Pocket Manual

for

Dyers and Printers

on

the application of

The Coal-Tar Colours

of the

Farbwerke

vorm.

Meister Lucius & Brüning

Hoechst o/M.

1903.

Farbwerke vorm. Meister Lucius & Brüning
Hoechst o. M.

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The Coal Tar Colours.

Sole Agents for the U. S. A.

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PREFACE.

This work has been compiled for the use of our customers with the intention of serving as a handy reference book. It contains notes upon the application and characteristics of our products.

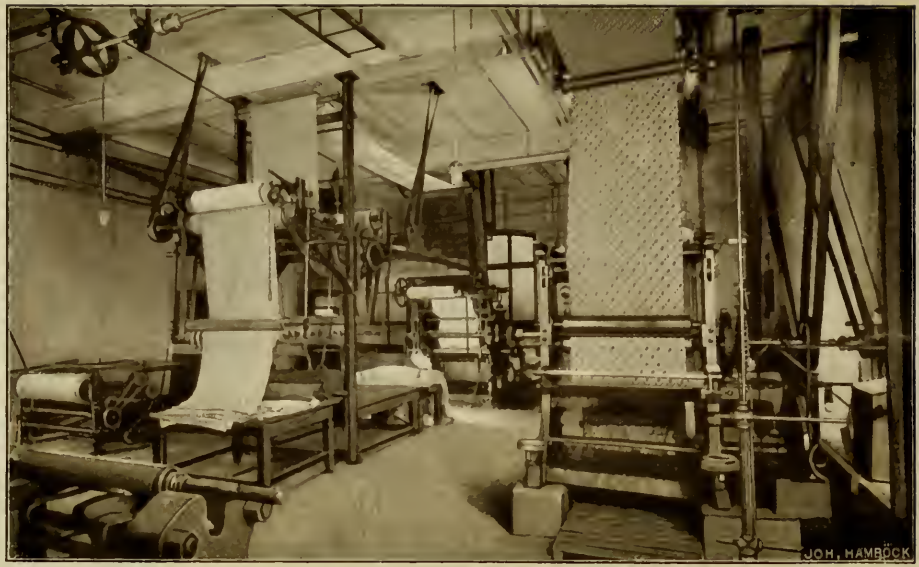
We have classified the contents, firstly, according to the different branches of the dyeing industries and, secondly, we have further subsidised the different headings as regards the employment and the properties of our colours.

This classification admits of quick information regarding the dyeing methods and fastness properties of each separate colour, and will also aid the dyer in his choice of dyestuffs, especially adapted to and suitable for a set purpose.

The manysidedness of the subject however, is so great that it is impossible to treat the different matter exhaustively or in detail, — and we can therefore scarcely warrant its exactness in every detail — but we hope at least that this book will serve the practical dyer as a guide and adviser when following his profession.

Dyehouse (exterior).

Dyehouse (interior).



Printing Department.

A. WOOL DYEING.

a) Wool Colours, classified according to modes of dyeing.

1. Wool Colours dyed in an acid bath.

The bath is prepared with 10% Glauber's salt and 4% sulphuric acid or 10% tartar substitute, and the necessary amounts of dyestuff; after entering the material, the temperature is raised to the boil and the dyeing operation finished by boiling for $^3/_4$ to $1^1/_2$ h. For dyestuffs which do not equalize well, more Glauber's salt and less or weaker acids are required.

Acid Magenta, all brands, **Acid Cerise** O, II, **Acid Maroon** O, **Maroon** S, **Orseilline** R, B.

Soluble Blue, all brands, **Bleu de Lyon**, all brands, **Guernsey Blue, Opal Blue, Blackley Blue**, all brands, **Cloth Blue** O, **Full Blue** O, **Navy Blue** V, **Opal Blue** superior (soluble) **Cotton Blue**, all brands, **Pure Blue**, all brands, **Cotton Lightblue** O soluble, **China Blue** R, 1, 2.

Acid Violet 3RA, 4RS, 3RS, II, R conc. new, N, 5BF, 5BFI, 7BN, **Neutral Violet** O.

Acid Green O, D, M, conc., conc. D, conc. M, II, **Acid Green** solution 5 times concentrated.

Patent Blue, all brands.

Cyanine B, B conc. patented.

Keton Blue 4BN solut, 4BN powder, pat.

Patent Green O, V, VS, patented.

Naphthalene Green V, conc., patented.

Naphthalene Blue B, B extra, D patented.

Indigo Substitute BS, B, WE, B extra, BS extra, pat., **Patent-Marine Blue** pat.

Acid Rosamine A pat., **Fast Acid Red** A pat., **Fast Acid Violet** B, R, A2R, pat., **Fast Acid Blue** R, R conc., pat., **Fast Acid Eosine** G, G extra pat., **Fast Acid Phloxine** A, A extra pat., **Fast Acid Magenta** G, G conc. pat.

Fastblue, all brands, **Black Blue** O, **Black-Black** O, **Fast-Darkblue** R, **Nigrosine** No. I, II, III, IV, A.

Azo Acid Magenta G, B, pat., **Azo Acid Carmine** B pat., **Alkali Fastred** R and B pat.

Chromotrope G, 2R, 2B, 6B, 7B, 8B, 10B pat.

Archil Substitute G pat., Amido Naphthol Red G, 6B.
Victoria Violet 4BS, 8BS pat., Azo Acid Blue B pat., Azo Acid Black, all brands.
Naphthol Black D, Azo Black O, Amido Naphthol Black 4B, 6B, 4B extra, S.
Chinoline Yellow O, extra.
Naphthol Yellow S, SE.
Azo Yellow conc., O, R, Victoria Yellow O, double, conc., Metanil Yellow extra.
Flavazine T, S, L.
Orange, all brands. Brilliant Orange G, O, R.
Solid Brown O, Yellow shade, NT, L, Azo Brown V, Naphthol Brown O.
Scarlet, all brands, Brilliant Lake Scarlet G, R, RR, Scarlet 6R cryst.
New Coccine O, Coccinine O, B.
Victoria Scarlet, all brands.
Brilliant Croceïne, all brands.
Rocceline N, Fastred all brands.
Brilliant Crimson O, B, Brilliant Rubine O, Victoria Rubine O, G.
Amaranth O, E.
Clothred O, Fast Claret Red O, Naphtho Rubine O, Naphthol Red O.
Claret Red, all brands.
Rosazeïne, all brands.
Red YB, Y, YG, Y2G pat.
Victoria Blue B.

2. Wool Colours dyed in an acid bath which excel as regards equalizing.

Patent Blue V, N, superior, L, G, B, J1, J2, J3, G conc., B conc., patented.
Cyanine B, B conc., pat.
Naphthalene Green V, conc., pat.
Keton Blue 4BN solution, 4BN powder, pat.
Fast Acid Eosine G, G extra, pat., Fast Acid Phloxine A, A extra, pat., Fast Acid Magenta G, G conc, pat.
Fast Acid Violet A2R, R, pat.
Chromotrope G, 2R, 2B, pat.
Azo Acid Magenta G, B, pat.
Amido Naphthol Red G, 6B.
Acid Violet N.
Chinoline Yellow O, extra.
Naphthol Yellow S, SE.
Flavazine S, L.
Azo Yellow conc., O, Victoria Yellow O, double, conc,
Orange G, No. 1, No. 2, No. 4, No. 4LL.
Brilliant Orange G, O.
Rosazeïne O, B, OG, B extra, G extra.
Victoria Blue B.

3. Colours dyed in an acid bath which are developed with bichrome.

The bath is prepared with 3–6 % sulphuric acid and 10—20 % Glauber's salt or 20 % tartar substitute and the necessary amounts of dyestuff; the material is entered at about 122° F, the temperature raised to the boil and boiling continued for 1 h.; then the bath is cooled down a little and the requisite amount of bichrome (3 %) added; the bath is again heated to the boil and the shade developed by ½ to 1 h's boiling. For Chromotrope FB, F4B, S, SR, Chrome Brown RO and BO, — 2 % sulphuric acid and 3 % lactic acid are added to the bath along with the bichrome to obtain shades fast to milling.

