 163–168.

Claret.

Claret shades are produced with *Oxamine Fast Claret B, G, Cotton Corinth, Oxamine Claret B, M, Oxamine Garnet M*, or with combinations of *Oxamine Red, Oxamine Fast Red F* and *Oxamine Black BH, R, RN, A, N, Cotton Black BGNX, E extra, RW extra.*

Shades faster to washing are produced with *Sulphine A, N, NN* diazotised and developed with Oxamine Developer B, or *Sulphine A, N, NN* in combination with *Oxamine Black BH, R, RN*, diazotised and developed with Beta-Naphthol (see page 108); also *Oxamine Red* after-coppered (process on page 111).

Also mixed shades from *Oxamine Red*, *Cotton Black BGNX*, *E extra*, *RW extra*, after-treated with *Paranitraniline* or *Nitrosamine Red* by process No 24, page 109.

Green. Dark Green (Olive).

Green shades are obtained from *Oxamine Green MN*, *D*, *G*, *B*, also from combinations of *Oxamine Pure Blue 5B*, *5BX* with *Cotton Yellow GI* or *Pyramine Yellow G*. Dark green and olive shades are obtained from *Oxamine Dark Green MN* and from combinations of *Oxamine Blue BG*, *Oxamine Black BH* with *Pyramine Yellow R* or *Pyramine Orange 3G*.

Shades faster to washing are given by mixtures of *Oxamine Blue BG*, *Cotton Yellow GI* or *R*, after-treated with copper sulphate (process 1, page 111), also by *Oxamine Blue BG*, either alone or in combination with *Cotton Yellow GI*, after-treated with *Nitrosamine Red* or *Paranitraniline*, and then, if desired after-coppered in the *Nitrosamine Red* or *Paranitraniline* bath using process No 24, page 109—110.

Brown.

The various brands of the following may be used: *Thiazine Brown*, *Cotton Brown*, *Oxamine Brown*, *Oxamine Dark Brown*, shaded, if necessary, with *Pyramine Yellow R*, *G*, *Pyramine Orange 3G*, *Thiazine Red R*, *G*, *Oxamine Red*, *Oxamine Fast Red F*, *Cotton Red 4B*, *4BX*, *4B extra*.

Also the following cheaper combinations:

- a) *Pyramine Orange 3G* or *Pyramine Yellow R*, *G* with *Cotton Red 4B*, *4BX*, *4B extra* or *Oxamine Red* and *Cotton Black BGNX*, *RW extra*, *E extra*; or *Oxamine Brown 3G* with *Cotton Black E extra*, *RW extra*, *BGNX*.
- b) *Oxamine Brown 3G*, *G*, *GR*, *Oxamine Dark Brown G*, *R*, shaded with *Pyramine Yellow R*, *Cotton Black BGNX*, *E extra*, *RW extra*.

Shades faster to washing are produced with the following combinations:

- a) *Oxamine Brown B, R* and *Cotton Yellow GI* or *R*, after-coppered according to process page 111.
- b) *Oxamine Blue BG, Oxamine Red* and *Cotton Yellow GI* or *R*, after-treated with copper sulphate—potassium bichromate—acetic acid by process No 2, page 112.
- c) *Oxamine Brown R, B*, diazotised and developed with *Oxamine Developer M*, or after-treated with *Nitrosamine Red paste* or *Paranitraniline* by process No 24 on page 109, and, if desired, after-coppered as in process 1, page 111.
- d) *Pyramine Orange 3G, Oxamine Brown 3B* or *Cotton Yellow GI* with *Oxamine Red* and *Cotton Black BGNX, E extra*, after-treated with *Paranitraniline* or *Nitrosamine Red paste* as in process No 24, page 109 and then, if desired, after-coppered as in process 1, page 111.

Grey.

Oxamine Black brands, e. g. *BH, R, RN, A, N, Cotton Black 3B* in pale shades, shaded with *Cotton Orange G, R, Pyramine Yellow R, Thiazine Red R, G, Thiazine Brown G, R*; also self-shades of the *Cotton Black* brands, e. g. *E extra, BGNX*, likewise in light shades (commencing dyeing carefully with the addition of soda, afterwards adding a little Glauber's salt).

Black.

The *Cotton Black* brands are useful for cheap shades.

Shades faster to washing are given by all the *Oxamine Black* brands diazotised and developed with *Oxamine Developer M*; also by the *Cotton Black* brands after-treated with *Paranitraniline* or *Nitrosamine Red paste* (process No 24, page 109, and, if desired, brightened with basic blue (*Methylene Blue*)). See process No 28, page 126.

The dyeing of cotton

with sulphur dyestuffs (Kryogene dyestuffs).

Dyeing with sulphur dyestuffs in a
warm sodium sulphide bath.

Dyeing with Kryogene Black in a
cold fermentation vat.

Sulphur dyestuffs employed for
dyeing cotton direct.
(Kryogene dyestuffs.)

Process N^o 25.

Add to the dyestuff the requisite quantities of sodium sulphide and soda (see note a below), pour boiling water over the whole, whilst stirring, and add this solution to the dye-bath — about 200 gallons —, to which common salt or Glauber's salt has previously been added.

Light shades are dyed for about 1 hour at 120° F. with the addition of 10—20 lbs. common salt (or Glauber's salt),

Dark shades and black with 50—60 lbs. common salt (or calcined Glauber's salt).

Then squeeze or ring out, so as to lose as little liquor as possible, and rinse well.

Detailed recipes will be found in the special pattern-cards in each case.

With regard to dyeing in the cold in a sodium sulphide bath see note f below.

— For 100 lbs. cotton. —

Notes. a) When dyeing the first four lots, it is advisable in each case to take as much concentrated sodium sulphide (or twice as much crystalline sodium sulphide) as dyestuff. For further lots take only half these quantities. To the first bath 5½ lbs. soda-ash should always be added, but to the old bath only ½—1 lb.

- b) When working with concentrated dyestuffs (marked in the following list with an asterisk) about 1½ times to twice as much conc. sodium sulphide (or 3—4 times as much cryst. sodium sulphide) should be added to the first bath.

This quantity is to be reduced after the third or fourth dyeing, as already mentioned under a, to about one-half.

- c) Difficulties met with in securing even dyeings (especially in pale shades) can be removed by adding 2—5 lbs. Turkey red oil F (about 50%), or by increasing the quantity of sodium sulphide.
- d) When working with *Kryogene Blue B, BX, BN, BNO, Kryogene Black Blue BGT, BGTO*, the shades must be developed, as described in detail in our special pattern-card (N° 388), by steaming in the presence of air, or by storing in a damp, warm place.
- e) Substantive and basic colouring matters are in general not suitable for simultaneous shading of the sulphur dyestuffs in the sodium sulphide bath; *Oxamine Red* and *Saffranine T extra* are, however, comparatively good. On the other hand, colouring matters of the classes named may be used for shading in a fresh bath after dyeing (e. g. *Cotton Blue BB* may be used for topping *Kryogene Black* to obtain shades similar to *Aniline Black*).

When topping in this way with basic colouring matters, it is a good plan, in order to ensure evenness, to add to the bath a sufficient quantity of acetic acid 9° Tw. (30%) or alum, and rinse the cotton well before entering. Cf. also process N° 28, page 126.

- f) The sulphur dyestuffs, except *Kryogene Blue B, BX, BN, BNO, Kryogene Black Blue BGT, BGTO* are also more or less suitable for dyeing in the cold.

Since, however, the liquor becomes less readily exhausted when working in this manner, the first bath should be prepared with twice the usual quantity of colouring matter. It may further be noted as a defect of the

cold process that tightly twisted yarns and thick materials are imperfectly dyed through and the dyeings to some extent wanting in fastness.

- g) *Kryogene Brown A* can be dyed without any addition of either sodium sulphide or soda.
- h) *Kryogene Black, Kryogene Blue B, BN, Kryogene Black Blue BGT* (not developed) are much used for bottoming for deep Indigo dyeings. In this case the cotton should first be dyed with, on an average, 3% *Kryogene Black TB* or *TG*, or 5% *Kryogene Blue B, BN* or *Kryogene Black Blue BGT*, and then rinsed and entered into the vat.

Suitable sulphur colouring matters (the brands marked * are concentrated):

Yellow.	<i>Kryogene Yellow G, R.</i> * <i>Kryogene Yellow GX, RX.</i>
Brown.	<i>Kryogene Brown G, RB, A.</i> * <i>Kryogene Brown GX, RBX.</i>
Olive.	<i>Kryogene Olive.</i> * <i>Kryogene Olive X.</i>
Blue.	<i>Kryogene Blue B, BN.</i> * <i>Kryogene Blue BX, BNO.</i> <i>Kryogene Black Blue BGT.</i> * <i>Kryogene Black Blue BGT O.</i> <i>Kryogene Direct Blue G, B.</i> * <i>Kryogene Direct Blue GO.</i>
Black.	<i>Kryogene Black TB, TG, TBN, TGN.</i> * <i>Kryogene Black TBO, TGO.</i>

Dyeing with Kryogene Black in the cold fermentation vat.

(Letters Patent No 12,219/07.)

Process No 26.

(Example for setting a vat of 60 gallons.)

Fill the vat with cold water and set it with:

- 8 lbs. flour (wheat or potato flour)
- 6 » bran
- 2 » syrup or honey or 4 lbs. dates (raisins, grapes, etc.)
- 5 » soda crystals (2 lbs. soda-ash or pearl-ash, or 4 lbs. Illig or Kallia)
- 3 » *Kryogene Black TGO* or *TBO*.

Prepare with soda as required, so that the vat always turns phenolphthaleïn paper red.

After 3—4 days the vat should be dark green and clear, then begin dyeing with several dips as with Indigo.

To feed the vat take:

- 3 lbs. *Kryogene Black TGO* or *TBO*
- $\frac{1}{2}$ lb. flour
- $\frac{1}{2}$ » bran
- $\frac{1}{2}$ » syrup.

Note. The concentration of the vat is regulated by the depth of shade desired. To secure a full black with a bluish tone 5—7 lbs. *Kryogene Black TBO* or *TGO* per 100 gallons liquor are sufficient. A bronzy brown-black can be obtained in a strong vat with 10 lbs. of the above brands in 5—6 dips. *Kryogene Black TGO* is the most suitable for the last mentioned shade.

The dyeing of cotton
with basic dyestuffs on a tannin mordant.

1. Mordanting and dyeing.
 2. Topping with basic dyestuffs on a ground of substantive (direct) or sulphur colours.
-

Dyeing cotton, previously mordanted with tannic acid.

(Basic dyestuffs and certain Soluble Blues.)

Process N^o 27.

A. Mordanting the cotton.

Enter the cotton, immediately after boiling out, into a concentrated tannic acid bath at 140—180° F., and let it remain in overnight (for pale shades 1—2 hours may suffice). Lift, squeeze out or wring, or, if desired, hydroextract and fix for about 20 minutes in a fresh, cold antimony salt bath.

— For 100 lbs. cotton. —

Notes. a) For lighter shades take 1—2 lbs., for darker shades 2—5 lbs. tannic acid per 165—175 gallons.

b) Instead of tannic acid the following tannin matters can be used. Their relative mordanting action is approximately:

10 lbs. tannic acid	=	40 lbs. sumac leaves
	=	18—20 » sumac extract (finest quality)
	=	34 » myrabolans
	=	14 » Chinese galls.

To fix the tannin on yarn, mordanted with 10 lbs. tannic acid,

		4 lbs. antimony salt
	or about	4 ¹ / ₂ » tartar emetic
	» »	2 ¹ / ₂ » Patent Salt
	» »	4 ¹ / ₂ » antimonin

must be taken.

- c) The mordanting baths can be freshened up with about half the amount of tannin mordant first taken — for medium to dark shades — and used for further lots.
- d) For duller, cheaper shades a bath containing ferrous acetate, nitrate of iron or ferrous sulphate instead of antimony salt can be used. The quantity to be taken is determined by the depth of the grey bottom desired.
- e) If the soda has not been removed from the cotton after boiling out by a thorough washing, it is advisable to sour, before mordanting, in a fresh cold bath containing 1 part hydrochloric acid in 1000 parts water.

B. Dyeing.

— For 100 lbs. cotton. —

After mordanting, rinse and dye with the addition of a little acetic acid or alum (1—2 lbs.). The solution of the colouring matter should not be added all at once, but in three or four portions. Commence dyeing cold and, when the greater part of the colour has been taken up by the cotton, warm slowly to about 140° F.

- Notes.*
- a) To correct hard water when dyeing with *Victoria Green*, *Brilliant Green*, *Diamond Green*, *Victoria Blue*, and *Night Blue*, 1—2 gallons acetic acid 9° Tw. (30%) per 1000 gallons liquor are used.
 - b) When dyeing with *Victoria Blue B*, *4R*, *Victoria Pure Blue* and also *Indoine Blue* (see special recipes Nos 9 and 682), the temperature of the bath must be finally raised to boiling point.
 - c) When dyeing with *Soluble Blue*, *Fast Blue* and *Nigrosine*, the addition of 5—10 lbs. alum is necessary.
 - d) The general fastness of dyeings, produced with basic colouring matters, is much increased by after-treatment for 1/2 hour with 1/2—1 lb. tannic acid (or an equivalent quantity of some other tannin matter) and 1/2 lb. antimony salt per 100 gallons liquor.

Suitable dyestuffs are the following:

Yellow.

Auramine brands.
Rheonine G, A, N, G D.

Phosphine N, E.
Euchrysine 2 G, R.

Orange. Brown.

Chrysoidine brands.
Vesuvine brands.
Cannelle, e. g. O F.

Euchrysine RR.
Flavinduline O, II.
Phosphine, e. g. N.

Red.

Rhodamine brands
(also the "extra" brands).
Saffranine brands.
Saffranine Scarlet B, G.
Diamond Magenta brands.

Magenta powder A, A B.
Cerise brands.
Rubine N.
Magenta Scarlet G, B.

Violet.

Methyl Violet brands
(also the "extra" brands).

Crystal Violet.
Ethyl Purple.

Blue.

Methylene Blue brands.
Nile Blue brands.
Marine Blue brands.
Victoria Blue brands.
Victoria Pure Blue B.
Night Blue.
Cotton Blue brands.

Dark Blue B, R.
New Blue S.
Indoine Blue brands.
* *Soluble Blue brands, e. g.*
IN, IB, LS, PP, IV red
shade, TB, TR, 4 R.
* *Fast Blue brands, e. g. B, 5B, R.*

Green.

Victoria Green brands.
Brilliant Green brands.

Diamond Green G, B.
Malachite Green G, B.

Grey. Black.

Jet Black brands.
* *Nigrosine brands, e. g. WH.*

Jute Black brands, e. g. G, B.

* Acid dyes, which can also be used for dyeing tannin-mordanted cotton.

Topping with basic dyestuffs
on a ground of substantive (direct)
or sulphur colours.

Process N^o 28.

Top the cotton, which has previously been dyed with substantive or sulphur dyestuffs and well rinsed, in a fresh cold or lukewarm bath with the addition of 1—3 lbs. acetic acid. The dyestuff solution may be added all at once, but it is preferable to add it in several portions.

— For 100 lbs. cotton. —

All the basic colouring matters given under process N^o 27, page 125, except *Indoine Blue* and *Victoria Blue*, are suitable for this treatment. The latter are not often used for topping as above, but when employed must always be dyed at the boil with the addition of a little alum or aluminium sulphate.

**Processes for dyeing cotton
with Indanthrene colours
(and similar vat dyestuffs).**

1. Dyeing of cotton yarn.
2. Dyeing of cotton piece-goods

On the under-water jigger.

By the padding process.

In the dipping vat.

Appendix.

Special process for dyeing

Anthraflavone G paste on
cotton yarn.

The dyeing of cotton with Indanthrene dyestuffs.

A. Cotton yarn.

Process N° 29.

Boil out the cotton with soda alone or together with Turkey red oil, and wash. Run the necessary quantity of water* into a suitable dye-vessel, add the caustic soda* and heat to 140° F. (in the case of *Indanthrene Blue G C*, *G C D* and *R C* only to 122° F.). Skim off the precipitate of lime, which floats on the surface, add first the hydrosulphite* and then the dyestuff* (made into a thin paste with 5 to 10 times as much hot water) through a sieve, while stirring slowly. Let the bath stand until complete solution of the dyestuff has taken place, which can be recognised by the clear, deep blue or brown colour of the liquor.

In dyeing very pale shades and when difficulties in level dyeing are met with, enter the yarn at a lower temperature. Only half fill the vat with water (say 100–125 gallons), heat to 140° (or 122°) F., add the caustic soda, the hydrosulphite and the dyestuff, and when solution is effected fill up the vat, while stirring, to 225 gallons with cold water, so that the final temperature is about 104° F.

Enter the yarn, which has been thoroughly wetted out, turn quickly four times, heat the vat (while constantly turning) in 15 minutes to 140° (or 122°) F., and work for a further 15 minutes at this temperature (with short intervals between the turns, if considered safe).

* See table, page 129.

For darker shades enter the yarn at 140 ° F. (*Indanthrene Blue GC* and *RC* at 122 ° F.) and turn as usual for $\frac{3}{4}$ —1 hour. Then, either let off the liquor or throw up the yarn as usual.

Let the yarn drain for a short time and then rinse in a bath containing about 2 oz. Hydrosulphite conc. B. A. S. F. powder per 100 gallons. Thoroughly wash out the caustic soda in two further fresh baths, sour with 1—1½ pints sulphuric acid per 100 gallons water in 3—4 turns, and rinse. Finally soap warm or at the boil.

For the first dye-bath always take 2 gallons caustic soda 53 ° Tw. per 100 gallons liquor. The amount of hydrosulphite used should be $\frac{1}{4}$ of the weight of dyestuff, but never less than 1 lb. nor more than 4 lbs. per 100 gallons liquor.

Dissolving Hydrosulphite conc. B. A. S. F. powder.

Add the hydrosulphite to the bath either in solid form, by slowly strewing it in, or dissolve it shortly before use in about ten times its weight of cold water and add this solution to the bath. If it is desired to prepare a hydrosulphite solution beforehand and keep it for some time, proceed as follows:

Strew 10 lbs. Hydrosulphite conc. B. A. S. F. powder into
7½ gallons cold water and, when solution is effected, add
2¾ pints caustic soda 53 ° Tw.

From 8—8½ times as much of this solution as of Hydrosulphite conc. B. A. S. F. powder should be taken.

It is very important for the success of the dyeing operation to employ only the best hydrosulphite. Hydrosulphite conc. B. A. S. F. powder must be kept in closed vessels and preserved from damp, and when taking out any of the powder, dry scoops, spoons, etc. should be used.

For 100 lbs. cotton yarn take:

about 225 gallons water (20—25 times the weight of the yarn)

4½ » caustic soda 53° Tw. (2 gall. per 100 gall. dye-bath) for both pale and full shades.

Table A.

Dyestuff (ordinary paste)		Hydrosulphite conc. B. A. S. F. powder, either added directly to the bath or dissolved in ten times as much water.
o/o	lbs.	lbs.
0,5	½	2 lbs. 3½ oz.
1	1	2 » 3½ »
2	2	2 » 3½ »
3	3	2 » 3½ »
5	5	2 » 3½ »
10	10	2½ lbs.
15	15	3¾ »
20	20	5 »
30	30	7½ »
40	40	8 lbs. 13 oz.
50	50	8 » 13 »

These figures refer to ordinary paste colours; if the concentrated or powder brands are employed, less dyestuff (as shown in the following table) must be taken. The quantities of caustic soda and Hydrosulphite conc. B. A. S. F. powder remain the same in all cases.

Table B.

	Ordinary paste	Double paste	Powder
<i>Indanthrene Yellow G</i>	100	50	12½
» <i>R</i>	100	50	12½
» <i>Orange RT</i>	100	50	—
» <i>Copper R</i>	100	50	—
» <i>Brown B</i>	100	—	11
» <i>Maroon R</i>	100	—	—
» <i>Violet R extra</i>	100	—	25
» <i>RT</i>	100	—	—
» <i>Blue RS</i>	100	50	10
» <i>GC</i>	100	50	10
» <i>RC</i>	100	50	14
» <i>GCD</i>	100	50	—
» <i>Dark Blue BO</i>	100	—	25
» <i>Green B</i>	100	—	—
» <i>Olive G</i>	—	—	10
» <i>Grey B</i>	100	50	—

Exhausting the bath and dyeing further lots. In dyeing pale shades the baths are almost completely exhausted, so that their use for further lots can hardly be recommended.

With dark shades, on the other hand, except with *Indanthrene Violet R extra paste*, *RT paste*, and *Indanthrene Dark Blue BO paste* (which exhaust almost completely even in high percentages), a certain quantity of dyestuff remains behind in the bath. To make use of this, dye a fresh lot of yarn a pale shade in the old bath after addition of about $\frac{1}{2}$ gall. each of hydrosulphite solution and caustic soda per 100 gallons; or, bring the old bath to its original strength by adding sufficient dyestuff, caustic soda and hydrosulphite*. This operation can be repeated several times.

For this purpose add first to the old bath from $\frac{1}{6}$ — $\frac{1}{5}$ of the quantity of caustic soda originally taken, fill the vat with water, bring up to the original temperature, and then add in the usual way the Hydrosulphite conc. B. A. S. F. powder and the necessary dyestuff.

Notes. a) Dissolving the powder brands. Stir up the dyestuff with about $\frac{2}{3}$ of the quantity of caustic soda 53° Tw. and hydrosulphite to be taken for dyeing, and let stand for 15 minutes. Then dilute with about 20 times as much water at 140° F. (in the case of *Indanthrene Blue GC* and *RC* at 122° F.) and add this "stock vat" through a sieve to the dye-liquor, to which the remainder of the caustic soda and hydrosulphite has been added. Stir up carefully and allow to stand for a short time; the dyestuff then dissolves readily.

* To bring old dye-baths up to their original strength the following approximate figures may be found useful:

First bath	Additions to the old bath			
10% dyestuff	8 $\frac{1}{2}$ % dyestuff	2,125 % Hydrosulphite conc.	B. A. S. F. pwd.	
15% »	11 % »	2,75 % »	»	»
20% »	14 % »	3,5 % »	»	»
25% »	16 % »	4 % »	»	»
30% »	18 % »	4,5 % »	»	»
40% »	24 % »	6 % »	»	»

- b) *Indanthrene Violet R* and *Indanthrene Dark Blue BO* are not very suitable for shades under 5 %, and *Indanthrene Violet RT* is not adapted for shades under 15 % dyestuff, such dyeings turning much redder when moistened. With dark shades, especially in combination with *Indanthrene Blue RS*, this is less noticeable.
- c) The temperature of the bath should be kept at about 122—131 ° F. with *Indanthrene Blue GC, GCD, RC*, and at about 140—149 ° F. with the other Indanthrene dyestuffs. Care must be taken not to raise the temperature too high, this having a bad effect on the dyestuff. *Indanthrene Maroon R* can be dyed alone according to recipe No 1065 at 194 ° F. and produces fuller shades when thus dyed.

Indanthrene Violet R extra and *Indanthrene Dark Blue BO* also give fuller, but duller shades when dyed at 194 ° F., and *Indanthrene Yellow G* and *R* in combinations can also, if necessary, be dyed at higher temperatures, but the dyeings are not deeper.

- d) If through any mischance the yarn has turned out streaky in dyeing, considerable improvement can be effected by treatment in a bath containing about 1/2 gallon hydro-sulphite solution per 100 gallons water.
- e) The shade of yarn dyed with *Indanthrene Blue RS* can be rendered rather redder and brighter by lightly soaping with 3—5 lbs. soap per 100 gallons at about 140 ° F. By soaping at the boil, either with or without addition of soda, the shade turns more reddish blue and becomes purer and brighter, but in the case of *Indanthrene Blue GC, GCD* and *RC* this change to red is less marked. A similar effect can be produced by boiling with water for 15—30 minutes, and also by steaming with or without pressure. The reddish blue shade produced is not changed further by repeated treatment with soap, etc. *Indanthrene Yellow* is not affected in shade by soaping, etc.

Dyeings with *Indanthrene Grey B*, *Indanthrene Maroon R*, *Indanthrene Brown B*, *Indanthrene Violet brands*, *Indanthrene Dark Blue BO*, *Indanthrene Green B*, *Indanthrene Olive G*, *Indanthrene Orange RT*, *Indanthrene Copper R* change but little.

- f) By treating dyeings, produced with *Indanthrene Blue RS*, with chlorine ("chemicking") the blue turns greenish blue to green according to the strength of the chlorine bath, but the original shade can be completely restored by treatment in a dilute, lukewarm solution of hydrosulphite (about $\frac{1}{2}$ lb. Hydrosulphite conc. B. A. S. F. powder per 100 gallons water).

Steaming (best for 2 hours at 15 lbs. pressure) makes the dyeings much faster to chlorine. It is advisable to steam the yarn after soaping and before washing out the soap. *Indanthrene Yellow G, R*, *Indanthrene Violet RT, R extra*, *Indanthrene Dark Blue BO*, *Indanthrene Orange RT*, *Indanthrene Copper R* withstand even strong chemicking without change of shade. The shades of *Indanthrene Blue GCD* and *RC* are but little changed by chlorine; *Indanthrene Grey B* turns brown and *Indanthrene Maroon R* turns yellow-brown, but the original shade can be restored in each case by after-treatment with hydrosulphite solution. *Indanthrene Brown B* and *Indanthrene Olive G* are partly destroyed by chlorine; *Indanthrene Green B* turns blackish.

- g) To make dyeings with *Indanthrene Yellow R* and *G* as fast to light as possible, they should always be soaped at the boil after being dyed, or steamed under pressure.
- h) The use of Indanthrene dyestuffs for yarns in coloured woven goods, which have to undergo a subsequent boiling with soda or caustic soda, is somewhat restricted. The difficulty — viz., bleeding — can be overcome to a considerable extent by a simple addition ("Ludigol") to the boiling alkaline bath; but, it is necessary to determine the most advantageous recipe and the degree of success in each individual case.

The following are suitable Indanthrene dyestuffs:

- Indanthrene Yellow G paste, G double paste, G powder,
R paste, R double paste, R powder.*
- » *Golden Orange G paste, G double paste.*
 - » *Orange RT paste, RT double paste.*
 - » *Copper R paste, R double paste.*
 - » *Brown B paste, B powder.*
 - » *Maroon R paste.*
 - » *Violet R extra paste, R extra powder, RT paste.*
 - » *Blue RS paste, RS double paste, RS powder.*
 - » » *GC paste, GC double paste, GC powder.*
 - » » *GCD paste, GCD double paste, GCD powder.*
 - » » *RC paste, RC double paste, RC powder.*
 - » *Dark Blue BO paste, BO powder.*
 - » *Green B paste.*
 - » *Olive G powder.*
 - » *Grey B paste, B double paste, B powder.*

B. Cotton piece-goods.

Medium and dark shades are best dyed on the under-water jigger; for paler shades, and in cases where there is difficulty in dyeing level, the padding process should be employed. To obtain very deep and full shades with *Indanthrene Blue RS* refer to our special process N^o 1059.

1. Dyeing on the under-water jigger.

Process N^o 30 a.

Preparation of the dye-bath. Boil out the goods with soda alone or with the addition of Turkey red oil (also bleaching them if necessary), and roll them evenly on the delivery roller of the jigger. Fill up with the requisite quantity of water,* add the caustic soda,* and heat to 122—140° F. while the piece is running (in the case of *Indanthrene Blue GC, GCD* and *RC* heat only to 122—131° F.).

Skim off any lime that floats on the surface, add first the hydrosulphite* and then the dyestuff* (previously made into a thin paste with 5—10 times as much hot water) through a sieve whilst slowly stirring the liquor. Let the whole stand for a few minutes till the dyestuff is completely reduced,

* See note page 134.

which is recognised by the clear, deep blue or brown colour of the bath. Run now for 1—1½ hours at the temperature indicated.

Rinse the goods in a bath containing 2½ oz. Hydrosulphite conc. B. A. S. F. powder per 100 gallons water, thoroughly wash out the caustic soda, and sour with about 1—2 pints sulphuric acid per 100 gallons water. Finally wash, and soap at the boil.

Rinsing, souring, etc., can also be carried out in rope form (for light goods only) or on an ordinary jigger.

To make dyeings with *Indanthrene Yellow* as fast as possible, soap the dyed goods for about half an hour at the boil, or steam them. To bring about a more rapid oxidation of this colouring matter after dyeing, add to the souring bath about 5—8 oz. potassium bichromate per 100 gallons liquor.

* The relative proportions of dyestuff, water, caustic soda and hydrosulphite for fixed percentages of dyestuff can be seen from the following table.

In all cases 2—2½ gallons caustic soda 53° Tw. per 100 gallons dye-bath are required. Of Hydrosulphite conc. B. A. S. F. powder about ¼ of the weight of dyestuff is taken, but never less than 1¼ lbs. nor more than 4 lbs. per 100 gallons liquor.

The quantities of dyestuff are calculated for "ordinary paste goods". When using the concentrated brands or powder pay attention to the remarks on pages 129 et seq.

For 65 lbs. cotton piece-goods are required:

about 90 gallons water (10—15 times the weight of the goods)
1¾—2¼ » caustic soda 53° Tw. (2—2½ gallons per 100 gallons liquor)
for both pale and heavy shades.

Dyestuff (ordinary paste)		Hydrosulphite conc. B. A. S. F. powder added to the bath either directly or dissolved in ten times as much water.
%	lbs.	lbs.
5	3¼	1 lb. 2 oz.
10	6½	1 » 11 »
15	9¾	2 lbs. 8 »
20	13	3 » 5 »
25	16¼	3 » 8 »
30	19½	3 » 8 »
40	26	3 » 8 »

Exhaustion of the bath and its use for further lots. See the remarks with reference to this on page 130, under cotton yarn. The following table will afford some idea of the quantities of dyestuff and hydrosulphite necessary.

First bath	Additions to the old bath			
15% dyestuff	11% dyestuff, 2,75% Hydrosulphite conc.	B.A.S.F. pwd.		
20% »	14% » 3,5% »	» »	» »	» »
25% »	16% » 4% »	» »	» »	» »
30% »	18% » 4% »	» »	» »	» »
40% »	24% » 4% »	» »	» »	» »

2. Padding process.

(On the printing or padding machines.)

Process N^o 30 b.

Make the dyestuff into a thin paste and pad the bleached piece-goods either on the printing machine in the usual way (best done with two plain rollers) and dry, or pad (e. g. for thicker goods) on the padding machine and either dry them or roll them up without drying.

Proceed as follows:

Make 1—20 lbs. of the dyestuff (ordinary paste colour) carefully and evenly into a paste with 12½—15 lbs. gum-thickening 1:1, make up with water to 10 gallons and pass the whole through a cotton cloth to prevent the possibility of spots. Pad with this liquor and develop at 140—149° F. (*Indanthrene Blue GC, GCD* and *RC* at 122—131° F.) for ½—¾ hour on an under-water jigger or in an ordinary jigger, nearly filled with liquor, which contains 2½ gallons caustic soda 53° Tw. and 1¼—1½ lbs. Hydrosulphite conc. B. A. S. F. powder per 100 gallons water. Finally rinse.

Add to the first wash-water about 3 oz. Hydrosulphite conc. B. A. S. F. powder per 100 gallons water and give two ends. When the caustic soda has been thoroughly washed out, sour with 1—2 pints sulphuric acid 168° Tw. per 100 gallons, wash out well and soap at the boil.

- Notes.* a) The padding bath can be used up without any further addition, but the developing bath must be renewed each time. To develop about 400 yards goods, 6—7 ends of 5—7 minutes each are required. Thin materials may be rinsed, soured and soaped in rope form.
- b) When dyeing with *Indanthrene Yellow*, oxidation may be accelerated by adding to the souring bath from 5—6½ oz. potassium bichromate per 100 gallons.

All the Indanthrene dyestuffs in paste form mentioned on page 133 are suitable for use by the padding process. The powder brands cannot be so employed.

3. Dyeing in the dipping vat.

Process N° 31.

Preparation of a stock vat.

Stir up 10 lbs. *Indanthrene Blue RS paste* with
2 gallons caustic soda 53° Tw., and add one after
the other, while stirring, solutions of
5 lbs. 10 oz. copperas in 1½ gallons of water, and
1¼ lbs. tin crystals in 2 pints of water. Stir up well
and allow to stand for ½ hour.

Preparation of the dye-bath: Heat the bath to 160—180° F. and add to it the necessary quantities of caustic soda 53° Tw. and stock vat according to the shade desired. The amount of caustic soda added must be so regulated that each 100 gallons of the vat, as ready for dyeing, contains 6 gallons of caustic soda 53° Tw. As the stock vat contains caustic soda, it will be readily understood that an increased addition of stock vat must be accompanied by a corresponding decrease in the amount of caustic soda added. Detailed proportions are given in the following table:

Dye-bath with		1/2 lb.	1 lb.	1 1/2 lbs.
		<i>Indanthrene Blue RS</i> per 10 gallons		
Water	about	92 1/2 galls.	91 galls.	89 1/2 galls.
Caustic soda 53° Tw.	»	5 »	4 »	3 »
Stock vat	»	2 1/2 »	5 »	7 1/2 »

Having well boiled out and dried the material, stretch it on a dipping frame, heat the vat to 160—180° F., stir it well and lower the frame into it. For self-shades dye 10 to 20 minutes, for resist prints only about 5 minutes, then raise the dipping frame without delay, put it into water, wash slightly, remove the goods from the frame, rinse thoroughly and remove the iron by souring with 1/2 gall. sulphuric acid per 100 gallons of water. Then rinse well once more, and soap at the boil to produce bright, reddish shades.

- Notes.*
- a) During the dyeing process the temperature should not be allowed to sink below 158° F.
 - b) The stock vat can be kept for several days, if covered.
 - c) The strength of the bath and the time necessary for dyeing can be tested by dipping in small swatches of cloth.
 - d) The goods must be rinsed at once on the frame after dyeing, otherwise uneven, spotted or streaky greenish shades may result, but such uneven pieces can be improved by treatment for 10 minutes in a bath containing 2 gallons caustic soda 53° Tw. and 1/2 gallon hydrosulphite solution per 100 gallons water. This after-treatment is only to be recommended for self-shades; white resists should be treated only with about 1 1/2 pints caustic soda and 3 gallons hydrosulphite solution per 100 gallons water.
 - e) It is possible to dye, as in the case of indigo, in several dips instead of in one; in fact, very deep shades are best dyed in this way.

f) Economy may be effected by dyeing further lots in the dipping vat, which can be brought up to its original strength by addition of stock liquor. After the vat has stood for some time, e. g. overnight, sharpen it before dyeing with 2—4 oz. Hydrosulphite conc. B. A. S. F. powder per 100 gallons liquor.

g) *Indanthrene Dark Blue BO* is also suitable for dyeing in the hydrosulphite vat with hydrosulphite and caustic soda alone. For this purpose heat the dipping vat, which has been filled with water, to 150° F. and add per 100 gallons liquor

2½ gallons caustic soda 53° Tw.

1 gallon hydrosulphite solution (containing about 1¼ lb. Hydrosulphite conc. B.A.S.F. powder)

15 lbs. Indanthrene Dark Blue BO.

In dyeing further lots, replenish the bath by adding, as necessary, water and caustic soda in the proportions given above. The dye-bath can be brought up to the required strength by adding dyestuff and twice as much hydrosulphite solution (e. g., 3—4 lbs. dyestuff and 5—6 pints hydrosulphite solution containing ¾ to 1 lb. Hydrosulphite conc. B. A. S. F. powder). If the bath has cooled down, warm it up again to 150° F. and use it for further lots with the addition of about ½ gallon hydrosulphite solution per 100 gallons. When working the vat out it must be sharpened after each dip with about 1—1½ pints hydrosulphite solution per 100 gallons liquor.

All the dyestuffs given in Table B on page 129 can be used for dyeing in the dipping vat either alone or for shading *Indanthrene Blue RS*. *Indanthrene Blue GC* is not very suitable.

A description of the method of working with *Anthraflavone G*, which behaves in its dyeing properties much like the Indanthrene colours, may conveniently be classified here.

Special process for Anthraflavone G paste.

Dyeings with this colouring matter are remarkable for their pure yellow shade and their excellent fastness to washing and chlorine, but they are less fast to light than the Indanthrene dyestuffs.

Process N° 32.

Heat the bath to 104–122° F. and prepare it with the proportions given in the table below (see page 140), first adding the caustic soda, then the Glauber's salt and finally strew in the hydrosulphite.

Make the dyestuff into a thin paste with about 10 times as much hot water (or vat liquor) and add it through a fine sieve to the bath, stirring carefully. When solution has taken place (shown by the clear, red-brown colour of the bath) enter the yarn, which has been well wetted out, and dye for ½–1 hour at 104–122° F., with frequent turning. Rinse in a bath containing 1½–2 oz. Hydrosulphite conc. B.A.S.F. powder in 100 gallons water, then sour with 1 pint sulphuric acid per 100 gallons water, rinse again and soap at the boil.

When using the old dye-bath for further lots take approximately the following quantities:

dyestuff	about ¾ of the original quantity
caustic soda 53° Tw.	about ½ the original quantity
hydrosulphite	the same amount as at first
Glauber's salt	2–3 lbs.

— For 100 lbs. cotton. —

- Notes.* a) This dyestuff is principally suitable for self-shades, and its combination with Indanthrene colours is not to be recommended.
- b) If difficulties in levelling are met with, it is advisable to leave out the Glauber's salt altogether or to take less.
- c) The dyestuff is not so readily taken up by the yarn if more caustic soda is used than is here given.

Suitable proportions of caustic soda and hydrosulphite for certain percentages of dyestuff are as follows.

For 100 lbs. cotton yarn take

330 gallons water

13 pints caustic soda 53° Tw. ($\frac{1}{2}$ gallon per 100 gallons dye-bath)

Anthraflavone G paste		Hydrosulphite conc. B. A. S. F. powder added to the bath either directly or previously dissolved in 10 times as much water	Glauber's salt
%	lbs.	lbs.	lbs.
5	5	3 $\frac{3}{4}$	20
10	10	3 $\frac{3}{4}$	44
30	30	7 $\frac{1}{2}$	50

The following dyestuffs are suitable for dyeing by above process:

- Indanthrene Yellow G paste, G double paste, G powder, R paste, R double paste, R powder,*
- » *Orange RT paste, RT double paste,*
 - » *Golden Orange G paste, G double paste,*
 - » *Copper R paste, R double paste,*
 - » *Red G paste, G double paste, R paste, R double paste,*
 - » *Claret B paste, B double paste.*

Also, if necessary,

- Indanthrene Brown B paste, B powder,*
- » *Blue G C paste, G C double paste, G C powder,*
 - » *G C D paste, G C D double paste, G C D powder.*

Further details will be found in our special pattern-cards.

Processes for dyeing cotton

with Indigo pure B.A.S.F.

1. Forms of vat and their use.
 2. Properties and strengths of the various brands of Indigo.
 3. Copperas vat.
 4. Zinc-lime vat.
 5. Hydrosulphite vat.
 6. Fermentation vat.
-

Dyeing in the vat with Indigo pure B.A.S.F.

Kinds of vat:

For dyeing cotton the following vats are employed:

- a) the copperas vat,
- b) the zinc-lime vat,
- c) the hydrosulphite vat,
- d) the fermentation vat.

Cotton vats differ from the wool-dyeing vats chiefly in being much more alkaline (caustic soda or lime); their dyeing strength is also generally higher (3 lbs. Indigo powder = 15 lbs. 20 % paste per 100 gallons, and even more), and they are as a rule worked in the cold, except the fermentation vat which can also be used warm.

Uses of the various vats:

Indigo can be used for dyeing cotton in all stages of manufacture, but the chief forms are yarn in hanks or warps, cops or cheeses, or piece-goods.

The copperas vat or, still better, the zinc-lime vat is suitable for dyeing yarn in hanks and for piece-goods, whether plain or printed with resists. The hydrosulphite vat is chiefly used for dyeing ordinary piece-goods (as is also the bisulphite-zinc-soda vat) and for dyeing in machines. With reference to the employment of the fermentation vat for dyeing cotton see page 149.

Properties and strengths of the various brands of Indigo:

The brand Indigo *G*, which possesses a greenish tone, finds application when special stress is laid on the fastness to chlorine, whilst the brand *Indigo R* is useful for blues with a very reddish tone. *Indigo RBN* yields considerably brighter, purer and faster dyeings than ordinary Indigo.

With regard to further properties and strengths cf. wool, page 39 ff.

Brands of Indigo:

The following brands of Indigo are suitable for dyeing cotton in the various vats. For the warm and cold fermentation vats the easily soluble "S" brands (except *SB paste*) must be used, or special brands for special cases.

Paste

Indigo pure B.A.S.F. paste 20%

»	»	»	»	30%
»	»	»	»	20% S*
»	»	»	»	40% S*
»	»	»	»	20% SB*
»	»	»	»	20% G
»	»	»	»	40% R

Powder:

Indigo pure B.A.S.F. powder

»	»	»	»	L
»	»	»	»	SL*
»	»	»	»	G
»	»	»	»	R
»	»	»	»	RBN

Lumps:

Indigo pure B.A.S.F. small lumps

»	»	»	»	»	S.
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* Cf. page 144 under B.

Indigo solutions, Indigo vat:*Indigo Solution B. A. S. F. 20% for cotton*

»	»	»	20% R
»	Vat	»	60%.

Dyeing process N° 33.

Information as to the preparation of the various forms of vats, the difficulties generally met with and the precautions to be observed can only be given in condensed form here. We are always ready to assist parties having interest for more detailed instructions.

A. Copperas vat.

Stock vat for 200 gallons dye-liquor.

Strong vat.

Mix 30 lbs. *Indigo pure B. A. S. F. paste 20%*
 (= 6 lbs. in powder) with about
 6 gallons water at 140° F., then slake
 36 lbs. quick-lime and make into a thin, smooth
 paste with hot water (140° F.). Add this
 to the Indigo; then stir in
 30 lbs. green copperas (sulphate of iron) dissolved
 in about 10 gallons water at 120–140° F.,
 and make up with water to 50–60 gallons.

Vat of medium strength.

20 lbs. <i>Indigo pure B. A. S. F. paste 20%</i>	} made up to 40 gallons.
25 » quick-lime	
20 » green copperas	

Weak vat.

10 lbs. <i>Indigo pure B. A. S. F. 20%</i>	} made up to 20 gallons.
18 » quick-lime	
18 » green copperas	

Allow this stock vat to stand for 4—6 hours, stirring occasionally. It is ready for use as soon as it has assumed a yellow colour. Then pour off the whole or a portion into the dye-vat, which has been about $\frac{3}{4}$ filled with water. Stir up, allow to settle and commence dyeing.

Notes. a) An indication of the good condition of the vat is the yellow colour of the sediment when stirred up; sufficient reducing agent is present so long as the sediment remains yellow, or when the vat, which has turned blue in the working, has become yellow again after being given the usual rest.

Otherwise, the vat must be reduced with a little copperas (in solution) and lime.

- b) The great drawback to the use of the copperas vat is that a considerable portion of the Indigo is always destroyed by over-reduction. The loss is generally about 25 %, but this may become even greater through unsuitable setting or through keeping the stock liquor (which should be used up, if possible, the day after mixing) too long. Besides this, the copperas vat contains a great deal of sediment, and for this reason replenishment with fresh stock liquor is not usual. This entails a frequent setting of new vats and a consequent loss of time.
- c) The only advantage of the copperas vat is that it is simple to set and does not easily get out of order.
- d) If a very weak vat with only a small quantity of stock liquor is to be prepared, the dye vat should be prepared with about 2 lbs. each of lime and copperas before adding the stock liquor.

B. Zinc-lime vat.

The "S" brands, marked on page 142 with an asterisk, which are very easily and readily soluble, are chiefly employed for this class of vat; also *Indigo R, G* and *RBN*.

Example of a stock vat for 200 gallons dye-liquor.

Mix 20 lbs. *Indigo paste 20% SB* (or the corresponding quantity of other S brands) with
2½ » zinc dust made into a paste with 4 gallons of hot water (120—140° F.), and add
8—10 » quick-lime, which has previously been slaked to a uniform paste. Make up the mixture with hot water to
16 gallons and stir occasionally; the liquor should have a temperature of 120—140° F.

In about 3—5 hours the mixture is pure yellow in colour and ready for use.

Dye-vat:

Set the vat with ½ lb. zinc dust and 2 lbs. lime, slaked to a thin cream, per 200 gallons, stir up and allow to stand for some time. Then pour in the stock liquor, or part of it, and stir up. After settling, the vat is ready for use.

Notes: a) An indication of the good condition of the vat is the yellow colour of the sediment. If the vat turns greenish after dyeing, the yellow colour can generally be restored by energetic stirring, but if it does not return after standing for some time, ½—1 lb. zinc dust, made into a fine paste with water, and 1—2 lbs. lime, slaked to a paste, should be added and the vat stirred up and allowed to stand.

b) Compared with the copperas vat, the zinc-lime vat has the great advantage that the unavoidable loss of dyestuff in reduction is only about ⅓ as much, and the sediment is less by ⅘, so that the bath may be frequently replenished and kept in use for a much longer period.

But also in the case of the zinc-lime vat the loss of dyestuff in the stock liquor increases considerably through high temperature and long keeping, so that the stock liquor should be used up, if possible, in one or two days.

C. Hydrosulphite vat.

1. Hydrosulphite-soda vat.

Example of a stock vat for 200 gallons dye-liquor.

Stir well together

20 lbs. *Indigo pure B.A.S.F. 20 %* (=4lbs. Indigo pure powder or lumps) with
4 gallons cold water and
3½ lbs. Hydrosulphite conc. B. A. S. F. powder.
After 10 minutes add
1¼ gallons caustic soda 77° Tw. and heat the whole to 140° F.

- Notes.* a) Test the progress of the reduction about every 15 minutes by dipping in a piece of glass. When the vat is ready for use the glass and the drops from it are clear yellow in colour and the liquor oxidises in about half a minute.
- b) Instead of preparing this stock liquor, Indigo Solution B.A.S.F. 20 % may be used. Details are to be had in our special recipe 1073.

Dye-vat:

Set the vat with 2 oz. Hydrosulphite conc. B. A. S. F. powder per 200 gallons, stir up, then add the whole, or nearly the whole, of the stock liquor, according to the shade desired, and stir up once more. The vat is ready for use when the liquor is of a yellow-green colour, and is kept in condition by the addition of stock liquor or hydrosulphite and caustic soda, as required.

Note. When the hydrosulphite-soda vat is correctly worked, there is no loss of Indigo, so that, in spite of the extra cost of hydrosulphite as against that of the other usual reducing agents, it is in many cases the most advantageous vat to use. As it is also the only vat free from sediment, it is specially applicable for dyeing in machines or in the continuous vat.

2. Bisulphite-zinc-soda vat.

Stock vat for 200 gallons liquor.

I. Mix together

3 gallons bisulphite 57° Tw. in small portions at a time with

3—3½ lbs. zinc dust, and let the mixture stand a short time, stirring carefully now and again, until the sediment is pale grey in colour.

II. Mix

30 lbs. *Indigo pure B.A.S.F. paste 20%* with
2½—3 gallons caustic soda 77° Tw.

Add mixture I to mixture II and heat to a temperature of 120° F. Reduction, shown by the stock liquor turning yellow, is complete in about ½—1 hour.

Dye-vat:

Set the vat with a mixture of 1 gallon bisulphite 57° Tw. and 1 lb. zinc dust (treated as in I above) per 100 gallons, and stir up. In a short time add as much stock liquor as necessary, according to the depth of shade desired, and stir up well again.

The vat is ready for use as soon as it has become clear and yellowish green. It is fed with stock liquor and the bisulphite-zinc-soda mixture mentioned above.

Note. The bisulphite-zinc-soda vat has the same advantages over the zinc-lime and copperas vats as the hydrosulphite-soda vat, but is inferior to the latter in that it is not entirely free from sediment, and loss of dyestuff cannot be altogether avoided.

It is advisable to use up the stock liquor as soon as possible, otherwise decomposition of the Indigo may take place.

3. Special process
for dyeing with Indigo pure B. A. S. F. powder RBN
in the warm Hydrosulphite vat.

Example of a stock vat.

Make 4 lbs. *Indigo pure B. A. S. F. powder RBN* into a paste with hot water, make up to 8—10 gallons and add, one after another, while stirring, about
1 gallon caustic soda 71—77° Tw. and
4 lbs. Hydrosulphite conc. B. A. S. F. powder.

Heat the whole to 120° F. and let it stand for 15 to 30 minutes.

Dye-vat:

Heat the vat to 120° F., add 3 oz. Hydrosulphite conc. B. A. S. F. powder and $\frac{3}{4}$ pint caustic soda 71—77° Tw. per 200 gallons liquor, and add the stock liquor, stirring well.

Work the material for 20—30 minutes under the surface, wring out or squeeze, then let the goods oxidise and rinse as usual with Indigo dyeings.

Notes. a) The addition of about $\frac{1}{2}$ gallon of a solution of glue 1:1 assists the dyestuff in being taken up and produces brighter shades. A subsequent soaping increases the fastness of the dyeings and their brightness.

- b) This vat is specially suitable for dyeing yarns which are difficult to penetrate (embroidery yarn, etc.) or thick piece-goods. Cotton piece-goods can be dyed in the ordinary jigger.
- c) Dyeings obtained from *Indigo RBN* are of a purer, bluer shade and also faster to washing, chlorine and rubbing than those produced by the ordinary brands of Indigo.

D. The fermentation vat.

The fermentation vat is worked warm, but in some countries the cold vat is also used. For the warm method the Indigo «S» brands (except SB paste) and Indigo Vat are used; for the cold process, certain special brands, and also Indigo White are mainly employed.

The only difference between the fermentation vat for cotton and that for wool consists in the greater proportion of alkali and dyestuff contained in the former.

The fermentation vat is chiefly used in the East for dyeing cotton, and is mostly worked cold. It is worked warm in Russia, the Balkan States, Italy and Scandinavia.

In the rest of Europe the fermentation vat is little used for cotton dyeing, and then only when the goods are required to possess the peculiar odour imparted by this vat.

With regard to working the vat, etc., the remarks on page 46 with regard to wool generally apply also in the case of cotton.

Processes for dyeing cotton with Alizarine dyestuffs.

1. Aluminium mordant:

A. Cotton yarn.

New Red. Claret, Violet, Pink.

Old Red.

Simplified Turkey Red process.

B. Cotton piece-goods.

Turkey Red, etc.

2. Iron mordant:

The production of violet shades.

3. Chromium mordant:

Process with chromium chloride or
chromium bisulphite.

The dyeing of cotton
with Alizarine dyestuffs on an
aluminium mordant.

Turkey Red, Claret, Violet and other shades.

A. Cotton yarn.

Process N° 34 (I—III).

I. New Red.

Boil out the cotton for 3—5 hours with 11 lbs. soda ash and 6³/₄ lbs. sodium silicate 77° Tw., wash well, hydro-extract and oil with a solution of 1 part Turkey red oil F (50%) in 9 parts water at 110° F., then dry well overnight at 140–160° F. Mordant with aluminium acetate, or basic aluminium sulphate, or basic aluminium acetate-sulphate 9° Tw. (prepared as described on page 325), and dry once more overnight at 122° F. Treat the goods for 30 minutes in a bath containing 11 lbs. chalk in 75 gall. water at about 100° F., and wash out thoroughly. Dye for 2 hours, dry and steam for 1 hour under 15 lbs. pressure, or for 2 hours without pressure, brighten with 5 lbs. soap and 1/2 lb. tin crystals per 100 gall. water, wash out well and dry.

- Notes.* a) For a deep red, the oiling is repeated, drying after each operation.
- b) The dyeing is commenced in the cold with the addition of acetate of lime, acetic acid and Alizarine paste 20% (6—13% on the weight of the cotton according to the depth of shade). The yarn is worked for 1/2 hour

in the cold, heated in 1 hour to 150° F., and the dyeing continued at this temperature for 1 hour more. The goods are then rinsed, hydroextracted, oiled again, if desired, and dried at 120—140° F.

If the water is of about 6° of hardness, 1/4 oz. acetate of lime 28° Tw. and 1 1/2 oz. acetic acid 12° Tw. (50%) per 100 gallons water are added, these quantities being increased or diminished according as the water contains more or less lime.

- c) If a steaming apparatus is not available, dyeing can be done at the boil. The red obtained, however, will not be so bright. When Alizarine Red is dyed at the boil, the shade is improved by adding a little Turkey red oil F (50%), say 3—8% on the weight of the cotton. This addition is not necessary with other dyestuffs.
- d) By the use of smaller quantities of Alizarine Red, lighter reds and pinks are obtained. For pink shades note specially the process given on page 153.

— For 500 lbs. cotton yarn. —

The following Alizarine dyestuffs are suitable for this process. Those marked with an asterisk are generally dyed at the boil without being steamed.

Orange.	* <i>Alizarine Orange A.</i>
Brown.	* <i>Anthracene Brown paste 20%.</i>
Pink. Red.	<i>Alizarine paste 20% (V1 new, V2 a bluish, V2 old, V3, GF, GD, GI, SX, RG). Purpurine.</i>
Claret.	* <i>Alizarine Maroon.</i>
Violet.	* <i>Anthracene Blue paste (e. g. R paste, B paste, G paste).</i>
Green.	* <i>Coeruleine S paste.</i>

We here append the following special process, which resembles the New Red process.

Claret and Violet shades with Alizarine Red and Anthracene Blue.

Boil out the cotton, as directed under New Red, page 151, wash well and oil with a mixture of 1 part Turkey red oil S and 9 parts water to which about 1 gallon ammonia per 100 gallons has been added, wring out, or hydroextract, and dry overnight. Repeat the oiling as before and mordant, preferably by steeping the yarn overnight in aluminium acetate of 9° Tw. Next morning, hydroextract, fix the mordant by treating for ½ hour at 115° F. in a solution of 15 lbs. sodium phosphate per 100 gallons water, and wash out. Then dye for 2 hours under the same conditions as given on page 157, note c, and finish by soaping for ½ hour at the boil (5 lbs. soap per 100 gallons).

For this process the brands mainly adapted are:

Alizarine V2a bluish and Anthracene Blue R, RR.

Note. The quality of the Turkey red oil is of importance. It can be obtained from Messrs G. Siegle & Co., G.m. b.H., Stuttgart.

The dyeing of light shades (pinks) with Alizarine dyestuffs.

Boil out the cotton in a solution of 2—3 lbs. soda-ash per 100 gallons water, wash with clean water, hydroextract and squeeze or wring out. Bleach the yarn by means of bleaching powder, or by the electrical method, and mordant in

aluminium acetate 4 ½° Tw.

or basic aluminium sulphate 4 ½° Tw.,

treating the material until it is uniformly soaked with the mordant. Wring out quickly, squeeze out, or hydroextract, and dry for 24 hours at about 120° F.

Prepare an oiling bath with

1 part Turkey red oil F (50%) per
20 parts water,

work the cotton in this till it is completely and evenly soaked, wring out quickly, squeeze, or hydroextract, and dry for 24 hours at about 120° F.

Mordant a second time with aluminium acetate, or basic aluminium sulphate, exactly as described above, and chalk the mordanted cotton, when dry, in a warm bath (85—105° F.) containing 5 lbs. chalk per 100 gallons water, for about 1/2 hour. Then wash out well in fresh water.

Prepare the dye-bath with

1/2—5%	Alizarine 20%	} on the weight of the goods,
1/4—2 1/2%	Turkey red oil F (50%)	

and enter the cotton cold. After working for 1/4 hour, heat slowly to 140—150° F., maintain at this temperature for 1 hour and wash out well after dyeing. Steam for 1 hour under 7 lbs. pressure, or for 2 hours without pressure, and brighten at the boil in a bath containing

5 lbs. soap per 100 gallons water

for 1/2—1 hour (according to shade), wash out well and dry.

Notes. a) In the case of yellow shades of Alizarine (scarlet) the brightening is done at about 140° F.

b) The process can also be used for piece-goods and loose cotton.

The most suitable dyestuffs for this process are the bluish brands of Alizarine, such as *Alizarine V1 new, V2 a bluish*. The yellow shades of Alizarine and also the dyestuffs named on page 152 can likewise be dyed by this process.

II. Old Red.

This process gives the fastest Turkey reds to washing and rubbing.

Boil out the cotton with soda or caustic soda, wash well and oil at a temperature of 115° F. in a first bath of

10 lbs. Gallipoli oil and	} making up with water to 10 gallons.
5 » potash, dissolved in	
3 gallons water	

Wring out, hang the yarn 5—8 hours in the air, and dry overnight at about 140° F.

Make up the residue of the first bath with water to 10 gallons (second oil-bath) and treat the yarn as before. Make up the second bath with water again to 10 gallons and oil the yarn for a third time. Then steep the dry yarn for 4 hours in clean water at a temperature of 95° F.*, wring out, wash well, and dry.

Mordant the yarn with basic aluminium sulphate 9° Tw. (prepared as described on page 325), dry at 120° F., treat in a bath containing 8 lbs. chalk and 4 lbs. sodium phosphate per 100 gallons water, and wash out well. Dye for 2 hours (as described for New Red), but this time at 160—170° F., and wash well again. Steam for 2 hours under 22 lbs. pressure, brighten, first with 9 lbs. soap and 3 ¼ lbs. soda-ash, then a second time with 9 lbs. soap and ½ lb. tin crystals, wash well and dry at a temperature not higher than 140° F.

— For 100 lbs. yarn. —

This process is adapted for Alizarine, but can also be employed with the other dyestuffs enumerated on page 152.

* Adding, if necessary, potash or soda.

III. Simplified Turkey Red process.

(Protected by Letters Patent 18742/99.)

This method of working is mainly useful for dyeing yarn, and produces a red, which is faster to rubbing and washing than that obtained by the New Red process.

Boil out the cotton as described under *I*, page 151, rinse and oil the hydroextracted yarn at a temperature of from 105° to 120° F. on the oiling machine with the mixture as per Note *a* below. Pass through a second time and pile the yarn overnight, turning it over once. Next morning hydroextract and dry in drying chambers at a temperature of 140° F. till next day.

Then mordant in lead-lined vessels at a temperature of 120—140° F. with a solution, as described in Note *b* below, hydroextract well, wash until blue litmus paper is no longer reddened and dye at the boil in lots of 100 lbs. with about 9 lbs. *Alizarine 20%* and 1—2 gall. calcium acetate 15° Tw. (according to the hardness of the water). For a fast, fiery red, that rubs very little, add 2 lbs. glue and 3 1/2 lbs. sumac extract (or a decoction of 5 lbs. sumac leaves.) Brighten by boiling in a closed kier (using water as free from lime as possible) for 2 hours under 22 lbs. pressure, adding to the water first 1—4 lbs. soda-ash, then later 9 lbs. Marseilles soap, 1/2 lb. tin crystals, and 10 gallons of what is left of the oiling liquor referred to above. Wash, hydroextract and dry.

— For 500 lbs. cotton yarn. —

Notes. a) Preparation of the oil solution. Dissolve 10 lbs. caustic soda solid, 20 lbs. sodium stannate, 12 lbs. sodium aluminate (about 45% Al_2O_3) and 8 lbs. sodium phosphate in 12 1/2 gallons boiling condensation water, add 80 lbs. castor oil first runnings and boil the whole till a clear solution is obtained; then make up to 45 gallons with condensation water.

Add to the above an emulsion of 6 1/4 lbs. Gallipoli oil and 1 lb. soda-ash in 2 gallons warm (condensation) water. Dilute 2 gallons of the cold stock liquor, showing 17° Tw., with twice as much condensation water and oil with this mixture.

- b) The mordant, which shows a density of 17° Tw. when cold, is prepared by dissolving 100 lbs. aluminium sulphate (about 18% Al_2O_3), 9 lbs. sal ammoniac and 13 lbs. magnesium sulphate (Epsom salts) in 90 gallons hot condensation water. It is allowed to settle overnight and the supernatant liquor syphoned off next morning. The mordanting liquor can be used quite well for further lots.

In the first oiling, 1 pint stock liquor is added for each pair of hanks; in the mordanting 2 1/4 pints mordant-liquor are allowed for every fresh 2 lbs., if treated in the machine, or 1 1/2 pints if the mordanting is done by hand.

- c) The cotton is entered into the cold dye-bath, worked for 1/4 hour, the bath brought to the boil within 1 hour and the temperature maintained for 1/2—1 hour. The goods are then washed and hydroextracted.

B. Cotton piece-goods.

(Turkey Red, etc.)

Process N^o 35.

Oil the goods by giving them 1—2 passages in the padding machine through a solution of 1 part Turkey red oil F (50 %) in 4—6 parts water. Dry at 120—140° F., and steam if desired.

Mordant with aluminium acetate 9° Tw., dry, and fix by hanging in the air, or by a short steaming.

Chalk in a bath containing 5—10 lbs. chalk and an equal quantity of sodium phosphate per 100 gallons water, wash out carefully, dye as in the process for New Red (page 151) and finish also as directed in that process by oiling, steaming and brightening (soaping).

Suitable dyestuffs for this process are given on page 152.

More exact instructions and detailed recipes than those given under A I—III and B can always be had on application.

Dyeing cotton with Alizarine dyestuffs on an iron mordant.

Process N° 36.

Boil out the cotton with soda or caustic soda, wash thoroughly, oil in a solution of $\frac{1}{2}$ —1 part Turkey red oil F (50 %) in 9 parts of water, and dry well. Then mordant the cotton with ferrous acetate 3—12^o Tw. (according to the depth of shade desired), dry thoroughly and let it hang for 48 hours. Work it in a bath containing 5 lbs. chalk per 100 gallons water for $\frac{1}{2}$ hour at 120^o F., wash well, dye at the boil for $1\frac{1}{2}$ —2 hours, wash and soap.

- Notes.* a) It is very important to let the cotton hang long enough, so that the iron mordant becomes well fixed.
b) Dyeing is commenced cold, the bath heated in $\frac{3}{4}$ hour to the boil and boiling continued for 1— $1\frac{1}{2}$ hours.

The following brands are suitable for use by this method:

Violet. *Alizarine paste 20 % (V1 new, V2 a bluish).*

Dyeing cotton with Alizarine dyestuffs on a chrome mordant.

Process N° 37.

Boil out the cotton with soda or caustic soda, wash well and mordant with either:

- a) Chromium chloride 32° Tw. Steep for 12 hours, wring out and wash well with plenty of water (hard, running water is best). Oil in a bath of 1 part Turkey red oil F (50%) and 9 parts water, wring out well and dry at 140° F.; or,
- b) Chromium bisulphite 7-15° Tw. Steep for 12 hours, wring out well and treat the cotton, without washing, for 10—15 minutes at a temperature of 140° F. in a bath containing 5—10 lbs. soda-ash per 100 gallons water, then wash out well, hydroextract and oil as described under *a*.

For deep, dull shades treat the cotton, after oiling, for 12 hours in a boiling bath of 10 lbs. sumac extract (53° Tw.) per 100 gallons liquor (or with the corresponding quantity of a decoction of sumac leaves), let it cool, take out the cotton, wring out and then mordant, without rinsing, with chromium chloride (or chromium bisulphite).

Dye the mordanted cotton for 2—2½ hours at the boil, in the case of *Alizarine Red*, *Alizarine Orange* and *Alizarine Maroon* with the addition of calcium acetate, in all other cases with acetic acid, wash out well and soap in the usual way.

- Notes.*
- a) The treatment with oil may be omitted for very pale shades, but in this case the shades are less fast to chlorine.
 - b) For darker shades it is a good plan to treat the cotton twice with chromium chloride, i. e. after oiling to mordant it again with chromium chloride.
 - c) For very dark, dull shades, the use of sumac is to be recommended.
 - d) The Turkey red oil, sumac, chromium chloride and chromium bisulphite baths can be used for further lots after having been sufficiently replenished.
 - e) A mixed mordant of chromium chloride and aluminium acetate 9° Tw. is useful for many shades; in this case the mordanted yarn is dried at about 120° F., chalked and washed.
 - f) In the case of *Alizarine Red*, etc. the quantity of calcium acetate added should be about ¼—⅕ of the weight of dyestuff used; for other dyestuffs the quantity of acetic acid used is regulated by the hardness of the water.
 - g) Dyeing is commenced cold and continued cold for 15 minutes, the bath is then brought to the boil in ¾ hour and boiled for 1—1½ hours.

More detailed directions for the above process can be had on application.

162 Cotton. Alizarine dyestuffs on a chrome mordant.

The following Alizarine dyestuffs are suitable for dyeing on a chromium mordant:

Yellow.

Galloflavine paste. *Reso flavine paste.*
Mordant Yellow G, GR, R.

Orange.

Mordant Yellow 3R.

Brown.

Anthracene Brown 20%. *Alizarine Orange A.*

Claret.

Alizarine paste 20% (V1 new, V2 a bluish, V2 old, V3, GF, GD, GI, SX, RG).

Blue. Bluish Green.

Alizarine Blue X paste, S paste, C paste, R paste, SR paste.
Anthracene Blue R paste, B paste, G paste, G G paste.
Alizarine Indigo Blue S paste.

Violet.

Galleine paste. *Gallocyanine F paste, D paste.*

Green.

Coeruleine S paste. *Alizarine Green S paste.*

Processes for the
production of dyestuffs
on the fibre
(the so-called Ice-colours).

1. Nitrosamine Red.
 2. Paranitraniline Red (Para Red)
Cotton yarn. Cotton piece-goods.
 3. Chloranisidine Scarlet.
 4. Naphthylamine Claret.
 5. Orange from
Metanitraniline R.
- } Chiefly
} for
} piece-goods.
-

Production of dyestuffs on the fibre.

(The so-called Ice-colours.)

I. Dyeing with Nitrosamine Red.

A. On Cotton yarn.

Process N^o 38.

Example for 50 lbs. yarn.

1. Preparation with Beta-Naphthol.

Stock liquor for paler red:

1½ lbs. Beta-Naphthol	} made up to 7½ gallons.
1½ » caustic soda 77° Tw.	
5 lbs. 5 oz. Turkey red oil F 50 0/0	

Stock liquor for deeper red:

1 lb. 14 oz. Beta-Naphthol	} made up to 7½ gallons.
1 » 14 » caustic soda 77° Tw.	
5 lbs. 5 » Turkey red oil F 50 0/0	

The best plan is to work with a deep wooden vessel (as usually employed in Turkey red dyeing), commencing with about 3 gallons liquor or with an oiling machine. Work 2 lbs. at a time of the dry yarn (which has previously been well boiled with soda, or bleached) in this solution and wring out over the liquor. For every further 2 lbs. add about 1½ pints of the above stock liquor.

Then hydroextract the yarn and dry as quickly as possible in a separate, well ventilated room at 120° F.

2. Development of the yarn prepared as above.

For paler red

6 lbs. 12 oz. <i>Nitrosamine Red paste</i>	} made up with cold water to 7½ gall.
2 » 8 » hydrochloric acid 32 ° Tw.	
2 » 4 » sodium acetate crystals	

For deeper red

8 lbs. 2 oz. <i>Nitrosamine Red paste</i>	} made up with cold water to 7½ gall.
3 » 1 » hydrochloric acid 32 ° Tw.	
2 » 12 » sodium acetate crystals	

Method of working.

Stir up the *Nitrosamine Red* with about 3½ gallons cold water, add the hydrochloric acid slowly, let the mixture stand for ½ hour, make up to 7½ gallons and add the sodium acetate shortly before use.

To develop, pour about 3½ gallons of the above solution, diluted with an equal quantity of water, into the wooden vessel and work in this liquor 2 lbs. at a time of the yarn, which has been previously prepared with Beta-Naphthol, dried and thoroughly cooled. Wring out over the liquor and rinse with the utmost despatch. For the next 2 lbs. yarn add 1½ pints of the above developing liquor, and so on.

Finally, soap the yarn at about 120 ° F. with about 5 lbs. soap per 100 gallons, or treat with a solution of 2 lbs. oxalic acid per 100 gallons at about 120 ° F. After rinsing, the operation is complete.

Notes. a) Particular care must be taken to adhere to the above directions, particularly that no changes be made in the proportions of the materials used for preparing and developing.

b) The soaping and the after-treatment with oxalic acid increase the blueness of the shade.

We shall be pleased to send, on request, minutely worked out recipes for dyeing with *Nitrosamine Red*.

B. On Cotton piece-goods.

1.

Saturate the dried, bleached goods in the padding machine with the following solution:

Beta-Naphthol solution.

Dissolve 3 lbs. 5 oz. Beta-Naphthol in
3 » 5 » caustic soda 77° Tw. and
4½ gallons hot water, add
11 lbs. Turkey red oil F (50%), stir and
make up to 22 gallons.

2.

After drying in the hot flue, or on the ordinary drying machine with the cylinders wrapped round with cotton cloth, and cooling, develop the red in the padding machine with the following solution:

Developing bath.

Stir carefully together

a) { 17 lbs. 10 oz. *Nitrosamine Red paste* with
4½ gallons cold water, add, while stirring well,
8 lbs. 2½ oz. hydrochloric acid 32° Tw. and let the
whole stand, with occasional stirring,
for 20–30 minutes.

Dissolve separately

b) { 8 lbs. 13 oz. sodium acetate crystals in
4½ gallons cold water.

Pour solution *b* into solution *a* shortly before use and make up with cold water to 22 gallons.

After developing in the cold and squeezing, rinse thoroughly by means of a spray, soap, wash and dry.

- Notes.*
- a) During the padding as well as during the developing, Beta-Naphthol solution or developing liquor flows in from a storage-vat placed beside the padding machine at the same rate as the liquor is being used up.
 - b) The concentration of the Naphthol solution should be regulated according to the quality of the goods and the pressure they are subjected to in squeezing. 25 lbs. per 100 gallons padding liquor may be considered a maximum and 15 lbs. a minimum. The additions of caustic soda, etc., must naturally then be varied accordingly.
 - c) In general, the same precautions must be observed as when dyeing cotton yarn, process N^o 38, page 163.

II. Dyeing with Paranitraniline (Para Red).

A. On Cotton yarn.

Process N^o 39.

Example for 50 lbs. cotton yarn.

1. Preparation with Beta-Naphthol.

Proceed as described on page 163.

2. Development of the prepared yarn.

For paler red:

1 lb. 3 oz. <i>Paranitraniline</i>	} made up with cold water to 7½ gallons.
3 lbs. 7 » hydrochloric acid 32 ° Tw.	
10 » sodium nitrite	
3 » 1 » sodium acetate crystals	

For deeper red:

1 lb. 6 oz. <i>Paranitraniline</i>	} made up with cold water to 7½ gallons.
4 lbs. 1 » hydrochloric acid 32° Tw.	
12 » sodium nitrite	
3 » 11 » sodium acetate crystals	

Method of working.

Make the Paranitraniline into a paste with an equal quantity by weight of hot water, add 3—4 pints cold water and then the hydrochloric acid. Cool the mixture to 68° F. and pour in, while stirring vigorously, 3—4 lbs. broken ice and immediately afterwards add the solid sodium nitrite in one lot. Shortly before use add the sodium acetate in solution. Then develop, and finish as described on page 164.

The notes on page 164 apply here also.

B. On Cotton piece-goods.

1.

Pad the dried, bleached goods on the padding machine with the following

Beta-Naphthol solution.

Dissolve 3 lbs. 5 oz. Beta-Naphthol in
3 » 5 » caustic soda 77° Tw. and
4½ gallons water, by gently heating; add
11 lbs. Turkey red oil F (50%) and make
up with cold water to 22 gallons.

Dry at 120° F. in the hot flue, or as described under B 2, page 165, and develop according to the same directions with the following solution:

2.

Developing liquor.

Make 3 lbs. 1 oz. *Paranitraniline* into a paste with
6 pints hot water and dissolve by the addition of
6¹/₄ » hydrochloric acid 32° Tw.

Cool by means of

11 lbs. ice and add in one lot, while stirring,
1 lb. 10 oz. sodium nitrite,

taking care that the temperature does not rise above 50° F.
After standing for 10 minutes, filter and make up with cold
water to 11 gallons. Shortly before use add

7 lbs. 11 oz crystallised sodium acetate dissolved in
1¹/₂ gallons water, and make up with cold water
to 22 gallons.

After developing finish as described on page 165.

Note. Chemically the same red is produced by Nitrosamine
Red as by Paranitraniline. The first-named is
simpler to work with and requires less care (within
limits) than Paranitraniline, but the latter, on the other
hand, is rather cheaper.

III. Dyeing Scarlet with Chloranisidine P.

Only for piece-goods.

Process N° 40.

Prepare the dried, bleached goods in the same way as with Para Red, by padding with the Beta-Naphthol solution given below. Dry, cool thoroughly and pass through the cold diazo-solution of Chloranisidine P. After airing for 1—2 minutes, rinse well and soap slightly.

Beta-Naphthol solution.

Dissolve 3 lbs. 5 oz. Beta-Naphthol in
3 » 5 » caustic soda 77° Tw. and
4½ gallons warm water, add
11 lbs. Turkey red oil F (50%), make up
with water to 22 gallons and allow the
solution to cool.

Chloranisidine P solution.

Dissolve 4 lbs. 5 oz. Chloranisidine P in
11 gallons water and
3 lbs. 5 » hydrochloric acid 32° Tw. by warming,
and then cool with ice to 40—50° F.
Add slowly, while stirring, a solution of
1 lb. 8½ oz. to 1 lb. 9 oz. sodium nitrite in 2 gallons water and stir
for 10—15 minutes. Diazotising is then
complete. Shortly before use add a
solution of
4½ lbs. sodium acetate in 2 gallons water and
make up with cold water to 22 gallons.

The developing bath prepared in this manner must not
be filtered before use.

IV. Dyeing Claret with Alpha-Naphthylamine.

Usually for piece-goods.

Process N^o 41.

Pad the dried, bleached goods on the padding machine with the following solution (as directed on page 165):

Beta-Naphthol solution.

Dissolve 5 lbs. 8 oz. Beta-Naphthol in
5 » 8 » caustic soda 77^o Tw. and
6 1/2 gallons hot water; add
16 lbs. 8 oz. gum tragacanth (60:1000) or
11 » Turkey red oil F (50%), and make up
with cold water to 22 gallons.

Dry at a temperature of 120^o F. and develop with the following solution (as directed under B 2, page 165).

Developing liquor.

Dissolve 3 lbs. 2 oz. Alpha-Naphthylamine base in
6 1/2 gallons hot water and
2 pints hydrochloric acid 36^o Tw, cool, and add
4 » » » 36^o » and
44 lbs. ice. When the temperature has sunk to
32^o F., stir in
4 1/2 pints sodium nitrite solution (2 lbs. 14 oz.
per gallon). Then filter, saturate before
use with
6 lbs. 10 oz. sodium acetate crystals and make up
with cold water to 22 gallons.

Rinse and finish as directed on page 165.

V. Dyeing Orange with Metantraniline R.

For piece-goods only.

The method of working is the same as with *Paranitriline*, and the recipe given for the latter can be used without altering the proportions.

Processes for dyeing Aniline Black on cotton.

1. Single-bath Aniline Black.
 2. Oxidation Black.
 3. Topping with a single-bath Black
 - a) on a Sulphur Black ground.
 - b) on a Substantive Black ground.
-

Dyeing of Aniline Black.

I. Single-bath Aniline Black.

Process N° 42.

Example for 50 lbs. yarn.

Dissolve 10 lbs. potassium bichromate or sodium bichromate,
2 » sulphuric acid 168° Tw., and
3 » hydrochloric acid 32° Tw. in
75 gall. water, stir well, and add
5 lbs. Aniline salt O (B. A. S. F.) in solution.

Work the yarn in this liquor for 1½ hours cold, then heat to 120° F. and after 1 hour finally raise the temperature to 175° F. Rinse well and soap for about 1 hour at 130—175° F. with

5½ lbs. soap and
1½ oz. olive oil.

Wring out without rinsing, or hydroextract, and dry.

Note. In place of 5 lbs. Aniline salt O, 3 lbs. 9 oz. Aniline oil O, dissolved in 4 lbs. 10 oz. hydrochloric acid 32° Tw., may be used.

II. Oxidation Black.

Process N° 43.

Steep the dry yarn in a cold bath containing

108—110 lbs.	Aniline salt O (B. A. S. F.)
36— 40 »	potassium (or sodium) chlorate
13— 15 »	copper sulphate
25— 30 »	aluminium acetate 15° Tw.
5 »	wheat starch

per 100 gallons.

This liquor should show 7 1/2° Tw. Wring out evenly and oxidise for about 12 hours in a damp, warm room at a temperature of about 85° F.

When the oxidation is complete, which may be recognised by the very dark green colour of the material, treat the yarn for about 1/2 hour at 160° F. with a solution of 2 1/2 lbs. potassium bichromate per 100 gallons. Rinse well, soap and brighten first with soda, then with soap and oil, or with similar substances.

- Notes.*
- The wheat starch mentioned above must first be boiled with water and then mixed in.
 - The bath can be used for a considerable time and must be replenished by the addition of the above stock liquor, taking care that it always remains at 7 1/2° Tw.
 - Considerable practical experience is required in working the oxidation aniline black process to prevent the yarn from becoming tender, especially during the moist hanging in the oxidation chamber.

The recipe given above is only intended to be of use in assisting with a few hints those who wish to gain some general information about this process.

III. Topping with Aniline Black (single-bath)

on a bottom of

1. Sulphur Black, or
2. Substantive Black or Blue.

Process N° 44.

1. On a bottom of Sulphur Black.

Bottom the cotton with 5 $\frac{1}{2}$ —10 lbs. *Kryogene Black TG* or *TB* by the usual method for sulphur colours, rinse and top in a fresh bath with $\frac{1}{2}$ — $\frac{3}{4}$ the quantities given in process 42, according to the depth of shade desired.

— For 100 lbs. cotton. —

2. On a bottom of Substantive Black or Blue.

Dye the cotton according to process N° 20 with 2 $\frac{1}{4}$ to 3 $\frac{1}{4}$ lbs. *Violet Black**, *Cotton Black E extra**, *RW extra**, and top with *Aniline Black* in a fresh bath as directed in 1 above.

— For 100 lbs. cotton. —

**Note.* Should a specially reddish black be desired, the material can be bottomed with *Cotton Red 4B*, *4BX* or *4B extra*. For a bluish black the following can be used for bottoming: *Oxamine Copper Blue 2R*, *Oxamine Dark Blue BG*, *Oxamine Blue BG*, alone or in combination with the Substantive Blacks mentioned above.

Processes of minor importance for dyeing cotton.

1. Dyeing unmordanted cotton with the addition of alum or sulphate of alumina.
Victoria Blue. Indoine Blue. Soluble Blue.
 2. Dyeing unmordanted cotton in a weakly acid (acetic acid), lukewarm bath.
Rhodamine 6 G, 3 G, S. Methylene Blue. Diamond Green.
 3. Dyeing unmordanted cotton in a common salt bath.
Eosine dyestuffs and certain acid dyestuffs (Cotton Scarlet, etc.).
 4. Direct dyeing with stannate of soda and sulphuric acid.
Soluble Blue.
 5. Direct dyeing with the addition of tannic acid and sulphuric acid.
Soluble Blue.
 6. Dyeing on a mordant of Turkey Red oil with certain basic dyestuffs.
Specially for *Rhodamine*.
 7. Dyeing on a mordant of soap and stannic chloride.
Soluble Blue. Methylene Blue.
 8. Dyeing on a mordant of tannic acid and aluminium acetate.
Rhodamine S.
 9. Dyeing on a mordant of alum and stannate of soda.
Cotton Scarlet, Orange X, etc.
-

Dyeing Processes of minor importance.

The dyeing of unmordanted cotton with the addition of alum or aluminium sulphate.

(For Victoria Blue, Indoine Blue,
Soluble Blue, etc.)

Process N° 45.

Add 1—2 lbs. alum, or $\frac{1}{2}$ —1 lb. aluminium sulphate, to the lukewarm bath, which should be kept as concentrated as possible, bring slowly to the boil, turn off the steam and continue to work the material for a short time.

— For 100 lbs. cotton. —

Note. This process is adapted for the production of bright blue shades (*Corn-flower blue*) with *Victoria Blue B* (also *4R*), and can also be used with *Soluble Blue* and *Nigrosine*.

If *Indoine Blue* be dyed according to this process, the bath should be kept at the boil for a good half hour to ensure better fixation of the colour.

The dyeing of unmordanted cotton in a lukewarm bath with the addition of a little acetic acid.

(For delicate shades with certain basic dyestuffs.)

Process N° 46.

Treat the bleached cotton in a warm soap bath before dyeing; rinse, and enter into the bath, adding 1-2 lbs. acetic acid 9° Tw. (30%) per 100 gallons according to the hardness of the water. Wring out and dry without rinsing.