Chromogene I, pat.
Chromotrope G, 2R, 2B, 7B, 8B, 10B, S, SB, SR, FB, F4B, pat.
Chrome Brown RO, BO, pat.
Acid Alizarine Red G pat.
Acid Alizarine Grenade R.
Acid Alizarine Violet N.
Acid Alizarine Blue GR, BB, pat.
Acid Alizarine Green G pat.
Acid Alizarine Blue Black B pat.
Acid Alizarine Grey G pat.
Acid Alizarine Black R, 3B, 3B extra, pat.
Acid Alizarine Brown B.
Ceruleïne B paste, BWR pat.
Alizarine Red 1 WS.
Alizarine Orange N, R, P.
Alizarine Yellow GGW powder, GGW paste, pat., RW powder, RW paste.
Mordant Yellow O.
Chrome Black B, T, pat. (developed with bichromate of potash and copper sulphate).

3a. Acid Colours which may be used for shading off after chroming.

Patent Blue V, N, L, B, J1, J2, J3, G conc., B conc., A, A conc., patented.
Patent Green V, VS, pat.
Cyanine B, B conc., pat.
Naphthalene Green V, conc., pat.
Keton Blue 4BN solution, 4BN powder, pat.
Fast Acid Violet A2R, R pat., **Fast Acid Red A** pat.
Fast Acid Eosine G pat., **Fast Acid Phloxine** A pat.
Fast Acid Magenta G pat.
Acid Violet N, 5BF, 3RA, **Black Blue** O.
Chinoline Yellow O.

Flavazine L, S, T.
Azo Yellow O, conc., **Victoria Yellow** O., double, conc.
Orange G, No. 2, No. 4, No. 4 LL, **Brilliant Orange** G, O.
Amido Naphthol Red G, 6B.
Alkali Fastred R, B, pat.

4. Wool Colours dyed in an acid bath which may be developed with fluoride of chrome.

The bath is prepared with 4—6 % sulphuric acid and 10—20 % Glauber's salt or 10—15 % tartar substitute and the necessary amounts of dyestuff; the material is entered at 122° F, the bath heated to the boil and boiling continued for 1 h.; then the bath is cooled a little, and the requisite amount (3 %) of fluoride of chrome added, the temperature is again raised to the boil, and the shade developed by boiling for about 1 h.

Chromotrope G, 2R, 2B, 6B, 7B, 8B, 10B, pat.
Victoria Violet 4BS, 8BS, pat., **Azo Acid Blue** B pat.
Acid Alizarine Brown B.
Acid Alizarine Red G pat.
Acid Alizarine Grenade R.
Acid Alizarine Violet N.
Acid Alizarine Blue GR, BB, pat.
Acid Alizarine Dark Blue SN pat.
Acid Alizarine Green G pat.
Acid Alizarine Grey G pat.
Acid Alizarine Black R, 3B, 3B extra, T, SE paste, pat.
Ceruleïne B paste, BWR, pat.
Alizarine Red 1WS.
Alizarine Orange N, R, P.
Alizarine Yellow GGW powder, GGW paste pat.
Mordant Yellow O.

4a. Acid Colours which may be used for shading off after the addition of fluoride of chrome.

Patent Blue V, N, L, B, J1, J2, J3, G conc. B conc., A, A conc., pat.
Patent Green V, VS, pat.
Cyanine B, B conc., pat.
Naphthalene Green V, conc., pat.
Keton Blue 4BN solution and 4BN powder pat.
Fast Acid Violet A2 R, R pat., **Fast Acid Red** A pat.
Fast Acid Eosine G pat., **Fast Acid Phloxine** A pat.
Fast Acid Magenta G pat,
Acid Violet N, 5BF, 3RA, **Blackblue** O.
Chinoline Yellow O.

Flavazine S, L, T.
Azo Yellow O, conc., **Victoria Yellow** O, double conc.
Orange G, No. 2, No. 4, No. 4 LL, **Brilliant Orange** G and O.
Amido Naphthol Red G, 6B.
Alkali Fast Red R, B, pat.

5. Wool Colours dyed in an acid bath which may be developed with alum.

The bath is prepared with 3 to 4% sulphuric acid and 10% Glauber's salt and the necessary amounts of dyestuff; the material is entered at 122° F, the bath heated to the boil and boiling continued for 1 h.; then according to the depth of the shade 5 to 10% alum (free from iron) are added to the bath, and the shade developed by boiling for about 1 h.

Chromotrope G, 2R. 2B, 6B, 7B, 8B, 10B, pat.
Victoria Violet 4BS, 8BS, pat., **Azo Acid Blue** B pat.
Alizarine Red 1WS.
Alizarine Orange N, R, P.
Alizarine Yellow GGW powder, GGW paste pat.

5a. Acid Colours which may be used for shading off after developing with alum.

Patent Blue V, N, L, B, J1, J2, J3, G conc., B conc., A, A conc., pat.
Patent Green V, VS, pat.
Cyanine B, B conc., pat.
Naphthalene Green V, conc., pat.
Keton Blue 4BN solution, 4BN powder, pat.
Fast Acid Violet A2R, R pat., **Fast Acid Eosine** G pat., **Fast Acid Phloxine** A pat., **Fast Acid Magenta** G pat.
Rosazeine O, B, OG, extra, B extra, G extra.
Acid Violet N, 5BF, 3RA.
Chinoline Yellow O.
Flavazine S, L, T,
Azo Yellow O, conc., **Victoria Yellow**, O, double, conc.
Orange G, No. 2, No. 4, No. 4 LL, **Brilliant Orange** G, O.
Scarlet B extra, **Scarlet** R, 2R, 3R.
Alkali Fast Red R, B pat.
Amido Naphthol Red G, 6B.

6. Wool Colours dyed in an acid bath and developed with copper sulphate.

The bath is prepared with 30% Glauber's salt and 2—4% sulphuric acid or 20% Glauber's salt and 10% tartar substitute

and the necessary amounts of dyestuff: the material is entered at about 100° F, the bath slowly heated to the boil and boiling continued for 1 h; after cooling the bath a little, the necessary amounts of copper sulphate (1—3%) are added and the shade developed by boiling for another ½ h. In many cases the copper sulphate may be added to the bath at the beginning of the dyeing operation.

Copper Red N.
,, **Blue** B, B extra, pat.
,, **Black** S pat.
Chrome Black B, T, pat. (devel. with Chrome and Copper).

6a. Acid Colours which may be used for shading off after the addition of copper sulphate.

Patent Blue V, N, L, B, J1, J2, J3, G conc., B conc., A, A conc., pat.
Patent Green V, VS, pat.
Cyanine B, B conc., pat.
Naphthalene Green V, conc., pat.
Keton Blue 4BN solution, 4BN powder, pat.
Fast Acid Violet A 2R, R, pat,, **Fast Acid Red** A pat.
Fast Acid Eosine G pat., **Fast Acid Phloxine** A pat., **Fast Acid Magenta** G pat.
Acid Violet N, 5BF, 3RA.
Chinoline Yellow O.
Flavazine S, L, T.
Azo Yellow O, conc., **Victoria Yellow** O, double, conc.
Orange G, No. 2, No. 4, No. 4LL, **Brilliant Orange** G, O.
Alkali Fast Red R, B, pat.
Amido Naphthol Red G, 6B.

7. Wool Colours dyeing upon alum mordant.

Mordanting: The bath is prepared:

for dark shades with 3% tartar, 2% oxalic acid, 10% alum,
for light shades with 1½% ,, 1% ,, ,, 5% ,,

the material is boiled for 1½ h whilst worked continuously, then rinsed and dyed.

Dyebath: For all dyestuffs stated below (with the exception of the different brands of Ceruleine, Alizarine Red 1WS, and Alizarine Yellow GGW, which are dyed with acetic acid) the bath is prepared with 2½% acetate of lime, 2% tannin, and the necessary amount of dyestuff which is previously stirred up and diluted with water. The material is entered, the bath gradually heated to the boil (within 1 h), and boiling continued for about 1½ h; then the material is rinsed and dried.

Alizarine Red all brands in paste and powder.
Alizarine Orange N, R, P, NL in paste and powder.
Cerulein conc., paste A, paste SW, S, S conc.
Alizarine Brown R, S, RD, N, G, F, H, 1424, 1258.
Alizarine Yellow GGW, paste and GGW powder, pat.

8. Wool Colours dyeing upon chrome mordant.

a) Ordinary method:

Mordanting: The bath is prepared with:

3 % bichrome
2½ % tartar
or
3 % bichrome
1 % sulphuric acid
or
2 % bichrome
3 % lactic acid
1 % sulphuric acid

for hard water about 5 % acetic acid 12° Tw. are added. The material is entered at about 158° F, and the bath heated to the boil (if lactic acid is used, the temperature must be raised slowly), and boiling continued for about 1½ h. Before starting the dyeing operation, the material is slightly rinsed.