Note. This process serves especially for the production of delicate, bright pinks with *Rhodamine 6 G*, *3 G* (also *S*), and pale shades with *Methylene Blue* and *Diamond Green G* and *B*.

The dyeing of unmordanted cotton in a concentrated common salt bath, cold or lukewarm.

(For dyestuffs of the *Eosine* group and certain acid dyestuffs.)

Process N° 47.

a) Dye in a lukewarm, very concentrated bath with the addition of 50 lbs. common salt per 100 gallons water.

This process can be used with all the *Eosine*, *Erythrosine*, *Rose Bengal* and *Phloxine* brands.

- b) Dye in a lukewarm, very concentrated bath with the addition of 10–20 lbs. common salt per 100 gallons water.

This method is suitable for *Quinoline Yellow*, *Quinoline Yellow extra*, *Naphthol Yellow S*, *Metanil Yellow*, *Metanil Yellow extra*.

- c) Dye in a lukewarm, very concentrated bath with the addition of 10–20 lbs. common salt and $\frac{1}{2}$ –2 lbs. alum per 100 gallons water.

This process can be used for *Azoflavine RR*, *Orange II*, *GR*, *X*, *Scarlet RA*, *R*, *RR*, *RRR*, *Cotton Scarlet*, *Cotton Scarlet extra*, *Erythrine P*, *X*, *RR*, and *Fast Scarlet* brands.

General method of working.

Work the cotton in the bath for about $\frac{3}{4}$ hour, wring out very evenly without rinsing, and dry, if possible, cold.

- Notes.* a) The process is useful for the production of bright shades which, however, are not very fast either to washing or water.
- b) Hard and fast rules for the quantities of dyestuff necessary can scarcely be laid down, as the proportion varies, when the other conditions of working are correct, from 2–10 lbs. dyestuff for the first bath per 100 lbs. cotton. The baths are not nearly exhausted and must be preserved for further use.

Detailed processes may be had on application.

**The dyeing of cotton direct with an addition of
stannate of soda and sulphuric acid.**

(For Soluble Blue.)

Process N° 48.

Prepare the bath (which should be kept as concentrated as possible) with

2—3 lbs. dyestuff
2 » stannate of soda
1 lb. sulphuric acid 168° Tw.

Enter the cotton at a temperature of 175° F., wring out without rinsing (or hydroextract) and dry. For further lots add dyestuff according to the shade desired and about $\frac{1}{4}$ of the above quantities of sodium stannate and sulphuric acid.

— For 100 lbs. cotton. —

Note. This process is especially suitable for obtaining quickly and easily a bright blue with *Soluble Blue*.

The dyeing of cotton by the direct method with an addition of tannic acid and sulphuric acid.

(For specially bright shades with *Soluble Blue, Methyl Soluble Blue, Methyl Soluble Blue 3 S.*)

Process N° 49.

Treat the cotton for $\frac{1}{4}$ hour in a concentrated, warm (120° F.) bath containing, according to the depth of the shade to be dyed, 2—10 lbs. tannic acid and $\frac{1}{4}$ — $\frac{1}{2}$ pint sulphuric acid 168° Tw. per 100 gallons, and allow the bath to cool down. Wring out or squeeze evenly without rinsing, and dry.

Note. It is economical to use the old baths for further lots, adding for each new lot of cotton about $\frac{1}{3}$ of the dyestuff and $\frac{1}{10}$ of the tannic acid and sulphuric acid first taken.

**The dyeing of cotton, mordanted with Turkey red oil,
with certain basic dyestuffs.**

(For *Rhodamine B*, as a self-shade and also in combination
with *Auramine*.)

Process N° 50.

Soak the bleached, dry cotton, 2 lbs. at a time, as is usually done in dyeing Turkey red, in a deep vessel containing about 3 gallons of a solution of

1 part Turkey red oil F (50 %) in
2 parts water.

For every succeeding lot of 2 lbs. add so much of this solution to the bath that the volume of the liquor remains constant. Wring out the saturated cotton and squeeze it evenly, dry, and repeat the whole oiling operation once or twice. Then dye in a fresh, cold bath without any addition other than the dyestuff. Dry without rinsing.

Tones of unsurpassed beauty can be produced with *Rhodamine B* and *Auramine G, II*, etc., when worked according to this method.

Note. Particulars of a more complicated method of dyeing *Rhodamine*, etc. on cotton mordanted with Turkey red oil and aluminium acetate may be had on application.

**The dyeing of cotton mordanted with soap
and stannous chloride.**

(For specially fine shades with *Soluble Blue*, *Methylene Blue*, etc.)

Process N° 51.

Work the cotton $\frac{1}{2}$ hour in a lukewarm bath containing 4—5 lbs. soap per 100 gallons water, wring lightly, or hydro-extract, and dry. Then steep the cotton for $\frac{1}{2}$ hour in a cold bath of 2 lbs. stannous chloride per 100 gallons water, rinse and dye for $\frac{1}{2}$ —1 hour in a lukewarm bath with the addition of $\frac{1}{2}$ —1 lb. alum per 100 gallons water.

Note. None of the baths are exhausted and they can be used for further lots by replenishing with about $\frac{1}{3}$ of the quantities of mordant and dyestuff originally taken.

The process is useful for the production of very bright, but not particularly fast shades with *Soluble Blue* and *Methylene Blue*.

**The dyeing of cotton, mordanted with tannic acid
and aluminium acetate.**

Process N° 52.

Mordant the goods with tannic acid as directed on page 123, but follow this with a bath of aluminium acetate instead of antimony salt. Take about 20 gallons aluminium acetate 9° Tw. for every 100 gallons liquor.

Note. The process is specially suitable for the production of bright pink shades with *Rhodamine S*, *S extra*.

**The dyeing of cotton, mordanted with alum
and stannate of soda.**

(For the production of full, bright shades with certain
acid dyestuffs.)

Process N^o 53.

Work the yarn for about half an hour in a cold, concentrated bath (3^o Tw.) of stannate of soda; leave it in for a few hours, then wring out carefully and steep for 1 hour in a bath of 2 lbs. alum per 100 gallons water. Wring out evenly and dye in a concentrated bath for $\frac{3}{4}$ hour at about 140^o F. Wring out without rinsing and dry (if possible, cold).

For further lots keep the tin bath always at 3^o Tw.; the alum bath must be renewed each time. Only about $\frac{1}{2}$ of the dyestuff originally taken need be used to replenish the dye-bath.

Note. This process is specially suitable for certain acid colours, such as *Cotton Scarlet*, *Cotton Scarlet extra*, *Erythrine*, *Orange X*.

Methods of dyeing cotton in dyeing machines.

A. Dyeing cops, cheeses, etc.

1. Dyeing with substantive colours.
2. Dyeing with substantive colours, developed.
3. Dyeing with sulphur colours.
(Kryogene dyestuffs.)
4. Dyeing with basic colours.
5. » » Indigo pure B. A. S. F.
6. » » Indanthrene colours.
7. » » Nitrosamine Red paste or
 Paranitraniline for Para Red.

B. Dyeing cheeses in the froth of the boiling dye-bath.

The dyeing of cops, cheeses, etc., in machines.

I. Preparation.

For delicate shades, which are difficult to dye level, boil the cops, etc. with about 2 lbs. soda-ash and, preferably also, 1—3 lbs. Turkey red oil (50%) for 15—30 minutes, rinse and commence dyeing.

— For 100 lbs. cops, etc. —

II. Dyeing.

Process N° 54 (1—7).

1. Method of working with substantive (direct) dyestuffs.

- a) Dyeing. Work as a rule for 30—45 minutes at the boil with the addition of 10—20 lbs. crystalline Glauber's salt or 5—10 lbs. common salt. With the brands marked (3) on pages 184—186, add also up to 2 lbs. soda-ash.

In dyeing full shades, work for another $\frac{1}{4}$ hour after turning off the steam.

- b) After-treatment. If the dyeings obtained are to be treated with metallic salts, according to the process described on page 111, to increase their fastness, add first to a fresh bath the given quantity of acetic acid, work for a few minutes, and then add the solutions of copper

sulphate and potassium bichromate. Work in this bath for about $\frac{1}{2}$ hour at 100—120° F., and then rinse most thoroughly.

— For 100 lbs. cops, etc. —

- Notes.* a) Instead of crystalline Glauber's salt, half as much calcined Glauber's salt can be used.
- b) If difficulties are met with as regards penetration or evenness, better results can often be obtained by adding 1—3 lbs. Turkey red oil, or a suitable substitute.
- c) All systems and makes of apparatus are, as a rule, suitable for dyeing with substantive dyestuffs.

2. The further development of substantive (direct) dyeings on the fibre.

- a) **Diazotising.** Dye the cops with direct dyestuffs according to process N° 20, rinse well, and enter into a cold bath containing

1 lb. sodium nitrite and
2 lbs. sulphuric acid 168° Tw.

per 100 gallons. Work in this bath for $\frac{1}{4}$ hour and then rinse in a fresh, cold bath containing 1 lb. hydrochloric acid per 100 gallons.

- b) **Developing.** After diazotising and rinsing as above, develop at once for 15—30 minutes in a fresh, cold bath, using the developer necessary for the shade desired (cf. page 107). Finally rinse thoroughly.

The following brands are particularly suitable for both light and dark shades:

Yellow.

¹ *Sulphine A, N, NN.*

² *Pyramine Yellow G, R.*

Orange.¹ *Cotton Orange G, R.*² *Pyramine Orange RR.***Brown.**¹ *Thiazine Brown G, R.*¹ *Cotton Brown RN.***Red. Crimson.**¹ *Thiazine Red G, R.*² *Oxamine Red 3 B.***Blue.**² *Oxamine Pure Blue 5 B.*² *Oxamine Blue 3 B.***Blue Black.**² *Oxamine Black A, N, R.*² *Oxamine Black RN, BH.***Black.**² *Cotton Black 3 B.*² *Cotton Black 3 G.*

All the above and also the undermentioned brands are suitable for medium and dark shades:

Yellow.⁴ *Cotton Yellow GI, GR, GRR.***Orange.**² *Pyramine Orange 3 G.***Brown.**² *Oxamine Brown 3 G, G, GR, R, B.*² *Cotton Brown G, R VN.*² *Oxamine Dark Brown G, R.***Red.**² *Cotton Red 4 B, 5 B.*² *Cotton Rubine.*² *Cosmos Red.*² *Oxamine Red.*² *Oxamine Fast Red F.***Claret.**² *Oxamine Fast Claret G, B.*² *Oxamine Claret B, M.*² *Oxamine Garnet M.*

Violet.³ *Oxamine Violet.***Blue.**³ *Oxamine Blue 4 R, 3 R.*³ *Oxamine Copper Blue R R.*³ *Oxamine Dark Blue B R, R.*³ *Oxamine Blue R X N, A,**G N, B G.*³ *Oxamine Dark Blue B G, M N.***Green.**³ *Oxamine Green B, G, M N.*³ *Oxamine Dark Green M N.***Blue Black.**³ *Oxamine Black R R.***Black.**³ *Cotton Black B G N X, E extra, P F extra, R W extra.*

Further, the dyestuffs diazotised and developed on the fibre (the so-called diazo-dyes, cf. also page 106):

¹ *Sulphine A, N, N N.*³ *Oxamine Blue 3 R, 4 R, B G.*³ *Oxamine Violet.*³ *Oxamine Black brands.*³ *Cotton Black E extra, R W extra.*

See pages 107—109 for suitable developers and the resulting shades.

Notes. The dyestuffs marked ¹ give brighter and fuller shades, if common salt is used, whilst *Pyramine Orange R R* — marked ² — yields rather brighter shades with Glauber's salt.

In dyeing with the brands marked ³ it is advisable to use a little soda, in addition to the Glauber's salt, to ensure complete development, whilst with the brands marked ⁴, in addition to Glauber's salt, 2 lbs. sodium phosphate per 100 gallons water and a little Turkey red oil or soap (not soda on any account) should be used to attain the greatest purity, depth and evenness.

3. Method of working with sulphur dyestuffs (Kryogene dyestuffs).

- a) Dyeing. It is advisable to first boil out the cops, which are then dyed on the same general lines as described in process No 25.

To dye a black, for example, set the first bath as follows:

- 15 lbs. *Kryogene Black TB* or *TG*
- 10—15 » sodium sulphide (concentrated)
- 5 » soda-ash
- 20 » crystalline Glauber's salt (or half as much calcined Glauber's salt or common salt).

Dye for 1 hour at the boil and rinse thoroughly.

- b) Brightening. To obtain the fullest shade of black, brighten afterwards with a little Turkey red oil and fat.

— For 100 lbs. cops, etc. —

The following sulphur dyestuffs are suitable for the production of both light and dark shades. Those brands marked with an asterisk are more concentrated.

Yellow.	<i>Kryogene Yellow G, R.</i> * <i>Kryogene Yellow GX, RX.</i>
Brown.	<i>Kryogene Brown A, G, RB.</i> * <i>Kryogene Brown GX, RBX.</i>
Blue.	<i>Kryogene Direct Blue G.</i> * <i>Kryogene Direct Blue GO.</i>
Olive.	<i>Kryogene Olive.</i> * <i>Kryogene Olive X.</i>
Black.	<i>Kryogene Black TB, TBN, TG, TGN.</i> * <i>Kryogene Black TBO, TGO.</i>

For medium and dark shades only, the following are also suitable:

Blue.	<i>Kryogene Blue B, BN</i> * <i>Kryogene Blue BX, BNO</i>	} developed by steaming or storing.
Blue Black.	<i>Kryogene Black Blue BGT</i> * <i>Kryogene Black Blue BGTO</i>	

4. Working with Indoine Blue and other basic dyestuffs.

- a) Mordanting. Boil out the cops with water and then allow the boiling mordanting liquor (1—2 lbs. tannic acid) to circulate through them for 15 minutes; turn off the steam and continue the mordanting operation until the bath has cooled down to about 115° F.

Then rinse cold for not more than a few minutes. Fix in a fresh cold bath for ½ hour with antimony salt and rinse well.

(With reference to the relative proportions of tannic acid and antimony salt see process No 27, page 123.)

- b) Dyeing. Add to the fresh bath the quantity of aluminium sulphate necessary for the *Indoine Blue*, allow to circulate for a few minutes, add the dyestuff solution in several portions at intervals, bring to the boil, keep at the boil for ½ hour and dye for ¼ hour longer after turning off the steam. With the other basic dyestuffs mentioned below, diminish the quantity of aluminium sulphate or replace it, if desired, by alum or acetic acid. Dye at 105—115° F., *Methylene Blue* at 160° F. (but not at the boil).

All dyestuffs which dye on a mordant (tannin and antimony) — see page 125 — give good results in machines having powerful circulation. Amongst these the following are specially valued on account of their shade and fastness:

Blue.

Methylene Blue brands.

Victoria Blue brands.

Victoria Pure Blue B.

Indoine Blue brands.

Violet.

Methyl Violet brands.

Green.

Diamond Green brands.

5. Working with Indigo pure B. A. S. F.

For dyeing Indigo pure, the hydrosulphite vat is chiefly used; details as to method of dyeing, stock liquor and the brands of Indigo suitable will be found on page 146 under C 1.

Suitable machines are those in which the liquor, during circulation, comes as little as possible into contact with the air. The apparatus must also be provided with a suction pump, so that the liquor can be extracted as completely as possible from the material after dyeing.

6. Method of working with Indanthrene dyestuffs.

Boil out the cops, etc. for 1 hour with

2—3 lbs. soda-ash or caustic soda 77° Tw. and

2—3 » Turkey red oil F (50%)

per 100 gallons water, and then wash well.

To prepare the dye-bath, fill the apparatus with water at 140° F. (in the case of *Indanthrene Blue GC* and *GCD* at 120° F.) and add the requisite quantities of caustic soda 53° Tw. and hydrosulphite (see table page 129). Stir up the dyestuff with about 5—10 times its quantity of hot water, add this to the bath through a fine sieve, stir up, without letting the liquor come much into contact with the air, and allow the bath to stand for 5 minutes till the dyestuff has completely dissolved, which can be seen from the clear deep blue or brown colour of the solution.

It is advisable to dissolve the hydrosulphite just before use, and, if possible, to prepare the dye-bath in a reservoir connected with the dyeing apparatus.

With very light shades, and when there is difficulty in getting level dyeings, it is recommended to commence dyeing at a lower temperature. In this case the reservoir is only half filled with water, heated up to 120 or 140° F., and the caustic soda, hydrosulphite and dyestuff are added as above. When the dyestuff has gone into solution, the reservoir is

filled up with cold water (the liquor meanwhile being well stirred), so that the temperature finally stands at about 95—105° F.

If the liquor has been made up in a separate reservoir, it is run into the machine, which is then started, and the liquor heated in about 20 minutes to 140° F. (with *Indanthrene Blue GC* and *GCD* only to 120° F.).

For medium and dark shades the temperature is kept at 120 or 140° F. from beginning to end of the dyeing operation, which should take about $\frac{3}{4}$ hour.

Run off the liquor (or return it to the reservoir, if it is to be further used), and wash the goods a short time with cold water containing 2½—3 oz. Hydrosulphite conc. B. A. S. F. powder per 100 gallons.

Wash well with cold water, then sour with dilute acid (about $\frac{3}{4}$ —1½ pints sulphuric acid 168° Tw. or, in the case of iron apparatus, 2½—4 pints acetic acid 9° Tw. (30%) per 100 gallons) and finally rinse well. To attain the greatest possible fastness it is absolutely necessary, especially with *Indanthrene Yellow G* and *R*, to soap the material at the boil after dyeing, or, if this is not practicable because of too much frothing, to treat it for about $\frac{1}{4}$ — $\frac{1}{2}$ hour with boiling water to which has been added 1—2 lbs. soda-ash per 100 gallons. These operations can also be carried out after the material has been woven into the piece.

Continuous working in old liquors.

In dyeing light shades the baths are almost completely exhausted, and a further use of the liquor is hardly to be recommended, as only a saving in caustic soda can be effected thereby.

With dark shades, on the other hand (except with *Indanthrene Violet RT* and *Indanthrene Dark Blue BO*, which exhaust fairly completely even in high percentages), there is always a certain quantity of dyestuff left in the bath,

which can be further utilised by adding about $\frac{1}{4}$ — $\frac{1}{3}$ of the quantities of caustic soda and hydrosulphite originally taken, filling up with water and dyeing a new lot of cotton in this liquor. The light shade thus obtained can be made use of as such, or can be topped in a fresh bath to the desired depth. Dye-liquor that has once been allowed to cool down cannot be used again.

- Notes.*
- a) Hard water (i. e. containing lime) must be purified before it is used for dyeing. For this purpose an adequate quantity of soda is added, the water stirred up and the white precipitate which forms allowed to settle, the clear water only being employed for dyeing. Condensation water is to be recommended as the most advantageous for machine dyeing.
 - b) To accelerate the oxidation in the case of *Indanthrene Yellow G* and *R*, it is advisable, after having rinsed the material as free from vat liquor as possible, to work it for about 10 minutes in a bath containing 5—8 oz. potassium bichromate per 100 gallons. The goods should then be well rinsed, soured and finished. If desired, the bichromate can be added directly to the souring bath.
 - c) With regard to the choice of machine, the remarks made on page 189, under 5, for Indigo apply in this case also, except that with the Indanthrene colours a suction pump for partial drying is not absolutely necessary.
 - d) The quantity of water is regulated by the construction of the apparatus; the quantity of caustic soda by the volume of the liquor. The minimum quantity of hydrosulphite (even for light shades) is $1\frac{1}{4}$ lbs., the maximum (for dark blue and violet) 4 lbs. per 100 gallons dye-liquor.
 - e) It is desirable to have the vats and machines for dyeing Indanthrene colours made of wood, iron or an alloy of nickel and copper, and so constructed that the liquor during circulation comes into contact with the air as little as possible. When this cannot be avoided the quantity of hydrosulphite must be correspondingly increased. It is of advantage to have a separate vessel for dissolving

the dyestuff. Phosphor-bronze has been found good for outlet-taps and valves, copper is to be avoided if at all possible.

- f) The material must under all circumstances be well wetted out before dyeing, or uneven results may easily be obtained.
- g) The temperature of the dye-bath should be maintained at about 120° F. with *Indanthrene Blue GC* and *GCD*, and at about 140° F. with the other Indanthrene dyestuffs. Care must be taken that the liquor does not reach too high a temperature or the dyestuff will be unfavourably affected. *Indanthrene Violet R extra* and *Indanthrene Dark Blue BO*, when dyed at 195° F., give somewhat fuller but duller shades. If desired, *Indanthrene Yellow G* and *R* can also be dyed at a higher temperature (e. g. in combination with other colours), but do not give deeper shades.
- h) If material, dyed with *Indanthrene Blue RS*, is soaped hot or at the boil the shade comes up somewhat redder and brighter; with *Indanthrene Blue GC* and *GCD* there is less alteration towards the red side, whilst the shades produced with the other Indanthrene dyestuffs are but slightly changed. The same effect is produced by boiling with water for 1/4—1/2 hour or by steaming with or without pressure.

Dyeings of *Indanthrene Yellow G* and *R* must be soaped at the boil or steamed, for the attainment of the best possible fastness to light.

A chlorine treatment causes the blue obtained with *Indanthrene Blue RS* to become greenish blue to green, according to the strength of the bleaching liquor; the original shade can be completely restored by a treatment with dilute, lukewarm hydrosulphite solution (6—8 oz. Hydrosulphite conc. B. A. S. F. powder per 100 gallons water). The dyeings are made considerably faster to chlorine by steaming (best for 2 hours under 15 lbs. pressure); it is advisable to steam the cotton in its soaped, unwashed condition.

Indanthrene Blue GC and *GCD* alter but little, when subjected to chlorine.

Indanthrene Yellow G and *R*

- » *Violet RT*
- » *Dark Blue BO*
- » *Orange RT*
- » *Copper R*

withstand even a strong chlorine treatment, without the shade and depth being affected.

Indanthrene Brown B and *Indanthrene Olive G* are partly destroyed by chlorine; *Indanthrene Green B* turns black.

i) See note *h*, page 132.

The following *Indanthrene* dyestuffs are suitable for dyeing cops:

- Indanthrene Yellow G* paste, *G* double paste,
 R paste, *R* double paste,
- » *Orange RT* paste, *RT* double paste,
- » *Copper R* paste, *R* double paste,
- » *Brown B* paste,
- » *Maroon R* paste (where the demands are not
 too high),
- » *Violet RT* paste,
- » *Blue RS* paste, *RS* double paste,
 GC paste, *GC* double paste,
 GCD paste, *GCD* double paste,
- » *Dark Blue BO* paste,
- » *Green B* paste,
- » *Olive G* powder.

Dyestuffs suitable for application by the "Anthraflavone process" on the basis of the instructions given on pages 139—140 will be found on page 140.

7. Method of working with Nitrosamine Red paste or Paranitraniline for the production of Para Red.

a) Preparation with Beta-Naphthol.

Treat the dry cops for $\frac{1}{4}$ hour in a lukewarm bath containing about

- 18—20 lbs. Beta-Naphthol,
- 18—20 » caustic soda 77° Tw.
- 65 » Turkey red oil F (50%)
- 8 » sodium bisulphite 71° Tw.
(= about 3 lbs. bisulphite powder),

per 100 gallons. Remove the superfluous liquor by means of the suction pump attached to the machine, or with a centrifugal hydroextractor, so that the weight of 1 lb. dry cops after this treatment (i. e. still damp) is not more than 2 lbs. at the outside.

- Notes.*
- a) The Beta-Naphthol is dissolved by pouring over it the caustic soda and a little hot water, stirring up till dissolved, and then adding the rest of the water lukewarm. Finally add the bisulphite and Turkey red oil.
 - b) If the old bath is used for further lots, it is replenished with about 1 gallon of the above Beta-Naphthol solution per 10 lbs. cops.

b) Development of the naphthol-prepared cops.

The developing liquor consists of

- 106 lbs. *Nitrosamine paste*
- 40 » hydrochloric acid 32° Tw.,

per 100 gallons, prepared as described on page 165. The scum which appears on the surface must be removed, and a concentrated solution of

- 40 lbs. cryst. sodium acetate

added when the liquor is in the machine.

Having prepared the cops with Beta-Naphthol and dried them well, treat them in this cold developing liquor for about 1/4 hour. Remove superfluous liquor by suction, or hydroextract, rinse well and dry, preferably with the cops in an upright position.

- Notes.* a) When the old developing bath is used for further lots, as much of the undiluted stock solution as has been removed with the first lot, together with a corresponding quantity of sodium acetate, is added to it.
- b) The temperature of the stock liquor and of the developing bath must not be allowed to rise above 64° F. More should never be made than will be used on the same day. In warm weather, the bath can be kept cool by replacing part of the water with ice.

For reasons of economy it is advisable to prepare as many cops with Beta-Naphthol as can be developed in one day. Since this latter operation requires much less time, several days can be occupied in preparing the cops, which can then all be developed in one day.

When working with *Paranitraniline* instead of *Nitrosamine Red paste*, prepare in exactly the same way with Beta-Naphthol solution as directed for *Nitrosamine Red*.

For the diazotising, the preparation of the developing liquor, etc., follow the directions given in process No 39, page 166.

The dyeing of cheeses in the froth of the dye-liquor.

Process N° 55.

Place the cheeses on their sides in a box, or basket, and dye for 1—1½ hours in the froth of the vigorously boiling dye-liquor, containing a small quantity of Glauber's or common salt and perhaps also a little Turkey red oil F (50%), 1 to 2 gallons per 1000 gallons liquor, added for the purpose of increasing the frothing. To get the cheeses evenly dyed and well penetrated they should be kept completely covered by the froth without coming into contact with the liquor itself and, if possible, they should be turned once during the process.

Note. The dye-vessel should not be filled to more than about 1/5 of its capacity. An ordinary case, made of wooden laths, or a basket may be utilised for holding the cheeses and should be suspended in the froth with the bottom about 5 inches above the surface of the liquor. The quantity of Glauber's salt or common salt required — which is less than that used in process 20 — varies according to the depth of the shade.

The most suitable dyestuffs are, generally speaking, those given on page 184 ff. for cop dyeing, i. e., the easily soluble sulphur and substantive dyestuffs.

Indigo, Indanthrene, the basic colouring matters and the developing dyestuffs cannot be used for this process.

Classification
of the
Cotton dyestuffs
according to their fastness.

(See notes on page 1.)

Level-dyeing properties.

Fastness to washing.

- » » light.
- » » chlorine.
- » » boiling acid
(fastness to cross-dyeing).
- » » sizing.
- » » ironing.

Dyestuffs which withstand
mercerising.

Note. The new Indanthrene dyestuffs mentioned on page 140 could not be classified in these tables, as they were added whilst the book was in the press. Their fastness properties are, however, of the same excellence as the other members of the Indanthrene class.

ABBREVIATIONS.

<i>(Cu)</i>	== after-treated with sulphate of copper (process on page 111).
<i>(Cu Cr)</i>	== after-treated with potassium bichromate, sulphate of copper and acetic acid, as given on page 112.
<i>(Nitroso)</i>	== after-treated with diazotised Paranitraniline or Nitrosamine Red paste, process N ^o 24, page 109.
<i>(formaldehyde)</i>	== after-treated with formaldehyde, process page 114.
<i>(diazo-beta)</i>	== diazotised and developed with Beta-Naphthol, process N ^o 23, page 106.
<i>(diazo-B)</i>	== diazotised and developed with Oxamine Developer B, process N ^o 23, page 106.
<i>(diazo-R)</i>	== diazotised and developed with Oxamine Developer R, process N ^o 23, page 106.
<i>(diazo-M)</i>	== diazotised and developed with Oxamine Developer M, process N ^o 23, page 106.
<i>(diazo-resorcin)</i>	== diazotised and developed with Resorcin, process N ^o 23, page 106.
<i>(diazo-OR)</i>	== diazotised and developed with Orange Developer R, process N ^o 23, page 106.
<i>(diazo-soda)</i>	== diazotised and developed with soda, process N ^o 23, page 106.
<i>(diazo-bl.)</i>	== diazotised and developed with bleaching powder, process N ^o 23, page 106.
<i>(chrome)</i>	== dyed on a chromium mordant, process N ^o 37 page 160.
<i>(aluminium)</i>	== dyed on an aluminium mordant, process N ^o 34, page 151.
<i>(iron)</i>	== dyed on an iron mordant, process N ^o 36, page 159.
<i>(tan)</i>	== after-treated with tannin, as given on page 124, note <i>d.</i>

Level-dyeing properties.

The following products must be classed with the most even-dyeing substantive, basic and sulphur dyestuffs. (For members of the other groups of dyestuffs, see the notes on page 200.)

Yellow.

Substantive dyestuffs:	<i>Cotton Yellow R.</i>	<i>Pyramine Yellow R, G.</i>
Basic dyestuffs:	<i>Auramine II, O. Cannelle, Cannelle O F.</i>	<i>Rheonine A, N, G. Euchrysine brands.</i>
Sulphur dyestuffs:	<i>Kryogene Yellow brands.</i>	

Orange.

Substantive dyestuffs:	<i>Cotton Orange G, R.</i>	<i>Pyramine Orange RR.</i>
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Brown.

Substantive dyestuffs:	<i>Thiazine Brown G, R. Oxamine Brown 3 G.</i>	<i>Cotton Brown RN. Cotton Brown RV, G.</i>
Sulphur dyestuffs:	<i>Kryogene Brown A, G, G X.</i>	<i>Kryogene Brown RB, RBX.</i>

Red.

Substantive dyestuffs:	<i>Thiazine Red G, R.</i>	<i>Cotton Rubine.</i>
Basic dyestuffs:	<i>Saffranine Scarlet G, B. Magenta Scarlet G, B. Diamond Magenta brands. Magenta powder A, AB. Saffranine T extra.</i>	<i>Rhodamine B, 6 G, 3 G, S. Cerise brands (only in pale and medium shades). Induline Scarlet.</i>

Violet.

Basic
dyestuffs: *Methyl Violet brands* (the bluish brands). *Ethyl Purple.*
Methyl Violet brands (the reddish brands). *Crystal Violet.*

All the violet dyestuffs are very much the same in this respect and only dye very evenly in medium and dark shades.

Blue.

Substantive
dyestuffs: *Oxamine Blue B G.* *Oxamine Dark Blue B G.*

Basic
dyestuffs: *Dark Blue B, R.* *Nile Blue A, B B, B.*
New Blue S. *Victoria Blue B*
Cotton Blue brands. (working cautiously).
Methylene Blue brands. *Victoria Pure Blue B*
Nile Blue R. (working cautiously).
Indoine Blue brands.

Sulphur
dyestuffs: *Kryogene Direct Blue B.*
Kryogene Direct Blue G, G O.
Kryogene Blue B, B X, B N, B N O (developed).
Kryogene Black Blue B G T, B G T O (developed).

Green. Olive.

Basic
dyestuffs: *Diamond Green B, G.*

Sulphur
dyestuffs: *Kryogene Olive.*

Grey. Black.

Substantive
dyestuffs: *Oxamine Black brands* *Violet Black.*
(RR not so good).

Basic
dyestuffs: *Yet Black* (with tannin-iron mordant).

Sulphur
dyestuffs: *Kryogene Black T B, T B O, T B N, T G, T G O, T G N*
(for Black).

Notes. a) We would particularly point out that names of substantive colours printed above in heavy types indicate the brands which also yield level dyeings in mixtures, e. g. for fancy shades. All the products not mentioned have the average even-dyeing properties of this class of dyestuffs.

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- b) The sulphur dyestuffs named above also give level dyeings in combination, if sufficient sodium sulphide is added to the dye-bath.
- c) With regard to the evenness of the basic dyestuffs on a tannin mordant it should be noted that this largely depends upon the strength of the mordant used. A level mordant combined with careful working afterwards in dyeing will produce a level dyeing.
- d) In general, the remarks made under *c* apply to all the Alizarine dyestuffs not given here when dyed on an aluminium, iron or chrome mordant (Turkey red, etc.).
- e) For the production of even dyeings (especially on yarn) with the Indigo pure B. A. S. F. brands suitable for cotton, a factor of importance, apart from the good condition of the vat, is the skillfulness of the workman.
- f) To obtain level dyeings with the Indanthrene colours, sufficient hydrosulphite must be added. *Indanthrene Yellow R, G, Indanthrene Blue RS, G C, G C D, Indanthrene Copper R, Indanthrene Brown B, Indanthrene Orange RT* and *Indanthrene Olive G* produce the most level dyeings, especially as self-shades.

Fastness to washing.

The following are amongst the fastest dyestuffs of their kind to washing:

Yellow.

Substantive
dyestuffs: *Cotton Yellow G I* (Cu soaped). *Sulphine* (diazo-soda, Cu).
Cotton Yellow R (Cu).
Cotton Yellow G I (Nitroso, Cu soaped). *Pyramine Yellow R* (formaldehyde).

Basic
dyestuffs: *Auramine G, II.* *Rheonine brands.*
Euchrysine brands. *Phosphine N, E.*

Sulphur
dyestuffs: *Kryogene Yellow G, G X, R, R X.*

Alizarine
dyestuffs: *Mordant Yellow brands* (chrome). *Galloflavine* (chrome).
Reso flavine (chrome).

Indanthrene
and other vat
dyestuffs: *Indanthrene Yellow G, R.* *Anthraflavone G.*

Orange.

Substantive
dyestuffs: *Pyramine Orange 3 G* (Nitroso). *Sulphine* (diazo-resorcin).
Sulphine (diazo-O R).

Alizarine
dyestuffs: *Alizarine Orange A* (aluminium).

Indanthrene
dyestuffs: *Indanthrene Orange R T.*

Ice-colours: *Orange* (with *Metanitraniline R*).

Brown.

Substantive

dyestuffs: *Oxamine Brown B, R*
(diazo-beta, Cu); (Nitroso, Cu); (diazo-R, Cu);
(formaldehyde); (diazo-M, Cu); (Cu or Cu Cr).
Oxamine Maroon (Cu or Cu Cr); (Nitroso, Cu).
Sulphine brands (diazo-M).
Thiazine Brown G, R (Cu).

Sulphur

dyestuffs: *Kryogene Brown A, G, GX.* *Kryogene Brown RB, RBX.*

Alizarine

dyestuffs: *Alizarine Orange A* *Anthracene Brown*
(chrome). (aluminium or chrome).

Indanthrene

dyestuffs: *Indanthrene Maroon R.* *Indanthrene Copper R.*
Indanthrene Brown B.

Scarlet. Red.

Substantive

dyestuffs: *Oxamine Red* (Cu). *Oxamine Fast Red F.*
Sulphine (diazo-beta).

Basic

dyestuffs: *Rhodamine 6 G, 3 G, 3 B, B* (tan). *Rhodamine 6 G, 3 G, 3 B, B.*
Induline Scarlet (tan). *Rhodamine S* (tan).

Alizarine

dyestuffs: *Alizarine Red brands*, especially the bluish brands
(aluminium).

Ice-colours:

Para Red (with *Paranitraniline* or *Nitrosamine Red*).
Scarlet (with *Chloranisidine P*).

Crimson. Claret.

Substantive

dyestuffs: *Sulphine* (diazo-B, Cu). *Oxamine Claret M* (Cu).
Oxamine Red (Nitroso, Cu). *Oxamine Garnet M* (Cu).

Basic

dyestuffs: *Saffranine M N, T extra* (tan).

Alizarine

dyestuffs: *Alizarine Maroon* *Alizarine Red brands*
(aluminium or chrome). (chrome).

Ice-colours:

Claret (with *Alpha-Naphthylamine*).

Violet.

Basic dyestuffs:	<i>Methyl Violet brands</i> (tan). <i>Crystal Violet</i> (tan). <i>Ethyl Violet</i> (tan).	<i>Methyl Violet brands</i> . <i>Crystal Violet</i> .
Alizarine dyestuffs:	<i>Anthracene Blue R</i> (aluminium). <i>Galleine</i> (chrome).	<i>Gallocyanine</i> (chrome). <i>Alizarine Red brands</i> (iron).
Indanthrene dyestuffs:	<i>Indanthrene Violet R extra, R T.</i>	

Blue.

Substantive dyestuffs:	<i>Oxamine Copper Blue</i> <i>RR</i> (Cu). <i>Oxamine Blue B, B G,</i> <i>GN</i> (Cu).	<i>Oxamine Violet</i> (diazo- beta, Cu); (diazo-B, Cu). <i>Oxamine Dark Blue M,</i> <i>MN</i> (Cu).
Basic dyestuffs:	<i>Victoria Blue R.</i> <i>Victoria Pure Blue B</i> (tan). <i>Indoine Blue brands.</i> <i>Methylene Blue brands</i> (tan).	<i>Victoria Blue B, 4 R</i> (tan). <i>Marine Blue brands</i> (tan). <i>Dark Black B, R</i> (tan). <i>New Blue S</i> (tan). <i>Nile Blue brands</i> (tan).
Sulphur dyestuffs:	<i>Kryogene Blue B, B X, B N, B N O</i> (developed). <i>Kryogene Direct Blue B, G, G O.</i> <i>Kryogene Black Blue B G T, B G T O</i> (developed).	
Alizarine dyestuffs:	<i>Alizarine Blue X, S, R, C</i> (chrome). <i>Alizarine Indigo Blue</i> (chrome).	<i>Anthracene Blue</i> (chrome).
Indanthrene dyestuffs:	<i>Indanthrene Blue R S,</i> <i>G C, G C D, R C.</i>	<i>Indanthrene Dark Blue</i> <i>B O.</i>
Indigo:	<i>Indigo pure B. A. S. F. brands for cotton</i> (especially <i>R B N</i>).	

Green.

Substantive

dyestuffs: *Oxamine Blue BG* (Nitroso, Cu).

Basic

dyestuffs: *Diamond Green B* (tan).

Alizarine

dyestuffs: *Coeruleine* (chrome or aluminium). *Alizarine Green* (chrome).

Indanthrene

dyestuffs: *Indanthrene Green B.* *Indanthrene Olive G.*

Grey.

Indanthrene

dyestuffs: *Indanthrene Grey B.*

Blue Black. Black.

Substantive

dyestuffs: *Oxamine Black brands* (diazo-M, Cu); *Oxamine Black RR* (formaldehyde).
(diazo-beta, Cu). *Cotton Black E extra,*
Cotton Black brands (Nitroso, Cu). *RW extra, PF extra,*
BGNX, BGX (formaldehyde).

Sulphur

dyestuffs: *Kryogene Black TB, TBO, TBN, TG, TGO, TGN.*

Aniline Black:

One-bath Aniline Black. *Oxidation Black.*

Note. These dyestuffs are also remarkable for their good fastness to washing in the presence of white cotton.

Fastness to light.

The following brands may be counted amongst the fastest dyestuffs of their kind to light:

Yellow.

Substantive		
dyestuffs:	<i>Cotton Yellow GI, R</i> (also Cu).	<i>Sulphine</i> (diazo-bl.).
Basic		
dyestuffs:	<i>Auramine II, O</i> (tan). <i>Rheonine A, N, G</i> (tan). <i>Rheonine A, N, G</i> .	<i>Phosphine N, E</i> . <i>Flavinduline II</i> .
Sulphur		
dyestuffs:	<i>Kryogene Yellow R, RX</i> .	
Alizarine		
dyestuffs:	<i>Mordant Yellow</i> (chrome). <i>Resoflavine</i> (chrome).	
Indanthrene		
dyestuffs:	<i>Indanthrene Yellow R, G</i> (if soaped).	

Orange.

Substantive	
dyestuffs:	<i>Pyramine Orange 3G</i> .
Alizarine	
dyestuffs:	<i>Alizarine Orange</i> (aluminium).
Indanthrene	
dyestuffs:	<i>Indanthrene Orange R T</i> .
Ice-colours:	<i>Orange</i> (with <i>Metanitraniline R</i>).

Brown.

Substantive		
dyestuffs:	<i>Cotton Black E extra,</i> <i>RW extra</i> (Cu). <i>Oxamine Brown R, B,</i> <i>M</i> (Cu). <i>Oxamine Brown R, B</i> (Nitroso, Cu).	<i>Thiazine Brown R, G</i> (Cu). <i>Oxamine Maroon</i> (Cu); (Nitroso, Cu).