Dyebath: The bath is neutralized with 2 to 10 % acetic acid 12° Tw. according to the degree of hardness of the water and the nature of the dyestuffs used; the material is entered into the cold bath, the temperature raised to the boil within 1 h, and boiling continued for 1½—2 h.

Piece goods, which are dyed through with difficulty, also hats etc., are dyed with the addition of 5 % acetate of ammonia at the boil for ½—¾ h; then the necessary amount of acetic acid is added to the bath.

b) Method for dyeing in mechanical dyeing apparatus.

Mordanting: The bath is prepared with 5 % tartar and 8 % alum, the material is boiled for 1½ h, whilst continuously worked, and then slightly rinsed.

Dyebath: The bath is prepared with the necessary amounts of dyestuff, which is previously stirred up and diluted with water, and then added to the bath through a fine sieve, — also 2 to 3 % ammonia is added, then the apparatus for circulating the dye liquid is set in motion and the temperature raised to the boil; after 1 h's boiling acetic acid is gradually added and boiling continued until the dyestuff is fixed.

c) One bath method:

The bath is prepared with 1½ % bichrome, 3 % lactic acid, and 1 % sulphuric acid; the material is entered at about 158° F. the temperature raised to the boil (within ½ h), and boiling continued for 1 h; then the bath is cooled to about 122° F, and some

ammonia added until the dye liquid is neutral; the requisite amounts of dyestuff are then added, and the bath heated to the boil; after ½ h's boiling some acetic acid is given into the bath and boiling continued until the dyebath is exhausted.

Alizarine Red, all brands in paste and powder.
Alizarine Orange N, R, P, NL in paste and powder.
Alizarine Brown, all brands in paste and powder.
Alizarine Blue DN, DNW, F, R, RR, A, B, 942, 942G.
Alizarine Darkblue S, SV.
Alizarine Blue SB, SBW, SR, SRW, SBR, S2R.
Alizarine Claret R paste.
Alizarine Green S paste.
Alizarine Yellow paste.
Ceruleïne paste B, BW conc., BWR powder pat.
Ceruleïne conc., W powder, paste A, paste SW, S, S conc.
Galleïne conc., W powder, R conc. powder, paste A, R, R double.
Alizarine Yellow GGW powder and GGW paste, pat.
Mordant Yellow O.

8a. Acid colours which are suitable for shading off at the boil upon material which was previously mordanted.

Patent Blue A pat.
Naphthalene Green V, conc., pat.
Fast Acid Blue R, R conc., pat.
Fast Acid Violet A2R, R, B, pat,, **Fast Acid Magenta** G pat., **Fast Acid Eosine** G pat., **Fast Acid Phloxine** A pat.
Acid Violet N, 5BF, 3RA.
Flavazine S, L, T.
Azo Yellow O, conc.
Victoria Yellow O, double, conc.
Orange No. 2, No. 4, No. 4LL.
Brilliant Orange G, O, R.
Alkali Fast Red R. B pat.
Amido Naphthol Red G, 6B.

9. Wool Colours which dye wool in a soap bath.

The bath is prepared with 5% Olive Oil and the solutions of the requisite amounts of dyestuff; the material is dyed at 122—140° F for about 1 h; after dyeing the material is hydroextracted and finally stoved.

Magenta, all brands.
New Magenta O pat.
Methyl Violet, all brands.

Victoria Blue B.
Methylene Blue and **Marine Blue**, all brands.
Brilliant Green, all brands.
Auramine, patented, all brands,
Safranine and **Methylene Violet**, all brands.
Rosolane O, T, R paste, B paste, pat.
Rosazeïne O, B, OG, extra, B extra, G extra.

10. Wool Colours which dye wool in a neutral bath, without any addition.

After adding some acetic acid to the bath in order to counteract carbonates of lime and magnesia, often present in the water, the colours are added, after previously diluting the dyestuff-solutions with water, and the material dyed at about 176—194° F.

Magenta, all brands, **New Magenta** O pat., **Cerise** G, R.
Grenadine, all brands, **Maroon** O, extra, **Cardinal** R, G.
Phosphine, all brands.
Brilliant Green and **Malachite Green**, all brands.
Methyl Violet, all brands, **Violet Crystals** O.
Vesuvine, all brands, **Chrysoidine** A cryst., C cryst.
Auramine conc., O, I, II, pat.
Azo Phosphine GO, BRO, pat.
Victoria Blue B.
Rosolane, all brands, pat.

11. Wool Colours which dye in an alkaline bath.

The bath is prepared with 5—10% Borax and the necessary amounts of dyestuff solution; the material is entered, the temperature raised to the boil and boiling continued for ¾—1 h. Then the goods are well rinsed and finally „soured" in a bath containing about 5% Sulphuric Acid, by working them for ¼ h at 84—147° F. Instead of Sulphuric Acid, Alum or Perchloride of Tin may be used for „souring", which increases the fastness to milling.

Alkaline Blue, all brands.
Methyl Alkaline Blue MLB.
Alkaline Violet O.

12. Wool Colours which dye in an acetic acid bath.

The bath is prepared with 10% acetic acid 12° Tw., 10% acetate o soda, and the necessary amount of dyestuff; the material is

entered into the cold bath, the bath heated to 176° F (within ½ h), and the dyeing operation finished in about 1 h.

Eosine, all brands.
Erythrosine, all brands.
Phloxine, all brands.
Rose Bengale, all brands.

13. Wool Colours for Vat dyeing.

Indigo paste or powder is dyed in the Fermentation or Hydrosulphite Vat in exactly the same manner as the natural product. Indigo MLB Vat I is dyed in a Hydrosulphite Vat according to our own process, which is protected by patent:

a. Preparing the vat.

The cistern is filled with water of 105—115° F; ammonia is added until a slight alkaline reaction is noticeable and then the following ingredients are one by one poured into the vat containing about 300 gall.

1) 1 Gall. Glue solution 1:10.
2) 1—1½ Gall. Hydrosulphite.
3) ½—1 Gall. Indigo MLB Vat I (according to the depth of shade required).

If properly prepared the vat will show a green-yellowish appearance.

b. The dyeing of loose wool in an open vessel.

After preparing (setting) the vat, it is stirred a few times and the well wetted wool (about 60 lbs.) entered. Two men must move the wool slowly about, under the surface of the liquid for 15—20 min. Then it is taken out and well squeezed through a wringing apparatus attached to the cistern, and allowed to oxidise in the air; then it is put back into the vat without any more Indigo being added and treated as before.

If a very dark blue is required 1—2 pints of Bisulphite 72° Tw. diluted with water must be gradually sprinkled over the wool and the latter manipulated as before

For further dyeing operations the vat must be neutralized in case Bisulphite has been added, but for very dark shades, which require considerable additions of Indigo MLB Vat I it is not absolutely necessary to neutralize the liquid beforehand.

c. The dyeing of slubbing in a mechanical apparatus.

After preparing the vat, about 100—200 lbs. of slubbing are put into the apparatus and the latter set in motion. After 5—10 min some Bisulphite, diluted with equal parts of water, is gradually

added through a dripping funnel, until the vat shows a slight acid reaction (Phenolphtaleine-Test.)

After about 15 min the apparatus is emptied and the slubbing then oxidised by treating it with cold water.

d. The dyeing of yarn in an open vessel.

This dyeing operation is only distinguished from the dyeing of loose wool by the difference in handling. A sufficiently deep yarn dyeing-cistern is used as a vessel. The yarns are hung on cords, or better still on bent ⌐└┘⌐ shaped iron rods and moved about under the liquid. Light and medium shades are dyed like loose wool in a slightly alkaline vat; for dark blues, Bisulphite is added for the second dip just before the material is entered. Whenever a darker shade is required it is always advisable to give two dips on account of the better equalization.

e. The dyeing of piece goods.

The dyeing of piece goods is best carried out in cisterns which contain an arrangement, by means of which the pieces pass over indiarubber rollers underneath the surface of the vat. Before dyeing the goods are well moistened, preferably on a „washer", then hydroextracted and then entered into the vat and worked according to quantity and depth of shade required for 15—30 min. Then the pieces are taken out, squeezed through a broad-squeezing machine (wringer) and oxidised in the air by plating down, or by treating with cold water.

As is the case in dyeing loose wool and yarns, two dips are usually given and for very dark blues Bisulphite is added to the vat before the second dip, until the liquid reacts slightly acid.