Sulphur dyestuffs:	<i>Kryogene Brown A.</i>	<i>Kryogene Brown RB, RBX, G, GX.</i>
Alizarine dyestuffs:	<i>Anthracene Brown</i> (chrome).	<i>Alizarine Orange</i> (chrome). ¹
Indanthrene dyestuffs:	<i>Indanthrene Maroon R.</i> <i>Indanthrene Brown B.</i>	<i>Indanthrene Copper R.</i>

Scarlet. Red. Pink.

Substantive dyestuffs:	<i>Oxamine Fast Red F.</i>	<i>Oxamine Red (Cu).</i>
Basic dyestuffs:	<i>Induline Scarlet</i> (tan). <i>Saffranine T extra.</i>	<i>Rhodamine B, 3 G, 6 G, S</i>
Alizarine dyestuffs:	<i>Alizarine Red brands</i> (aluminium), especially the bluish brands; also for pink shades.	
Ice-colours:	<i>Para Red</i> (with <i>Nitrosamine Red</i> or <i>Paranitraniline</i>). <i>Scarlet</i> (with <i>Chloranisidine P</i>).	

Claret.

Substantive dyestuffs:	<i>Oxamine Red</i> (Nitroso, Cu).	
Alizarine dyestuffs:	<i>Alizarine Red brands</i> (chrome).	<i>Alizarine Maroon</i> (aluminium).
Ice-colours:	<i>Claret</i> (with <i>Alpha-Naphthylamine</i>).	

Violet.

Alizarine dyestuffs:	<i>Alizarine Red brands</i> (iron).	
Indanthrene dyestuffs:	<i>Indanthrene Violet R T, R extra.</i>	

Blue.

Substantive

dyestuffs:	<i>Oxamine Copper Blue</i> <i>RR</i> (Cu).	<i>Oxamine Blue 3R, 4R</i> (diazo-B, Cu).
	<i>Oxamine Blue A</i> (Cu).	<i>Oxamine Blue 3R, 4R,</i> <i>BG</i> (diazo-beta, Cu).
	<i>Oxamine Blue BG,</i> <i>GN</i> (Cu).	<i>Oxamine Violet</i> (diazo-beta, Cu).
	<i>Oxamine Dark Blue</i> <i>M</i> (Cu).	
	<i>Oxamine Blue B</i> (also Cu).	

Basic

dyestuffs:	<i>Methylene Blue brands</i> (tan).	<i>Cotton Blue brands</i> (tan).
	<i>Indoine Blue brands</i> (tan).	<i>Nile Blue brands</i> (tan).

Alizarine

dyestuffs:	<i>Alizarine Blue S, C, R, X</i> (chrome).	<i>Alizarine Indigo Blue</i> (chrome).
	<i>Anthracene Blue brands</i> (chrome).	

Sulphur

dyestuffs:	<i>Kryogene Blue B, BX, BN, BNO</i> (developed).
	<i>Kryogene Direct Blue B, G, GO.</i>
	<i>Kryogene Black Blue BGT, BGT O</i> (developed).

Indanthrene

dyestuffs:	<i>Indanthrene Blue RS, GC, GCD, RC</i> (exceedingly fast, also in pale shades).
	<i>Indanthrene Dark Blue BO.</i>

Indigo:

Indigo pure B. A. S. F. brands for cotton
(especially *RBN*).

Green. Olive.

Alizarine

dyestuffs:	<i>Coeruleine</i> (chrome or aluminium).	<i>Alizarine Green</i> (chrome).
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Indanthrene

dyestuffs:	<i>Indanthrene Green B.</i>	<i>Indanthrene Olive G.</i>
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Sulphur

dyestuffs:	<i>Kryogene Olive</i> (after-treated).
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Grey. Black Blue. Black.

Substantive

dyestuffs: *Oxamine Black brands* *Cotton Black brands*
(diazo-M, Cu) for black (for black shades).
shades. *Cotton Black brands*
Oxamine Black brands (Nitroso, Cu).
(diazo-beta, Cu).

Sulphur

dyestuffs: *Kryogene Black TB, TBO, TBN, TG, TGO, TGN*
(all exceedingly fast).

Indanthrene

dyestuffs: *Indanthrene Grey B.*

Aniline Black:

Oxidation Black. *Single-bath Aniline Black.*

Fastness to chlorine.

The following are the fastest dyestuffs of their kind to chlorine:

Yellow.

Substantive dyestuffs:	<i>Sulphine brands</i> (diazo-bl.).	<i>Pyramine Yellow G.</i>
Basic dyestuffs:	<i>Flavinduline II, O</i> (tan).	<i>Phosphine N, E</i> (tan).
Alizarine dyestuffs:	<i>Mordant Yellow brands</i> (chrome).	
Indanthrene and other vat dyestuffs:	<i>Indanthrene Yellow G, R.</i>	<i>Anthraflavone G.</i>

Orange.

Substantive dyestuffs:	<i>Pyramine Orange R.</i>	
Alizarine dyestuffs:	<i>Alizarine Orange A</i> (aluminium) [Old Red process].	
Indanthrene dyestuffs:	<i>Indanthrene Orange R T.</i>	
Ice-colours:	<i>Orange</i> (from <i>Metanitraniline R</i>).	

Red. Pink.

Substantive dyestuffs:	<i>Sulphine brands</i> (diazo-beta).	
Basic dyestuffs:	<i>Rhodamine 3B, 3G, 6G</i> (tan).	<i>Induline Scarlet</i> (tan). <i>Saffranine T extra</i> (tan).
Alizarine dyestuffs:	<i>Alizarine Red brands</i> (aluminium) [Old Red process].	
Ice-colours:	<i>Para Red</i> (from <i>Nitrosamine Red paste</i> or <i>Paranitraniline</i>). <i>Scarlet</i> (from <i>Chloranisidine P</i>).	

Brown.

Indanthrene
dyestuffs: *Indanthrene Copper R.*

Violet.

Alizarine
dyestuffs: *Alizarine Red* (iron).

Indanthrene
dyestuffs: *Indanthrene Violet R T, R extra.*

Blue.

Basic
dyestuffs: *Methylene Blue* (tan) [especially the greenish brands].

Alizarine
dyestuffs: *Alizarine Blue R, C, X, S* (chrome).

Indanthrene
dyestuffs: *Indanthrene Blue G C, G C D, R C.*
Indanthrene Dark Blue B O.

Indigo:
Indigo pure B. A. S. F. [G, R B N.

Claret.

Ice-colours: *Claret* (from *Alpha-Naphthylamine*).

Green. Olive.

Basic
dyestuffs: *Diamond Green B, G* (tan).

Alizarine
dyestuffs: *Coeruleine* (aluminium).

Black.

Aniline Black: *Oxidation Black.*

Note. Certain dyestuffs, particularly of the basic class, lose depth and change in shade according to the strength and duration of the chlorine treatment; they are also then liable to bleed. It is therefore advisable to determine by experiment beforehand the extent to which the shade is affected, and then in dyeing to keep the shade fuller or brighter accordingly.

Fastness to boiling acid liquors (cross-dyeing).

The following are amongst the fastest dyestuffs of their kind to boiling acid liquors :

Yellow.

- Substantive
dyestuffs: *Sulphine brands* (diazo-bl.).
- Basic
dyestuffs: *Auramine brands* (tan). *Flavinduline O, II* (tan).
Rheonine A, N, G (tan).
- Sulphur
dyestuffs: *Kryogene Yellow G, GX, R, RX*.
- Indanthrene
and other vat
dyestuffs: *Indanthrene Yellow G. * Indanthrene Yellow R.*
Anthraflavone G.

Orange.

- Substantive
dyestuffs: *Sulphine brands* (diazo-resorcin).
Sulphine brands (diazo-OR).
- Indanthrene
dyestuffs: ** Indanthrene Orange R T.*

Brown.

- Substantive
dyestuffs: *Oxamine Brown B, R* (diazo-beta or diazo-M).
- Sulphur
dyestuffs: *Kryogene Brown RB, RBX, G, GX.*
** Kryogene Brown A.*
- Basic
dyestuffs: *Vesuvine BL, B* (tan).
- Indanthrene
dyestuffs: ** Indanthrene Maroon R. * Indanthrene Brown B.*
** Indanthrene Copper R.*

Blue.

Substantive

dyestuffs: *Oxamine Violet* (diazo-B); (diazo-R); (diazo-beta).
Oxamine Blue BG (diazo-R).
Oxamine Blue 3R, 4R (diazo-beta).

Basic

dyestuffs: *Indoine Blue brands* *Night Blue* (tan).
[especially * *BR*] (tan). *Nile Blue brands* (tan).
Victoria Blue brands *Methylene Blue brands*
(tan). (tan).
Victoria Pure Blue B (tan).

Sulphur

dyestuffs: *Kryogene Direct Blue B.* * *Kryogene Direct Blue*
G, GO.

Alizarine

dyestuffs: *Alizarine Blue S, X, C, R* (chrome).

Indanthrene

dyestuffs: * *Indanthrene Blue RS, GC, GCD, RC.*

Indigo:

* *Indigo pure B. A. S. F. brands for cotton.*

Red.

Substantive

dyestuffs: *Sulphine brands* (diazo-beta or diazo-B).

Basic

dyestuffs: *Rhodamine brands* (tan). *Saffranine MN, T extra*
Induline Scarlet (tan). (tan).

Green. Olive.

Basic

dyestuffs: *Diamond Green B, G* (tan).

Alizarine

dyestuffs: *Coeruleine* (chrome).

Indanthrene

dyestuffs: * *Indanthrene Green B.* * *Indanthrene Olive G.*

Violet.

Indanthrene
dyestuffs: * *Indanthrene Violet R 1, R extra.*

Alizarine
dyestuffs: *Galleine* (chrome).

Grey.

Indanthrene
dyestuffs: * *Indanthrene Grey B.*

Black Blue. Black.

Substantive
dyestuffs: *Oxamine Black brands* (diazo-beta) *Oxamine Black brands* (diazo-R); (diazo-M).

Sulphur
dyestuffs: * *Kryogene Black TB, TBO, TBN, TG, TGO, TGN.*

Aniline Black: * *Oxidation Black.*

- Notes.*
- a) The dyestuffs marked with an asterisk do not stain the wool, or only very slightly, when cross-dyed in an acid bath.
 - b) It should be remembered that the sulphur dyestuffs often act as a mordant during the subsequent cross-dyeing operation, e. g. with acid dyestuffs, and that the original shade may thus be more or less altered.
 - c) Dyeings with the foregoing colouring matters, especially with the basic dyestuffs or their combinations, are liable to show more or less a loss in depth or a change of shade when cross-dyed in an acid bath at the boil. It is therefore advisable, on the basis of tests made beforehand, to keep the shades fuller and brighter than the patterns, e. g. for checking-threads.

Fastness to sizing.

The following are the fastest dyestuffs of their kind to sizing:

Yellow.

Substantive dyestuffs:	<i>Sulphine brands</i> (diazo-soda).	<i>Pyramine Yellow G, R.</i> (for cream shades).
Basic dyestuffs:	<i>Auramine II</i> (tan). <i>Rheonine A, N, G</i> (tan). <i>Phosphine N</i> (tan).	<i>Euchrysine brands</i> (tan). <i>Rheonine A, G.</i>
Alizarine dyestuffs:	<i>Mordant Yellow brands</i> (chrome).	
Sulphur dyestuffs:	<i>Kryogene Yellow G, GX, R, RX.</i>	
Indanthrene and other vat dyestuffs:	<i>Indanthrene Yellow G, R. Anthraflavone G.</i>	

Orange.

Substantive dyestuffs:	<i>Cotton Orange G.</i> (for cream shades).	<i>Sulphine</i> (diazo-resorcin).
Indanthrene dyestuffs:	<i>Indanthrene Orange R T.</i>	
Alizarine dyestuffs:	<i>Alizarine Orange A</i> (chrome or aluminium).	
Ice-colours:	<i>Orange</i> (from <i>Metanitraniline</i>).	

Brown.

Substantive dyestuffs:	<i>Oxamine Brown B, R</i> (diazo-beta).	
Alizarine dyestuffs:	<i>Anthracene Brown</i> (chrome or aluminium).	

Sulphur
dyestuffs: *Kryogene Brown brands.*

Indanthrene
dyestuffs: *Indanthrene Brown B. Indanthrene Maroon R.*
Indanthrene Copper R.

Scarlet. Red.

Substantive
dyestuffs: *Sulphine brands* *Oxamine Red*
(diazo-beta). (for pink shades).

Basic
dyestuffs: *Rhodamine 6 G, 3 G, B, Rhodamine 6 G, 3 G.*
S, 3 B (tan). *Saffranine T extra* (tan).
Saffranine MN (tan).

Alizarine
dyestuffs: *Alizarine Red brands* (aluminium),
especially the bluish brands.

Ice-colours: *Para Red* (from *Nitrosamine Red* or *Paranitraniline*).
Scarlet (from *Chloranisidine P*).

Claret.

Substantive
dyestuffs: *Sulphine* (diazo-B). *Oxamine Red* (nitroso).

Alizarine
dyestuffs: *Alizarine Red brands* *Alizarine Maroon*
(chrome). (chrome or aluminium).

Ice-colours: *Claret* (from *Alpha-Naphthylamine*).

Blue.

Substantive
dyestuffs: *Oxamine Copper Blue* *Oxamine Blue BG*
RR (Cu). (diazo-R or beta).
Oxamine Violet
(diazo-beta or B).

Basic
dyestuffs: *Victoria Blue R, 4 R* (tan). *Victoria Pure Blue B* (tan).
Nile Blue A, R (tan). *Cotton Blue R* (tan).
New Blue S (tan). *Methylene Blue brands*
Indoine Blue brands (tan). (tan).
Dark Blue R, B (tan). *Marine Blue brands* (tan).
Cotton Blue BB (tan). *Nile Blue B, BB* (tan).
Victoria Blue B (tan).

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Alizarine dyestuffs:	<i>Alizarine Blue C, X, S,</i> <i>R</i> (chrome). <i>Anthracene Blue</i> (chrome).	<i>Alizarine Indigo Blue S</i> (chrome).
Sulphur dyestuffs:	<i>Kryogene Blue B, BX, BN, BNO</i> (developed). <i>Kryogene Direct Blue B, G, GO.</i> <i>Kryogene Black Blue BGT, BGT O</i> (developed).	
Indanthrene dyestuffs:	<i>Indanthrene Blue RS,</i> <i>GC, GCD, RC.</i>	<i>Indanthrene Dark Blue</i> <i>BO.</i>
Indigo:	<i>Indigo pure B. A. S. F. brands for cotton.</i>	

Violet.

Basic dyestuffs:	<i>Methyl Violet BB</i> (tan).	
Indanthrene dyestuffs:	<i>Indanthrene Violet RT, R extra.</i>	
Alizarine dyestuffs:	<i>Galleine</i> (aluminium). <i>Gallocyanine D, F</i> (chrome).	<i>Alizarine Red brands</i> (iron).

Green. Olive.

Basic dyestuffs:	<i>Diamond Green B, G</i> (tan).	<i>Diamond Green BG.</i>
Alizarine dyestuffs:	<i>Coeruleine</i> (chrome or aluminium).	<i>Alizarine Green S</i> (chrome).
Sulphur dyestuffs:	<i>Kryogene Olive</i> (after-treated).	
Indanthrene dyestuffs:	<i>Indanthrene Green B.</i>	<i>Indanthrene Olive G.</i>

Grey.

Indanthrene dyestuffs:	<i>Indanthrene Grey B.</i>	
Sulphur dyestuffs:	<i>Kryogene Black TB, TBN, TBO, TG, TGN, TGO</i> (in pale shades).	

Fastness to ironing.

The following dyestuffs either do not suffer any great change in shade through hot ironing, or the original shade returns when cold :

- Substantive dyestuffs: All the direct dyestuffs (also diazotised and developed) and those after-treated with metallic salts or diazotised Paranitraniline named on pages 102–114. The following are not so good : *Cotton Red S, Oxamine Brown MN, Oxamine Garnet M, Cotton Corinth G, Oxamine Blue A, G, GN, Oxamine Green D, Oxamine Dark Green M* and *Sulphine* (diazo-B).
- Basic dyestuffs: The basic dyestuffs named on page 125.
- Sulphur dyestuffs: The dyestuffs named on page 121.
- Acid dyestuffs: * » » » » 125, *soluble Blue brands, etc.*
- Alizarine (mordant) dyestuffs: » » » » » 152.
- Indigo: *The Indigo pure B. A. S. F brands* for cotton, named on page 142.
- Indanthrene dyestuffs: The dyestuffs named on page 132.
- Ice-colours: The products named on page 163 ff.

Dyestuffs which withstand mercerisation.

The following are the fastest of their kind in this respect:

Yellow.

Substantive dyestuffs:	<i>Sulphinc</i> (diazo-soda).	<i>Pyramine Yellow R.</i>
Sulphur dyestuffs:	<i>Kryogene Yellow G, G X, R, R X.</i>	
Alizarine dyestuffs:	<i>Mordant Yellow brands</i> (chrome).	
Indanthrene and other vat dyestuffs:	<i>Indanthrene Yellow R, G. Anthraflavone G.</i>	

Orange.

Substantive dyestuffs:	<i>Pyramine Orange R, 3 G.</i>	
Indanthrene dyestuffs:	<i>Indanthrene Orange R T.</i>	
Alizarine dyestuffs:	<i>Alizarine Orange A</i> (aluminium).	

Brown.

Sulphur dyestuffs:	<i>Kryogene Brown G, GX, RB, R B A.</i>	
Alizarine dyestuffs:	<i>Anthracene Brown</i> (chrome).	<i>Alizarine Orange A</i> (chrome).
Indanthrene dyestuffs:	<i>Indanthrene Brown B.</i>	<i>Indanthrene Maroon R.</i>
	<i>Indanthrene Copper R.</i>	

Red.

Substantive dyestuffs:	<i>Oxamine Fast Red F.</i>	<i>Cotton Corinth G.</i>
Alizarine dyestuffs:	<i>Alizarine Red</i> [the bluish brands], (chrome and iron).	<i>Alizarine Red</i> [the bluish brands], (aluminium).
	<i>Alizarine Maroon</i> (aluminium).	
Ice-colours:	<i>Para Red</i> (from <i>Nitrosamine Red paste</i> or diazotised <i>Paranitraniline</i>).	

Blue. Violet.

Substantive

dyestuffs: *Oxamine Violet* (diazo-beta); (diazo-R or B).
Oxamine Blue 3R, 4R (diazo-beta); (diazo-R or B).
Oxamine Black RR (diazo-beta).

Sulphur

dyestuffs: *Kryogene Direct Blue B, G, GO*.
Kryogene Black Blue BGT, BGT O (developed).

Alizarine

dyestuffs: *Alizarine Blue R, C, X, S*. *Anthracene Blue*.

Indanthrene

dyestuffs: *Indanthrene Blue RS, Indanthrene Dark Blue*
G C, G C D (the brand *BO*
RS turns a little greener). (turns a little redder).
Indanthrene Violet RT, R extra.

Indigo:

Indigo pure B. A. S. F. brands for cotton.

Green. Olive.

Alizarine

dyestuffs: *Coeruleine* (chrome). *Alizarine Green S*
(chrome).

Indanthrene

dyestuffs: *Indanthrene Green B*. *Indanthrene Olive G*.

Black.

Substantive

dyestuffs: *Cotton Black brands*.

Sulphur

dyestuffs: *Kryogene Black brands* (white becomes slightly tinted).

Aniline Black:

Oxidation Black.

- Notes.* a) The heavily printed names are those of dyestuffs which do not stain adjacent white cotton.
b) With few exceptions, the substantive dyestuffs show practically no change of shade, but of course the goods must be at once thoroughly rinsed after removing the acid. Cotton present may be more or less strongly tinged. The substantive dyestuffs enumerated above in ordinary type should satisfy all usual requirements, especially in light shades.

SILK.

Silk

The preparation of silk before dyeing.

I. Boiling-off (degumming).

A. Raw silk (reeled silk).

1. Boiled-off silk.

Method of working.

Treat the raw silk for $\frac{3}{4}$ — $1\frac{1}{2}$ hours at the boil in a bath of 40—60 gallons containing 3 lbs. Marseilles soap, adding, if necessary, 5—7 oz. soda-ash to remove any hardness in the water. During this operation the silk should be turned once or twice.

If necessary, boil the silk a second time for $\frac{3}{4}$ hour in a fresh bath with half the above quantity of Marseilles soap.

Rinse in lukewarm water (adding, if necessary, a little soda) and then wash once more cold.

— For 10 lbs. silk. —

Note. The second soap bath, replenished with $1\frac{1}{2}$ lbs. soap, serves as first bath for a second lot of silk. The first degumming bath furnishes the valuable boiled-off liquor (bast soap) so much used in dyeing.

2. Souple silk (soft, not boiled-off silk).

Method of working.

Wet out and soften the silk for $\frac{3}{4}$ hour at 100° F. in a bath containing $1\frac{1}{2}$ lbs. Marseilles soap; then bleach, for yellow silk, with aqua regia* (on an average, diluted to $4\frac{1}{2}^{\circ}$ Tw.) or with sulphurous acid in the sulphur stove, and souple for $\frac{3}{4}$ —1 hour with $6\frac{1}{2}$ oz. cream of tartar, $1\frac{1}{2}$ oz. sulphuric acid 168° Tw. and $1\frac{1}{4}$ pints aqueous sulphurous acid at a temperature of between 130 and 170° F., according to the kind of silk.

Remove all acid by rinsing well, first in warm water and then twice in fresh cold water.

— For 10 lbs. silk. —

3. Écru (hard silk).

Method of working.

Wet out the silk thoroughly in lukewarm water or in a soap solution, rinse and dye without further treatment.

B. Schappe silk (spun silk).

Method of working.

Treat for $\frac{3}{4}$ hour at the boil in a bath of 40—60 gallons water with the addition of 7—8 oz. soda-ash, turn carefully and not too often, then work for $\frac{3}{4}$ hour in a second warm bath containing $1\frac{1}{2}$ lbs. Marseilles soap, rinse thoroughly and hydroextract.

— For 10 lbs. silk. —

Note. For delicate shades the Schappe silk must be bleached, before dyeing, with sodium peroxide or hydrogen peroxide.

* A mixture of 1 part nitric acid with 2 parts hydrochloric acid.

C. Tussah silk (wild silk).

Method of working.

Having rinsed out the silk once or twice, boil it off for 1 hour in a bath containing 1 lb. soda crystals (or $\frac{1}{2}$ lb. soda-ash) per 10 gallons water, rinse twice, sour lukewarm with 3—5 oz. hydrochloric acid per 10 gallons water and wash out thoroughly two or three times, bleaching, if necessary.

D. Floss silk (silk waste, noils).

Floss silk is generally dyed without any further preparation.

II. Bleaching of silk.**1. In the sulphur stove.**

Method of working.

Hang the damp silk (it may previously have been passed through a weak soap bath), before dyeing, in a tightly closed wooden chest, and stove, preferably overnight, by burning about 8 oz. sulphur. Repeat the process, if necessary, and then rinse several times with lukewarm water.

— For 10 lbs. silk. —

Note. For white, stove preferably after dyeing (tinting).

2. With hydrogen peroxide or sodium peroxide.

(Generally used for Schappe or Tussah silk.)

a) Hydrogen peroxide.

Method of working.

Steep the Tussah for a few hours (or overnight) in a bleaching bath of about 12 gallons prepared with

2—3 gallons hydrogen peroxide (12 volumes)
 $\frac{3}{4}$ — $1\frac{1}{4}$ pints silicate of soda
1— $1\frac{1}{2}$ lbs. white soap (in solution).

Heat to 120° F. and turn occasionally.

After bleaching, sour in a fresh bath, containing sulphuric acid, and rinse.

For 10 lbs. silk. —

- Notes.* a) If the goods are not sufficiently bleached, the operation is repeated after having replenished the bath with the necessary quantity of bleaching agents. If desired a stronger bleaching bath can be used.
- b) Keep the bleaching liquor slightly alkaline from the commencement to the end of the operation.

b) Sodium peroxide.

1st method of working

Pour 1 lb. 6 oz. of sulphuric acid (168° Tw.) carefully into 10 gallons cold water, and sift in, whilst slowly stirring, 1 lb. sodium peroxide (taking care to use a dry scoop or spoon). Make the solution, which is slightly acid, weakly alkaline with sodium silicate (testing with litmus paper), turn for $\frac{1}{4}$ hour in the cold, heat to 120—140° F., work for another $\frac{1}{4}$ hour, and raise the temperature to near the boiling point. Test the alkalinity of the bath once more and add, if necessary, a little more sodium silicate.

Continue the bleaching for 6—8 hours (or overnight), heating up now and again.

Rinse twice with fresh water, sour with sulphuric acid, wash again twice and soap at the boil with $\frac{1}{2}$ lb. Marseilles soap per 10 gallons water. Then rinse once or twice, stove overnight as directed on page 223 and rinse again.

2nd method of working.

Enter the silk into a bleaching bath composed as follows:

5 lbs. 14 oz. sulphuric acid
4 $\frac{1}{2}$ lbs. sodium peroxide
15 gallons water
1 $\frac{1}{2}$ lbs. sodium silicate
1 $\frac{1}{2}$ » white soap, previously dissolved,

and work as given above under 1.

— For 10 lbs. silk. —

Note. If a slighter bleaching effect is desired, take from $\frac{1}{3}$ to $\frac{2}{3}$ of the above quantities.

3. Bleaching with Aqua regia.

(For souple silk.)

Method of working.

After treating the silk in a soap bath, work it in an Aqua regia bath of 4 $\frac{1}{2}$ ° Tw. till it has a greenish tint, and proceed further as given under 2 on page 222.

Note. Care must be taken that the silk does not acquire a yellowish tinge, which denotes that the action has proceeded too far. The green shade mentioned disappears on washing thoroughly.

III. Weighting of silk.

Lack of space prevents us from giving any detailed description of the various methods of weighting in use, so that only the chief features of the processes mostly employed can be mentioned. (Details are to be found in special works, e. g. *Silbermann*,* *Steinbeck*,** etc.)

The weighting can take place:

1. Before dyeing

- a) by using perchloride of tin
- b) » » phosphate » »
- c) » » » » » and silicic acid.

2. After or during dyeing

- a) by using sumac extract, tannic acid, or a decoction of gall nuts
- b) by using sugar with or without the addition of magnesium salts.

* Henri Silbermann. "Die Seide. Ihre Gewinnung und Verarbeitung." Published by Gebhard Kühnmann, Dresden.

** "Bleichen und Färben der Seide und Halbseide im Strang und Stück" by Carl H. Steinbeck. Published by Julius Springer, Berlin.

Processes for dyeing silk with Aniline dyestuffs.

1. Dyeing in an acid boiled-off liquor bath.

Chiefly for acid dyestuffs, including those soluble in spirit; also for some basic, substantive and Alizarine dyestuffs which dye without a mordant.

2. Dyeing from a slightly acid (broken) boiled-off liquor bath.

For Eosine dyestuffs and most of the basic and substantive dyestuffs; also those which are further developed (see also appendix).

3. Dyeing from a very slightly alkaline or neutral boiled-off liquor bath.

For Alkali Blue, Soluble Blue.

4. Dyeing from a standing weak Marseilles soap bath.

For white shades with Spirit Blue, for Saffranine, Diamond Magenta brands, yellow from Nitrosamine Red paste, also for Alkali Blue, and generally for bottoming with acid, basic and substantive dyestuffs.

5. Dyeing from an acetic acid bath without boiled-off liquor or soap.

This method is used for acid dyestuffs; also for basic and substantive dyestuffs wherever sufficient boiled-off liquor is not at hand.

6. Dyeing Tussah silk.

7. Dyeing Floss silk.

Appendix: Selection of Aniline dyestuffs for the production of the shades most frequently required.

Dyeing of silk in an acid boiled-off liquor bath.

This process is especially suitable for acid dyestuffs, Spirit Blues and certain substantive and basic dyestuffs.

Process N° 56.

Prepare the dye-bath with 10—15 gallons boiled-off liquor (see note *a*), 30—45 gallons water and an excess of sulphuric acid (see note *b*). Heat to 100° F., turn the boiled-off silk several times, then throw it up and add the necessary quantity of dyestuff in solution. Stir well, enter the silk again into the bath and turn it rapidly 5—7 times. Raise the temperature to 140° F. and finish by dyeing at the boil, throwing up the goods and boiling up the bath from time to time. Rinse and brighten.

— For 10 lbs. silk. —

- Notes.* a) Boiled-off liquor is obtained by boiling-off (degumming) raw silk with about 25—30 % of its weight of Marseilles soap, and should be used as fresh as possible (see also note on page 221).
- b) Sufficient sulphuric acid (or acetic, tartaric or citric acid) must be added to the dye-bath (which has become alkaline through the addition of the boiled-off liquor) that it tastes strongly acid and does not froth any more. (Test with blue litmus paper.)

Regarding the "broken" boiled-off liquor-bath, note *b*, see page 231.

- c) If, after matching off, it is found necessary to shade with a further quantity of dyestuff, it is advisable, in order to ensure evenness and a good fixation of the colour, to bring the bath to the boil again, but too often repeated boiling should be avoided as this damages the silk.
- d) It is, of course, not necessary to boil the bath when working with dyestuffs which give level shades at a temperature of 120—140° F.
- e) When using the substantive dyestuffs given below, viz. *Thiazine Red G, R, Oxamine Fast Red F*, start dyeing with only a little acid and increase the quantity gradually.

The following dyestuffs are suitable for this process:

Yellow.

- * *Quinoline Yellow.*
- * *Tartrazine.*
- † *Quinoline Yellow soluble in spirit.*
- * *Naphthol Yellow S.*
- * *Primazine Yellow G.*
- * *Azoflavine RS, RR, 3R, 3G extra, S*, also the brands marked "new," as well as *Azoflavine FF* which contains nothing soluble in fat.

Orange.

- * *Orange N, II, G, X.*

Brown.

Combinations of acid dyestuffs may be used, for example *Orange, Fast Red* and *Induline*, and even in some cases acid and basic dyestuffs together.

Red.

- * *Acid Rhodamine R, RR, 3R.*
- * *Thiazine Red G, R.*
- * *Silk Red G, R, N.*
- * *Oxamine Fast Red F.*
- * *Brilliant Carmine L.*
- * *Fast Red AV.*
- * *Erythrine X, RR, P, 7B.*
- * *Wool Red G, R.*
- * *Fast Scarlet B, G, GGN.*
- * *Azocarmine B, BB, BX, G paste.*
- * *Crystal Scarlet.*

Violet.

- | | |
|--|--|
| <ul style="list-style-type: none"> * <i>Acid Violet 4 RN.</i> *** <i>Anthraquinone Violet</i>
(for pale shades fast to light). | <ul style="list-style-type: none"> * <i>Acid Violet 3 BN, 4 BL,</i>
<i>6 BN, 7 B.</i> * <i>Alkali Violet R, 4 BN, 6 B.</i> |
|--|--|

Blue.

- | | |
|---|---|
| <ul style="list-style-type: none"> * <i>Soluble Blue, e. g. 4 R,</i>
<i>1 N, T B.</i> * <i>Pure Blue I, II.</i> * <i>Silk Blue B.</i> * <i>Methyl Soluble Blue.</i> * <i>Fast Blue RR, greenish,</i>
<i>5 B.</i> *** <i>Cyananthrol brands.</i> ** <i>Victoria Blue B, 4 R.</i> ** <i>Victoria Pure Blue B.</i> ** <i>Night Blue.</i> * <i>Neptune Blue B, B G.</i> | <ul style="list-style-type: none"> ** <i>Indoine Blue brands.</i> † <i>Spirit Blue brands.</i> † <i>Parme soluble in spirit.</i> *** <i>Anthraquinone Blue</i>
<i>SR extra paste</i>
<i>SR extra powder,</i>
(for pearl shades fast to light). *** <i>Anthracene Blue S W G G,</i>
<i>S W G G extra.</i> *** <i>Brilliant Anthrazurol.</i> * <i>Induline NN.</i> † <i>Induline N.</i> |
|---|---|

Green.

- | | |
|---|--|
| <ul style="list-style-type: none"> * <i>Light Green SF yellow</i>
<i>shade, SF blue shade.</i> * <i>Acid Green G B.</i> * <i>Neptune Green brands.</i> * <i>Wool Green S.</i> | <ul style="list-style-type: none"> *** <i>Anthraquinone Green GXN</i>
(for delicate shades, fast to
light). <i>Diamond Green B, G</i>
(see also page 231). |
|---|--|

Grey. Black.

- | | |
|---|---|
| <ul style="list-style-type: none"> * <i>Nigrosine W, W G, W L.</i> † <i>Nigrosine C, G.</i> † <i>Japan Black brands.</i> | <ul style="list-style-type: none"> * <i>Palatine Black 4 B, 4 B X, B</i>
<i>for Silk, B X, M Z</i>
<i>and the other</i> * <i>Palatine Black brands.</i> |
|---|---|

* denotes acid dyestuffs; ** basic dyestuffs; *** Alizarine dyestuffs.

† denotes dyestuffs soluble in spirit. Before adding these to the dye-bath they must be dissolved by stirring up well with hot methylated spirit. The solution should be used warm if possible.

Dyeing in a slightly acid "broken" boiled-off liquor bath.

The process is suitable for the Eosine dyestuffs and for most of the basic and substantive dyestuffs.

Process N° 57.

The method of working is exactly the same as in process N° 56, page 227. Use, however, acetic, tartaric or citric acid, also, if necessary, sulphuric acid. Avoid excess of acid and add just sufficient so that the bath has a faintly acid taste and does not froth any more.

Suitable dyestuffs are:

Yellow.

<i>Auramine G, O, II.</i>	<i>Chrysoidine A, RL.</i>
<i>Rheonine A, N, G.</i>	<i>Euchrysine R, GG.</i>
<i>Vesuvine B, OOO extra, BL.</i>	<i>Phosphine N.</i>

Red.

<i>Rhodamine B, G, 3 G, 6 G</i> (also the "extra" brands).	<i>Rubine N.</i>
<i>Diamond Magenta I</i> <i>small needles.</i>	The Eosine dyestuffs:
<i>Magenta powder A.</i>	<i>Eosine brands</i> } see also
<i>Magenta II small crystals.</i>	<i>Erythrosine brands</i> } page 234,
<i>Cerise D IV.</i>	<i>Rose Bengal brands</i> } note b.
	<i>Phloxine brands</i> }
	<i>Eosine soluble in spirit.</i>

Violet.

<i>Methyl Violet brands,</i> e. g. <i>R, B, BB, 4 B,</i> <i>6 B.</i>	<i>Crystal Violet.</i>
	<i>Ethyl Purple.</i>
	<i>Iris Violet.</i>

The dyestuffs mentioned here are basic dyestuffs, except the Eosines and those mentioned below under "additional notes."

Blue.

Victoria Blue R.
Nile Blue brands,
e. g. *B, R, B B.*

Night Blue (see also page 229).

Green.

Diamond Green B, G (see also page 229).
Victoria Green.

Besides these, all the substantive dyestuffs mentioned on pages 102 and 103.

- Notes.* a) The quantity of acid taken may with advantage be slightly increased when dyeing with the *Rhodamine, Eosine, Erythrosine* or *Phloxine* brands.
- b) The bath is termed "broken" when it contains just so much acid that it tastes faintly acid, or has a neutral reaction, i. e., does not affect either blue or red litmus paper.

Additional notes.

Certain of the substantive colouring matters, after having been dyed as above, can be diazotised and developed* on silk in the same way as on cotton (see page 106) and yield shades which are very fast to washing and water.

The following dyestuffs may be used in this way:

Yellow.

Sulphine A, N, NN, diazotised and soaped at the boil.
» diazotised and developed with Orange Developer R.

Orange. Brown.

Sulphine A, N, NN, diazotised and developed with Oxamine Developer B.

Red.

Sulphine A, N, NN, diazotised and developed with Alpha or Beta-Naphthol.

* The developer is dissolved as given on page 107 for cotton.

Dark Blue (shades similar to indigo).

Oxamine Blue 4R, 3R, diazotised and developed with Beta-Naphthol or Oxamine Developer B or R.

Oxamine Violet, diazotised and developed with Beta-Naphthol or Oxamine Developer B or R.

Oxamine Blue BG, diazotised and developed with Oxamine Developer B or R.

Blue Black. Black.

Oxamine Black brands, diazotised and developed with Beta-Naphthol or Oxamine Developer M (or combinations of the two developers).

Dyeing in a slightly alkaline or
neutral boiled-off liquor bath.

The process is chiefly suitable for the Alkali Blues, Soluble Blues and certain basic and substantive dyestuffs.

Process N° 58.

Proceed as in process N° 56, page 227, but add no acid and only half as much boiled-off liquor. Rinse and brighten strongly.

Suitable colouring matters:

Alkali Blue brands,
e. g. *R, B extra, 6B.*
Methyl Alkali Blue.
Soluble Blue brands.

For Alkali Blue see also
process N° 59, page 233.

Dyeing in a standing weak Marseilles soap bath.

Specially suited for all white tones, for Saffranine,
Alkali Blue and fast yellow from Nitrosamine
Red paste.

Process N^o 59.

Prepare the bath (30—45 gallons) with 1—3 lbs. Marseilles soap, according to the hardness of the water (see note below), bring to the boil, enter the silk and dye at the boil. Rinse well to remove all soap, which is best done in the washing machine, if desired with the addition of a little soda to the water, and brighten thoroughly.

— For 10 lbs. silk. —

Note. More or less Marseilles soap must be taken according to the hardness of the water. If necessary, the water may be corrected with soda before adding the soap. The soap bath should froth strongly.

Suitable dyestuffs are:

- Yellow.** *Nitrosamine Red paste.*
- Red.** *Saffranine, e. g. MN, T extra (also Diamond Magenta).*
- Blue.** *Parme (soluble in spirit) shaded, if necessary, to a greener tone with the Spirit Blue brands (used for whites which are stoved after dyeing. This process is also useful for the Alkali Blue brands).*

Dyeing in an acetic acid bath
without the addition of boiled-off
liquor or soap.

.....

Besides being useful for bottoming with acid dyestuffs, such as *Azoflavine*, *Fast Red*, *Orange II*, etc., this process may also be employed with basic and substantive dyestuffs, and, in general, whenever sufficient boiled-off liquor is not available.

.....

Process N° 60.

Enter the silk into the lukewarm bath, raise the temperature slowly, first to 140° F., and then to 175° F., and add sufficient acetic acid (see note a) to satisfactorily exhaust the bath. Bring once or twice to the boil, rinse and, if necessary, brighten.

- Notes.* a) When dyeing with basic colouring matters (see page 125), the bath is prepared with about 1/2 lb. acetic acid 9° Tw. (30%) per 100 gallons and the goods are entered cold. The filtered dyestuff solution is added in small portions at a time, and the silk turned well. The bath is afterwards heated to 175° F. The silk is not brightened as a rule in this case.
- b) The Eosine dyestuffs (see page 230) can also be dyed by this process, in which case the bath does not need to be boiled since they dye sufficiently level, even at 120—140° F.
-

Dyeing of Tussah silk.

Process N° 61.

Add the dyestuff in solution to the weakly acid bath (acetic acid or sulphuric acid), enter the silk, turn seven times, heat to 120° F., turn another seven times and bring to the boil. Hydroextract and hang up to dry without rinsing.

Note. For pale shades, which must be dyed on bleached material (see page 224), acetic acid is used; for medium to dark shades, sulphuric acid.

The following dyestuffs are specially suitable:

Yellow. *Fast Yellow G.*

Orange. *Orange II, N.*

Red.

<p>* <i>Rhodamine B.</i> <i>Azocarmine G paste.</i> <i>Fast Scarlet B.</i> <i>Fast Red AV.</i></p>	<p><i>Naphthol Red S, GR.</i> <i>Acid Violet 4 RN.</i> <i>Acid Magenta S.</i></p>
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Violet. *Acid Violet 6 BN.*

Blue. *Neptune Blue B, BG.*

<p>Green. <i>Light Green SF</i> <i>yellow shade</i></p>	<p><i>Wool Green S.</i></p>
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Black. Black shades are best produced by combinations of basic green (e. g. *Diamond Green*) with *Fast Red AV*.

* Basic dyestuffs; the others are acid dyestuffs.

Dyeing of Floss (Bourette) silk, silk noils, etc.

Process N° 62.

The process is, in general, the same as N° 60, page 234, i. e., it is carried out in an acetic acid bath without boiled-off liquor. If the bath is in this way not sufficiently exhausted, as is the case with many of the acid and substantive dyestuffs, and with some of the basic dyestuffs (e. g. *Victoria Blue* and *Indoine Blue*), add finally 2—10 oz. of sulphuric acid.