Indigo MLB powder, pat.		
„ MLB extra (99—100%), pat.	suitable for Hydrosulphite	
„ MLB Vat I 20%, pat.	Vats	
„ **White** MLB 40%, pat.		
„ MLB/G powder, pat.	suitable for Hydrosulphite and	
„ MLB paste 20%, pat.	Fermentation Vats.	

14. Wool Colours which can only be dyed in copper vessels, if additions of sulphocyanide salts are made.

Naphthalene Blue B, B extra, D pat.
Victoria Violet 4BS, 8BS, pat., **Azo Acid Blue** B pat.
Azo Acid Black pat., all brands.
Chromotrope FB, F4B, pat.
Acid Aliz. Black R, 3B. 3B extra, T pat.
Acid. Aliz. Blue BB, GR, pat.
Acid. Aliz. Dark Blue SN pat.
Acid Aliz. Green G, pat.
Acid Aliz. Blueblack B pat.

15. Wool Colours, especially suitable for dyeing in a mechanical dyeing apparatus.

Indigo MLB Vat. I 20%, pat.
Indigo White MLB 40%, pat.
Chromogen I, pat.
Chromotrope FB, F4B, S, SB, SR, pat.
Acid Alizarine Red G pat.
Acid Alizarine Grenade R.
Acid Alizarine Violet N.
Acid Alizarine Blue BB, pat.
Acid Alizarine Blue Black B pat.
Acid Alizarine Green G pat.
Acid Alizarine Grey G pat.
Acid Alizarine Black R, 3B, 3B extra, T pat.
Acid Alizarine Brown B.
Alizarine Yellow GGW pat., **Mordant Yellow** O.
Chrome Black B, T, pat.
Alizarine Red, all brands.
Alizarine Orange, all brands.
Alizarine Brown, all brands.
Alizarine Blue „S" brands, DNW.
Alizarine Claret R paste.
Patentblue A pat.
Fast Acid Violet A2R, pat., **Fast Acid Blue** R pat.
Flavazine S, L, T, **Amido Naphthol Red** G, 6B, and most Acid dyestuffs.

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b) Wool Colours classified according to specific properties.

1. Wool Colours which may be dissolved in the acidified dye liquid without any danger of spots etc.

Patent Blue V, N, superior, L, G conc., patented.
Cyanine B, B conc., pat., **Keton Blue** 4BN, solution, powder, pat.
Naphthalene Green V, conc., pat.
Naphthalene Blue B, B extra pat.
Victoria Violet 4BS, 8BS, pat.
Azo Acid Blue B pat.

Chromotrope 2R, 6B pat.
Amido Naphthol Red G, 6B.
Orange G.
Flavazine T.
Chinoline Yellow O.

2. Wool Colours which must not be dissolved in the acidified dye liquid.

Soluble Blue, Bleu de Lyon. Blackley Blue, Guernseyblue Opalblue, all brands.
Cloth Blue O, **Full Blue** O.
Alkaline Blue, all brands.
Cotton Blue, Pure Blue, all brands.
Acid Violet R, conc. new, N, 5BF, 5BFI, 7BN, **Neutral Violet** O.
Fastblue, all brands, **Blackblue** O.
Nigrosine, all brands.
Rocceline N, **Fastred** O.
Fast Acid Violet A2R, R, B, pat., **Fast Acid Blue** R, R conc., pat., **Acid Rosamine** A pat.
Alizarine Yellow GGW, powder pat.
Alizarine Brown, all powder brands.
Galleïne conc., W powder, R conc. powder.
Ceruleine conc., BW conc., BWR conc., pat.

3. Wool Colours, which leave cotton white.

Acid Magenta, all brands, **Acid Violet** 4RS, 3RS.
Acid Green, all brands.
Patent Blue V, N, L, LL, superior pat., **Cyanine** B pat., **Keton Blue** 4BN pat.
Naphthalene Green V, conc., pat., **Naphthalene Blue** B, B extra pat.
Chinoline Yellow O, extra.
Naphthol Yellow S, SE.
Flavazine T.
Orange G.
Scarlet R, 2R, 3R, 4R, 5R, 6R, **Scarlet** 6R cryst.
Victoria Rubine O, G, **Naphthol Red** O.
Victoria Scarlet 2R, 3R, 4R, 5R, 6R, **New Coccine** O.
Archil Substitute G pat.
Alkali Fast Red R pat., **Azo Acid Carmine** B pat.
Azo Acid Magenta G, B pat., **Amido Naphthol Red** G, 6B.
Chromotrope G, 2R, 2B, 6B, 8B, 10B pat.
Victoria Violet 4BS, 8BS, pat., **Azo Acid Blue** B pat.
Azo Acid Black B, G, 3BL, 3BL extra, BL, GL, TL conc., TL extra pat.
Acid Aliz. Blue BB pat.

Acid Aliz. Green G pat.
Mordant Yellow O.
Aliz. Red 1 WS.
Chromogen I pat.
Chromotrope FB, F4B, 8B, 10B, S, pat.

4. Wool Colours of great fastness to light.

Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Alizarine Yellow paste.
Alizarine Yellow GGW powder, GGW paste, pat.
Mordant Yellow O.
Alizarine Orange, all brands.
Alizarine Red 1 WS powder, 1 W, 4 FW.
Alizarine Claret R paste.
Alizarine Blue, all brands.
Alizarine Brown, all brands.
Ceruleine, all brands.
Chromotrop FB, F4B, S, SB, SR, pat.
Acid Alizarine Black R, 3B, 3B extra, T, SE paste pat.
Acid Alizarine Brown B.
Acid Alizarine Red G pat.
Acid Alizarine Grenade R.
Acid Alizarine Violet N.
Acid Alizarine Blue BB, GR, pat., Acid. Aliz. Darkblue SN pat.
Acid Alizarine Grey G pat.
Acid Alizarine Blueblack B, pat.
Chromogen I pat.
Flavazine L.
Brilliant Croceïne yellow shade, blue shade.
Cloth Red O, Fast Claret Red O.
Alkali Fastred R, B, pat., Azo Acid Carmine B pat.
Chromotrope 2R pat., Amido Naphthol Red G, 6B.
Azo Acid Magenta B, G, pat.
Fast Acid Violet R, A2R pat.

5. Wool Colours fast to stoving.

Auramine, all brands.
Phosphine, all brands.
Magenta, all brands, New Magenta O pat.
Methyl Violet, all brands, Violet crystals O.
Victoria Blue B.
Brilliant Green, all brands.
Rosazeïne, all brands.
Eosine, all brands, Erythrosine, all brands, Phloxine, all brands, Rose Bengale, all brands.
Fast Acid Eosine G pat., Fast Acid Phloxine A pat., Fast Acid Magenta G pat.

Acid Rosamine A pat., **Fast Acid Red** A pat.
Fast Acid Violet A 2R, R, B, pat., **Fast Acid Blue** R, R conc., pat.
Acid Violet N, 5BF, 5BFI, 7BN, **Neutral Violet** O.
Patent Blue, all brands, pat., **Cyanine** B, B conc., pat.
Keton Blue 4BN solution, 4BN powder, pat., **Patentgreen** VS pat.
Fastblue, all brands, **Blackblue** O, **Black Black** O, **Fast Darkblue** R.
Chinoline Yellow O.
Naphthol Yellow S, SE.
Flavazine S, L, T.
Azo Yellow O, conc., **Victoria Yellow** O, double, conc.
Orange G, R, No. 1, No. 2, No. 4, No. 4 LL, **Brilliant Orange** G, O, R.
Scarlet GG, G, GRII, R, RR, 3R, 3R superior, 4R.
Brilliant Rubine O, **Brilliant Crimson** O, B.
Alkali Fastred R, B, pat., **Azo Acid Carmine** B pat.
Azo Acid Magenta G, B, pat., **Archil Substitute** G pat.
Amido Naphthol Red G, 6B.
Chromotrope G, 2R, 2B, 6B, 8B, 10B pat.
Victoria Violet 4BS, 8BS, pat, **Azo Acid Blue** B pat.
Azo Acid Black, all brands, pat.
Chromotrope S, SB, SR, pat.
Chromotrope FB, F4B, 8B. 10B, pat.
Chrome Brown RO, BO, pat.
Chrome Black B, T, pat.
Acid Alizarine Black R, 3B, 3B extra, T, SE paste, pat.
Acid Alizarine Blueblack B pat.
Acid Alizarine Grey G pat.
Acid Alizarine Brown B, D.
Acid Alizarine Grenade R.
Acid Alizarine Red G pat.
Acid Alizarine Violet N.
Acid Alizarine Blue BB, GR, pat.
Acid Alizarine Darkblue SN pat.
Acid Alizarine Green G pat.
Alizarine Yellow GGW, powder, GGW paste, pat.
Alizarine Red 1WS (developed with Chrome).
Alizarine Claret R paste.
Alizarine Blue, all brands.
Ceruleïne paste A, SW, B pat.
Indigo MLB powder, pat.
Indigo MLB extra (99—100 %), pat.
Indigo MLB G powder, pat.
Indigo MLB paste 20 %, pat.
Indigo MLB Vat I 20 %, pat.
Indigo White MLB 40 %, pat.