— For 10 lbs. silk. —

- Notes.* a) Alkali Blue should be dyed in a neutral bath with the later addition of a little acetic acid, *Indoine Blue* and *Victoria Blue* from a bath made strongly acid from the start with sulphuric acid.
- b) If there are no special requirements as to fastness the basic dyestuffs should be made use of wherever possible.

On the other hand, if silk checking threads for woollen piece-goods are wanted, the shade must generally be fast to milling. In this case the shades are also required to be bright so that not only must brilliant dyestuffs be used but also a sufficiently white material.

The following dyestuffs may be considered for shades fast to milling with white wool, silk and cotton:

Yellow: *Sulphine*, diazotised and developed with soap, *Nitrosamine Red paste* (process N° 59, page 233).

Pink: *Rhodamine B*, 6 G, 3 G.

Dark Blue, Blue: *Oxamine Violet*, diazotised and developed with Beta-Naphthol or Oxamine Developer B or R, *Indoine Blue*, *Victoria Blue B, R*, 4 R, *Victoria Pure Blue B* and *Alkali Violet 6 B*.

If fastness to milling with white cotton is not stipulated, any of the substantive dyestuffs would be suitable, either dyed direct or also after-coppered.

c) If the shade must be very fast, certain single-bath after-chromed dyestuffs can be used for pale to medium shades, e.g. *Mordant Yellow brands*, *Alizarine Orange*, *Alizarine Red (V2 a bluish)*, *Anthracene Blue S W G G*, *Palatine Chrome Brown W* (after-treated with potassium bichromate or chromium fluoride).

Other dyestuffs suitable for dyeing floss silk are the following:

Yellow.

<i>Auramine brands.</i>	<i>Rheonine brands.</i>
** <i>Azoflavine brands.</i>	<i>Euchrysine R, G G.</i>

Orange.

Orange II, X.

Red.

* <i>Eosine brands.</i>	** <i>Silk Red G, R, N.</i>
* <i>Erythrosine brands.</i>	** <i>Fast Scarlet B.</i>
* <i>Phloxine brands.</i>	<i>Magenta Scarlet G, B.</i>
* <i>Rose Bengal brands.</i>	

Crimson. Claret.

<i>Diamond Magenta brands.</i>	<i>Cerise DIV.</i>
<i>Magenta Powder brands.</i>	

Violet.

** <i>Acid Violet 4 RN.</i>	<i>Crystal Violet.</i>
<i>Methyl Violet brands.</i>	

Blue.

<i>Victoria Blue brands.</i>	<i>Marine Blue brands.</i>
<i>Cotton Blue R.</i>	<i>New Blue S.</i>
<i>Methylene Blue brands.</i>	<i>Indoine Blue brands.</i>

Green.

Diamond Green B, G.

Grey-Blue. Black.

** <i>Nigrosine WH.</i>	** <i>Palatine Black brands.</i>
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Each of these products, however, must be tested beforehand as to whether it satisfies the requirements of each special case.

* denotes Eosine dyestuffs; ** acid dyestuffs; those not marked are basic dyestuffs.

Useful selection of Aniline dyestuffs for shades chiefly required.

White.

See page 233 under blue for white shades.

Pale Blue.

Light, delicate shades are best dyed with the pure *Alkali Blue brands*, e. g. *Alkali Blue 6 B*, *Methyl Alkali Blue*, by process No 60, page 234.

Brighten in a bath made strongly acid with sulphuric acid. Shade, if desired, in a fresh, weakly acid bath with basic *Violet* or *Green*.

Dark Blue.

Use the *Alkali Blue brands* according to process No 58, page 232, or *Silk Blue B*, *Victoria Blue*, *Soluble Blue*.

Navy Blue.

- a) Bottom the silk, e. g. with *Alkali Blue*, in a standing soap bath, and finish by topping in a fresh, strongly acid boiled-off liquor bath with *Azoflavine* (or *Orange II*), afterwards adding slowly basic dyestuffs, such as *Methyl Violet*, basic *Green*, *New Blue S*, etc.
- b) Dye in a strongly acid boiled-off liquor bath with *Silk Blue B* at a temperature of 100° F., raise the temperature to 140° F., darken in the same bath with *Azoflavine*, heat again to 140° F., and add basic *Violet*, finally bringing to the boil.
- c) Shades which are less full overhand are obtained by bottoming with *Induline NN* in a strongly acid boiled-off liquor bath and topping with basic dyestuffs in a fresh boiled-off liquor bath acidified with acetic acid.

Red (Scarlet). Cardinal. Garnet.

Bright scarlet shades are obtained with *Silk Red G, N, R*, the *Scarlet brands*, *Cochineal Red A*, *Fast Scarlet B*, and yellower scarlets with combinations of *Rhodamine B* and *Orange II*.

Cardinal and Garnet shades are dyed by bottoming with *Orange II*, *Fast Red AV* according to process No 56, page 227, and topping in a fresh, weakly acid boiled-off liquor bath with suitable basic dyestuffs (e. g., by adding sufficient *Diamond Magenta* or *Magenta powder A* to produce the necessary depth).

Brown (Olive).

Bottom with *Orange II* or *Azoflavine* (either alone or with the addition of *Fast Red AV*) without boiled-off liquor, adding acetic acid shortly before bringing to the boil. Then top in a strongly acid boiled-off liquor bath, using *Fast Red*, *Acid Violet*, *Light Green* or other suitable acid dyestuffs.

Black.

Unless great fastness is desired, dye black shades with *Palatine Black brands* in an acid bath with the addition of sulphuric acid (instead of acetic acid).

The Alizarine dyestuffs, which are fast to light, air and washing, must be employed if greater fastness be desired; if merely fastness to water and washing be wanted, the diazotised and developed substantive dyestuffs will suffice.

Processes for dyeing silk
with
Alizarine and other mordant dyestuffs
and with **Indigo.**

Dyeing Alizarine dyestuffs on a mordant:

1. Aluminium mordant.
2. Nitrate mordant.
3. Chromium mordant.
4. Iron mordant.

Dyeing with Alizarine dyestuffs in one bath.

Dyeing in the vat with Indigo pure
B. A. S. F.

Dyeing on a mordant in a bath containing acetic acid and boiled-off liquor.

Generally used for the Alizarine dyestuffs (mordant dyestuffs) and the vegetable colouring matters.

A. Aluminium mordant.

Process N° 63.

1. Mordanting.

After thoroughly wetting out the boiled-off and washed silk, mordant the goods by steeping them for 12 hours (generally overnight) in a cold to lukewarm bath containing 6 lbs. alum and 9½ oz. soda crystals per 10 gallons. Next morning wring, squeeze or hydroextract the silk, enter it into a bath containing a solution of sodium silicate (water glass) at ¾° Tw., and without previously rinsing turn it for about 15 minutes. Rinse thoroughly, if possible in running water, and wring out.

2. Dyeing.

Add to the bath about 2 gallons of fresh boiled-off liquor per 10 gallons dye-liquor, and add, through a fine sieve, the dyestuff, which has been previously well stirred up with water. Slightly acidify the bath (when dyeing with *Alizarine Red* see note *a*) with acetic acid 9° Tw. (30%), enter the silk, turn for about 15 minutes in the cold, bring to the boil in ¾ hour, and boil for 1 hour. Rinse well, soap and, if desired, wash out and brighten.

- Notes.* a) When dyeing with *Alizarine Red* add sufficient acetic acid to the boiled-off liquor-bath to neutralise it, i. e. till it does not affect either blue or red litmus paper. With soft water add acetate of lime to produce fiery shades. In the case of the other Alizarine dyestuffs the bath is made slightly acid.
- b) The use of water containing iron, and also iron parts in the construction of the dyeing apparatus must be avoided.

Suitable dyestuffs for this method are:

Yellow.	<i>Fast Mordant Yellow.</i> <i>Resoflavine paste or powder.</i>
Orange.	<i>Alizarine Orange A 15 %₀, A powder.</i>
Brown.	<i>Anthracene Brown 20 %₀, powder.</i>
Red.	<i>Alizarine paste, e. g. V1 new 20 %₀, V2a bluish,</i> <i>SX 20 %₀.</i> <i>Alizarine Maroon paste or powder.</i>
Violet.	<i>Anthracene Blue B paste, SB powder, G paste,</i> <i>SG powder, GG paste, SGG powder,</i> <i>R paste, SR powder.</i> <i>Gallocyanine D paste, F paste, F powder.</i> <i>Galleine paste or powder.</i>
Green.	<i>Coeruleine S paste, S powder.</i>

B. Nitrate mordant.

Process N° 64.

1. Mordanting.

Enter the boiled-off silk into the nitrate bath of 8° to 15° Tw. (according to depth of shade) prepared as given below, give a few turns and leave it in for 12 hours, e. g. overnight. Next morning wring out, wash, if possible with running water, and dye without drying.

2. Dyeing.

Proceed exactly as directed for the aluminium mordant (page 241) and use the same dyestuffs.

Preparation of the nitrate mordant.

Dissolve separately in the necessary quantities of water:

10 $\frac{1}{2}$ lbs. aluminium sulphate,
2 $\frac{1}{2}$ » acetate of lime and
6 $\frac{3}{4}$ » nitrate of lime,

and mix the three clear solutions together. To render harmless any iron salts that may be present, add further

$\frac{1}{4}$ oz. potassium ferrocyanide and
 $\frac{3}{4}$ » stannic chloride 53° Tw.

Make up with water to 5 gallons, filter off the precipitate and bring the filtrate to 8–15° Tw., as required.

Note. The old mordanting baths can be brought up to their original strength again by a corresponding addition of nitrate mordant.

Suitable dyestuffs for this method are given on page 242 under "Aluminium mordant."

C. Chrome mordant.

Process N° 65.

1. Mordanting.

Turn the boiled-off and rinsed silk for 15 minutes in a bath of chromium chloride 32° Tw. (B. A. S. F.) and allow it to steep in this bath overnight. Next morning wring out well, wash (if possible in running water), and then fix in a sodium silicate bath at $\frac{3}{4}$ ° Tw., and finish as given above under A 1.

2. Dyeing.

Work exactly as given above under A 2, page 241, in a boiled-off liquor-bath, slightly acidified with acetic acid.

- Notes.* a) To avoid expense, the volume of the chromium chloride bath should be kept as small as possible, and after use it should be brought up to strength again (32° Tw.) by replenishing with chromium chloride 53° Tw. (B. A. S. F.).
- b) The fixing bath of sodium silicate (for which bicarbonate is sometimes substituted) must be renewed each time.

Besides the Alizarine dyestuffs, mentioned on page 242, the following are also suitable:

Yellow.

<i>Mordant Yellow G, R, 3R, GT, GGT.</i>	<i>Galloflavine paste or powder.</i>
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Blue. Violet.

<i>Alizarine Blue S, SRW paste or powder.</i>	<i>Anthraquinone Blue SR extra paste, SR extra powder.</i>
<i>Cyananthrol RB.</i>	
<i>Alizarine Indigo Blue S paste.</i>	

Bluish Green.

Alizarine Green S paste.

Black.

Alizarine Black (see additional note).

Additional note.

To produce black shades, *Alizarine Black WX extra paste, WR paste, WR 40%, SW* and *SWR paste* may be dyed in a very concentrated bath without the addition of boiled-off liquor or acetic acid, and the bath can be used for further lots by replenishing with half the quantity of dye-stuff originally taken.

For *Alizarine Black* with iron mordant see below.

D. Iron mordant.

Process N^o 66.

Black shades may be produced according to this process by the use of *Alizarine Black* in a bath containing acetic acid and soap (in the same way as Logwood Black). At the same time weighting of the silk takes place.

1. Mordanting.

Steep the boiled-off silk for 2 hours in a solution of stannic chloride 53^o Tw., wring out, rinse and soap for about 1/2 hour at 95^o F. in a soap bath also containing soda.

Mordant in a bath of "nitrate of iron" (basic ferric sulphate) at 53^o Tw., turn for 1/4 hour, wring out and wash. Afterwards soap the silk for 1 hour with 1 1/2 lbs. soap and wash out again.

Then work the silk for 1/2 hour in a freshly prepared solution of

1 lb. yellow prussiate of potash and

1 lb. 3 oz. hydrochloric acid 32^o Tw. (30%)

at a temperature of 140^o F., wring out and wash well.

Finally treat the goods in a bath containing 5 lbs. catechu for 2 hours at the boil and then throw up.

— For 10 lbs. silk. —

2. Dyeing.

Heat the bath to 140^o F. and add about

1/2 lb. Marseilles soap and

3/4 pint acetic acid 9^o Tw.

(more or less acid according to the hardness of the water). The dyestuff, previously made into a paste with cold water, is added through a fine sieve.

246 Silk. Alizarine dyestuffs on an iron mordant.

Turn the silk for 15 minutes, bring to the boil, and dye boiling for 1½ hours, throwing up the silk and boiling up the bath at intervals.

Soap, rinse well and brighten.

— For 10 lbs. silk. —

- Notes.* a) The weighting can be increased by repeating the mordanting, and diminished by omitting the grounding with tin.
- b) The used mordanting baths (except the prussiate of potash bath) can be again brought up to the original strength and employed for further lots.

Suitable dyestuffs are :

Black.

Alizarine Black WX extra paste, WR paste, WR paste 40th, SW paste, SRW paste.

Alizarine Blue Black SW paste, W paste.

For shading :

Alizarine Blue. Coeruleine.
Alizarine Red. Mordant Yellow.
Galloflavine.

Dyeing with Alizarine and other
mordant dyestuffs by the
single-bath process.

This process is only suitable for the production of pale
shades.

Process N^o 67.

Add to the lukewarm bath (85 ° F.)

for an aluminium mordant:

3 % alum and }
2 » oxalic acid } on the weight of silk,

for a chrome mordant:

3 % chromium acetate 30 ° Tw. and }
1.5 » oxalic acid } on the weight
of silk,

or

5 % chrome alum and }
2 » acetic acid 9 ° Tw. (30 %) } on the
weight of silk,

and then add the dyestuff, which has been carefully made
into a paste with cold water, through a fine sieve. Enter
the boiled-off silk, and turn for $\frac{1}{4}$ hour. Bring to the boil
in about $\frac{3}{4}$ hour and boil for 1 hour. Wash out, soap
at the boil, rinse and brighten with acetic acid.

The Alizarine dyestuffs mentioned on page 242 are
suitable for the aluminium mordant, those on
page 244 for the chrome mordant.

Dyeing silk in the vat with Indigo pure B.A.S.F.

For dyeing silk with Indigo the following vats are employed :

1. The **fermentation vat**, as described for wool, page 45. This vat is still very extensively used in Egypt and the Far East (China, Japan).
2. The **bisulphite-zinc vat**. The process is identical with that given on page 43 for wool, except that the vat is set and worked cold. This method is only seldom used.
3. The **zinc-lime vat**. Here also, the process is practically the same as that given on page 144 for cotton, but care must be taken to keep the vat less strongly alkaline and to use only a quarter as much lime. This vat is used for special purposes and is also worked cold.

For suitable Indigo brands, see the products mentioned under the various processes.

Treatment of silk after dyeing.

1. After-tanning of shades produced with Aniline dyestuffs.
2. Brightening. Finishing.

Treatment of silk after dyeing.

A. "After-tanning" of shades produced with Aniline dyestuffs.

(This treatment increases the fastness to water, washing and rubbing.)

Having dyed and rinsed the silk, treat it for 2 hours at about 100° F. in a bath containing 1 lb. tannic acid per 50 gallons water and wring out. In order to further increase the fastness, turn the silk for $\frac{1}{4}$ — $\frac{1}{2}$ hour in a fresh, cold bath containing $\frac{1}{2}$ lb. antimony salt per 50 gallons water, rinse and finish by brightening.

By means of this "after-tanning," the fastness of a number of acid and basic dyestuffs, and, to a certain extent, also that of the Eosines, substantive and spirit-soluble dyestuffs is increased.

- Notes.*
- a) As a result of this treatment, the shades are more or less altered, and this must be taken into account when dyeing to shade.
 - b) Instead of tannic acid, a corresponding quantity of the other tannin matters, such as galls, myrabolans, etc., may of course be used (cf. page 123).
 - c) For very pale shades, the quantity of tannic acid may be somewhat reduced, and for darker shades, increased.

B. Brightening. Finishing.

Method of working.

After dyeing and rinsing, brighten (scoop) the silk, in a cold to lukewarm bath, to which a little sulphuric or acetic acid has been added, until it tastes just acid. Hydrochloric acid is seldom used. Tartaric acid may advantageously be used for *Rhodamine* dyeings instead of acetic acid.

Chappe silk, which is generally manufactured into velvet and plush, should be rinsed twice after dyeing and treated in a so-called "softening" bath prepared as follows: Pour slowly a solution of 15 lbs. soda-ash (or 30 lbs. soda crystals) into a solution of 50 lbs. alum, and make up to 160 gallons. Then prepare a fresh bath with a little acetic acid and some of the above "softening mordant" and treat the Chappe in this bath.

Weighted silk is treated as a rule in an acetic acid (or tartaric or citric acid) brightening bath containing an oil emulsion. The latter is prepared by thoroughly boiling $\frac{1}{4}$ — $\frac{1}{2}$ lb. olive oil with about an equal quantity of soda and three times as much water. This quantity of emulsion is sufficient for 10 lbs. silk.

If the silk is heavily weighted, add about 5 oz. of glue to the brightening bath.

Finishing increases the lustre of the silk and takes place as a rule after brightening and drying. Tram and Tussah silks should be treated in the lustreing machine; with souple silk string on the machine or on rods, this imparting at the same time the necessary softness.

ARTIFICIAL SILK.

Dyeing processes.

1. Behaviour towards the various classes of dyestuffs.
 2. Selection of dyestuffs for dyeing
 - I. Chardonnet silk
 - II. "Glanzstoff" (Lustre silk)
 - III. Viscose silk.
-

Dyeing of artificial silk.

There are at present several varieties of artificial silk on the market which differ in the method of manufacture. As regards dyeing and their behaviour towards the different classes of colouring matters, they may be divided into the following three groups:

- I. **Chardonnet silk,**
- II. **"Glanzstoff,"**
- III. **Viscose silk.**

Although **Chardonnet silk** has such a great affinity for basic dyestuffs that even in high percentages a previous mordanting with tannic acid and antimony is rendered unnecessary, it has such a small affinity for substantive dyestuffs, that a high percentage of these latter must be used to produce dark shades.

"Glanzstoff," on the other hand, has great affinity for substantive and little for basic dyestuffs, so that the latter, if dyed without a mordant, yield only light shades and require a tannic acid and antimony mordant to produce full shades.

Viscose silk occupies a position midway between the other two, having less affinity than **"Glanzstoff,"** but more than **Chardonnet silk** for direct dyestuffs. Basic dyestuffs can be dyed in pale to medium shades without mordanting, but for higher percentages require a tannin mordant.

Artificial silk fibre has so little affinity for the acid dyestuffs that these are of very little interest.

It may also be mentioned that artificial silk, dyed with substantive dyestuffs, can be topped with basic dyestuffs by process N° 28, page 126. Artificial silk requires no special preparation except a thorough wetting-out before dyeing. Too high temperatures must be avoided in dyeing.

I. Chardonnet silk.

Process N° 68 a.

For basic dyestuffs.

Enter the goods into a cold bath containing $1\frac{3}{4}$ oz. acetic acid 9° Tw. (30%), add the dyestuff (which has been dissolved in hot water) in small portions at a time, turning after every addition, and raise the temperature slowly to 140° F.

— For 10 lbs. artificial silk. —

Suitable dyestuffs are given on page 254.

Process N° 68 b.

For substantive dyestuffs.

Prepare the bath with $\frac{1}{2}$ — $1\frac{1}{2}$ lbs. crystalline Glauber's salt (or half as much calcined Glauber's salt) according to the depth of shade desired, then add the dyestuff, completely dissolved in hot water, and dye for $\frac{1}{2}$ —1 hour at a temperature of 120—160° F.

— For 10 lbs. artificial silk. —

Note. Difficulties in obtaining level dyeings (for example with pale shades) can be overcome by adding Turkey red oil, or soap and soda, or by not adding the Glauber's salt to the bath until dyeing has proceeded for some time.

When using *Cotton Yellow GI, GR, GRR* add sodium phosphate instead of soda.

II. "Glanzstoff."

Process N° 68 c.

Dye with substantive dyestuffs as under I, process N° 68 b; with basic dyestuffs for pale shades as in process N° 68 a.

When using larger percentages of basic dyestuffs, proceed as follows:

Mordant the silk for 1 hour at a temperature of 120° F. in a bath containing $\frac{3}{4}$ —1½ oz. tannic acid, according to depth of shade, turn slowly at intervals, and wring out. Then turn the material for 15 minutes in a freshly prepared cold bath containing $\frac{1}{2}$ —1½ oz. antimony salt, rinse thoroughly and dye as in process N° 68 a, page 252 (under I).

— For 10 lbs. artificial silk. —

The colouring matters given on page 254 are suitable for use here.

III. Viscose silk.

Process N° 68 d.

Dye with substantive dyestuffs as given under dyeing process N° 68 b, page 252.

Work with basic dyestuffs as given under dyeing process N° 68 a, taking less of the dyestuff; for darker shades use process N° 68 c.

For suitable dyestuffs see next page.

The following dyestuffs are specially suitable for the dyeing of artificial silk. The products marked with an asterisk are basic, the others substantive dyestuffs.

Yellow.

<i>Cotton Yellow G I.</i>	* <i>Auramine O, II, II E.</i>
<i>Pyramine Yellow G, R.</i>	* <i>Euchrysine R, G G.</i>

Orange. Brown.

<i>Pyramine Orange 3 G, R, R R.</i>	<i>Cotton Brown R N.</i>
<i>Cotton Orange G.</i>	<i>Oxamine Brown G, 3 G, G R.</i>
* <i>Rheonine A.</i>	

Red.

<i>Cotton Red 4 B, 4 B X,</i>	* <i>Saffranine M N.</i>
<i>4 B extra.</i>	* <i>Rhodamine B, G, 3 G, 6 G.</i>
<i>Oxamine Red 3 B.</i>	* <i>Diamond Magenta brands.</i>
<i>Thiazine Red R.</i>	<i>Cotton Rubine.</i>

Violet.

* <i>Methyl Violet brands.</i>	<i>Oxamine Violet.</i>
* <i>Crystal Violet.</i>	

Blue.

<i>Oxamine Blue A, B, 3 B, 3 R,</i>	* <i>Victoria Blue B.</i>
<i>4 R.</i>	* <i>Marine Blue R N.</i>
<i>Oxamine Pure Blue 5 B, 5 B X.</i>	* <i>Methylene Blue.</i>

Green.

<i>Oxamine Green B, G.</i>	* <i>Diamond Green B, G.</i>
* <i>Malachite Green B, G.</i>	

Grey. Black.

<i>Oxamine Black R N, B H</i>	<i>Cotton Black 3 G, B G N X,</i>
<i>(for shading).</i>	<i>E extra, R W extra.</i>
* <i>Jet Black (in combinations, e. g. with Methylene Blue B,</i>	
<i>Rheonine A).</i>	

Classification
of the
Silk dyestuffs
according to their fastness.

(See notes on page 1.)

Fastness to water.

Fastness to light.

Fastness to boiling-off.

ABBREVIATIONS.

<i>(dialzo-soap)</i>	== diazotised and developed with soap, process N° 57, additional note, page 231.
<i>(dialzo-beta)</i>	== diazotised and developed with Beta-Naphthol, process N° 57, additional note, page 231.
<i>(dialzo-B)</i>	== diazotised and developed with Oxamine Developer B, process N° 57, additional note, page 231.
<i>(dialzo-R)</i>	== diazotised and developed with Oxamine Developer R, process N° 57, additional note, page 231.
<i>(dialzo-M)</i>	== diazotised and developed with Oxamine Developer M, process N° 57, additional note, page 231.
<i>(dialzo-alpha)</i>	== diazotised and developed with Alpha-Naphthol, process N° 57, additional note, page 231.
<i>(dialzo-resorcin)</i>	== diazotised and developed with Resorcin, process N° 57, additional note, page 231.
<i>(dialzo-O R)</i>	== diazotised and developed with Orange Developer R, process N° 57, additional note, page 231.
<i>(chrome)</i>	== dyed on a chromium mordant, process N° 65, page 243.
<i>(aluminium)</i>	== dyed on an aluminium mordant, process N° 63, page 241.
<i>(iron)</i>	== dyed on an iron mordant, process N° 66, page 245.
<i>(tan)</i>	== after-treated with tannin, as given on page 249.



Fastness of dyeings to water; fastness against bleeding into white silk.

The following are the fastest dyestuffs of their kind:

Yellow.

Alizarine

dyestuffs: *Mordant Yellow G, R, 3 R, G T, G G T* (chrome). *Galloflavine* (chrome).
Reso flavine (chrome).

Acid dyestuffs:

Tartrazine (tan). *Metanil Yellow* (tan).
Fast Yellow extra (tan). *Naphthol Yellow S* (tan).
Yellow from Nitrosamine Red paste (tan). *Fast Yellow Y, G* (tan).
(process No 59, page 233). *New Fast Yellow R* (tan).
Azoflavine FF (tan).

Basic

dyestuffs: *Auramine II* (tan). *Auramine G* (tan).
Euchrysine G G, R R (tan). *Rheonine A, N, G*.
Rheonine A, N, G (tan). *Chrysoidine A* (tan).
Phosphine N (tan).

Substantive

dyestuffs: *Cotton Yellow R* (tan). *Cotton Yellow G I, G R, G R R* (tan).
Pyramine Yellow G, R (tan). *Sulphine* (diazo-O R).
Sulphine (diazo-soap). *Sulphine* (diazo-resorcin).

Spirit-soluble

dyestuffs: *Quinoline Yellow* soluble in spirit (tan).

Orange.

Alizarine

dyestuffs: *Alizarine Orange A* (aluminium).

Substantive

dyestuffs: *Pyramine Orange 3 G* (tan). *Cotton Orange G, R* (tan).

Acid dyestuffs: *Orange G, II* (tan).

Brown.

- Alizarine
dyestuffs: *Anthracene Brown* (aluminium and chrome). *Alizarine Orange A* (chrome).
- Acid dyestuffs: *Naphthylamine Brown*.
- Substantive
dyestuffs: *Thiazine Brown G, R* (tan). *Oxamine Dark Brown brands* (tan).
Cotton Brown RN, RVN (tan). *Sulphine* (diazo-M); (tan).
Oxamine Brown brands (tan).
- Basic
dyestuffs: *Vesuvine brands* (tan).

Red.

- Alizarine
dyestuffs: *Alizarine Red* (aluminium and chrome). *Alizarine Maroon* (aluminium and chrome).
- Acid dyestuffs: *Sorbine Red* (tan). *Palatine Scarlet A, 3R* (tan).
Cochineal Red (tan). *Erythrine X* (tan).
Naphthol Red (tan). *Fast Red E* (tan).
Acid Magenta S (tan). *Azocarmine*.
- Basic
dyestuffs: *Rhodamine G, B, S* (tan). *Diamond Magenta* (tan).
Rhodamine 6G, 3G, 3B (tan). *Saffranine T extra, MN* (tan).
- Substantive
dyestuffs: *Thiazine Red G* (tan). *Oxamine Red 3B*.
Cotton Red 4B, 4BX, 4B extra (tan). *Sulphine* (diazo-alpha); (diazo-beta); (tan).
Oxamine Fast Red F (tan). *Thiazine Red R* (tan).
Oxamine Red (tan). *Oxamine Claret B, M* (tan).
- Eosine
dyestuffs: *Phloxine GN* (tan).

Violet.

- Alizarine
dyestuffs: *Gallocyanine* (aluminium and chrome). *Galleine* (aluminium and chrome).
Anthracene Blue (aluminium).

Acid dyestuffs: *Acid Violet 3 BN, 4 BL, 4 B C, 6 BN, 7 B* (tan). *Acid Violet 4 RN* (tan).
Alkali Violet brands (tan).

Basic dyestuffs: *Methyl Violet brands* (tan). *Crystal Violet* (tan).
Ethyl Purple (tan).

Substantive dyestuffs: *Oxamine Violet* (tan).

Blue. Dark Blue. Bluish Green.

Alizarine dyestuffs: *Anthracene Blue* (chrome). *Anthraquinone Blue SR extra paste, SR extra powder* (chrome).
Alizarine Blue (chrome). *Alizarine Indigo Blue S* (chrome).
Cyananthrol RB (chrome); (tan).

Acid dyestuffs: *Soluble Blue brands* (tan). *Fast Blue brands* (tan).
Pure Blue brands (tan). *Induline NN* (tan).
Neptune Blue B (tan). *Silk Blue B* (tan).
Methyl Soluble Blue (tan). *Wool Blue S* (tan).

Basic dyestuffs: *Victoria Blue 4 R, B, R* (tan). *Nile Blue B, BB* (tan).
Night Blue (tan). *Indoine Blue brands* (tan).
Victoria Pure Blue B (tan). *Nile Blue A* (tan).
Indoine Blue R (tan).

Substantive dyestuffs: *Oxamine Blue BG, A, B, 4 R, 3 R* (tan). *Oxamine Blue BG* (diazo-B or R); (tan).
Oxamine Blue 3 R, 4 R (diazo-beta); (diazo-B); (diazo-M); (tan). *Oxamine Dark Blue brands* (tan).
Oxamine Violet (diazo-alpha); (diazo-beta); (diazo-B or -M); (tan).

Indigo: *Indigo pure B. A. S. F. brands.*

Spirit-soluble dyestuffs: *Parne soluble in spirit* (tan). *Induline N* (tan).
Spirit Blue brands (tan).

Green. Olive.

- Alizarine
 dyestuffs: *Coeruleine S* (aluminium or chrome). *Alizarine Green S* (chrome).
- Acid dyestuffs: *Light Green brands* (tan). *Wool Green S* (tan).
Neptune Green S G (tan). *Neptune Green S* (tan).
Agalma Green B (tan).
- Basic
 dyestuffs: *Diamond Green B, G* (tan).
- Substantive
 dyestuffs: *Oxamine Green G, B* (tan). *Oxamine Green M* (tan).

Black. Black Blue.

- Alizarine
 dyestuffs: *Alizarine Black* (processes Nos 65 and 66, chrome or iron).
- Acid dyestuffs: *Nigrosine brands* (tan). *Palatine Black brands* (tan).
- Basic
 dyestuffs: *Jet Black* (tan).
- Substantive
 dyestuffs: *Violet Black* (tan). *Oxamine Black brands* (diazo-beta); (diazo-M).
- Spirit-soluble
 dyestuffs: *Nigrosine C or G* (tan). *Japan Black extra*.

Note. Dyeings with the acid, basic, substantive and spirit-soluble colours are made much faster to water by an after-treatment with tannic acid.

Fastness to light.

The following are the fastest of their kind to light:

Yellow.

Alizarine	dyestuffs: <i>Mordant Yellow brands</i> (chrome).	<i>Galloflavine.</i>
Acid dyestuffs:	<i>Quinoline Yellow.</i> <i>Yellow from Nitrosamine</i> <i>Red paste</i> (process No 59, page 233).	<i>Tartrazine.</i> <i>Fast Yellow, extra.</i> <i>Fast Yellow J.</i> <i>Azoflavine brands.</i>
Substantive	dyestuffs: <i>Cotton Yellow G I, R.</i> <i>Pyramine Yellow G, R.</i>	<i>Sulphine</i> (diazo-soap). <i>Sulphine</i> (diazo-O R).
Spirit-soluble	dyestuffs: <i>Quinoline Yellow soluble in spirit.</i>	
Basic	dyestuffs: <i>Auramine brands.</i>	

Orange.

Alizarine	dyestuffs: <i>Alizarine Orange A</i> (aluminium).	
Acid dyestuffs:	<i>Orange N, G, II.</i>	
Substantive	dyestuffs: <i>Pyramine Orange 3 G, R.</i>	<i>Cotton Orange G, R.</i>

Brown (Reddish Brown).

Alizarine	dyestuffs: <i>Alizarine Orange A</i> (chrome).	<i>Anthracene Brown</i> (chrome).
Substantive	dyestuffs: <i>Thiazine Brown G, R.</i>	<i>Oxamine Brown G, 3 G, G R.</i>

Red.

Alizarine		
dyestuffs:	<i>Alizarine Red</i> (aluminium or chrome).	<i>Alizarine Maroon</i> (aluminium or chrome).
Acid dyestuffs:	<i>Silk Red R.</i> <i>Fast Red AV, C.</i> <i>Erythrine RR, X, P.</i> <i>Palatine Scarlet A, 3R.</i> <i>Azocarmine brands.</i>	<i>Silk Red G, N.</i> <i>Scarlet R, RR, 3R.</i> <i>Cotton Scarlet.</i> <i>Naphthol Red S.</i> <i>Fast Red E, B.</i>
Basic		
dyestuffs:	<i>Rhodamine brands.</i> <i>Induline Scarlet.</i>	<i>Diamond Magenta brands.</i>
Substantive		
dyestuffs:	<i>Oxamine Fast Red F.</i> <i>Sulphine (diazo-beta).</i>	<i>Thiazine Red R, G.</i>
Spirit-soluble		
dyestuffs:	<i>Eosine</i> soluble in spirit.	
Eosine		
dyestuffs:	<i>Eosine BN</i> (the fastest of its kind to light).	

Violet.

Alizarine	<i>Anthraquinone Violet.</i>	<i>Gallocyanine</i> (chrome or aluminium).
dyestuffs:	<i>Galleine</i> (chrome or aluminium).	<i>Anthracene Blue</i> (aluminium).
Acid dyestuffs:	<i>Acid Violet 4RN.</i>	<i>Acid Violet 6BN.</i>
Basic		
dyestuffs:	<i>Crystal Violet.</i>	

Blue.

Alizarine		
dyestuffs:	<i>Cyananthrol brands.</i> <i>Anthraquinone Blue.</i> <i>Alizarine Blue</i> (chrome).	<i>Anthracene Blue</i> (chrome). <i>Alizarine Indigo Blue</i> (chrome).
Acid dyestuffs:	<i>Cyananthrol.</i> <i>Anthraquinone Blue.</i> <i>Soluble Blue brands.</i>	<i>Pure Blue brands.</i> <i>Fast Blue 5B, greenish, RR.</i> <i>Silk Blue B.</i>

Basic		
dyestuffs:	<i>Night Blue</i> (in darker shades). <i>Victoria Blue B, 4 R</i> (in darker shades).	<i>Victoria Pure Blue B</i> (deep shades). <i>Nile Blue A, B, BB.</i> <i>Indoine Blue brands.</i>
Substantive		
dyestuffs:	<i>Oxamine Black brands</i> (diazo-beta).	<i>Phenamine Blue G.</i>
Indigo:	<i>Indigo pure B. A. S. F. brands</i> (for medium and dark blue).	
Spirit-soluble		
dyestuffs:	<i>Parme soluble in spirit.</i> <i>Spirit Blue.</i>	<i>Induline N.</i>

Green. Olive.

Alizarine		
dyestuffs:	<i>Coeruleine S</i> (chrome or aluminium).	<i>Anthraquinone Green GXN.</i> <i>Alizarine Green S</i> (chrome).
Acid dyestuffs:	<i>Anthraquinone Green GXN.</i> <i>Neptune Green.</i> <i>Wool Green.</i> <i>Light Green brands.</i>	<i>Agalma Green B.</i> <i>Anthraquinone Blue</i> <i>SR extra paste,</i> <i>SR extra powder.</i>
Basic		
dyestuffs:	<i>Diamond Green G, B.</i>	

Grey Blue. Black Blue. Black.

Alizarine		
dyestuffs:	<i>Alizarine Black</i> (chrome or iron) [for black shades].	
Acid dyestuffs:	<i>Palatine Black 3 G, 4 B,</i> <i>B for silk.</i>	<i>Nigrosine WL.</i>
Substantive		
dyestuffs:	<i>Oxamine Black brands</i> (diazo-M).	
Spirit-soluble		
dyestuffs:	<i>Yapan Black brands.</i>	<i>Nigrosine C, G.</i>

Fastness to boiling-off

(Fastness to boiling soap).

The following are amongst the fastest in this respect:

Yellow.

Alizarine
dyestuffs: *Fast Mordant Yellow G* (aluminium).

Acid dyestuffs: *Yellow* from *Nitrosamine Red paste*
(process No 59, page 233).

Substantive
dyestuffs: *Sulphine* (diazo-soap).

Orange.

Alizarine
dyestuffs: *Alizarine Orange A* (aluminium).

Brown.

Alizarine
dyestuffs: *Anthracene Brown* (chrome). *Alizarine Orange A*
(chrome).

Red.

Alizarine
dyestuffs: *Alizarine Red*, blue shade brands (chrome or aluminium).
Alizarine Maroon (chrome or aluminium).

Violet.

Alizarine
dyestuffs: *Galleine* (chrome or aluminium).

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Blue.

Alizarine

dyestuffs: *Alizarine Blue* (chrome). *Alizarine Indigo Blue*
(chrome).

Indigo: *Indigo pure B. A. S. F. brands.*

Green. Olive.

Alizarine

dyestuffs: *Coeruleine S* *Alizarine Green S*
(chrome or aluminium). (chrome).

Black.

Alizarine

dyestuffs: *Alizarine Black* (iron or chrome).

MIXED FABRICS.

I. Wool and cotton
(unions).

II. Silk and cotton
(half-silk) [satin, etc.].

III. Silk and wool
(half-silk) [Gloria, etc.].

Processes for dyeing unions

(Wool and cotton).

1. General survey of the various methods of working.
2. Preparation of unions for dyeing.
3. Dyeing of unions.

Several bath process.

Two-bath process.

Single-bath process.

Process for the production of shades as fast to milling as possible.

Process for mercerising and dyeing union pieces.

Unions.

(Wool and Cotton.)

For dyeing unions the following methods are the ones chiefly employed, the choice depending on requirements and the amount of cotton present:

1. The several bath method.

This is the old method of working and is still much employed. It is used for union piece-goods and also yarn, especially where the brightness and purity of the shade cannot otherwise be obtained, and where the quality of the goods demands it (handle, etc.). The process consists in first dyeing the wool with acid or one-bath chrome dyestuffs, basic colours, etc., and then mordanting and topping the cotton with basic dyestuffs. (For details see page 268.)

2. The two-bath process.

This process differs from the above in being much simpler. It is employed, for instance, with unions which contain but little cotton, e. g. as burls, or in which the cotton is less visible (for instance as warp), and when no great fastness to washing is required. On the other hand, shades can be obtained by this method, which are faster to light than those produced by the single-bath process described below.

The process can be carried out in two ways:

- a) By first dyeing the wool with acid dyestuffs, and then, after thoroughly rinsing, topping the cotton with substantive dyestuffs. (For details see page 269.)

- b) By first dyeing the cotton in the milling operation with such substantive dyestuffs as are sufficiently fast to boiling with acid to withstand the subsequent operation of topping the wool at the boil in an acid bath, without suffering any great change in shade or loss of depth.

This process is only suitable for dark shades and for black. (For details see page 270).

3. The single-bath process.

This process can be used for such goods as contain a large amount of cotton, and besides being the simplest method, it takes less time than either of the other two. It is chiefly employed for piece-goods, but can also be used for yarn and slubbing where no great fastness to washing and milling is required; in all cases where such fastness is expected of dyeings on union yarn, loose union material, etc., it is necessary to submit them to a further treatment, details of which will be found in processes 72 and 73, pages 274—275.

In the single-bath process, wool and cotton are dyed together in the same (neutral) bath with the addition of Glauber's salt or common salt (dyeing process, page 271).

The dyeing of shades as fast to milling
as possible.

This method is employed for loose union material (un-carbonised rags) and union yarn, etc., when a certain fastness to milling is necessary.

The dyeing is carried out according to the single-bath process, after-treating in a fresh bath with

- a) formaldehyde and acetic acid, or
- b) bichromate of potash, sulphate of copper and acetic acid, or

c) bichromate of potash and formaldehyde (with *Union Fast Black SB*).

For details see page 274, process No 72.

For method of working with *Union Fast Black SB* see process No 73, page 275.

The mercerising of union piece-goods.

This method is for the production of crêpon effects.

Process for mercerising, see page 276.

Dyeing process, see page 271.

A. Treatment of unions before dyeing.

Method of working: Scour dirty (greasy) union material in the same way as wool, by washing, preferably in the washing machine, with lukewarm water to which soda or a little ammonia has been added.