6. Wool Colours fast to boiling in acids.

Chromogen I pat.
Copper Blue B extra pat.
Acid Alizarine Black SE paste pat.
Alizarine Blue, all brands.

Ceruleïne paste A, SW paste, S, conc.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

7. Wool Colours of great fastness to washing.

Methyl-Violet, all blue brands, 2B, 3B etc.
Violet cryst. O.
Victoria Blue B.
Rosazeine, all brands.
Eosine, all brands, **Erythrosine**, all brands, **Phloxine**, all brands, **Rose Bengale**, all brands.
Fast Acid Eosine G pat., **Fast Acid Phloxine** A pat., **Fast Acid Magenta** G pat.
Acid Rosamine A pat., **Fast Acid Violet** A2R, R, B, pat.
Fast Acid Blue R, R conc., pat.
Acid Violet N, 5BF, 5BFI, **Neutral Violet** O.
Patent Blue all brands pat., **Cyanine** B, pat.
Keton Blue 4BN solution, 4BN powder, pat.
Indigo Substitute WE pat.
NaphthaleneGreenV, conc.pat., **Naphthalene Blue** B, B extr., pat.
Fastblue, all brands.
Chrysoïne G.
Scarlet R, 2R, 3R, 3R superior, 4R, 5R.
Scarlet B extra, **Clothred** O, **Fast Claret Red** O.
Azo Acid Carmine B pat.
Victoria Violet 4BS, 8BS, pat., **Azo Acid Blue** B pat.
Chromotrope 2B, 7B, 8B, 10B pat. (devel. with Chrome),
Chromotrope S, SB, SR, FB, F4B pat.
Chromogen I pat., **Chrome Brown** RO, BO pat.
Chrome Black B, T, pat,
Copper Blue B, B extra, pat., **Copper Black** S pat., **Copper Red** N.
Acid Alizarine Black R, 3B, 3B extra, T, SE pasie pat.
Acid Alizarine Blueblack B pat.
Acid Alizarine Grey G pat.
Acid Alizarine Brown B.
Acid Alizarine Red G pat.
Acid Alizarine Violet N.
Acid Alizarine Grenade R.
Acid Alizarine Blue BB, GR, pat.
Acid Alizarine Darkblue SN pat.
Acid Alizarine Green G pat.
Alizarine Yellow GGW, RW, pat.
Mordant Yellow O.
Alizarine Yellow paste.
Alizarine Orange, all brands.
Alizarine Red, all brands.
Alizarine Claret R paste, **Alizarine Brown**, all brands.

Alizarine Blue, all brands, **Alizarine Darkblue** S paste.
Alizarine Green S paste, pat.
Galleïne, all brands, **Ceruleïne**, all brands.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

8. Wool Colours which are not acted upon by street dirt.

Phosphine, all brands.
Magenta, Cerise, Grenadine, all brands, **Maroon** O, extra, **New Magenta** O pat.
Methyl Violet, all brands, **Violet crystals** O.
Victoria Blue B.
Rosazeïne, all brands.
Eosine, all brands, **Erythrosine**, all brands, **Phloxine** all brands, **Rose Bengale**, all brands.
Fast Acid Red A pat., **Fast Acid Magenta** G pat.
Acid Rosamine A pat., **Fast Acid Violet** A 2 R, R, B, pat.
Fast Acid Blue R, R conc., pat.
Acid Violet N, 5 BF, 5 BFI, **Neutral Violet** O.
Patent Blue, all brands, **Patent Green** V, VS, pat., **Indigo Substitute** B, BS, BS extra, WE, pat.
Cyanine B, B conc., pat.
Keton Blue 4 BN solution, 4 BN powder, pat.
Naphthalene Green V, conc., pat., **Naphthalene Blue** B, B extra, pat.
Fast Blueblack O, **Fast Darkblue** R, **Black Black** O.
Chinoline Yellow O, **Naphthol Yellow** S, SE.
Flavazine S, L, T.
Azo Yellow O, conc., R, **Chrysoine** G, **Victoria Yellow** O, double, conc.
Orange G, R, No. 1, No. 2, No. 4, No. 4 LL, **Brilliant Orange** G, O, R.
Scarlet GG, G, GR, R, RR, 3 R, 3 R superior, 4 R, 5 R, 6 R. **Scarlet** 6 R cryst.
Victoria Scarlet, all brands, **Scarlet** B extra.
Brilliant Croceïne and **Paper Scarlet**, all brands.
Coccinine O, B, **New Coccine** O.
Victoria Rubine O, G, **Brilliant Rubine** O, **Brilliant Crimson** O, B.
Rocceline N, **Fast Red**, all brands, **Amaranth**, all brands.
Claret Red, all brands, **Naphthol Red** O, **Naphtho Rubine** O.
Cloth Red O, **Fast Claret Red** O, **Solid Brown** O.
Azo Acid Carmine B pat., **Alkali Fast Red** R, B, pat.
Azo Acid Magenta G, B pat.
Amido Naphthol Red G, 6 B.

Victoria Violet 4BS, 8BS, pat., **Azo Acid Blue** B pat., **Azo Acid Black**, all brands, pat.
Amido Naphthol Black 4B, 4B extra, 6B, S.
Chromotrope 2B, 7B, 8B, 10B (developed with bichrome).
Chromotrope FB, F4B, S, SB, SR, pat.
Chromogen I pat., **Chrome Brown** RO, BO, pat.
Chrome Black B, T pat.
Copper Blue B extra pat.
Copper Red N.
Acid Alizarine Black R, 3B, 3B extra, T, SE paste, pat.
Acid Alizarine Grey G pat.
Acid Alizarine Blueblack B pat.
Acid Alizarine Brown B.
Acid Alizarine Grenade R.
Acid Alizarine Blue BB pat., (developed with bichrome).
Acid Alizarine Darkblue SN, pat.
Acid Alizarine Red G pat.
Acid Alizarine Violet N.
Acid Alizarine Green G pat.
Alizarine Yellow GGW, RW, pat. **Mordant Yellow** O.
Alizarine Yellow paste.
Alizarine Orange, all brands, **Alizarine Red**, all brands.
Alizarine Grenade R paste, **Alizarine Brown**, all brands.
Alizarine Blue, all brands, **Alizarine Darkblue** S paste,
Alizarine Green S paste pat.
Galleïne, all brands.
Ceruleïne, all brands.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat. I 20%, pat.
Indigo White MLB 40%, pat.

9. Wool Colours suitable for milling in cold water.

Eosine, all brands, **Erythrosine**, all brands, **Phloxine**, all brands, **Rose Bengale**, all brands.
Fast Acid Violet B, R, A2R, pat., **Acid Rosamine** A pat., **Fast Acid Blue** R, R conc., pat.
Acid Violet 7BN, 5BF, 5BFI.
Alkaline Blue, all brands.
Patent Blue A, AJ1, pat., **Indigo Substitute** WE pat.
Naphthalene Blue B, B extra, pat.
Flavazine T.
Scarlet R, 2R, 3R, 4R, 5R, 6R.
Scarlet 6R crystals, **Scarlet** B extra.
Victoria Scarlet RR, 2RB, 3R, 4R, 5R, 6R, RX, 2RX, 3RX.
Brilliant Croceïne and **Paper Scarlet**, all brands.
New Coccine O, **Coccinine** O, B.

Victoria Rubine O, **Naphthol Red** O, **Amaranth**, all brands.
Claret Red, all brands, **Cloth Red** O, **Fast Claret Red** O.
Azo Acid Carmine B pat., **Alkali Fast Red** R, B pat.
Victoria Violet 4BS, 8BS, pat., **Azo Acid Blue** B pat.
Copper Blue B, B extra, pat., **Copper Red** N.
Copper Black S pat.
Amido Naphthol Black 4B, 4B extra, 6B, S.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
All **Alizarine-Mordant-, Chrome developing-** and **Acid Aliz.-Colours.**

10. Wool Colours suitable for light milling in soap.

Magenta, all brands.
Methyl Violet, all brands, **Violet crystals** O.
Victoria Blue B.
Rosazeïne, all brands.
Eosine, all brands, **Erythrosine**, all brands, **Phloxine**, all brands, **Rose Bengale**, all brands.
Fast Acid Eosine G pat., **Fast Acid Phloxine** A pat., **Fast Acid Magenta** G pat.
Acid Rosamine A pat., **Fast Acid Violet** A2R, R, B, pat., **Fast Acid Blue** R, R conc., pat.
Acid Violet N, 5BF, 5BFI, **Neutral Violet** O.
Alkaline Blue, all brands
Patent Blue, all brands, **Cyanine**, B, B conc., pat.
Keton Blue 4BN pat.
Indigo Substitute WE pat.
Naphthalene Green V, conc., pat., **Naphthalene Blue** B, B extra, pat.
Fastblue, all brands.
Chinoline Yellow O.
Flavazine T.
Scarlet R, RR, 3R, 4R, 5R, 6R, B extra.
Brilliant Croceïne, Paper Scarlet, all brands.
Fastred O, S, **Cloth Red** O, **Fast Claret Red** O, **Claret Red** R, R extra.
Azo Acid Carmine B pat.
Copper Blue B, B extra, pat., **Copper Red** N, **Copper Black** S pat.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
All **Alizarine-, Mordant-, Chrome developing-** and **Acid Aliz.-Colours.**

11. Wool Colours suitable for the ordinary milling process.

Fast Acid Violet A2R, R pat.
Acid Rosamine A pat.,
Fast Acid Blue R, R conc., pat.
Acid Violet 5BF, 5BFI.
Patent Blue A pat.
} after-treated with Bichrome or as shading-off-colours in small quantities.

Chromotrope FB, F4B, S, SR, pat. (with Lactic Acid).
Chrome Brown RO, BO, pat. (with Lactic Acid).
Chromogen I pat.
Chrome Black B, T pat.
Acid Alizarine Black R, 3B, 3B extra, T, SE paste, pat.
Acid Alizarine Blue Black B pat., **Acid Aliz. Grey** G pat.
Acid Alizarine Brown B, **Acid Aliz. Grenade** R.
Acid Alizarine Blue BB, GR, pat. (devel. with Bichromate of potash).
Acid Alizarine Green G pat.
Alizarine Yellow paste.
Alizarine Yellow GGW, RW, pat., **Mordant Yellow** O.
Alizarine Orange, all brands. **Aliz. Red**, all brands.
Alizarine Claret R paste, **Aliz. Brown**, all brands.
Alizarine Blue, all brands, **Aliz. Darkblue** S paste.
Alizarine Green S paste pat.
Galleïne, all brands. **Ceruleïne**, all brands.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

12. Wool Colours suitable for very severe milling.

Alizarine Yellow paste.
Alizarine Orange, all brands.
Alizarine Red, all brands.
Alizarine Claret R paste.
Alizarine Brown, all brands.
Alizarine Blue, all brands.
Alizarine Darkblue S paste.
Galleïne, all brands.
Ceruleine, all brands.
Alizarine Green S paste pat.
Chromogen I pat.
Acid Alizarine Black SE paste, pat.
Acid Alizarine Blueblack B pat., **Acid Aliz. Grey** G pat.
Acid Alizarine Brown B.
Acid Alizarine Grenade R, **Acid Alizarine Red** G pat., **Acid Alizarine Violet** N.

Alizarine Yellow GGW pat., **Mordant Yellow** O.
Indigo MLB powder, pat.
Indigo MLB extra (99—100), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

13. Wool Colours which stand dry steaming.

All Dystuffs with exception of: **Auramine, Acid Magenta, Acid Violet** 4RS, 3RS, 1I, R conc., new., **Alkaline Blue, Soluble Blue, Cotton Blue, Malachite Green, Brilliant-Green, Acid Green, Azo Yellow, Scarlet** 5R, B extra, **Brilliant Croceïne, Paper Scarlet, Chromotrope** 7B, 2B, pat.

14. Wool Colours which stand wet steaming.

Alizarine Yellow paste.
Mordant Yellow O.
Alizarine Orange, all brands, **Alizarine Red,** all brands.
Alizarine Grenade R paste, **Alizarine Brown,** all brands.
Alizarine Blue, all brands, **Alizarine Darkblue** S paste, **Alizarine Green** S paste pat.
Ceruleïne, all brands, **Galleïne,** all brands.
Acid Alizarine Brown B, **Acid Alizarine Grenade** R., **Acid Alizarine Red** G pat.
Acid Alizarine Grey G pat. (devel. with Bichromate of potash).
Acid Alizarine Blue BB pat. (devel. with Bichromate of potash).
Acid Alizarine Green G pat.
Acid Alizarine Black SE paste, pat.
Chromotrope FB, F4B. S, SR. pat. (with Lactic Acid).
Chromogen I pat.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

15. Wool Colours which can be carbonized with Sulphuric Acid, and are fast to milling.

Alizarine Orange, all brands.
Alizarine Claret R paste.
Alizarine Blue, all brands, **Aliz. Darkblue** S paste.

Ceruleïne conc., S, S conc.
Milling Yellow O.
Chromogen I pat.
Chrome Brown RO, BO, pat. (with Lactic Acid).
Chromotrope FB, F4B, S, SR pat. (with Lactic Acid).
Acid Aliz. Black SE paste, pat.
Acid Aliz. Brown B, **Acid Aliz. Grenade** R.
Acid Alizarine Red G pat.
Chrome Black B, T, pat.
Acid Aliz. Grey G pat.
Acid Alizarine Blue BB pat. (developed with Bichrome).
Acid Alizarine Green G pat.
Patent Blue A pat.
Fast Acid Violet A2R, R, B, pat.
Fast Acid Blue R, R conc., pat.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

16. Wool Colours suitable for piece dyeing fast to carbonizing with Sulphuric acid.

All Colours with exception of: **Eosine,** all brands, **Erythrosine,** all brands, **Phloxine,** all brands, **Rose Bengale,** all brands, **Copper Black** S, **Copper Blue** B and B extra, **Copper Red** N, **Mordant Yellow** O, **Alizarine Yellow** paste, **Ceruleïne** B paste, BWR paste, BWR conc., **Aliz. Red,** all brands on Chrome and Alum-Mordant, **Aliz. Brown,** all brands, **Galleïne,** all brands.

17. Wool Colours with yellow nitric acid reaction.

Erythrosine, all brands, **Phloxine,** all brands.
Rose Bengale, all brands.
Acid Magenta, all brands, **Acid Violet** 4RS, 3RS, N, 5BF, 5BFI.
Neutral Violet O.
Soluble Blue SV.
Acid Green, all brands (reaction a dull yellow).
Patent Blue V, N, L, superior, B, pat.
Patent Blue, J-brands, A, AJI, patented (reaction a dull yellow).
Patent Green O, V, VS, pat. (reaction a dull yellow).
Cyanine B, **Keton Blue** 4BN solut., 4BN powder, pat. (reaction a dull yellow).
Naphthalene Green V, conc., pat. (reaction an orange-yellow).
Indigo Substitute B, BS, WE, patented (reaction a dull yellow).
Flavazine S, L, T.
Chromotrope 2R pat.