Scour material containing shoddy, (e. g. with dark, black shoddy weft) in the same way, and strip before dyeing in order to obtain bright shades. For details as to stripping see page 47, shoddy stripping processes *a-e*.

The stripping process *d* is often employed for union piece-goods with the following slight changes:

Boil the goods in a bath containing, on an average, 3—4 lbs. bichromate of potash and an equal quantity of sulphuric acid 168° Tw., then dye the wool as quickly as possible in the same bath* with the dyestuffs given below, rinse thoroughly and cover the cotton by the several bath process, page 268 (using for dark shades also iron salts).

— For 100 lbs. material. —

* If desired, in a fresh bath.

For this purpose the following dyestuffs fast to chroming are suitable:

Navy Blue.

Acid Violet PW, Soluble Blue 3376, SV, HA, HB.

Russian Green. Olive.

*Neptune Green SG. Agalma Green B.
Light Green SF yellow shade, Naphthol Yellow S.
SF blue shade. Orange N.*

Claret.

Acid Magenta S, SS. Wool Scarlet RR.

B. The dyeing of unions.

1. The several-bath method.

Process N^o 69.

After the goods have been dyed with acid colours (process N^o 1), or with one-bath chrome dyestuffs (process N^o 5) or other colours, rinse thoroughly and mordant for several hours in a cold bath of tannic acid (or in a solution of some other tannin substance) in a jigger, beck or washing machine. Then rinse lightly, and fix with antimony salt, or with nitrate of iron to give a dark ground, or combine the two methods, as given under "cotton" on page 124.

After washing well, top the cotton in a fresh, cold bath with basic dyestuffs, adding 2—4% acetic acid 9^o Tw. (30%), work up to the shade of the previously dyed wool (or dye the cotton a little fuller) and rinse well.

Notes. a) To obtain good results and for reasons of economy, work with as concentrated a mordanting bath as possible. Take, for example, in the jigger 3 lbs. tannic acid and 1½ lbs. antimony salt per 100 lbs. goods; for further lots replenish with about half these quantities.

Any other iron salt may be substituted for the nitrate of iron, but less profitably, e. g. pyrolignite of iron or ferrous sulphate.

When a grounding with iron salts is given, which is done more especially in the case of dark shades, sumac extract 53⁰ Tw. is often taken instead of tannic acid, 15—35 % on the weight of the goods being used, according to quality and conditions.

- b) If the iron ground comes out too dark, it may be lightened by rinsing in a fresh bath containing a little hydrochloric acid.
- c) If the cotton and wool are to be dyed different colours (shot effects), proceed as above, but bear in mind, in the case of bright shades, e. g. scarlet, etc., that basic dyes when topped in the cold always tinge the wool slightly, so that the wool should from the first be kept rather brighter than the pattern.

Suitable acid dyestuffs for the foregoing process are named on pages 9—11, the basic dyestuffs on page 125.

Of the latter, the *Indoine Blue brands*, *Victoria Blue B*, *Victoria Pure Blue B* and *Victoria Blue 4 R* are less suitable.

2. The two-bath method.

(Topping the cotton, or burls, in the washing machine or during the milling operation.)

Process N^o 70 a.

Dye the wool with acid dyestuffs* by process N^o 1, and wash very thoroughly with water to remove the acid (where permissible using a little soda or ammonia). Then top the cotton in a fresh concentrated bath with substantive dyestuffs, adding 2—5 lbs. Glauber's salt per 100 gallons liquor.

* or single-bath chrome colours, etc.

- Notes.* a) For economical reasons, the cotton in piece-goods is generally dyed (covered) in the washing machine. In the case of cloth for which the wool has been dyed in the loose (shoddy) fast to milling, the cotton can be topped in the milling operation. *Cotton Black B G X*, for instance, can be used with advantage for covering cotton and burls. In this case, take about 6 oz. *Cotton Black B G X* per piece (containing about 30 % cotton) weighing 70 lbs.. Dissolve the dyestuff with about 3 oz. soda in about 1/2 gallon hot water and add this solution to the milling liquor. After milling rinse in the usual way.
- b) If necessary, unions containing shoddy may be stripped beforehand as directed on page 47.

Suitable acid dyestuffs are given on page 9 ff, and substantive dyestuffs on page 102.

Process N^o 70 b.

Reversing process 70 *a*, first dye the cotton in the milling operation (95—105 ° F.) with 4—6 lbs. *Grounding Black*, or better 2—4 lbs. *Cotton Milling Black*, per 100 gallons milling liquor (consisting of soap and soda). Then rinse well and top the wool with acid dyestuffs in a fresh bath which should be kept acid from the commencement.

Note. In addition to black shades of comparatively good fastness to light, it is also possible to dye brighter shades by this process, e. g. navies, clarets, browns, etc.

Suitable acid dyestuffs for topping the wool are given on page 9; the most suitable substantive dyestuffs for the cotton are *Grounding Black*, *Cotton Milling Black*, *Cotton Black B G X*.

3. The single-bath method.

This process is based, firstly, on the property of certain substantive (direct) dyestuffs of dyeing cotton and wool uniformly in a neutral bath (i. e. in a bath containing Glauber's or common salt) at the boil, or of dyeing the cotton darker than the wool at a lower temperature; secondly, on the fact that a number of acid dyestuffs will dye wool from a neutral bath without noticeably dyeing the cotton. It is thus possible, by carefully selecting the substantive dyestuffs (using them, if desired, in combination with suitable acid dyestuffs, and suitably regulating the temperature of the bath) to produce the most varied shades in the simplest manner with a great saving of time.

To ensure success, the goods must be absolutely free from acid. (With regard to scouring, see page 4).

Process N° 71.

Dye for about 1 hour at the boil with the addition of 10—20 lbs. Glauber's salt or common salt and the necessary quantity of dyestuff in solution.

If the cotton is not dyed dark enough in comparison with the wool, allow the bath to cool down to about 140 to 160 ° F., add more of the substantive (direct) dyestuff, and finish at this temperature (140—160 ° F.). Afterwards rinse lightly.

— For 100 lbs. material. —

Notes. a) In general, bear in mind that a high temperature causes the substantive dyestuffs to be taken up more by the wool, whilst a lower temperature tends to increase the amount taken up by the cotton.

Note also that slight additions of alkali, e. g. soda or ammonia, prevent the substantive colouring matters from dyeing the wool too much.

- b) If the shade of the wool varies too much from that of the cotton, it may be corrected by working at the boil with the acid colouring matters given on pages 273—274.
- c) For the sake of economy the baths may be used for further lots, adding about $\frac{1}{4}$ — $\frac{1}{2}$ of the quantity of substantive dyestuff originally taken. The amount of acid dyestuff to be added varies according to the character of the dyestuff and depth of shade; for dark shades about $\frac{1}{5}$ — $\frac{1}{4}$ of the amount first taken will be found sufficient. Take for the second bath about $\frac{1}{2}$ and for the third about $\frac{1}{3}$ of the original quantity of Glauber's salt.
- d) Work the bath, especially for dark shades, as concentrated as possible. (The proportion of material to liquor should be from 1:20 to 1:30 in the case of piece-goods.)
- e) If materials, which contain shoddy, have been stripped with potassium bichromate and sulphuric acid according to process *d* (page 47) previous to dyeing by this single-bath process, they must be rinsed thoroughly and freed from acid in a freshly prepared bath containing soda or ammonia.

For the single-bath process the following substantive (direct) colours are suitable. Those marked with an asterisk do not dye the same shade on the wool and the cotton at the boil. The others dye cotton and wool more or less evenly at the boil, and at a lower temperature (100° F.) the cotton more strongly than the wool.

Yellow.*Cotton Yellow R.**Pyramine Yellow R, G.***Orange.***Cotton Orange R.**Pyramine Orange R, RR.*** Pyramine Orange 3G.*

Brown.

Thiazine Brown G, R.
 * *Cotton Brown RN.*
Cotton Brown RVN.

Oxamine Brown G, GR, 3G.
Oxamine Dark Brown G, R.

Red.

Cotton Red 4B, 4BX,
4B extra.

Thiazine Red G, R.

Crimson. Claret.

* *Oxamine Red.*
 * *Oxamine Red 3B.*
 * *Cotton Rubine.*

* *Oxamine Fast Red F.*
 * *Oxamine Claret M, B.*

Blue.

Oxamine Pure Blue 5B, 5BX.
Oxamine Blue 3B, G, GN,
B, BG, A, RX, RXN.
 * *Oxamine Blue 3R, 4R.*

* *Oxamine Copper Blue RR.*
 * *Oxamine Dark Blue BG, R,*
BR.
Union Blue B, R.

Violet.

* *Oxamine Violet.*

Green.

Oxamine Green B, G.

Black Blue. Black.

Oxamine Black A, N, 2R,
RN, BH, BHN.
Cotton Black
RW extra, E extra,
PF extra, BGNX,
B, BN, BNX.

Grounding Black.
Cotton Milling Black.
Union Black brands
 (e. g. 2BNI, 3BN).

Among the acid dyestuffs the *Alkali Violets*, *Alkali Blues* and *Rhodamines* are very suitable for dyeing the wool in a neutral bath:

Yellow.

Quinoline Yellow.

Azoflavine brands
 (e. g. S, RS).

Orange.

Orange N, II.

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Red. Claret.

Fast Scarlet B.
Fast Red AV.

New Claret R.
Rhodamine B.

Blue. Violet.

Alkali Blue B extra.
Alkali Violet 6B, 4BN, R.
Acid Violet 6BN, 4BL, 4BC.

Neptune Blue BG, B.
Neutral Blue for wool.

Green.

Wool Green S.
Neptune Green SG.

Agalma Green B.

Black.

Palatine Black, e. g. 3G, 4BS, 4B.
Agalma Black brands.

Production of shades as fast to milling
as possible.

Single-bath dyeing process with after-treatment.

In the last few years, this new method of dyeing loose, uncarbonised rags containing cotton, union Italians, union yarns, etc., has been introduced. It avoids carbonising and the consequent loss of weight, and yet satisfies all requirements as to fastness to washing and milling. Proceed as follows:

Process N° 72.

Dye as in process N° 71 with the addition of 20 lbs. crystallised Glauber's salt (or half as much calcined Glauber's salt) for 1 hour at the boil, then shut off steam and continue dyeing for $\frac{1}{2}$ hour.

Then treat for $\frac{1}{2}$ hour in a fresh bath

either: a) at 100—120 ° F. with 3 lbs. formaldehyde (30 %) and 2 lbs. acetic acid 9 ° Tw. (30 %).
or b) at 120—140 ° F. with $1\frac{1}{2}$ lbs. copper sulphate, $1\frac{1}{2}$ lbs. bichromate of potash and 3 lbs. acetic acid 9 ° Tw. (30 %).

— For 100 lbs. material. —

Dyestuffs suitable for use by method *a* are given on page 114; on page 112 those for use with *b**.

For acid dyestuffs which withstand the action of a bichromate bath, see page 24.

For dyeing Black, *Union Fast Black SB* is specially suitable, using the following process:

Process N° 73.

Prepare the bath with 4—6 lbs. of the dyestuff, 20 lbs. crystallised Glauber's salt (or half as much calcined Glauber's salt) and enter the goods at the boil. After about $\frac{3}{4}$ hour add 2—3 lbs. acetic acid 9 ° Tw. (30 %) and boil for another 20 minutes. Then shut off steam and chrome in the same bath by adding 5—8 oz. potassium bichromate dissolved in water, and then treat in a fresh bath with 3 lbs. formaldehyde 30 % and 2 lbs. acetic acid 9 ° Tw. (30 %) for $\frac{1}{2}$ hour at 120 ° F.

— For 100 lbs. material. —

Notes. a) The after-treatment with formaldehyde can, if necessary, be carried out in the same bath after chroming.
b) The black produced satisfies all ordinary requirements for fastness to milling with white wool, cotton and silk.

* When only fastness to milling with wool is required, *Cotton Black F extra* can be used for black without further after-treatment.

Mercerising union piece-goods.

For the sake of completeness, the following process is given for producing raised designs on union piece-goods (crimped effects).

Method of working.

Give the scoured unions, in a stretched condition, a short passage (1—3 minutes) through caustic soda of 42 to 52° Tw., keeping the temperature as low as possible (about 45—55° F.). Squeeze and pass without delay through water, acidified with such an excess of hydrochloric acid that it still tastes acid after passage of the goods. Then rinse very thoroughly, which is best done in running water.

To dye goods mercerised as above, make use of the single-bath process, page 271, and the dyestuffs there mentioned.

Note. Two-colour effects, e. g. black cotton and coloured wool, may be produced by using as warp cotton, which has previously been dyed black with colouring matters fast to cross-dyeing (see page 211), mercerising the whole piece and finally dyeing the wool with acid dyestuffs in the usual manner (page 9). Similar two-colour effects can also be obtained by the two-bath and several-bath processes, pages 268—270. The cotton and wool exhibit greater affinity for dyestuffs after mercerising.

Processes for dyeing half-silk

(Silk and cotton).

1. General survey of the various processes.
2. Preparation of the half-silk (satin, etc.).
3. Dyeing half-silk (satin, etc.).

In several baths.

In one bath.

Half-silk (satin, etc.)

(Silk and cotton.)

General survey of the methods of dyeing.

1. Several-bath method.

This method is chiefly employed when brightness and purity of shade cannot be otherwise obtained. It consists in previously dyeing the silk with acid or basic colouring matters, then mordanting the cotton and dyeing in the cold with basic colours. Substantive dyestuffs may be used for after-dyeing the cotton when they yield sufficiently bright shades. See process No 74, page 278.

2. Single-bath process.

The use of this method is everywhere preferred, where feasible, to the foregoing process on account of its simplicity. The goods are dyed with substantive colouring matters in an alkaline soap bath and then the silk is topped in an acid brightening bath with basic or acid dyestuffs, or with both together. See process No 75 a, page 279.

In some cases the cotton and silk are dyed together in the alkaline soap bath with substantive dyestuffs only, or, to cover the silk better, suitable basic and acid dyes, or both together, are used in the same bath. See process No 75 b, page 279.

A. Treatment of satin before dyeing.

Silk and cotton unions are generally dyed in the form of piece-goods or ribbons and, after singeing, are treated in the same way as silk.

The treatment is briefly as follows :

First boiling-off bath. Prepare the first bath with 20—25 lbs. Marseilles soap per 40—60 lbs. piece-goods, enter the material and boil off for about 1½—2 hours.

Second boiling-off bath. Now treat the goods once more in a similar manner for ¼—½ hour in a second boiling-off bath (the so-called discharging bath), containing about 10 lbs. Marseilles soap, and pass through a warm soda bath to remove the soap. Afterwards wash out, pass through a bath made sufficiently acid with hydrochloric or sulphuric acid to taste slightly acid, and finally rinse thoroughly.

B. Dyeing satin.

1. Several-bath method.

Process N° 74.

Dye the silk with acid or basic dyestuffs in a bath made weakly acid with sulphuric or acetic acid, as in process N° 60, with the addition of boiled-off liquor, if desired. Then rinse and top the cotton in a cold bath with basic dyestuffs according to process N° 27, page 123, after having previously mordanted for 2 hours (also in the cold) with tannic acid and antimony salt (or with corresponding substitutes, see page 123).

- Notes.*
- a) If particoloured, white or shot effects are to be produced by this process, the goods should be lightly treated with chlorine after dyeing the silk, to keep the cotton clear enough.
 - b) When dyeing to shade, always keep the cotton rather fuller than the silk.

- c) Since the silk is always slightly darkened when topping the cotton with basic dyestuffs in the cold, lighten it, if necessary, by lukewarm rinsing with the addition of Turkey red oil, or a little bran, or even by soaping lightly.
- d) In certain cases, e. g. for shot effects, use suitable substantive dyestuffs for topping the cotton, working in an alkaline soap-bath after having rinsed well.

For suitable acid and basic dyestuffs see pages 228—230, substantive (direct) dyestuffs are given on page 104.

2. Single-bath process.

Process N° 75.

a) This process is most generally used for substantive dyestuffs, topping, if necessary, with other dyestuffs.

Prepare the bath with 1—3 lbs. Marseilles soap and $\frac{1}{2}$ lb. calcined soda per 100 gallons dye-liquor, dye the cotton for $\frac{3}{4}$ —1 hour with suitable substantive dyestuffs nearly at the boil, and rinse (if the water be hard, with the addition of a little soda to the rinsing bath). Then top the silk with basic or acid dyestuffs in a freshly prepared cold or warm bath, to which acetic, hydrochloric or sulphuric acid has been added.

b) Chiefly used for paler shades.

Dye, nearly at the boil, as given above under a), in an alkaline soap bath with substantive dyestuffs, using at the same time suitable acid or basic colouring matters (or both together); rinse and brighten in a fresh acetic acid bath.

- Notes.*
- a) The addition of Glauber's salt to the soap bath, which should, however, be avoided if possible, increases the depth of colour on the cotton.
 - b) Unevenness of shade can be avoided by boiling up the bath once or twice.
 - c) In process N° 75 a the addition of boiled-off liquor to the brightening bath tends to prevent unevenness which, especially in dark shades, is liable to occur.

d) If hydrochloric or sulphuric acid be used in the brightening bath, the goods must always be rinsed afterwards with water; this is not necessary if acetic acid be employed.

e) Single-bath shot effects are produced by using either such substantive dyestuffs as leave the silk sufficiently white, or, on the other hand, dyestuffs which chiefly dye the silk.

The following substantive (direct) colouring matters dye the cotton more than the silk in an alkaline soap bath:

Those marked * leave the silk very much paler than the cotton.

Yellow.

Cotton Yellow R, GI, GR. *Pyramine Yellow G, R.*

Orange.

* *Pyramine Orange R.* * *Cotton Orange R, G.*
Pyramine Orange RR.

Brown.

* *Thiazine Brown G, R.* *Oxamine Maroon.*
* *Cotton Brown RN.* * *Oxamine Brown 3G.*
Oxamine Brown MNI.

Red.

Thiazine Red G, R. *Oxamine Fast Claret B, G.*
Cotton Red 4B, 4BX, *Oxamine Claret M, B.*
4B extra. *Cotton Corinth G.*
Oxamine Red, 3B. *Oxamine Garnet M.*
Oxamine Fast Red F.

Violet.

* *Oxamine Violet.*

Blue.

* *Oxamine Blue B, GN,* * *Phenamine Blue G.*
and the other *Oxamine Dark Blue M, BR, R.*
Oxamine Blue brands. * *Oxamine Pure Blue 5B, 5BX.*
* *Oxamine Copper Blue RR.* * *Oxamine Dark Blue BG.*

Green.

Oxamine Green B, G.

Grey. Black.

* *Oxamine Black brands.*

Cotton Black BGNX.

The following dyestuffs may be used for topping:

1. Basic dyestuffs, especially:

Yellow.

Auramine O, II.

Euchrysine GG, R.

Brown.

Chrysoidine E.

Rheonine brands.

Vesuvine OOO extra, BL.

Red.

Rhodamine S, 3G, 6G, B.

Saffranine brands.

Diamond Magenta brands.

Violet.

Crystal Violet.

Methyl Violet brands.

Blue.

Methylene Blue brands

Victoria Blue brands.

e. g. *BG, BH.*

Victoria Pure Blue B.

Green.

Diamond Green B, G.

Malachite Green B, G.

2. Acid dyestuffs, especially *Quinoline Yellow.*

When dyeing the silk from an alkaline soap bath according to process 75 b, the following colouring matters in addition to the substantive dyestuffs are especially useful:

Yellow.

Azoflavine brands.

282 **Satin (silk and cotton). Single-bath process.**

Red.

Saffranine T extra, TK.

Diamond Magenta brands.

Blue.

Alkali Blue brands.

Indoine Blue.

Methylene Blue brands.

Green.

Diamond Green B, G.

Malachite Green B, G.

The dyeing of silk and wool unions

(Gloria, Poplin, Bengaline, etc.).

1. General survey of the various methods of working.
 2. Preparation before dyeing.
 3. Dyeing wool and silk unions.
 - a) Uniform shades
 - b) Shot effects
 - In several baths.
 - In one bath.
-

Silk and Wool Unions

(Gloria, Poplin, Bengaline, etc.).

General survey of the methods of dyeing.

Owing to the different behaviour of the various coal-tar dyestuffs towards wool and silk, the dyer of silk and wool unions must choose his dyestuffs according to shade and effect desired, e. g. whether uniform shades or shot effects are required. He may have to select, either such colouring matters as dye wool and silk alike under certain conditions, or such as dye the silk slightly or practically not at all.

Dyeing is carried out chiefly on the winch, and the following processes are employed:

a) Uniform shades.

Dye the material in a boiling bath with acid dyestuffs with the addition of sulphuric acid. If the silk is then not full enough, as compared with the wool, add a further quantity of dyestuff, or bring it up to pattern with basic colours in a fresh bath containing a little acetic acid. See process page 284.

b) Shot (two-colour) effects.

1. Several-bath process.

This method consists in dyeing the wool with dyestuffs, which dye the silk as little as possible, or which can afterwards be easily stripped from the silk. The wool is dyed in a bath made acid with acetic acid from the start, adding afterwards acetic or sulphuric acid. The silk is then topped in a fresh acetic acid bath with basic or acid dyestuffs. This process must be employed when particularly

beautiful effects, rich in contrast, are desired. To produce effects, in which, after the wool has been dyed, the silk must remain white, or sufficiently white to allow of afterwards dyeing it in certain bright shades, the goods must be stripped before dyeing the silk (see page 286, note *b*). Detailed process page 286.

2. Single-bath process.

This process is seldom used, and only when less stress is laid on the production of striking contrasts.

It is carried out at the boil in a bath containing sulphuric acid, using a mixture of those colouring matters which dye silk and wool equally with those which dye the silk but little. For an example of this dyeing process see page 288.

A. Treatment of silk-wool goods before dyeing.

The preparation of silk-wool goods before dyeing can be effected in various ways, depending on the quality of the article, and consists, briefly, in singeing, crabbing, boiling-off and then steaming the material.

B. Dyeing silk-wool fabrics.

a) Uniform shades.

Process N° 76.

Prepare the lukewarm bath (60—80 gallons) with 1 lb. sulphuric acid 168° Tw. and the necessary dyestuff, and enter the goods after wetting them out well.

Bring gradually in $\frac{1}{2}$ hour to the boil, and keep at the boil for $\frac{1}{4}$ hour, or until the wool and silk have approximately the depth of colour and shade desired. If the silk is not full enough as compared with the wool, which is especially likely to occur with dark shades, shut off steam, and bring the silk to shade in 15—20 minutes by adding more dyestuff.

If it is necessary to tone the silk with basic dyestuffs (for certain shades to make them brighter and fuller), let off the first liquor and top the silk at the ordinary temperature in a fresh bath, containing acetic acid, with the basic colouring matters mentioned. Finally rinse.

— For 20 lbs. material. —

When dyeing in a strongly acid bath, the following colouring matters dye wool and silk alike as far as this is possible:

Yellow.

Quinoline Yellow.
Azoflavine brands.

Metanil Yellow brands.

Orange.

Orange II, N.

Red.

Silk Red N, G, R.
Fast Red brands.
Fast Scarlet brands.
Azocarmine G.

Rhodamine B.
Acid Rhodamine R, RR, 3R.
Acid Violet 4RN, 3BN,
4BN, 4BL, 6BN, 7B.

Blue.

Wool Blue SL, SL extra.

Neptune Blue R, B, BG.

Green.

Neptune Green S, SG.
Agalma Green B.

Light Green SF yellow shade,
SF blue shade.

Black.

Palatine Black MZ, 4BS.

Most of the basic dyestuffs mentioned on page 125 may be used in the above process for shading the silk.

b) Shot effects.**1. Several-bath process.****Process N° 77.**

Dye the wool at the boil in a bath to which $\frac{1}{4}$ pint acetic acid 9° Tw. (30%) per 100 gallons liquor has been added. Add about every 10 minutes a further quantity of acetic acid or sulphuric acid, commencing with the original amount and gradually increasing the additions until the bath is nearly exhausted, which is generally the case after boiling for $1\frac{1}{2}$ —2 hours.

Then top the silk, according to the shade required, either directly, or, after first stripping with ammonium acetate or some other stripping agent (see note *b* below), in a fresh lukewarm (85° F.) bath acidified with acetic acid, using basic or acid dyestuffs.

Notes. a) If the silk is found to absorb too much dyestuff in the first bath, this may be due either to not working warm enough, or to the addition of too much acid at the start, but the quality of the goods may also influence the resulting shot effects.

b) Most of the dyestuffs given below, or at least many of them, leave the silk fairly light when used by this process. If the silk is not sufficiently white either for a white or for dyeing some shades, this can be remedied by boiling (after the first dye-bath) for 5—10 minutes in a stripping bath containing about $\frac{3}{4}$ pint neutral ammonium acetate per 100 gallons water (e.g. for dyeing black with *Brilliant Black*). The stripping operation can be repeated, if necessary.

If the stripping be carried on too long with ammonium acetate, or in too concentrated a solution, the shade of the wool may also suffer.

Another silk-stripping process for the same purpose consists in running the goods, after the first wool dye-bath, for 20 minutes in a lukewarm bath containing either 10 lbs. bran or Turkey red oil F 50 % per 100 gallons water. The silk of half-silk goods can also be sufficiently bleached with hydrogen peroxide.

- c) In order to obtain as white as possible the silk threads in such woollen materials as must stand wear, e. g. men's suitings, etc., and which have been dyed with *Palatine Chrome Black S* or *Chrome Blue R*, the following stripping process with Hydrosulphite conc. B. A. S. F. powder may advantageously be used.

Treat the dyed material in a bath, containing $\frac{1}{2}$ lb. Hydrosulphite conc. B. A. S. F. powder and $\frac{3}{4}$ pint acetic acid per 100 gallons water, at a temperature of 100—120° F. until the silk is sufficiently white (about $\frac{1}{4}$ — $\frac{1}{2}$ hour).

The following colouring matters dye the silk so little (if the percentage of dyestuff taken be not too high) that they can be employed without any after-treatment (stripping) being necessary:

Yellow.	<i>Tartrazine.</i> <i>New Fast Yellow R.</i>	<i>Fast Yellow brands.</i>
Red.	<i>Sorbine Red.</i> <i>Mars Red G.</i>	<i>Acid Magenta S.</i>
Blue.	<i>Indigo Carmine D.</i>	<i>Indigotine.</i>

The dyestuffs given below dye the silk more or less in deep shades, but can afterwards be stripped sufficiently for most purposes by one or other of the stripping methods described.

Yellow.	<i>Naphthol Yellow S, SE.</i>	<i>Quinoline Yellow.</i>
Orange.	<i>Orange II, G.</i>	

Red.	<i>Scarlet G, RR, 3R.</i>	<i>Sorbine Red brands.</i>
	<i>Erythrine X.</i>	<i>Azocarmine G.</i>
	<i>Naphthylamine Red G.</i>	<i>Cochineal Red A.</i>

Green. *Light Green SF yellow shade.*

Blue. *Cyananthrol brands.*

Black. *Brilliant Black B.*

For topping the silk most of the basic dyestuffs named on page 125 may be used. In some cases the *Alkali Blues* and certain acid dyestuffs, such as the *Acid Violets*, *Neptune Blues*, can also be used.

2. Single-bath process.

Process N^o 78.

Work at the boil in a bath containing sulphuric acid, using such dyestuffs as leave the silk white, or practically white, in conjunction with colours which, as far as possible, dye the wool and the silk to the same extent. For example, to produce a two-colour effect, the silk green and the wool dark olive, dye with

2 lbs. *Wool Green S*
1 lb. *Acid Magenta S* and
1 » *Azoflavine 3R*

in a boiling sulphuric acid bath.

— For 100 lbs. *Gloria*. —

Note. The shade can be varied by altering the quantity of acid taken.

Various materials.

Various
materials

Processes for dyeing

Linen. Linen and Cotton Unions. Hemp.

Ramie. Jute. Coir.

Straw. Chip. Feathers.

Horsehair. Pigs' Bristles.

Sisal. Mexican grass. Piassava.

Esparto grass.

Horn buttons. Vegetable ivory.

Natural and artificial flowers.



Linen. Linen and Cotton Unions. Hemp.

A. Preparation of the material before dyeing.

Clean raw linen, linen and cotton unions and hemp by boiling with soda-ash, using 5–10% on the weight of the goods. If bleaching is necessary to obtain certain shades, this can be done by combining the “grassing” and chlorine bleaching processes, but want of space prevents a detailed account being given.

B. The dyeing of linen, linen and cotton unions and hemp.

Dyeing is carried out in much the same way as for cotton, so that it suffices to refer here to the chapters on cotton dyeing.

It should be noted that linen does not penetrate so well as cotton, and consequently less dyestuff is required to produce a given shade. For the same reason, in dyeing with substantive colours, for instance, the rate of absorption should be retarded by adding soap or Turkey red oil F (50%), (from 2–3% on the weight of the goods) or by using less Glauber's salt.

Note. The treatment of hemp differs from that of linen in that great fastness is not usually required. There is, however, a frequent demand for dyed twines that will not mark off on to white.

The following dyestuffs will be found to meet this want adequately:

1. Acid dyestuffs: *Pure Blue WA, I (Orange X, Erythrine P* and *Cotton Scarlet* can also be employed).
2. Basic dyestuffs: *Auramine II, Rhodamine 6G 3G, B, Saffranine T extra, Methylene Blue brands, Diamond Green G, B, (Diamond Magenta, Magenta Powder A, AB, Methyl Violet, Marine Blue BN, Victoria Blue, Victoria Pure Blue B, Jet Black* can also be employed).
3. Eosine dyestuffs: *Eosine A, Erythrosine IN*, etc.
4. Substantive dyestuffs, see page 102.

Ramie.

(China grass.)

The properties of ramie are, in general, similar to those of linen. Suitable dyestuffs and processes may be found under the chapters relating to linen and cotton.

Jute.

A. Treatment of jute before dyeing.

For many purposes jute is dyed unbleached and need only be cleansed by working in boiling water. If, however, special value is attached to purity and brightness of shade, the jute must be bleached by one of the following methods:

a) With bleaching powder, using the same process as for cotton (see page 98), taking, however, only 1—2 lbs. bleaching powder per 100 lbs. jute yarn.

b) With potassium permanganate and sulphurous acid, using the same process as for wool (see page 6).

B. The dyeing of jute.

1. Dyeing with acid dyestuffs.

This method is particularly suitable when good fastness to light and also thorough penetration are required.

Process N^o 79 a.

Enter the jute into a concentrated bath containing the necessary quantity of dyestuff and 1—3 lbs. alum, bring the liquor to the boil, keep at the boil for $\frac{1}{2}$ hour and then work the goods for about 30 minutes as the bath cools down.

— For 100 lbs. jute yarn. —

- Notes.* a) The baths do not exhaust (this is especially the case with dark shades) and can be used for further lots after replenishing as required with dyestuff and alum.
- b) As a rule, use for dark shades 100 gallons, and for light to medium shades 150—200 gallons dye-liquor per 100 lbs. jute yarn.
- c) When a copper boiler is used for dyeing, add to the bath about 3 oz. ammonium sulphocyanide per 100 gallons to prevent the shade being dulled.

The following acid dyestuffs are suitable:

Yellow.

Azoflavine brands
(e. g. *RS, 3R*).

Naphthol Yellow.
Primazine Yellow G.

Orange.

Orange N, II, X, R.

Brown.

Fast Brown N.

Red.

Silk Red N.
Scarlet RA.
Cotton Scarlet, extra.
Coir Red.
Fixing Scarlet G, R.

Fast Scarlet P, B.
Brilliant Scarlet P.
Erythrine P.
Fast Red AV.
New Claret R.

Blue. Violet.

Soluble Blue (e. g. *PP, 3376,*
TR, IN).

Pure Blue I, WA.

Fast Blue R, 5B.
Acid Violet brands
(e. g. *7B, PW*).

Green.

<i>Neptune Blue B, BG, R.</i>	<i>Neptune Green SBN, SG.</i>
<i>Light Green SF yellow shade, SF blue shade.</i>	<i>Agalma Green B. Wool Green S.</i>

Greyish Black.

<i>Brilliant Black B</i> (for grey shades fast to light).	<i>Nigrosine W, X.</i>
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2. Dyeing with basic dyestuffs.

This process is used when there is a demand for heavy shades at a low cost.

Process N° 79 b.

Enter the unmordanted yarn into the cold bath, adding the basic dyestuff (which has been well dissolved) in small portions at a time, heat slowly to 140—160° F., then shut off steam and dye for ½ hour longer.

- Notes.*
- For light shades the proportion of goods to liquor should be about 1 : 20, for darker shades 1 : 15.
 - Jute does not require to be mordanted like cotton for the basic dyestuffs owing to its already containing tannin substances.
 - If there is difficulty in obtaining level dyeings, add ¼ lb. alum per 100 lbs. yarn; with Indoine Blue add 1—3 lbs. alum (according to the hardness of the water), further bring the bath to the boil and boil for 15 minutes.
 - Dyeings faster to rubbing and water may be obtained by an after-treatment with about 1 lb. tannic acid (or a corresponding quantity of some other tannin matter, see page 123) in a fresh lukewarm bath.

- e) Hard water should be corrected by the addition of acetic acid; for example, for 7° hardness add 1/2 gallon acetic acid 9° Tw. (30%) per 100 gallons dye-liquor.
- f) *Victoria Blue B* and *Diamond Green B* are dissolved by first pouring a little acetic acid over the dyestuffs; about 3—5 parts acetic acid 9° Tw. (30%) per 1000 parts of the water used for dissolving are taken.

All the basic dyestuffs given on page 125 for cotton may be used by this method.

3. Dyeing with substantive (direct) dyestuffs.

These dyeings possess good fastness to water and rubbing.

Process N° 79 c.

Work for 3/4—1 hour at the boil adding 10—20 lbs. crystallised Glauber's salt (or half as much calcined Glauber's salt or common salt). With dark shades work for a further 1/2 hour while the bath is cooling down.

— For 100 lbs. jute yarn. —

Note. For dark shades use 100 gallons, for light shades 150 gallons liquor per 100 lbs. yarn.

All the substantive dyestuffs given on page 102 for cotton may be used for this method.

4. Dyeing with Eosine dyestuffs.

For the production of specially bright pink and red shades.

Process N° 79 d.

Prepare a concentrated bath with the addition of 25 to 50 lbs. common salt, enter the goods cold or lukewarm, bring to the boil, shut off steam and dye for a further $\frac{1}{2}$ hour.

- Notes.*
- a) The proportion of goods to liquor should be about 1:10.
 - b) The bath is not exhausted and can be used for further lots by adding sufficient dyestuff and about 10 lbs. common salt.
 - c) If the fastness to light of the dyestuffs given below is not sufficient, *Rhodamine B* should be used instead, shaded, if necessary, with *Auramine II* and dyed with the addition of acetic acid.

The following dyestuffs are suitable:

The *Eosines*, *Erythrosines*, *Phloxines* and *Rose Bengals*. Also *Rhodamine B* (see note *c* above).

5. Dyeing with sulphur colouring matters.

The process is seldom used, but is suitable for the production of shades specially fast to light and washing.

Process N° 79 e.

The method of working and dyestuffs used are the same as for cotton, with the exception that in the case of jute less dyestuff should be taken as a rule, and it is better that the temperature of the bath should not be higher than about 100–130° F.

Coir.

A. Preparation for dyeing.

Coir is dyed either raw or bleached. Bleaching powder, which is so largely employed for cotton and jute, is also suitable for bleaching coir; other bleaching agents used are hydrogen peroxide, sodium peroxide, potassium permanganate, etc. Good results can also be obtained with our new patented product

Decroline B. A. S. F.

applied as follows:

Bleaching with Decroline B. A. S. F. patented.

Steep the goods for 6 hours or overnight in a bath containing

2 pints hydrochloric acid (30 %)
1½ lbs. Decroline B. A. S. F. patented and
67½ gall. water.

Next morning rinse well.

Notes. a) The bleaching bath can be used for further lots after replenishing with

13½ gall. water
½ pint hydrochloric acid 30 % and
6 oz. Decroline.

b) In place of hydrochloric acid, sulphuric acid may be taken, if preferred (3 oz. per 10 gallons).

— For 100 lbs. coir. —

The processes for dyeing coir are similar in principle to those for jute (see page 291), but the following supplementary details are worthy of special attention.

In process N^o 79 a (for acid Aniline dyestuffs) leave the goods to cool down in the bath after dyeing, and allow about 2—3 hours for the whole dyeing operation. When large quantities of *Orange II* are used, add about 1/2 lb. alum per 100 lbs. coir yarn.

If difficulties as regards levelling are met with when using basic dyestuffs for process N^o 79 b, add about 1/2 lb. alum per 100 lbs. of yarn.

When dyeing with Eosine dyestuffs according to process N^o 79 d add about 20—30 lbs. of common salt per 100 gallons of dye-liquor.

When using substantive and sulphur dyestuffs, which are only seldom employed, the remarks made on pages 294—295 should be borne in mind; on the whole, the colours of these two classes do not go as far as the basic colours and work out, therefore, more expensive. Of the sulphur dyestuffs the most suitable are the *Kryogene Brown* and *Kryogene Yellow brands*.

Straw.

A. Preparation before dyeing.

Boil the straw-plait for 1½—2 hours in water, adding, if desired, ½ lb. sodium acetate per 100 lbs. material.

It should be noted that whilst the addition of sodium acetate certainly assists the boiling out of the material, it also causes a yellower ground shade, which may cause difficulty, especially in dyeing pale shades. A slight addition of tartaric acid when boiling out has the contrary effect, making the material lighter.

To obtain specially bright and clear shades, bleach the straw first with hydrogen peroxide, and then treat it with Blankit, to increase the effect, as directed below.

Bleaching with Blankit patented in combination with hydrogen peroxide.

Steep the material for several hours at 80—100° F. in a solution of hydrogen peroxide (prepared as given below), rinse, and then steep for several hours at the ordinary temperature in a solution of Blankit (10 lbs. per 100 gallons water). Rinse thoroughly and dry at as low a temperature as possible.

Preparation of the solution of hydrogen peroxide.

Dissolve 1½ lbs. oxalic acid in 10 gallons of very soft, cold water, and work in slowly, while stirring, 1 lb. sodium peroxide. Then add to the bath sufficient sodium silicate (about 1½ lbs. at 76° Tw.) to make it weakly alkaline (i. e., till it just colours red litmus paper blue).

Notes: a) The solution of Blankit can be used for further lots after adding about one-third of the original quantity of Blankit.

- b) To accelerate the bleaching action, the bleaching bath can be strengthened by taking only about half as much water (5 gallons) and the remaining quantities as above.

B. Dyeing the straw.

Process N° 80.

Dye the goods at the boil with the addition of $\frac{1}{2}$ —1 lb. tartaric acid or $\frac{1}{2}$ —2 lbs. acetic acid 9° Tw. (30%) till the straw is sufficiently dyed through (on an average from 1—3 hours). Then let the bath cool down and leave the material in for about 1 hour more (dark shades can be left in overnight).

— For 100 lbs. straw-plait. —

- Notes:* a) With basic dyestuffs (see below) add all the acid at once at the beginning, but add the dyestuff solution in small portions at a time. When using *Auramine II* with other colouring matters add this dyestuff after boiling is over.
- b) Acid dyestuffs should be added at the beginning together with the necessary acid.
- c) In working with a copper boiler add 3 oz. ammonium sulphocyanide per 100 gallons liquor to prevent the shade being dulled.

The following products are suitable for dyeing straw. Those marked with an asterisk are basic, the others are acid dyestuffs.

Yellow.

* <i>Auramine II.</i>	<i>Azoflavine brands.</i>
<i>Tartrazine, H.</i>	* <i>Rheonine A</i>
<i>Primazine Yellow G.</i>	(yellowish brown).
<i>Metanil Yellow, extra, PL.</i>	* <i>Euchrysine G, RR.</i>

Orange. Brown.

<i>Orange II, X, RO.</i>	* <i>Vesuvine B, BL, BLR,</i>
* <i>Chrysoidine A, RL.</i>	<i>000 extra.</i>

Red.

Fixing Scarlet G, R.
Scarlet RA.
Brilliant Scarlet P.
Fast Scarlet P.

Fast Red AV.
 * *Saffranine T extra.*
 * *Rhodamine 3B, B, G, 3G*
 (also the "extra" brands).

Violet.