Azo Acid Carmine B pat. (reaction a dull yellow with a blueish edge).
Aliz. Red 1 WS, on Alum-Mordant or developed with Alum.
Aliz. Blue, all brands (reaction dull yellow).
Galleïne, all brands (reaction dull yellow).
Ceruleïne conc., S, S conc., paste A, paste SW (reaction a reddish yellow).
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

18. Wool Colours which change only slightly or not at all when spotted with muriatic acid.

Acid Violet 3 RS, 4 RS, 7 BN.
Methyl Alkaline Blue MLB, **Alkaline Blue** 2 B—6 B.
Opal Blue, blue shade, green shade, superior soluble.
Fastblue, all brands, **Black Blue** O, **Fast Darkblue** R.
Fast Acid Eosine G, G extra, pat., **Fast Acid Phloxine** A pat.
Fast Acid Magenta G pat., **Fast Acid Violet** R, A 2 R, **Acid Rosamine** A pat., **Fast Acid Blue** R, R conc., pat.
Chinoline Yellow O.
Flavazine S, L, T.
Orange G, R, No. 2, **Brilliant Orange** G, O.
Scarlet, all brands, GG—4 R, 6 R, **Scarlet** 6 R cryst.
Victoria Scarlet, all brands, **New Coccine** O, **Coccinine** O, B.
Victoria Rubine O, G, **Brilliant Rubine** O, **Brilliant Crimson** O, B, **Naphthol Red** O, **Amaranth,** all brands.
Claret Red G, G extra, **Solid Brown** O.
Archil Substitute G pat.
Chromotrope 2 R, 2 B, 8 B, 10 B, pat.
Amido Naphtol Red G, 6 B.
Amido Naphtol Black 4 B, 4 B extra, 6 B, S.
Chromogen I pat., **Chrome Brown** RO, BO, pat.
Chrome Black B, T, pat.
Chromotrope 7 B, 8 B, 10 B, S, SR, FB, F 4 B pat. (devel. with Bichromate of potash).
Acid Aliz. Brown B, **Acid Aliz. Grenade** R.
Acid Aliz. Red G pat., **Acid Aliz. Violet** N.
Acid Aliz. Grey G pat. **Acid Aliz. Blue Black** B pat.
Acid Aliz. Black R, 3 B, 3 B extra, T, SE paste, pat.
Aliz. Blue, all brands.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

19. Wool Colours suitable for acid milling.

Indigo MLB powder, pat.
Indigo MLB extra (99—100 %), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20 %, pat.
Indigo MLB Vat I 20 %, pat.
Indigo White MLB 40 %, pat.
Chromotrope S, SR, FB, F4B, pat.
Chrome Brown RO, BO, pat.
Chromogen I pat.
Chrome Black B pat.
Acid. Aliz. Black R, SE paste, pat.
Acid Aliz. Red G pat., **Acid. Aliz. Grenade** R, **Acid. Aliz. Violet** N.
Acid Aliz. Grey G pat, **Acid Aliz. Blue Black** B pat.
Acid Aliz. Blue BB pat., **Acid Aliz. Darkblue** SN pat.
Acid Aliz. Green G pat.
Aliz. Blue, R, R conc., pat.
Ceruleïne conc., S, S conc., paste A, paste SW.
Fast Acid Blue R, R conc., pat.
Fast Acid Violet R, A2R, pat.
Patent Blue A pat.
Flavazine T.

B. COTTON DYEING.

a) Cotton Colours classified according to method of dyeing.

1. Cotton Colours dyed in a neutral bath.

The bath is prepared for light shades (1 % dyestuff) with 1 to 10 % common salt or calc. Glauber's salt, for medium shades (1 to 2 % dyestuff) with 10 to 15 % common salt, and for dark shades (2 to 4 % dyestuff or more) with 15 to 25 % common salt. Light shades are dyed at 86 to 140° F, medium or dark shades are dyed at the boil for 1 h.

Dianil Yellow G, R, 2R, 3G pat.
Dianil Direct Yellow S.
Aurophenine O.
Oxydianil Yellow O.
Primuline O.
Dianil Orange N, G pat.
Toluylene Orange R.
Dianil Red R, 4B, 10B.
Dianil Brown R, BD.
Brilliant Dianil Red R, R conc.
Delta Purpurine 5B.
Dianil Blue G, B, R, 2R, 3R, 4R, E, ET, BX, pat.
Dianil Dark Blue 3R pat.
Dianil Black E, RN extra, pat.

N.B. When dyeing in concentrated, baths on the Jigger or in apparatus, less salt and soda is required. The proper amount of salt necessary is best ascertained by twaddling. The dyebath after being cooled down to 59 to 68° F should show

for light shades 1.^{4} to 2.^{8}° Tw.
for medium shades 2.^{8} to 4.^{4}° Tw.
for deep shades 4.^{4} to 5.^{8}° Tw.

2. Cotton Colours dyed in a weak alkali bath.

The dyebath is prepared as described above (under No. 1), with the addition of 1 to 2 % soda.

Dianil Yellow 3G, G, R, 2R, pat.
Dianil Direct Yellow S.
Aurophenine O.
Oxydianil Yellow O.
Primuline O.
Dianil Orange G, F, R pat., N, **Toluylene Orange** R.
Dianil Scarlet G, 2R pat.
Dianil Red R, 4B, 10B, **Dianil Claret Red** B, G, **Dianil Magenta** O.
Brilliant Dianil Red R, R conc., **Delta Purpurine** 5B.
Dianil Brown 5G, 3GO, 2G, G, R, 3R, M, BD, B, D, X.
Dianil Fast Brown B.
Dianil Copper Brown O, **Dianil Japonine** G.
Dianil Green G pat.
Dianil Darkblue 3R pat.
Dianil Black G, R, AC, CB, E, T, RN extra, HW, pat.
Dianil New Black LBI pat.
Dianil Indigo O patented (can be used for loose material without any addition of soda).

3. Cotton Colours dyed in an alkali bath.

The following colours require for dark shades large amounts of alkali together with the usual addition of salt.

The bath is prepared with common salt as stated under No. 1, and 2 to 5% soda or 2 to 5% caustic soda 76.° Tw.

Dianil Darkblue R pat.
Dianilblack CR, N, pat.

The following colours may be dyed with alkali without adding salt.

The bath is prepared with the necessary amounts of dyestuff and ½ to 5% soda or caustic soda 76.° Tw.

Dianil Red R, 4B, 10B.
Brilliant Dianil Red R, R conc., **Delta Purpurine** 5B.
Dianil Black PR, PG.

To be dyed with 10% Phosphate of soda and 2% soap:

Cresotine Yellow G.

N.B. for No. 1 to 3.

In dyeing mercerised material it is advisable to add to the bath — together with the stated amounts of alkali — for light shades 2% Turkey red oil and 2½% sodium phosphate, for medium shades 2 to 10% Turkey red oil and 10 to 25% Glauber's salt cryst, and for dark shades 1% Turkey red oil and 25 to 40% Glauber's salt cryst.

4. Cotton Colours developed with Azophor Red.

After rinsing the dyed material is worked for ½ h in a cold bath containing 2–4% Azophor Red PN pat. and 1–2% acetate

of soda, then the material is rinsed again and eventually soaped. Azophor Orange MN pat. and the diazo-solutions of Benzidine and Paranitraniline are applied in a similar manner.

Primuline O.
Dianil Orange N, **Toluylene Orange** R.
Dianil Brown 5G, 3GO, 2G, G, R, 3R, M, BD, B, D, X.
Dianil Copper Brown, Dianil Japonine G.
Dianil Dark Blue R, 3R pat., **Dianil Indigo** O pat.
Dianil Black G, R, CR, N, AC, CB, E, T, PR, PG, RN extra, HW pat.
Dianil New Black LBI pat.

4a. Cotton Dyestuffs suitable for shading-off Azophor Red-developed colours.

The following colours which change only slightly when treated with Azophor Red PN pat. or Azophor Orange MN pat. are suitable for shading-off the colours given under No. 4.

Dianil Yellow R, 2R, 3G pat.
Dianil Direct Yellow S.
Aurophenine O.
Oxydianil Yellow O.
Dianil Orange G, F pat.
Dianil Green G pat.
Dianil Blue pat., all brands.
Dianil Claret Red G, B, **Dianil Magenta** O.
Dianil Fast Brown B.

5. Cotton Colours suitable for diazotising.

After rinsing the dyed material is treated for $^1/_2$ h in the cold diazotising bath which is prepared for light shades with: $1^1/_2$ % Nitrite and 5 % Muriatic acid, for dark shades with: $2^1/_2$ % Nitrite and $7^1/_2$ % Muriatic acid. After diazotising the material is rinsed and entered into the developing bath in which it is worked cold for $^1/_2$ h, then rinsed again, and finally soaped. The developing bath contains

for light to medium shades:

0,3 % Phenol, 0,9 % Caustic Soda 36° Tw.,
0,3 % Oxyphenol, 1,2 % Caustic Soda 36° Tw.,
0,5 % β-Naphthol, 1 % Caustic Soda 36° Tw.,
0,5 % Schaeffer's salt, 0,3 % Soda calc,
0,35 % m-Phenylene Diamine,
0,35 % m- Toluylene Diamine,

for medium to dark shades:

0,6% Phenol, 1,8% Caustic Soda 36° Tw.,
0,6% Oxyphenol, 2,4% Canstic Soda 36° Tw.,
1% β-Naphthol, 2% Canstic Soda 36° Tw.,
1% Schaeffer's salt, 0,6% Soda calc.,
0,7% m-Phenylene Diamine,
0,7% m-Toluylene Diamine.