* *Saffranine MN.*
Acid Violet 4RN.
 * *Magenta powder A, AB.*
 * *Diamond Magenta brands.*
 * *Cerise brands.*

* *Iris Violet.*
 * *Methyl Violet brands.*
 * *Marine Blue brands.*
 * *Crystal Violet.*
Anthraquinone Violet.

Blue.

Cyananthrol BGA, BA.
Anthracene Blue
SWG extra.
Brilliant Anthrazurol
 (only for pale shades fast
 to light).

Anthraquinone Blue
SR extra paste,
SR extra powder.
 * *Methylene Blue brands.*
 * *Dark Blue R, B.*
 * *Cotton Blue brands.*
 * *Nile Blue brands.*
Neptune Blue B.

Green.

Wool Green S.
Neptune Green SG, SBN.

* *Diamond Green G, B.*

Grey.

Nigrosine X.

Black.

* *Jute Black B.*
 * *Black for Straw.*

* *Jet Black.*

Wood Fibre.

(Chip).

A. Preparation before dyeing.

Thoroughly wet out the material in hot water and bleach it, if necessary, with chloride of lime like cotton or by the methods given for straw.

B. Dyeing of chip.

Process N^o 81.

- a) Dye with basic dyestuffs with the addition of 1—2 lbs. acetic acid 9^o Tw. (30%) or alum. Commence cold, raise the temperature to 160^o F., and then let the goods remain in the cooling bath for 1/2—1 hour.

Suitable dyestuffs are given on pages 299—300.

- b) Dye with acid dyestuffs with the addition of 2—3 lbs. acetic acid 9^o Tw. (30%) for 1/4—1/2 hour at the boil, afterwards letting the material remain for 1—2 hours in the cooling bath. Suitable dyestuffs are given below.
- c) Dye with substantive dyestuffs (see page 102, cotton) for 1/4—1/2 hour at the boil with the addition of 10 lbs. common salt or calcined Glauber's salt (or twice as much crystallised Glauber's salt), afterwards letting the material steep in the cooling bath for a short time.

— For 100 lbs. chip. —

The following acid dyestuffs, among others, are suitable for use here:

Yellow.

Quinoline Yellow.

Metanil Yellow.

Primazine Yellow G.

Tartrazine.

Azoflavine brands.

Orange.

Orange II, IIP, RO, X, N.

Red.

*Cotton Scarlet brands.
Erythrine brands.
Brilliant Scarlet P.
Fast Scarlet P.
Fixing Scarlet G, R.*

*Sorbine Red G.
Fast Red AV.
Scarlet RA.
Eosine brands.*

Violet.

Acid Violet brands.

Anthraquinone Violet.

Blue.

*Soluble Blue brands.
Alkali Blue brands.
Cyananthrol brands.
Brilliant Anthrazurol.
Anthraquinone Blue.*

*Wool Blue SL extra.
Neptune Blue B.
Ethyl Blue B.
Fast Blue brands.*

Green.

*Neptune Green SG, SBN.
Anthraquinone Green GXN.*

Agalma Green B.

Grey.

Nigrosine brands.

Brilliant Black brands.

Feathers.

A. Preparation before dyeing.

Method.

To remove grease, wash the feathers in a warm bath at 100—120 °F. to which has been added a little soda, ammonia or ammonium carbonate, and bleach, if necessary, with Blankit, sodium peroxide or hydrogen peroxide (cf. page 7).

Bed feathers, for example, can be bleached with Blankit as follows:

Pour fresh water over the well washed feathers, and add in portions, while stirring slowly and constantly, about 5 % Blankit on the weight of the feathers. Leave the feathers for some time (1—1½ hours) in the bleaching bath, stirring now and again with a wooden stick. Then rinse with pure water, hydroextract and steam.

When using the bleaching bath for further lots, replenish with 1—3 % Blankit on the weight of the feathers.

Note: Too violent stirring of the bath must be avoided.

B. Dyeing of feathers.

Process N° 82

(for acid Aniline dyestuffs).

Dye in a bath acidified with sulphuric acid (2—5 % on the weight of the goods) for about ½—1 hour at the boil, rinse and dry (if possible in a rotary machine).

Basic dyestuffs are less commonly employed. They should be dyed at a temperature of 100—120 °F. without any further addition.

All the acid dyestuffs given on page 9 for wool are suitable for use here. For basic dyestuffs see page 125.

Substantive dyestuffs are seldom used.

Horsehair. Pigs' Bristles.

Process N° 83.

Thoroughly cleanse the material with a warm solution of soda and soap, and dye it (according to fastness desired and the use to be made of the goods) with acid, after-chromed or (less usually) basic or substantive dyestuffs by the methods given for dyeing wool.

To dye black, the shade which is most largely in demand for this class of material, use the *Palatine Black* and *Agalma Black brands*. If greater fastness is desired (fastness to water, etc.) the *Palatine Chrome Black brands* or *Diamond Black F* may be taken (cf. page 19).

Sisal. Mexican grass. Piassava.
Esparto.

A. Sisal, Mexican grass.

Process N° 84.

Black is the colour most generally in demand. For this and other shades work with the substantive dyestuffs in the same way as for cotton. That is, dye at the boil with the addition of 10% calcined Glauber's salt and 1% soda-ash for 1 hour. Let the goods cool in the bath and rinse.

Cotton Black E extra is the most suitable for dyeing blacks; for colours, any of the other substantive dyestuffs given on page 102 for cotton may be made use of.

B. Piassava, Esparto.

Process N° 85.

Use substantive or basic dyestuffs for dyeing these fibres. The former can be dyed as directed for sisal hemp, and the latter in a warm bath at a temperature of 140—160° F. with the addition of $\frac{3}{4}$ —1½ pints acetic acid per 100 gallons dye-liquor.

For suitable substantive dyestuffs see page 102.

For suitable basic dyestuffs see page 125.

Of the latter, the *Vesuvine* brands are much used (especially for piassava) for the production of brown shades.

Vegetable Ivory and Horn Buttons.

Process N^o 86.

To dye buttons use acid, substantive or basic dyestuffs, as given under wool and cotton on pages 9, 102 and 125.

Dye with acid dyestuffs for 1 hour at the boil with the addition of the necessary quantity of dyestuff in solution and $\frac{1}{4}$ — $\frac{1}{2}$ pint acetic acid 9^o Tw. (30%) per 20 gallons dye-liquor.

Basic dyestuffs are also dyed in an acetic acid bath like acid dyestuffs for half an hour at the boil.

Dye substantive colours for 1 hour at the boil with the addition of 6—16 oz. Glauber's salt and a little soap per 20 gallons dye-liquor.

The quantity of dye-liquor should be about 15 times the weight of the material to be dyed.

Natural and Artificial Flowers.

A. Flowers, grasses, leaves, palm-sprays, etc.

Process N° 87 a.

Dye with basic dyestuffs at a temperature of 140—160° F. (or at the boil) with the addition of a little acetic acid ($\frac{1}{4}$ — $\frac{1}{2}$ pint per 20 gallons).

If greater fastness to light is desired, employ acid dyestuffs, in which case the goods to be dyed must first be prepared by the well-known patented processes with caustic alkalies, and then bleached with chlorine.

After dyeing, treat the leaves, etc. in a solution of magnesium chloride or calcium chloride of 16—32° Tw. to make them sufficiently pliable, and dry in the air.

B. Artificial flowers.

(Leaves of cotton, silk, cotton or silk velvet, paper, etc.).

Process N° 87 b.

Dye by dipping in concentrated solutions of the dyestuff, or by painting on the dyestuff by means of a brush.

The acid, Eosine, basic and substantive dyestuffs as given in the chapters on cotton and silk dyeing are suitable for use here also.

When dyeing with basic colours, if the water is hard, add about $\frac{1}{2}$ pint acetic acid 9° Tw. per 30 gallons water to the dye-liquor.

APPENDIX.

Mordants and Chemicals.

Tables.

Mordants and Chemicals.

1. Acids.
 2. Caustic soda, Sodium salts.
 3. Potassium salts.
 4. Ammonia, Ammonium salts.
 5. Lime, Calcium salts.
 6. Magnesium salts.
 7. Aluminium salts.
 8. Chromium compounds.
 9. Iron compounds.
 10. Manganese compounds.
 11. Zinc compounds.
 12. Copper compounds.
 13. Lead compounds.
 14. Tin compounds.
 15. Antimony compounds.
 16. Soaps, Oils, Solvents, etc.
 17. Tannins.
 18. Thickening agents, Sizing and
Finishing materials.
 19. Waterproofing substances.
-

1. Acids.

Acetic Acid 9° Tw. (30%), $C_2H_4O_2$, a colourless liquid, used as a fixing agent (also for levelling) in the dyeing of wool, cotton, silk, etc. It is also used for correcting hard water, for brightening silk and for the preparation of acetate of alumina. Along with metallic salts it is also employed in cotton dyeing for the after-treatment of substantive dyeings.

Sulphuric Acid 168° Tw., oil of vitriol, D. O. V., H_2SO_4 , a heavy corrosive liquid. It is the most usual addition to the bath, when dyeing wool with acid dyestuffs and many of the after-chromed colours. For this purpose it should always be used in conjunction with Glauber's salt. In the silk-dyehouse it serves for acidifying (cracking or breaking) the boiled-off liquor baths, and also for brightening the silk. Together with bichromate of potash (or soda) it is used in mordanting wool. The same combination in stronger solutions serves for stripping shoddy. Other uses of sulphuric acid are for decomposing sodium nitrite in the diazotising process, for souring yarn after bleaching with chlorine, for developing Alkali Blue, for decomposing sodium bisulphite in wool-bleaching, for acid milling, for removing lime from yarn, dyed in the indigo vat, etc.

It is also used in very large quantities for carbonising wool and for neutralising the caustic soda in the mercerisation process.

Hydrochloric Acid 30°—34° Tw. (30%), HCl , a strong solution of hydrochloric acid gas in water. The commercial product is either colourless, or has a yellowish

tint, due to the presence of traces of iron. It is used for dissolving Aniline Oil for Aniline Black dyeing, for souring cotton after bleaching with chlorine, for decomposing sodium nitrite in diazotising, for decomposing Nitrosamine Red and for the preparation of diazo-solutions in dyeing the ice-colours. It is also used in preference to sulphuric acid for souring after diazotising, as it does not develop so much heat, when diluted, and does not form insoluble precipitates with lime present in the water. Hydrochloric acid is used for rendering harmless any iron salts which may be present in water used for mordanting.

It is also added to the dye-bath when topping, with basic colours, cotton and silk unions which have been grounded with substantive dyestuffs; further to produce better penetration of thick materials (cheap felts) when dyeing with some basic colours.

Formic Acid 80 %, CH_2O_2 , a colourless, corrosive liquid with a penetrating odour, is placed on the market in concentrations varying from 80 % to 90 % of the pure acid.

It is used as a substitute for acetic or sulphuric acid in dyeing Alizarine and other colours, and for tartar when mordanting with chrome. It is one of the strongest organic acids, but, like acetic acid, does not attack vegetable fibres and is therefore specially suitable for union dyeing.

Formaldehyde*, $\text{C H}_2 \text{O}$, (30%), an aqueous solution with a peculiar pungent odour. It is used for after-treating substantive dyeings on cotton or unions to increase the fastness to washing.

* Classified here for the sake of convenience.

Nitric Acid, HNO_3 , a yellow, fuming, strongly corrosive liquid, generally sold at 66° Tw. It is used in a few cases for stripping shoddy, for producing yellow lists on indigo-dyed pieces and for the so-called indigo test, etc.

Tartaric Acid, $\text{C}_4\text{H}_6\text{O}_6$, colourless crystals, soluble in water. Tartaric acid is used in silk dyeing for acidifying "boiled-off" liquor baths when dyeing delicate shades, also for brightening silk.

Its acid potassium salt, tartar, is extensively used together with bichromate of potash (or soda) for mordanting wool.

Citric Acid, $\text{C}_6\text{H}_8\text{O}_7 + \text{H}_2\text{O}$, colourless crystals, soluble in water. It is sometimes used in silk dyeing for brightening, in some countries as an addition to the dye-bath itself.

Oxalic Acid, $\text{C}_2\text{H}_2\text{O}_4 + 2\text{H}_2\text{O}$, white crystals, soluble in water. It is added in a few cases to the acid dye-bath for wool; it is also used in the single-bath method for *Alizarine Red S* (after-treatment with alum) and *Anthracene Blue SWX extra*, and in fairly large quantities for dyeing logwood and Aniline colours together in one bath.

It serves, either alone or in conjunction with bichromate of potash and sulphuric acid, for stripping shoddy. It may also be used as a cheap substitute for tartar in chrome mordanting.

Lactic Acid, $\text{C}_3\text{H}_6\text{O}_3$, (50%), a thick yellowish or brownish liquid, which may be employed as a substitute for tartar in chrome mordanting. An addition of lactic acid when after-chroming *Chrome Blue A* and *R* improves the fastness to milling.

Tannic Acid, gallotannic acid, **T a n n i n**, $C_{14}H_{10}O_9 + 2H_2O$, comes on the market in the form of crystalline needles or as a bulky, pale yellow powder, readily soluble in water.

It is used very largely as a mordant for basic colours, but may be replaced by other tannin substances (see page 336).

Oleic Acid, olein, $C_{18}H_{34}O_2$, is a yellowish brown oil, insoluble in water, and becomes rancid on exposure to air.

It is used in large quantities for oiling wool and for the preparation of soaps for wool-scouring, also, to a limited extent, for dissolving the so-called colour bases.

Hydrosulphurous Acid, see Hydrosulphite, page 316.

Carbolic Acid, phenol, C_6H_5OH , a colourless crystalline mass with a strong corrosive (antiseptic) action. It is added to the size as a preservative. It is occasionally used as a developer.

2. Sodium Hydroxide, Sodium Salts.

Caustic Soda, sodium hydroxide, NaOH , white, strongly corrosive lumps, easily soluble in water.

Its aqueous solution is sold under the name of soda-lye and is frequently employed for boiling out unbleached cotton. It also serves as a discharging agent for several colours, as an addition to the indigo vat, as a solvent for Beta-Naphthol, Alpha-Naphthol and Phenol, for mercerising cotton and for the preparation of soap, etc.; in combination with glucose it is also used as a reducing agent.

The commercial solutions generally show 72° — 78° Tw. and contain 35 % solid caustic soda (NaOH).

Soda, soda-ash, "Alkali", sodium carbonate, Solvay soda, Na_2CO_3 , a white powder, easily soluble in water, used for boiling out cotton, wool-scouring, etc.

Soda is added to the dye-bath with many substantive and sulphur dyestuffs, and is also used for neutralising dye-liquors (wool), which have become too acid, for the preparation of basic alums and for neutralising carbonised wool.

Crystal Soda, soda crystals, $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$, colourless crystals, which effloresce when exposed to air.

It is used for the same purpose as soda-ash, but works out considerably more expensive. One part of soda-ash corresponds in effective value to $2\frac{7}{10}$ parts of soda crystals.

Common Salt, salt, sodium chloride, NaCl . White powder, soluble in water; frequently used when dyeing with substantive and Kryogene dyestuffs, also with colours of the Eosine or Cotton Scarlet group on cotton.

Borax, sodium borate, $\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}$, white powder or crystals, soluble in water. It is used as a weak alkali when dyeing Alkali Blue and also for the preparation of shellac-borax solution.

Sodium Silicate, water glass, soluble glass, $\text{Na}_2\text{Si}_4\text{O}_9$, is supplied as a thick colourless solution of 72°—78° Tw., and is used for fixing alumina and chrome mordants on silk, for neutralising sodium peroxide bleaching-liquors and as a weak alkali in Alkali Blue dyeing. It is also employed in silk-weighting, and as an addition to the boiling-out bath for cotton yarn, intended for Alizarine pink.

Bicarbonate of Soda, NaHCO_3 , a white powder, soluble in water; used for fixing alumina and chrome mordants on silk.

Sodium Peroxide, Na_2O_2 , a white powder, which must be carefully kept from contact with straw, wood or paper on account of the danger of explosion. It is very hygroscopic and must therefore be stored in well closed vessels. It dissolves in water with considerable evolution of heat.

Sodium peroxide is highly valued as a bleaching agent for silk, tussah, fine qualities of wool, straw, etc. See pages 7 and 224.

Hydrogen Peroxide*, H_2O_2 , comes into the market as a colourless aqueous solution (generally containing 12 volumes oxygen = 3% hydrogen peroxide). It is best stored in a dark place, e. g. in dark glass vessels or wooden casks, and should contain a small amount of acid. It is employed for bleaching textile fibres, etc., and has a similar action to sodium peroxide.

Sodium Sulphide, $\text{Na}_2\text{S} + 9\text{H}_2\text{O}$, a colourless or brownish crystalline mass, readily soluble in water and very corrosive. It is also on the market as sodium sulphide concentrated, a fused product having double the strength of the crystals. It is largely used in dyeing with the sulphur colours (Kryogene dyestuffs).

Sodium Bisulphate, "tartar substitute," acid sodium sulphate, NaHSO_4 , a white solid, easily soluble in water, largely

* Classified here for convenience, although not a sodium salt.

used in place of sulphuric acid and Glauber's salt in dyeing wool with acid and after-chromed colours. 10 parts of bisulphate of soda correspond to a mixture of 4 parts of sulphuric acid 168° Tw. and 10 parts of Glauber's salt crystals.

Sodium Sulphate, Glauber's salt, $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, small colourless crystals. It is extensively used as a levelling agent in wool dyeing, also as an addition to the dye-bath in the dyeing of direct and sulphur colours. Calcined Glauber's salt (free from water) is considerably cheaper, but more difficult to dissolve, and is therefore seldom used in the dyehouse.

44 parts of calcined Glauber's salt are equivalent to 100 parts of crystals.

Sodium Nitrite, NaNO_2 , small colourless crystals, easily soluble in water.

It is used to prepare diazotising baths for developing colours on the fibre. See page 106.

Sodium Chlorate, chlorate of soda, NaClO_3 , colourless crystals, soluble in water, used as an oxidising agent in dyeing Aniline Black. It has the advantage over the potassium salt of greater solubility.

Sodium bisulphite, bisulphite, NaHSO_3 , is supplied as an aqueous solution of 72°—78° Tw. in two qualities: Bisulphite A and Bisulphite B. The former contains free sulphurous acid and is delivered in wooden casks. The B brand is delivered in iron drums only.

We also supply a solid bisulphite in the form of a powder, which is quite stable when stored in a dry place, but decomposes on exposure to moist air. Liquid bisulphite should be kept in a fairly warm place during cold weather. 100 parts of the powder

are equivalent to 260 parts of liquid 72°—78° Tw., i. e. 260 lbs. bisulphite liquid 72°—78° Tw. may be prepared from 100 lbs. bisulphite powder.

Bisulphite is used for wool-bleaching, for rendering various Alizarine colours soluble, for the preparation of hydrosulphite (as in the zinc-bisulphite-indigo vat) and as an addition to the rinsing bath when bleaching with permanganate; it is also added to alkaline Beta-Naphthol solution to prevent material, prepared with the latter, from turning brown, etc.

Hydrosulphite conc. B. A. S. F. powder, sodium hydrosulphite, $\text{Na}_2\text{S}_2\text{O}_4$, a greyish white powder, easily soluble in cold water.

It is fairly stable in alkaline, but decomposes in neutral solution. The powder must be stored in a dry place and should only be taken out of the package with dry scoops. Hydrosulphite is chiefly used in the hydrosulphite-indigo vat and for dyeing colours of the Indanthrene class, Anthraflavone G and other similar vat dyestuffs.

Blankit, a white powder, soluble in cold water.

This product has recently found extensive use for bleaching bed-feathers, cocoa-nut fibre, wool, straw, leather, soap, glue, gelatine, etc.

The rules for hydrosulphite with regard to properties of solution, storage of powder, etc. also apply to Blankit.

Decroline, see page 330.

Sodium Thiosulphate, sodium hyposulphite, antichlor,

$\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$, colourless crystals, easily soluble in water. As the name "Antichlor" suggests, it is used to eliminate traces of chlorine, which may remain in cotton after bleaching. It is generally added to the second rinsing bath, through which the freshly bleached material passes.

Sodium Hypochlorite, Eau de Javelle, NaOCl , is obtained by adding soda-ash to a solution of bleaching powder, and is a good substitute for the latter. For this purpose a solution of $1\frac{1}{2}^\circ$ Tw. may be prepared by making:

2¼ lbs. bleaching powder into a smooth paste in a suitable vessel with
4½ pints of water and adding, while stirring,
12 of soda solution (containing 1 lb. 9 oz. soda-ash).

The liquor is then diluted with 5¼ pints of water, well stirred and the white precipitate allowed to settle. The clear solution is then poured off and diluted to $1\frac{1}{2}^\circ$ Tw.

This solution is used for chlorinating wool, for bleaching cotton (see page 98) and sometimes for bleaching shoddy.

Sodium Acetate, $\text{C}_2\text{H}_3\text{O}_2\text{Na} + 3\text{H}_2\text{O}$, colourless needle-shaped crystals. It is used in the developing baths with Nitrosamine Red and other ice-colours.

Sodium Phosphate, $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$, colourless crystals, easily soluble in water, which effloresce when exposed to the atmosphere. It is used when dyeing or printing sensitive substantive colours in order to obtain the brightest possible shades. It is also employed in large quantities for weighting silk (tin phosphate or tin weighting) and for fixing alumina mordants in the dyeing of Alizarine colours.

Sodium Stannate, see tin compounds, page 332.

Turkey Red Oil F and D. The former is the sodium salt of sulphonated ricinoleic acid, the latter the sodium salt of ricinoleic acid. See soaps, etc., page 335.

3. Potassium Salts.

Potassium Chlorate, chlorate of potash, KClO_3 , colourless crystals, soluble in water, used as an oxidising agent in dyeing Aniline Black.

Potassium Bitartrate, tartar, cream of tartar, Argol, $\text{C}_4\text{H}_5\text{O}_6\text{K}$. It is generally met with in the form of grey to greyish-red crystalline crusts, difficultly soluble in water; also as powder.

Tartar is used with bichromate for mordanting wool, but has been replaced in many cases by formic acid, lactic acid, oxalic acid, sulphuric acid, lactoline and other products.

Lactoline, potassium acid lactate, $\text{C}_3\text{H}_5\text{O}_3\text{K}$, comes on the market as a thick 50% liquid, and is used as a substitute for tartar in mordanting wool.

Potassium Carbonate, potash, pearl-ash, $\text{K}_2\text{CO}_3 + 2\text{H}_2\text{O}$, is a strong alkali, and comes into the market in the form of powder or lumps.

It is used in the potash-indigo vat and is added to the dye-bath for some substantive colours. It may be replaced in most cases by soda-ash, which is cheaper.

Potassium Permanganate, permanganate of potash, KMnO_4 , see page 329, Manganese compounds.

Potassium Ferrocyanide, yellow prussiate of potash, see page 329, Iron compounds.

4. Ammonia. Ammonium Salts.

Ammonia, NH_3 , or, dissolved in water, Ammonium Hydrate, liquid ammonia, caustic ammonia, $(\text{NH}_4)\text{OH}$. It comes on the market as a strongly smelling corrosive liquid and is used for scouring wool, for neutralising old dye-liquors, and as an addition to the dye-bath in the production of a number of shades on unions by the one-bath process. Small quantities are also used to clear Turkey red oil mordanting liquors. It is alkaline to litmus paper.

Ammonium Carbonate, $(\text{NH}_4)\text{HCO}_3 + (\text{NH}_4)\text{CO}_2\text{NH}_2$, white transparent mass, which gives off ammonia when exposed to air. It may be used for scouring wool and feathers.

Ammonium Acetate, acetate of ammonia, an aqueous alkaline solution, with an ammoniacal and empyreumatic smell. It may be prepared by mixing

380 parts by weight of ammonia (24%) and
1000 » » » » acetic acid 9° Tw. (30%)

and has a neutral reaction, i. e. it has no effect on either red or blue litmus paper. Ammonium acetate is used in dyeing woollen yarn and cloth to ensure even dyeing and good penetration.

We were the first to recommend it for wool-dyeing (in the year 1888). It is also highly valued as a harmless stripping agent for wool, shoddy, silk, etc., when the shade has come up too dark.

Ammonium Chloride, sal-ammoniac, NH_4Cl , a white crystalline powder or white cakes. It is used as a fixing agent in dyeing Turkey red.

Ammonium Sulphocyanide, NH_4CNS , colourless deliquescent crystals, easily soluble in water. It is used to counteract the injurious action of copper when dyeing Aniline, Alizarine or after-chromed colours in copper vessels. See pages 9 and 32.

Ammonium Sulphate, $(\text{NH}_4)_2\text{SO}_4$, a white crystalline powder with a sharp salt-like taste and a neutral reaction.

It serves as fixing agent in dyeing *Alizarine Black WX extra single* on slubbing in machines.

Ammonium Oxalate, $(\text{NH}_4)_2\text{C}_2\text{O}_4 + \text{H}_2\text{O}$, white crystals. This substance is used in dyeing certain after-chromed colours, which are sensitive to hard water (lime salts). It is added to the dye-bath as a corrective (see page 342). 1 lb. crystallised ammonium oxalate is equivalent to a mixture of

1 pint of a 10 % solution of oxalic acid and
1 $\frac{1}{4}$ pints ammonia 25 % (Sp. Gr. 0.910).

5. Lime. Calcium Salts.

Calcium Oxide, quicklime, burnt lime, CaO . Slaked with water: slaked lime, milk of lime, Ca(OH)_2 .

It is used for the preparation of calcium acetate and calcium nitrate, and, along with acetic acid, as an addition to the dye-bath in Turkey red dyeing if soft water is used. It finds extensive employment in the fermentation, copperas, zinc-lime and zinc-bisulphite vats.

Calcium Carbonate, chalk, CaCO_3 , a white insoluble, very finely divided powder, which is used in the Turkey red process to fix alumina (chalking). It is also added to tartar-emetic baths and to dye-baths for the so-called pastel colours. Chalk is also used for the preparation of calcium acetate and calcium nitrate.

Calcium Acetate, acetate of lime, $\text{Ca(C}_2\text{H}_3\text{O}_2)_2$, is a white or greyish-white substance, readily soluble in water. It is used when dyeing Alizarine Red on alumina-mordanted wool or on chrome-mordanted cotton.

A solution of 15° Tw. for this purpose may be conveniently prepared either, by dissolving

4 $\frac{1}{4}$ lbs. acetate of lime (solid) in 2 $\frac{1}{4}$ gallons water or, from burnt lime as follows:

6 lbs. burnt lime are slaked with

2 $\frac{3}{4}$ galls. water,

42 lbs. acetic acid 9° Tw. (30%) and

2 $\frac{3}{4}$ galls. water are added, and the solution thus obtained diluted to 15° Tw.

Acetate of lime is used in the preparation of nitrate mordant for Alizarine colours on silk, and should be as free from iron as possible.

Calcium Nitrate, $\text{Ca}(\text{NO}_3)_2 + 4\text{H}_2\text{O}$, is used in the preparation of the nitrate mordant for silk.

Calcium Hypochlorite, bleaching powder, $\text{Ca}(\text{ClO})_2 + \text{CaCl}_2$, a white powder which smells of chlorine. It is used for bleaching cotton, for chlorinating wool for printing purposes, and also for imparting to wool a silk-like lustre and handle.

As a rule, a solution of $1\frac{1}{2}^\circ$ Tw. is used. This is prepared by making:

2 $\frac{1}{4}$ lbs. bleaching powder to a smooth paste with
4 $\frac{1}{2}$ pints water and adding
5 $\frac{1}{4}$ » water. The mixture is well stirred and
allowed to settle. The clear solution
is drawn off and diluted to $1\frac{1}{2}^\circ$ Tw.

Bleaching powder solution is often replaced by hypochlorite of soda (Eau de Javelle), see page 317.

6. Magnesium Salts.

Magnesium Sulphate, Epsom salts, $\text{MgSO}_4 + 7\text{H}_2\text{O}$, colourless crystals of a bitter taste and readily soluble in water; used chiefly for weighting cotton and wool. It is also employed in the bleaching of silk as an addition to the peroxide bath and in cotton finishing.

Magnesium Chloride, $\text{MgCl}_2 + 6\text{H}_2\text{O}$, deliquescent, colourless crystals or a crystalline mass. It also comes into commerce in a fused state. It is used for carbonising wool, for weighting wool in finishing and for imparting to artificial flowers the necessary pliability.

7. Aluminium Salts.

Aluminium Acetate, acetate of alumina, $\text{Al}_2(\text{C}_2\text{H}_3\text{O}_2)_6$, is prepared from aluminium sulphate or alum and lead acetate (sugar of lead), or, by dissolving aluminium hydrate in acetic acid. An aqueous solution of the normal acetate decomposes on standing. For this reason it is generally replaced in the dyehouse by a

Sulphate Acetate of Alumina (red liquor), which is also prepared from aluminium sulphate and lead acetate. According to the quantity of lead acetate used, more or less of the sulphuric acid in the aluminium sulphate is replaced by acetic acid.

The compound $\text{Al}_2(\text{SO}_4)_2(\text{C}_2\text{H}_3\text{O}_2)_2$ is obtained from

4 $\frac{1}{4}$ lbs. lead acetate

6 $\frac{1}{4}$ » aluminium sulphate,

and the compound $\text{Al}_2\text{SO}_4(\text{C}_2\text{H}_3\text{O}_2)_4$ from

8 $\frac{1}{2}$ lbs. lead acetate

6 $\frac{1}{4}$ » aluminium sulphate.

The preparation of the above substances is carried out as follows: The hot solutions of aluminium sulphate and of lead acetate are mixed and, after allowing to settle, the clear solution is poured off from the white precipitate formed. The latter is lead sulphate and is washed with water, this wash-water being used to dilute the liquor to 15° Tw. or 9° Tw. If the solution is not quite clear, it must be filtered.

In cotton dyeing it is used instead of antimony salt for fixing tannic acid when special colour effects are desired. Its chief use is with Turkey red oil as a mordant for Alizarine colours.

Basic Aluminium Acetate Sulphate and Basic Aluminium Sulphate are used as mordants with Turkey red oil in the dyeing of Turkey red. The former is mainly used for the New Red process; the latter for the Old Red process, for Turkey red according to the combined process, and in special cases for the New Red process. Neither of these products is on the market.

The following methods of preparation have been found to give satisfactory results:

A. Preparation of basic aluminium acetate sulphate.

1. 50 lbs. aluminium sulphate (about 18% Al_2O_3) and 9½ » soda-ash are dissolved separately in 5 times their own weight of water. The soda solution is then slowly run into the aluminium sulphate while stirring.
1 gallon acetic acid 9° Tw. (30%) is added, and the liquor, when cold, diluted to 9° Tw.
2. 43 lbs. aluminium sulphate are dissolved in 30 gallons hot water, and 5 » acetic acid 12° Tw. (50%) added.
20 lbs. of sodium aluminium carbonate (free from iron) are then added slowly, and the liquor diluted to 9° Tw.

B. Preparation of basic aluminium sulphate.

- 40 lbs. aluminium sulphate (18% Al_2O_3) and 5 » soda-ash are dissolved separately in 5 times their weight of water. The soda solution is then slowly run into the aluminium sulphate solution, and the liquor diluted to 9° Tw.

Aluminium Sulphate, sulphate of alumina, Cake alum, $\text{Al}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$, a white crystalline mass, soluble in water. Commercial aluminium sulphate contains 12

molecules of water of crystallisation and thus 38% water and 18% Al_2O_3 . It should be quite free from iron.

It is used for preparing aluminium acetate, as a levelling or fixing agent for many cotton colours (e. g. Indoine Blue), for the preparation of nitrate mordant and for preparing alumina hydrate in the manufacture of lakes.

Potassium Aluminium Sulphate, alum, potash alum,

$\text{Al}_2(\text{SO}_4)_3 \cdot \text{K}_2\text{SO}_4 + 24\text{H}_2\text{O}$, colourless crystals or white powder.

Alum has been replaced to a great extent in the dyeing industry by aluminium sulphate, which is cheaper and has now been on the market for some years quite free from iron. Alum is used in the same way as aluminium sulphate for the preparation of alumina mordants in dyeing Alizarine Red, also to a great extent in waterproofing cotton, wool and silk, and as a levelling agent in dyeing basic and various acid colours (Soluble Blue, etc.) on tannin mordants.

1 part of aluminium sulphate is equivalent to 2 parts of alum.

Aluminium Chloride, AlCl_3 , is generally met with in the form of a solution of about 53° Tw., and is used for carbonising woollen piece-goods, dyed with colours, which are rather sensitive to acids.

Sodium Aluminate, alkaline pink mordant, $\text{Al}_2\text{O}_3 \cdot \text{Na}_2\text{O}$. A white crystalline mass, soluble in water.

It is used as a mordant for Turkey red on cotton.

Double Carbonate of Sodium and Aluminium, white lumps, used in the preparation of acetate and sulphate-acetate of alumina.

Nitrate Mordant is prepared by the double decomposition of aluminium sulphate and acetate and nitrate of lime. It is used in mordanting silk for Alizarine colours. For the method of preparation see page 243.

8. Chromium Compounds.

Chrome Alum, $\text{Cr}_2(\text{SO}_4)_3 \cdot \text{K}_2\text{SO}_4 + 24 \text{H}_2\text{O}$. Large violet-coloured crystals, easily soluble in water.

It is used for the preparation of chrome liquors for chrome tanning, etc., and in special cases as a fixing agent in wool dyeing.

Potassium Bichromate, bichromate of potash, "bichrome," "chrome," $\text{K}_2\text{Cr}_2\text{O}_7$. Yellowish red crystals, easily soluble in hot water.

It is used very largely for mordanting wool for Alizarines and various Aniline colours, also for after-chroming single-bath chrome colours and a few substantive colours.

It is also employed as a stripping agent in shoddy dyeing, for the production of chrome yellow on the fibre, as an oxidising agent in dyeing Aniline Black, etc.

Sodium Bichromate, $\text{Na}_2\text{Cr}_2\text{O}_7 + 2 \text{H}_2\text{O}$. Yellowish-red, crystalline, deliquescent mass, used for the same purposes as bichromate of potash. It is quite as efficient as the latter and is in addition cheaper and more soluble.

Chromium Fluoride, fluor chrome, $\text{Cr}_2\text{F}_4(\text{OH})_2$. A green powder, soluble in water, used for after-chroming Alizarine and certain substantive colours on wool. Another use for chromium fluoride is for after-treating substantive colours on cotton to increase the fastness to washing.

Chromium Acetate, acetate of chrome, $\text{Cr}(\text{C}_2\text{H}_3\text{O}_2)_3$, comes into the market as liquid green acetate of

chrome of 4^o Tw. A basic salt of the formula $\text{Cr}(\text{OH})(\text{C}_2\text{H}_3\text{O}_2)_2$ is sold as solid acetate of chrome, and, in a violet solution, as acetate of chrome 32^o Tw.

Chromium Chloride, 32^o Tw. and 53^o Tw., basic chromium chloride, $\text{Cr Cl}(\text{OH})_2$, is used in the form of a green solution as a mordant for Alizarine colours on cotton and silk.

Chromium Bisulphite, 48^o Tw. and 34^o Tw., a green solution, used as a mordant for Alizarine colours on cotton.

9. Iron Compounds.

Acetate of Iron, pyrolignite of iron, "black liquor,"

$\text{Fe}(\text{C}_2\text{H}_3\text{O}_2)_2$, a dark coloured liquid with a penetrating odour, is generally placed on the market at 23^o Tw. (also 32^o Tw. and 52^o Tw.).

In addition to its use as a mordant for Alizarine colours, it is employed for darkening cotton in the dyeing of cotton and unions. See page 269.

Nitrate of Iron was formerly prepared by treating copperas (ferrous sulphate) with nitric acid, hence the incorrect name "nitrate of iron." It is really a basic sulphate of iron or a mixture of the latter and iron nitrate. It is used in considerable quantities in silk dyeing. In general, it can be used in place of acetate of iron, and can in many cases advantageously replace the latter.

Nitrate of iron is usually sold in solution at 91^o Tw.

Ferrous Sulphate, copperas, $\text{FeSO}_4 + 7\text{H}_2\text{O}$. Bluish green crystals (the outside of which is generally brownish, due to decomposition and oxidation), easily soluble in water.

It is added to the dye-bath when dyeing wool with logwood and Aniline colours in a single bath. Another use is for fixing tannic acid on cotton, as a reducing agent in the "vitriol" indigo vat and in the dipping vat for Indanthrene colours.

Potassium Ferrocyanide, yellow prussiate of potash, $\text{K}_4\text{FeCy}_6 + 3\text{H}_2\text{O}$, yellow crystals.

It is used in the production of Prussian Blue, in the preparation of nitrate mordant to remove the iron and also in mordanting silk for Alizarine Black, etc.

10. Manganese Compounds.

Potassium Permanganate, permanganate of potash, KMnO_4 , dark red needle-shaped crystals with a blue metallic lustre.

It is used as a bleaching agent for certain textile fibres. See also page 6.

11. Zinc Compounds.

Zinc Dust, heavy grey powder, insoluble in water, a mixture of metallic zinc and zinc oxide.

It is used as a reducing agent for the various zinc-indigo vats, to prepare hydrosulphite for the hydrosulphite vat, etc.

Zinc Oxide, zinc white, Zn O , white bulky powder, insoluble in water.

It is often added to the dye-bath when dyeing the so-called pastel colours. See page 37.

Zinc Sulphate, white vitriol, $\text{Zn SO}_4 + 7\text{H}_2\text{O}$, colourless crystals, soluble in water, used for weighting cotton.

Zinc Chloride, Zn Cl_2 , a white deliquescent mass, easily soluble in water, used in considerable quantities in the sizing and finishing of cotton.

Decroline patented, white powder, insoluble in water.

It is used for stripping shoddy, rags, etc., and for bleaching cocoa-nut fibre, etc. Its reducing action (resulting in the destruction of the colour) only takes place in the presence of acids and on warming. See page 47.

12. Copper Compounds.

Copper Sulphate, blue stone, blue vitriol, $\text{Cu SO}_4 + 5 \text{H}_2 \text{O}$, blue crystals, soluble in water.

Its chief use is in dyeing Aniline Black, and for after-treating (coppering) substantive colours on cotton, either alone or in conjunction with bichromate and acetic acid, to increase the fastness.

It is also used in several single-bath processes for logwood with Aniline colours.

13. Lead Compounds.

Lead Acetate, sugar of lead, $\text{Pb}(\text{C}_2 \text{H}_3 \text{O}_2)_2 + 3 \text{H}_2 \text{O}$, colourless crystals. (That made from pyroligneous acid occurs in the form of a yellowish brown mass with a penetrating odour.)

It is used for the production of chrome yellow and chrome orange on cotton, also for the preparation of mordants (e. g. acetate of alumina), etc.

14. Tin Compounds.

Stannous Chloride, tin crystals, $\text{SnCl}_2 + 2\text{H}_2\text{O}$, colourless crystals, which dissolve in water to a cloudy solution.

It is used as an addition to the cochineal dye-bath and also for brightening Turkey red.

Stannic Chloride, double muriate of tin, $\text{SnCl}_4 + 3\text{H}_2\text{O}$. Comes into the market in the form of white crystalline lumps, which are hygroscopic and easily soluble in water.

It is used in cotton dyeing as a mordant for bright blue shades, in the preparation of nitrate mordant, and very largely for silk-weighting.

Pink Salt, $\text{SnCl}_4 + 2(\text{NH}_4\text{Cl})$. A double salt of stannic and ammonium chloride; colourless hygroscopic crystals, also used for silk-weighting.

Sodium Stannate, stannate of soda, preparing salt, $\text{SnO}_3\text{Na}_2 + 3\text{H}_2\text{O}$. A colourless crystalline mass, which effloresces on exposure to air; used in cotton dyeing as mordant for bright blue and red shades, also in silk-weighting.

15. Antimony Compounds.

Potassium Antimony Tartrate, tartar emetic,

$K(SbO)C_4H_4O_6 + \frac{1}{2}H_2O$. Large white crystals, containing about 43% antimony trioxide.

This product is largely used for fixing the tannin mordants on cotton, and is also used for the same purpose when "after-treating" dyeings on cotton and silk with tannic acid.

Antimony Salt, $SbF_3(NH_4)_2SO_4$. White crystals, readily soluble in water, containing about 47% antimony trioxide.

It is extensively used as a substitute for tartar emetic.

Antimonin, antimony lactate, a moist, yellowish mass; also used as a substitute for tartar emetic, and is applied in the same way.

Antimony Sodium Fluoride, double antimony fluoride,

SbF_3NaF . White crystals, easily soluble in water, containing about 66% antimony trioxide.

Patent Salt, a double salt of antimony fluoride and ammonium fluoride. Heavy crystals, containing 73—75% antimony oxide. Is used in place of tartar emetic, of which 10 parts are equivalent to about 6 parts Patent Salt.

Oxalate of Antimony, antimony and potassium double oxalate, $K_3Sb(C_2O_4)_3 + 4H_2O$.

It is used as a substitute for tartar emetic and antimony salt. After using the fixing baths for some time, 1 part antimony salt is equivalent to about 1 part antimony oxalate. The baths do not become so acid as in the case of tartar emetic.

All the other compounds of antimony, placed on the market, and which are used in dyeing (such as sodium salt of tartar emetic, etc.) are used for fixing the tannin matter on the fibre.

With reference to the antimony salts chiefly used, see page 123.

16. Soaps, Oils, Solvents, etc.

Soap, hard soap, soda soap, olive oil soap, tallow soap, Marseilles soap, etc., is soluble in water with which it forms a lather. It is extensively used in milling, washing, scouring and brightening dyed and undyed textile materials. Soap should be neutral, i. e. it should contain neither excess of alkali nor of insoluble unsaponified fat.

Soft Soap, potash soap, acts more powerfully than soda soap, and is occasionally used in the woollen industry.

Monopole Soap. Its aqueous solution has a weakly acid reaction and does not form insoluble precipitates with lime or magnesium salts; it is therefore very suitable for use with hard water, for instance, as a levelling agent in dyeing substantive colours.

It is also used when boiling out cotton as a substitute for Turkey red oil.

Boiled-off Liquor is a solution of silk-gum in soap formed in the boiling-off of silk. It is often added to the dye-bath in silk dyeing.

Olive Oil is used in the preparation of cotton for the old Turkey red process, and for softening cotton which has become hard in dyeing, (brightening Sulphur Black, Aniline Black, etc.).

Tournant Oil, Gallipoli oil, is rancid olive oil, used in the Old Turkey red process.

Castor Oil is used in the preparation of Turkey red oil.

Turkey Red Oil, a more or less clear oily liquid, giving a slightly cloudy solution in water.

Turkey red oil, for use in dyeing, is prepared by the action of sulphuric acid on castor oil, which action results in the formation of glycerine and the sulphuric ethers of ricinoleic acid — the so-called sulpholeates. On further treatment with ammonia, Turkey red oil F is obtained. Turkey red oil S is only partially soluble in water. The various Turkey red oils are used for boiling out cotton, and, as the name suggests, in preparing cotton for the Turkey red process for dyeing Alizarine colours on chrome mordant on cotton.

Turkey red oil is used as a mordant for very bright shades with Rhodamine on cotton, further in the dyeing of Nitrosamine Red, in "Foam dyeing" and as levelling agent in dyeing substantive colours on cotton.

Alcohol, spirits of wine, methylated spirit, ethyl alcohol, C_2H_5OH , used as a solvent for spirit colours and occasionally for basic colours.

Methyl Alcohol, wood spirit, CH_3OH , is used for the same purposes as ethyl alcohol.

Glycerine, $C_3H_5(OH)_3$, a colourless or yellowish thick, syrupy liquid with a sweet taste, is used in the preparation of alkaline chrome mordants and in finishing.

Diastafor is a preparation of diastose, and is used in the same way as malt extract to remove starch thickening, size, etc. from cotton materials.

17. Tannins.

Tannin, see tannic acid, page 312.

Sumac, yellowish brown leaves, possessing a strong smell (powdered sumach is not so reliable).

Sumac Extract, a thick brown solution, generally at a strength of about 53° Tw. It also comes into the market in the solid form.

Liquid extracts are very liable to ferment on storing, which causes a decrease in strength.

Myrabolans, hard nuts, more easily extracted when ground.

Gall Nuts are hard round excrescences, found on certain trees, such as various species of oak. They are caused by the sting of an insect. Before use they should be ground to a powder.

Divi-divi, hard nuts similar to myrabolans.

Quebracho, a Brazilian wood, from which also Quebracho extract is made.

Catechu, catch, catch extract, is used in weighting silk. It has been replaced to a great extent by substantive and sulphur colours.

The various tannin materials mentioned above are used as mordants (fixed with antimony or iron salts) in cotton dyeing. The percentage of tannin (tannic acid) in the various products varies greatly.

Details regarding the comparative values of the various tannins are to be found on page 123.

18. Thickening Agents. Sizing and Finishing Materials.

Dextrine, a white or yellowish substance, easily soluble in water. It is extensively used as a cheap finishing material for cotton and woollen piece-goods.

British Gum is burnt starch, and is used for the same purposes as dextrine.

Wheat Starch is also largely used in finishing. It can be worked up to a mucilage, the so-called "soluble starch," by treatment with strong caustic soda. The paste must be neutralised with acid before use.

Potato Starch is very largely used in sizing and finishing.

Gum Tragacanth, a highly valued finishing material and thickening agent.

Wheat Flour contains gum, and is used in finishing and as a thickening agent.

Leïogomme, roasted potato starch, a pale yellow powder, is used either alone or along with other thickeners in finishing.

Glue (animal) is a valuable finishing material, also used in Indigo dyeing.

Gelatine is also used to a certain extent in finishing.

Gum Arabic, also used in finishing.

19. Waterproofing Substances.

The general principle consists of treating the material with soap and after-treating with salts of alumina.

A combination, for instance, of soap and alum is very widely used, and good results have also been obtained by substituting for the alum other aluminium compounds, such as aluminium acetate, aluminium formate, etc. To proof cotton and linen goods, fatty, waxy or paraffin substances, such as tallow, stearine, etc., are sometimes used.

The following are two suitable processes for waterproofing dyed cotton or linen material:

1. Soak the dyed pieces with a solution of 5 lbs. soap in 100 gallons water, squeeze, pass through a solution of 10 lbs. alum in 100 gallons water, squeeze and dry. If necessary, repeat the whole process.
2. Pass the dry pieces on the padding machine through an emulsion prepared as given below at 70°—85° F., squeeze and pass through a cold solution of aluminium acetate of about 5° Tw. Then rinse lightly and dry hot.

The emulsion is prepared by boiling together:

6 lbs. white soap,
3 » tallow and
3 » stearine

with 10 gallons of water till completely dissolved.

Tables.

1. Measures.
 2. Weights.
 3. Temperature.
 4. Correction of hard water;
degrees of hardness.
 5. Specific gravity.
-

I. Measures.

a) Length.

Metric system:

1 metre = 10 dms. = 100 cms. = 1000 mms.

English measures:

1 yard = 3 feet = 36 inches = 0.9144 metre.

b) Area.

Metric system:

1 \square metre = 100 \square dms. = 10000 \square cms. = 1000000 \square mms.

English measures:

1 square yard = 9 square feet = 0.836 \square m.

c) Volume.

Metric system:

1 cbm. (cubic metre) = 1000 cdms. (1000 litres).

1 cdm. = 1 litre = 1000 ccms.

English measures:

1 cub. yard = 27 cub. feet = 0.7645 cbm.

1 gallon = 2 pottles = 4 quarts = 8 pints = 16 (or in some districts 32) gills = 4.5436 litres.

II. Weights.

Metric system:

1 kilogramme (kg.) = 10 hektogrammes (hg.) = 100 deka-
grammes (dg.) = 1000 grammes (gm.).

1 pound = $\frac{1}{2}$ kg. = 500 grammes.

English weights:

1 pound (lb.) = 16 ounces (oz.) = 453.6 grammes.

1 hundredweight (cwt.) = 112 lbs. = 50.8 ko.

1 ton = 20 cwts.

III. Temperature.

Comparison of the Centigrade thermometer scale with the Réaumur and Fahrenheit scales.

Centi- grade	Réaumur	Fahren- heit	Centi- grade	Réaumur	Fahren- heit	Centi- grade	Réaumur	Fahren- heit
+100	+80	+212	+53	+42.4	+127.4	+6	+4.8	+42.8
99	79.2	210.2	52	41.6	125.6	5	4	41
98	78.4	208.4	51	40.8	123.8	4	3.2	39.2
97	77.6	206.6	50	40	122	3	2.4	37.4
96	76.8	204.8	49	39.2	120.2	2	1.6	35.6
95	76	203	48	38.4	118.4	1	0.8	33.8
94	75.2	201.2	47	37.6	116.6	0	0	32
93	74.4	199.4	46	36.8	114.8	-1	-0.8	30.2
92	73.6	197.6	45	36	113	2	1.6	28.4
91	72.8	195.8	44	35.2	111.2	3	2.4	26.6
90	72	194	43	34.4	109.4	4	3.2	24.8
89	71.2	192.2	42	33.6	107.6	5	4	23
88	70.4	190.4	41	32.8	105.8	6	4.8	21.2
87	69.6	188.6	40	32	104	7	5.6	19.4
86	68.8	186.8	39	31.2	102.2	8	6.4	17.6
85	68	185	38	30.4	100.4	9	7.2	15.8
84	67.2	183.2	37	29.6	98.6	10	8	14
83	66.4	181.4	36	28.8	96.8	11	8.8	12.2
82	65.6	179.6	35	28	95	12	9.6	10.4
81	64.8	177.8	34	27.2	93.2	13	10.4	8.6
80	64	176	33	26.4	91.4	14	11.2	6.8
79	63.2	174.2	32	25.6	89.6	15	12	5
78	62.4	172.4	31	24.8	87.8	16	12.8	3.2
77	61.6	170.6	30	24	86	17	13.6	1.4
76	60.8	168.8	29	23.2	84.2	18	14.4	-0.4
75	60	167	28	22.4	82.4	19	15.2	-2.2
74	59.2	165.2	27	21.6	80.6	20	16	-4
73	58.4	163.4	26	20.8	78.8	21	16.8	-5.8
72	57.6	161.6	25	20	77	22	17.6	-7.6
71	56.8	159.8	24	19.2	75.2	23	18.4	-9.4
70	56	158	23	18.4	73.4	24	19.2	-11.2
69	55.2	156.2	22	17.6	71.6	25	20	-13
68	54.4	154.4	21	16.8	69.8	26	20.8	-14.8
67	53.6	152.6	20	16	68	27	21.6	-16.6
66	52.8	150.8	19	15.2	66.2	28	22.4	-18.4
65	52	149	18	14.4	64.4	29	23.2	-20.2
64	51.2	147.2	17	13.6	62.6	30	24	-22
63	50.4	145.4	16	12.8	60.8	31	24.8	-23.8
62	49.6	143.6	15	12	59	32	25.6	-25.6
61	48.8	141.8	14	11.2	57.2	33	26.4	-27.4
60	48	140	13	10.4	55.4	34	27.2	-29.2
59	47.2	138.2	12	9.6	53.6	35	28	-31
58	46.4	136.4	11	8.8	51.8	36	28.8	-32.8
57	45.6	134.6	10	8	50	37	29.6	-34.6
56	44.8	132.8	9	7.2	48.2	38	30.4	-36.4
55	44	131	8	6.4	46.4	39	31.2	-38.2
54	43.2	129.2	7	5.6	44.6	40	32	-40

IV. Correction of hard water (containing lime) with crystalline ammonium oxalate.

The following quantities of crystalline ammonium oxalate are necessary to render harmless (i. e., to precipitate) the lime contained in 100 gallons of water of the hardness indicated.

Degrees of hardness (English)	Crystalline ammonium oxalate	Degrees of hardness (English)	Crystalline ammonium oxalate
	oz.		oz.
1	$\frac{1}{3}$	11	$3\frac{2}{3}$
2	$\frac{2}{3}$	12	4
3	1	13	$4\frac{1}{3}$
4	$1\frac{1}{3}$	14	$4\frac{2}{3}$
5	$1\frac{2}{3}$	15	5
6	2	16	$5\frac{1}{3}$
7	$2\frac{1}{3}$	17	$5\frac{2}{3}$
8	$3\frac{2}{3}$	18	6
9	3	19	$6\frac{1}{3}$
10	$3\frac{1}{3}$	20	$6\frac{2}{3}$

Notes:

- a) The possibility of magnesia being present has not been taken into account in the above table.
- b) See page 343 for the comparison of English with German and French degrees of hardness. The preparation of ammonium oxalate is described on page 320.

Comparison of
German, English and French
degrees of hardness.

German	English	French
0.5	0.62	0.9
0.56	0.7	1.0
0.7	0.87	1.26
0.8	1.0	1.43
1.0	1.25	1.79
1.12	1.41	2.0
1.5	1.88	2.69
1.68	2.10	3.0
2.0	2.5	3.58
2.24	2.8	4.0
2.4	3.0	4.3
2.5	3.13	4.48
2.8	3.5	5.0
3.0	3.75	5.37
3.2	4.0	5.73
3.36	4.2	6.0
3.5	4.38	6.27
3.92	4.9	7.0
4.0	5.0	7.17
4.48	5.60	8.0
4.5	5.63	8.06
4.8	6.0	8.60
5.0	6.25	8.95
5.04	6.30	9.0
5.5	6.88	9.85
5.6	7.0	10.0
6.0	7.5	10.74
6.5	8.13	11.64
6.7	8.38	12.0
7.0	8.75	12.55
7.28	9.10	13.43
7.84	9.8	14.0
8.0	10.0	14.30
8.4	10.5	15.0
8.5	10.63	15.18
8.8	11.0	15.75
8.96	11.20	16.0
9.0	11.25	16.08
9.5	11.88	17.0
10.0	12.50	17.9
10.08	12.60	18.0
10.4	13.0	18.6
10.5	13.13	18.78
10.64	13.3	19.0
11.0	13.75	19.68
11.2	14.0	20.0
11.5	14.07	20.59
11.76	14.38	21.0
12.0	15.0	21.5

V. Specific Gravity.

Comparison of specific gravities with degrees
Twaddle (Tw.) and Beaumé (Bé).

Specific Gravity at 60° F.	Degrees Bé	Degrees Tw.	Specific Gravity at 60° F.	Degrees Bé	Degrees Tw.	Specific Gravity at 60° F.	Degrees Bé	Degrees Tw.
1.000	0.0	0	1.290	32.4	58	1.580	53.0	116
1.005	0.7	1	1.295	32.8	59	1.585	53.3	117
1.010	1.4	2	1.300	33.3	60	1.590	53.6	118
1.015	2.1	3	1.305	33.7	61	1.595	53.9	119
1.020	2.7	4	1.310	34.2	62	1.600	54.1	120
1.025	3.4	5	1.315	34.6	63	1.605	54.4	121
1.030	4.1	6	1.320	35.0	64	1.610	54.7	122
1.035	4.7	7	1.325	35.4	65	1.615	55.0	123
1.040	5.4	8	1.330	35.8	66	1.620	55.2	124
1.045	6.0	9	1.335	36.2	67	1.625	55.5	125
1.050	6.7	10	1.340	36.6	68	1.630	55.8	126
1.055	7.4	11	1.345	37.0	69	1.635	56.0	127
1.060	8.0	12	1.350	37.4	70	1.640	56.3	128
1.065	8.7	13	1.355	37.8	71	1.645	56.6	129
1.070	9.4	14	1.360	38.2	72	1.650	56.9	130
1.075	10.0	15	1.365	38.6	73	1.655	57.1	131
1.080	10.6	16	1.370	39.0	74	1.660	57.4	132
1.085	11.2	17	1.375	39.4	75	1.665	57.7	133
1.090	11.9	18	1.380	39.8	76	1.670	57.9	134
1.095	12.4	19	1.385	40.1	77	1.675	58.2	135
1.100	13.0	20	1.390	40.5	78	1.680	58.4	136
1.105	13.6	21	1.395	40.8	79	1.685	58.7	137
1.110	14.2	22	1.400	41.2	80	1.690	58.9	138
1.115	14.9	23	1.405	41.6	81	1.695	59.2	139
1.120	15.4	24	1.410	42.0	82	1.700	59.5	140
1.125	16.0	25	1.415	42.3	83	1.705	59.7	141
1.130	16.5	26	1.420	42.7	84	1.710	60.0	142
1.135	17.1	27	1.425	43.1	85	1.715	60.2	143
1.140	17.7	28	1.430	43.4	86	1.720	60.4	144
1.145	18.3	29	1.435	43.8	87	1.725	60.6	145
1.150	18.8	30	1.440	44.1	88	1.730	60.9	146
1.155	19.3	31	1.445	44.4	89	1.735	61.1	147
1.160	19.8	32	1.450	44.8	90	1.740	61.4	148
1.165	20.3	33	1.455	45.1	91	1.745	61.6	149
1.170	20.9	34	1.460	45.4	92	1.750	61.8	150
1.175	21.4	35	1.465	45.8	93	1.755	62.1	151
1.180	22.0	36	1.470	46.1	94	1.760	62.3	152
1.185	22.5	37	1.475	46.4	95	1.765	62.5	153
1.190	23.0	38	1.480	46.8	96	1.770	62.8	154
1.195	23.5	39	1.485	47.1	97	1.775	63.0	155
1.200	24.0	40	1.490	47.4	98	1.780	63.2	156
1.205	24.5	41	1.495	47.8	99	1.785	63.5	157
1.210	25.0	42	1.500	48.1	100	1.790	63.7	158
1.215	25.5	43	1.505	48.4	101	1.795	64.0	159
1.220	26.0	44	1.510	48.7	102	1.800	64.2	160
1.225	26.4	45	1.515	49.0	103	1.805	64.4	161
1.230	26.9	46	1.520	49.4	104	1.810	64.6	162
1.235	27.4	47	1.525	49.7	105	1.815	64.8	163
1.240	27.9	48	1.530	50.0	106	1.820	65.0	164
1.245	28.4	49	1.535	50.3	107	1.825	65.2	165
1.250	28.8	50	1.540	50.6	108	1.830	65.5	166
1.255	29.3	51	1.545	50.9	109	1.835	65.7	167
1.260	29.7	52	1.550	51.2	110	1.840	65.9	168
1.265	30.2	53	1.555	51.5	111	1.845	66.1	169
1.270	30.6	54	1.560	51.8	112	1.850	66.3	170
1.275	31.1	55	1.565	52.1	113	1.855	66.5	171
1.280	31.5	56	1.570	52.4	114	1.860	66.7	172
1.285	32.0	57	1.575	52.7	115	1.865	67.0	173

Comparison of degrees Beaumé and
specific gravity

A. For liquids heavier than water.

Degrees Beaumé	Spec. grav. at 54° F.	Degrees Beaumé	Spec. grav. at 54° F.	Degrees Beaumé	Spec. grav. at 54° F.
0	1.0000	25	1.2095	50	1.5301
1	1.0069	26	1.2198	51	1.5466
2	1.0140	27	1.2301	52	1.5633
3	1.0212	28	1.2407	53	1.5804
4	1.0285	29	1.2515	54	1.5978
5	1.0358	30	1.2624	55	1.6158
6	1.0434	31	1.2736	56	1.6342
7	1.0509	32	1.2849	57	1.6529
8	1.0587	33	1.2965	58	1.6720
9	1.0665	34	1.3082	59	1.6916
10	1.0745	35	1.3202	60	1.7116
11	1.0825	36	1.3324	61	1.7322
12	1.0907	37	1.3447	62	1.7532
13	1.0990	38	1.3574	63	1.7748
14	1.1074	39	1.3703	64	1.7960
15	1.1160	40	1.3834	65	1.8195
16	1.1247	41	1.3968	66	1.8428
17	1.1335	42	1.4105	67	1.8590
18	1.1425	43	1.4244	68	1.8640
19	1.1516	44	1.4386	69	1.8850
20	1.1608	45	1.4531	70	1.9090
21	1.1702	46	1.4678	71	1.9350
22	1.1798	47	1.4828	72	1.9600
23	1.1896	48	1.4984		
24	1.1994	49	1.5141		

B. For liquids lighter than water.

Degrees Beaumé	Spec. grav. at 54° F.	Degrees Beaumé	Spec. grav. at 54° F.	Degrees Beaumé	Spec. grav. at 54° F.
10	1.0000	28	0.8902	46	0.8022
11	0.9932	29	0.8848	47	0.7978
12	0.9865	30	0.8795	48	0.7935
13	0.9799	31	0.8742	49	0.7892
14	0.9733	32	0.8690	50	0.7849
15	0.9669	33	0.8639	51	0.7807
16	0.9605	34	0.8588	52	0.7766
17	0.9542	35	0.8538	53	0.7725
18	0.9480	36	0.8488	54	0.7684
19	0.9420	37	0.8439	55	0.7644
20	0.9359	38	0.8391	56	0.7604
21	0.9300	39	0.8343	57	0.7565
22	0.9241	40	0.8295	58	0.7526
23	0.9183	41	0.8249	59	0.7487
24	0.9125	42	0.8202	60	0.7449
25	0.9068	43	0.8156	61	0.7411
26	0.9012	44	0.8111		
27	0.8957	45	0.8066		

346 Specific gravity of caustic soda and bleaching powder solutions.

Specific gravity
of caustic soda at 60° F. (Lunge).

Degrees Beaumé	Degrees Twaddle	Spec. grav.	Na O H %	Degrees Beaumé	Degrees Twaddle	Spec. grav.	Na O H %
1	1·4	1·007	0·61	26	44·0	1·220	19·58
2	2·8	1·014	1·20	27	46·2	1·231	20·59
3	4·4	1·022	2·00	28	48·2	1·241	21·42
4	5·8	1·029	2·71	29	50·4	1·252	22·64
5	7·4	1·036	3·35	30	52·6	1·263	23·67
6	9·0	1·045	4·00	31	54·8	1·274	24·81
7	10·4	1·052	4·64	32	57·0	1·285	25·80
8	12·0	1·060	5·29	33	59·4	1·297	26·83
9	13·4	1·067	5·87	34	61·6	1·308	27·80
10	15·0	1·075	6·55	35	64·0	1·320	28·83
11	16·6	1·083	7·31	36	66·4	1·332	29·93
12	18·2	1·091	8·00	37	69·0	1·345	31·22
13	20·0	1·100	8·68	38	71·4	1·357	32·47
14	21·6	1·108	9·42	39	74·0	1·370	33·69
15	23·2	1·116	10·06	40	76·6	1·383	34·96
16	25·0	1·125	10·97	41	79·4	1·397	36·25
17	26·8	1·134	11·84	42	82·0	1·410	37·47
18	28·4	1·142	12·64	43	84·8	1·424	38·80
19	30·4	1·152	13·55	44	87·6	1·438	39·99
20	32·4	1·162	14·37	45	90·6	1·453	41·41
21	34·2	1·171	15·13	46	93·6	1·468	42·83
22	36·0	1·180	15·91	47	96·6	1·483	44·38
23	38·0	1·190	16·77	48	99·6	1·498	46·15
24	40·0	1·200	17·67	49	102·8	1·514	47·60
25	42·0	1·210	18·58	50	106·0	1·530	49·02

Specific gravity
and strength of solutions of bleaching powder at 60° F.

Degrees Beaumé	Specific gravity	Effective chlorine per 1000 parts
		parts
1	1·008	5
2	1·015	10
3	1·023	15
4	1·030	20
5	1·037	25
6	1·045	30
7	1·053	35
8	1·060	40
9·2	1·069	45
10·4	1·076	50
11·5	1·087	55
12·6	1·097	60
13·6	1·105	64

Specific gravity
of aqueous solutions of ammonia at 60° F.
(Lunge and Wiernik)
compared with water at 60° F.

Specific gravity	Per-centage NH ₃	1 gallon contains at 60° F. NH ₃ lbs.	Specific gravity	Per-centage NH ₃	1 gallon contains at 60° F. NH ₃ lbs.
1·000	0·00	0·000	0·940	15·63	1·460
0·998	0·45	0·045	0·938	16·22	1·521
0·996	0·91	0·091	0·936	16·82	1·574
0·994	1·37	0·136	0·934	17·42	1·627
0·992	1·84	0·182	0·932	18·03	1·681
0·990	2·31	0·229	0·930	18·64	1·734
0·988	2·80	0·277	0·928	19·25	1·786
0·986	3·30	0·325	0·926	19·87	1·842
0·984	3·80	0·374	0·924	20·49	1·893
0·982	4·30	0·422	0·922	20·12	1·947
0·980	4·80	0·470	0·920	21·75	2·001
0·978	5·30	0·518	0·918	22·39	2·056
0·976	5·80	0·566	0·916	23·03	2·109
0·974	6·30	0·614	0·914	23·68	2·163
0·972	6·80	0·661	0·912	24·33	2·219
0·970	7·31	0·709	0·910	24·99	2·274
0·968	7·82	0·757	0·908	25·65	2·329
0·966	8·33	0·805	0·906	26·31	2·383
0·964	8·84	0·852	0·904	26·98	2·439
0·962	9·35	0·899	0·902	27·65	2·494
0·960	9·91	0·951	0·900	28·33	2·550
0·958	10·47	1·003	0·898	29·01	2·605
0·956	11·03	1·054	0·896	29·69	2·660
0·954	11·60	1·107	0·894	30·37	2·715
0·952	12·17	1·159	0·892	31·05	2·770
0·950	12·74	1·210	0·890	31·75	2·826
0·948	13·31	1·262	0·888	32·50	2·886
0·946	13·88	1·313	0·886	33·25	2·946
0·944	14·46	1·365	0·884	34·10	3·014
0·942	15·04	1·417	0·882	34·95	3·083

Specific gravity
of hydrochloric acid
(Lunge and Marchlewski).

Spec. Gravity at 60° F.	Degrees Beaumé	Degrees Twaddle	100 lbs. contain		1 gallon contains	
			H Cl	Acid of 32° Tw.	H Cl	Acid of 32° Tw.
			lbs.	lbs.	lbs.	lbs.
1·000	0·0	0·0	0·16	0·49	0·016	0·049
1·005	0·7	1	1·15	3·58	0·12	0·36
1·010	1·4	2	2·14	6·66	0·22	0·67
1·015	2·1	3	3·12	9·71	0·32	0·99
1·020	2·7	4	4·13	12·86	0·42	1·31
1·025	3·4	5	5·15	16·04	0·53	1·64
1·030	4·1	6	6·15	19·16	0·64	1·97
1·035	4·7	7	7·15	22·27	0·74	2·31
1·040	5·4	8	8·16	25·42	0·85	2·64
1·045	6·0	9	9·16	28·53	0·96	2·98
1·050	6·7	10	10·17	31·68	1·07	3·33
1·055	7·4	11	11·18	34·82	1·18	3·67
1·060	8·0	12	12·19	37·97	1·29	4·03
1·065	8·7	13	13·19	41·09	1·41	4·38
1·070	9·4	14	14·17	44·14	1·52	4·72
1·075	10·0	15	15·16	47·22	1·63	5·08
1·080	10·6	16	16·15	50·31	1·74	5·43
1·085	11·2	17	17·13	53·36	1·86	5·79
1·090	11·9	18	18·11	56·41	1·97	6·15
1·095	12·4	19	19·06	59·37	2·09	6·50
1·100	13·0	20	20·01	62·33	2·20	6·86
1·105	13·6	21	20·97	65·32	2·32	7·22
1·110	14·2	22	21·92	68·28	2·43	7·58
1·115	14·9	23	22·86	71·21	2·55	7·94
1·120	15·4	24	23·82	74·20	2·67	8·31
1·125	16·0	25	24·78	77·19	2·78	8·68
1·130	16·5	26	25·75	80·21	2·91	9·06
1·135	17·1	27	26·70	83·18	3·03	9·44
1·140	17·7	28	27·66	86·17	3·15	9·82
1·1425	18·0		28·14	87·66	3·22	10·02
1·145	18·3	29	28·61	89·13	3·28	10·21
1·150	18·8	30	29·57	92·11	3·40	10·59
1·152	19·0		29·95	93·30	3·45	10·75
1·155	19·3	31	30·55	95·17	3·53	10·99
1·160	19·8	32	31·52	98·19	3·66	11·39
1·163	20·0		32·10	100·00	3·73	11·63
1·165	20·3	33	32·49	101·21	3·79	11·79
1·170	20·9	34	33·46	104·24	3·92	12·20
1·171	21·0		33·65	104·82	3·94	12·27
1·175	21·4	35	34·42	107·22	4·04	12·60
1·180	22·0	36	35·39	110·24	4·18	13·01
1·185	22·5	37	36·31	113·11	4·30	13·40
1·190	23·0	38	37·23	115·98	4·43	13·80
1·195	23·5	39	38·16	118·87	4·56	14·21
1·200	24·0	40	39·11	121·84	4·69	14·62

Specific gravity
of sulphuric acid (Lunge and Isler).

Specific gravity at 60° F.	Degrees Beaumé	Degrees Twaddle	100 lbs. contain H ₂ SO ₄	1 gallon contains H ₂ SO ₄
			lbs.	lbs.
1·000	0·0	0	0·09	0·01
1·005	0·7	1	0·83	0·08
1·010	1·4	2	1·57	0·16
1·015	2·1	3	2·30	0·23
1·020	2·7	4	3·03	0·31
1·025	3·4	5	3·76	0·39
1·030	4·1	6	4·49	0·46
1·035	4·7	7	5·23	0·54
1·040	5·4	8	5·96	0·62
1·045	6·0	9	6·67	0·71
1·050	6·7	10	7·37	0·77
1·055	7·4	11	8·07	0·83
1·060	8·0	12	8·77	0·85
1·065	8·7	13	9·47	1·02
1·070	9·4	14	10·19	1·09
1·075	10·0	15	10·90	1·17
1·080	10·6	16	11·60	1·25
1·085	11·2	17	12·30	1·33
1·090	11·9	18	12·99	1·42
1·095	12·4	19	13·67	1·50
1·100	13·0	20	14·35	1·58
1·105	13·6	21	15·03	1·66
1·110	14·2	22	15·71	1·75
1·115	14·9	23	16·36	1·83
1·120	15·4	24	17·01	1·91
1·125	16·0	25	17·66	1·99
1·130	16·5	26	18·31	2·07
1·135	17·1	27	18·96	2·15
1·140	17·7	28	19·61	2·23
1·145	18·3	29	20·26	2·31
1·150	18·8	30	20·91	2·39
1·155	19·3	31	21·55	2·48
1·160	19·8	32	22·19	2·57
1·165	20·3	33	22·83	2·66
1·170	20·9	34	23·47	2·75
1·175	21·4	35	24·12	2·83
1·180	22·0	36	24·76	2·92
1·185	22·5	37	25·40	3·01
1·190	23·0	38	26·04	3·10
1·195	23·5	39	26·68	3·19
1·200	24·0	40	27·32	3·28
1·205	24·5	41	27·95	3·37
1·210	25·0	42	28·58	3·46
1·215	25·5	43	29·21	3·55
1·220	26·0	44	29·84	3·64
1·225	26·4	45	30·48	3·73
1·230	26·9	46	31·11	3·82
1·235	27·4	47	31·70	3·91
1·240	27·9	48	32·28	4·00

(Continued).

Specific gravity at 60° F.	Degrees Baumé	Degrees Twaddle	100 lbs. contain H ₂ SO ₄	1 gallon contains H ₂ SO ₄
			lbs.	lbs.
1.245	28.4	49	32.86	4.09
1.250	28.8	50	33.43	4.18
1.255	29.3	51	34.00	4.26
1.260	29.7	52	34.57	4.35
1.265	30.2	53	35.14	4.44
1.270	30.6	54	35.71	4.54
1.275	31.1	55	36.29	4.62
1.280	31.5	56	36.87	4.72
1.285	32.0	57	37.45	4.81
1.290	32.4	58	38.03	4.90
1.295	32.8	59	38.61	5.00
1.300	33.3	60	39.19	5.09
1.305	33.7	61	39.77	5.19
1.310	34.2	62	40.35	5.28
1.315	34.6	63	40.93	5.38
1.320	35.0	64	41.50	5.48
1.325	35.4	65	42.08	5.57
1.330	35.8	66	42.66	5.67
1.335	36.2	67	43.20	5.77
1.340	36.6	68	43.74	5.86
1.345	37.0	69	44.28	5.96
1.350	37.4	70	44.82	6.05
1.355	37.8	71	45.35	6.14
1.360	38.2	72	45.88	6.24
1.365	38.6	73	46.41	6.33
1.370	39.0	74	46.94	6.43
1.375	39.4	75	47.47	6.53
1.380	39.8	76	48.00	6.62
1.385	40.1	77	48.53	6.72
1.390	40.5	78	49.06	6.82
1.395	40.8	79	49.59	6.92
1.400	41.2	80	50.11	7.02
1.405	41.6	81	50.63	7.11
1.410	42.0	82	51.15	7.21
1.415	42.3	83	51.66	7.30
1.420	42.7	84	52.15	7.40
1.425	43.1	85	52.63	7.50
1.430	43.4	86	53.11	7.59
1.435	43.8	87	53.59	7.69
1.440	44.1	88	54.07	7.79
1.445	44.4	89	54.55	7.89
1.450	44.8	90	55.03	7.98
1.455	45.1	91	55.50	8.08
1.460	45.4	92	55.97	8.17
1.465	45.8	93	56.43	8.27
1.470	46.1	94	56.90	8.37
1.475	46.4	95	57.37	8.46
1.480	46.8	96	57.83	8.56
1.485	47.1	97	58.28	8.65
1.490	47.4	98	58.74	8.76
1.495	47.8	99	59.22	8.85

(Continued).

Specific gravity at 60° F.	Degrees Beaumé	Degrees Twaddle	100 lbs. contain H ₂ SO ₄	1 gallon contains H ₂ SO ₄
			lbs.	lbs.
1.500	48.1	100	59.70	8.96
1.505	48.4	101	60.18	9.06
1.510	48.7	102	60.65	9.16
1.515	49.0	103	61.12	9.26
1.520	49.4	104	61.59	9.36
1.525	49.7	105	62.06	9.46
1.530	50.0	106	62.53	9.57
1.535	50.3	107	63.00	9.67
1.540	50.6	108	63.43	9.77
1.545	50.9	109	63.85	9.87
1.550	51.2	110	64.26	9.96
1.555	51.5	111	64.67	10.06
1.560	51.8	112	65.08	10.15
1.565	52.1	113	65.49	10.25
1.570	52.4	114	65.90	10.35
1.575	52.7	115	66.30	10.44
1.580	53.0	116	66.71	10.54
1.585	53.3	117	67.13	10.64
1.590	53.6	118	67.59	10.75
1.595	53.9	119	68.05	10.85
1.600	54.1	120	68.51	10.96
1.605	54.4	121	68.97	11.07
1.610	54.7	122	69.43	11.18
1.615	55.0	123	69.89	11.28
1.620	55.2	124	70.32	11.39
1.625	55.5	125	70.74	11.50
1.630	55.8	126	71.16	11.60
1.635	56.0	127	71.57	11.70
1.640	56.3	128	71.99	11.81
1.645	56.6	129	72.40	11.92
1.650	56.9	130	72.82	12.02
1.655	57.1	131	73.23	12.12
1.660	57.4	132	73.64	12.22
1.665	57.7	133	74.07	12.33
1.670	57.9	134	74.51	12.44
1.675	58.2	135	74.97	12.56
1.680	58.4	136	75.42	12.67
1.685	58.7	137	75.86	12.78
1.690	58.9	138	76.30	12.89
1.695	59.2	139	76.73	13.01
1.700	59.5	140	77.17	13.12
1.705	59.7	141	77.60	13.23
1.710	60.0	142	78.04	13.34
1.715	60.2	143	78.48	13.46
1.720	60.4	144	78.92	13.57
1.725	60.6	145	79.36	13.69
1.730	60.9	146	79.80	13.81
1.735	61.1	147	80.24	13.92
1.740	61.4	148	80.68	14.04
1.745	61.6	149	81.12	14.16
1.750	61.8	150	81.56	14.27

(Continued).

Specific gravity at 60° F.	Degrees Baumé	Degrees Twaddle	100 lbs. contain H ₂ SO ₄	1 gallon contains H ₂ SO ₄
			lbs.	lbs.
1-755	62-1	151	82-00	14-39
1-760	62-3	152	82-44	14-51
1-765	62-5	153	82-88	14-63
1-770	62-8	154	83-32	14-75
1-775	63-0	155	83-90	14-89
1-780	63-2	156	84-50	15-04
1-785	63-5	157	85-10	15-19
1-790	63-7	158	85-70	15-34
1-795	64-0	159	86-30	15-49
1-800	64-2	160	86-90	15-64
1-805	64-4	161	87-60	15-81
1-810	64-6	162	88-30	15-98
1-815	64-8	163	89-05	16-21
1-820	65-0	164	90-05	16-39
1-821			90-20	16-43
1-822	65-1		90-40	16-47
1-823			90-60	16-51
1-824	65-2		90-80	16-56
1-825		165	91-00	16-61
1-826	65-3		91-25	16-66
1-827			91-50	16-71
1-828	65-4		91-70	16-76
1-829			91-90	16-81
1-830		166	92-10	16-85
1-831	65-5		92-30	16-90
1-832			92-52	16-95
1-833	65-6		92-75	17-00
1-834			93-05	17-06
1-835	65-7	167	93-48	17-13
1-836			93-80	17-22
1-837			94-20	17-30
1-838	65-8		94-60	17-39
1-839			95-00	17-48
1-840	65-9	168	95-60	17-59
1-8405			95-95	17-65
1-8410			97-00	17-86
1-8415			97-70	17-99

Specific gravity
of acetic acid at 60° F. (Oudemans).

Specific gravity	Per-centage of C ₂ H ₄ O ₂	Specific gravity	Per-centage of C ₂ H ₄ O ₂	Specific gravity	Per-centage of C ₂ H ₄ O ₂
0.9992	0	1.0459	34	1.0725	68
1.0007	1	1.0470	35	1.0729	69
1.0022	2	1.0481	36	1.0733	70
1.0037	3	1.0492	37	1.0737	71
1.0052	4	1.0502	38	1.0740	72
1.0067	5	1.0513	39	1.0742	73
1.0083	6	1.0523	40	1.0744	74
1.0098	7	1.0523	41	1.0746	75
1.0113	8	1.0543	42	1.0747	76
1.0127	9	1.0552	43	1.0748	77
1.0142	10	1.0562	44	1.0748	78
1.0157	11	1.0571	45	1.0748	79
1.0171	12	1.0580	46	1.0748	80
1.0185	13	1.0589	47	1.0747	81
1.0200	14	1.0597	48	1.0746	82
1.0214	15	1.0607	49	1.0744	83
1.0228	16	1.0615	50	1.0742	84
1.0242	17	1.0623	51	1.0739	85
1.0256	18	1.0631	52	1.0736	86
1.0270	19	1.0638	53	1.0731	87
1.0284	20	1.0646	54	1.0726	88
1.0298	21	1.0653	55	1.0720	89
1.0311	22	1.0660	56	1.0713	90
1.0324	23	1.0666	57	1.0705	91
1.0337	24	1.0673	58	1.0696	92
1.0350	25	1.0679	59	1.0686	93
1.0363	26	1.0685	60	1.0674	94
1.0375	27	1.0691	61	1.0660	95
1.0388	28	1.0697	62	1.0644	96
1.0400	29	1.0702	63	1.0625	97
1.0412	30	1.0707	64	1.0604	98
1.0424	31	1.0712	65	1.0580	99
1.0436	32	1.0717	66	1.0553	100
1.0447	33	1.0721	67		

Note: The specific gravities above 1.0553 correspond to two solutions of quite different strengths. To determine whether a given acetic acid is above 78%, simply add a little water. If the S. G. rises then the acid was above 78%, and vice-versa.

Specific gravity
of formic acid at 70° F., compared with water at
40° F.

(Richardson and Allaire).

Specific gravity	Percentage by weight of CH ₂ O ₂	Percentage by volume of CH ₂ O ₂
0.9983	0	0.00
1.0020	1	0.82
1.0045	2	1.64
1.0071	3	2.48
1.0094	4	3.30
1.0116	5	4.14
1.0142	6	4.98
1.0171	7	5.81
1.0197	8	6.68
1.0222	9	7.55
1.0247	10	8.40
1.0371	15	12.80
1.0489	20	17.17
1.0610	25	21.73
1.0730	30	26.37
1.0848	35	31.10
1.0964	40	35.90
1.1086	45	40.82
1.1208	50	45.88
1.1321	55	51.01
1.1425	60	56.13
1.1544	65	61.44
1.1656	70	66.80
1.1770	75	72.27
1.1861	80	77.67
1.1954	85	83.19
1.2045	90	88.74
1.2141	95	94.48
1.2213	100	100.00

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