Primuline O.
Dianil Brown R, G, BD, M, B, D.
Dianil Dark Blue R, 3R pat.
Dianil Indigo O pat.
Dianil Black G, R, CR, N, AC, CB, E, T, pat.
Dianil New Black LBI pat.

5a. Cotton Dyestuffs suitable for shading-off diazotised shades.

The following cotton colours do not change in diazotising and developing and are therefore suitable for shading-off the colours given under No. 5.

Dianil Yellow R, 2R, 3G, pat.
Dianil Direct Yellow S.
Oxydianil Yellow O.
Aurophenine O.
Dianil Orange G, F, pat.
Dianil Red R, 4B, 10B.
Dianil Claret Red G, B.
Dianil Blue pat., all brands.
Dianil Fast Brown B.

6. Cotton Colours suitable for an after-treatment with copper sulphate.

The dyed and rinsed material is treated in a fresh bath containing 3 to 5% copper sulphate and 1½ to 2% acetic acid at 140 to 212° F for ½ h, and then rinsed. The copper sulphate bath may contain some basic dyestuffs for shading purposes; in this case the temperature is raised gradually after working for ¼ h cold.

Dianil Yellow R, 2R, 3G pat.
Cresotine Yellow G.
Dianil Orange G, F, R, pat., N.
Dianil Brown 5G, 3GO, 2G, 3R.
Dianil Fast Brown B.
Dianil Copper Brown O, **Dianil Japonine** G.
Dianil Blue pat., all brands.
Dianil Dark Blue R, 3R pat.
Dianil Black G, R, CR, N, AC, CB, E, T, RN extra, HW pat.
Dianil New Black LBI pat.

7. Cotton Colours suitable for chroming after dyeing.

The dyed and rinsed material is worked at 140 to 212° F for ½ h, in a bath containing:

3 to 4% Chloride of Chrome 32° Tw. or
3 to 4% Fluoride of Chrome and 1½% Acetic acid or
4 to 5% Chrome alum

and finally rinsed.

Dianil Yellow 3G pat.
Cresotine Yellow G.
Dianil Orange N.
Dianil Brown 5G, 3GO, 2G, **Dianil Fast Brown** B.
Dianil Copper Brown O.
Dianil Japonine G.
Dianil Green G pat.
Dianil Blue pat, all brands.
Dianil Darkblue R, 3R pat.
Dianil Black G, R, CR, N, AC, CB, RN extra, pat.
Dianil New Black LBI pat.

7a. Dyestuffs suitable for shading-off chromed colours.

The following cotton colours are not noticeably changed when after-treated with chloride of chrome, chrome alum, or fluoride of chrome.

Dianil Yellow R, 2R pat.
Dianil Direct Yellow S.
Oxydianil Yellow O.
Dianil Orange G, F, R pat.
Dianil Brown G, R, 3R, M, BD, B, D.

8. Direct Cotton Colours suitable for the chrome and copper after-treatment.

The dyed and rinsed material is worked in a fresh bath containing:

1½ to 2% Bichrome
2 to 3% Copper sulphate and
2% Acetic acid

at 140 to 212° F for ½ h and then rinsed.

Dianil Yellow 3G pat., **Cresotine Yellow** G, **Dianil Orange** N.
Dianil Brown 3GO, 2G, **Dianil Japonine** G, **Dianil Fast Brown** B.
Dianil Black G, R, CR, N, T, AC, CB, pat.
Dianil New Black LBI.

8a. Direct Cotton Colours which when developed with bichrome, copper sulphate, and sulphuric acid, produce exceptionally fast shades.

The dyed material is worked in a bath containing:
2% Bichrome
3% Copper sulphate and
2% Sulphuric acid 168½° Tw.
for ½ h at 140 to 212° F, then thoroughly rinsed and eventually soaped.

Cresotine Yellow G.
Dianil Brown 3GO, **Dianil Fast Brown** B. } for Brown
Dianil Japonine G. } for Brown
Dianil Black N pat.
Dianil Yellow 3G (up to 1% for shading-off).
Dianil Black CR, R pat. (for Black).

8b. Colours suitable as a bottom under Aniline Black.

The material is first dyed with 2 to 4% dyestuff, then topped in a fresh bath containing (for 100 lbs of material):

150 to 200 Gall. Water
2 to 3 lbs 9 oz Aniline salt
2 lbs 5½ oz Sulphuric acid 168½° Tw.
1½ lbs Copper sulphate
5 lbs Bichrome.

The material is entered into the cold bath and worked for ½ h, while at the same time the bichrome solution is added in several portions. Then the temperature is raised to 131° F during ½ h, and the material worked for another ½ h. Finally the goods are rinsed and soaped in a hot soap bath; to the latter 1 lb logwood extract may eventually be added to embellish the shade.

Dianil Black CR, R, AC, CB, G, N pat.
Dianil New Black LBI pat.
Dianil Dark Blue R pat.
Melanogen Blue B pat.
Melanogen G, T, pat.

9. Cotton Colours suitable for dyeing in a mechanical dyeing apparatus.

Dianil Yellow 2R, 3G pat., **Cresotine Yellow** G.
Dianil Direct Yellow S, **Aurophenine** O.
Primuline O.
Dianil Orange G pat., N, **Toluylene Orange** R.
Dianil Claret Red B, G.

Dianil Red R, 4B, 10B.
Brilliant Dianil Red R, R conc., **Delta Purpurine** 5B.
Dianil Scarlet G, 2R, pat.
Dianil Brown 3GO, R, BD, **Dianil Japonine** G, **Dianil Fast Brown** B.
Dianil Green G pat.
Dianil Blue pat., all brands.
Dianil Darkblue R, 3R pat., **Dianil Indigo** O pat.
Dianil Black G, R, CR, AC, CB, RN extra pat.
Dianil New Black LBI pat.

10. Cotton Colours suitable for padding in a two-roller-padding-machine.

The padding liquids are made up as follows:

	for **light**, about 10 parts	**medium**, 100 parts	**dark** shades 500 parts
Dyestuff			
Turkey red oil	2000 ,,	— ,,	— ,,
Sodium phosphate	250 ,,	500 ,,	500 ,,
Dextrine	1500 ,,	1500 ,,	1500 ,,
Water	92600 ,,	97900 ,,	97500 ,,
	100000 ,,	100000 ,,	100000 ,,

Light shades are padded twice at 104 to 122° F,
Dark ,, ,, ,, ,, ,, 158 to 176° F,
and then dried.

Dianil Yellow 2R, 3G pat., **Dianil Direct Yellow** S.
Aurophenine O, **Cresotine Yellow** G.
Oxydianil Yellow O.
Dianil Orange G pat., N, **Toluylene Orange** R.
Dianil Red R, 4B, 10B.
Brilliant Dianil Red R, R conc., **Delta Purpurine** 5B.
Dianil Brown 3GO, R, G, BD, M, B, D, **Dianil Fast Brown** B.
Dianil Japonine G.
Dianil Green G pat.
Dianil Blue pat., all brands.
Dianil Dark Blue R, 3R, pat.
Dianil Black PR, CR, R, pat.

11. Cotton Colours for tannin-antimony-mordants.

(Basic Colours).

The cotton yarn is **mordanted** in a concentrated bath (containing about the 10 fold amount of water) with 1 to 6% tannin, according to the depth of the required shade; the yarn is entered at 122° F, worked without steam for ½ h, and then left in the bath steeped for 6 to 12 h or preferably over night. After wringing and hydroextracting the yarn is entered into the fixing bath con-

taining ½ to 3% tartar emetic and 2 to 10% chalk, and worked at 68 to 77° F for ½ to ¾ h. Then the yarn is rinsed, eventually slightly soaped, and finally hydroextracted.

Old tannin baths can be used again when replenished with about 70% of the amount of tannin used for the first bath. In order to prevent decomposition, it is advisable to boil the baths repeatedly, or to add a little carbolic acid.

In many instances, especially for dark shades, the tannin can be replaced by cheaper products: 1 lb tannin equals about 1½ to 2 lbs. gall nuts, or 4 lbs. sumach extract 25%, or 5 to 6 lbs. sumach leaves.

Instead of tartar emetic, other antimony salts in equivalent proportions can be employed.

Piece goods are either mordanted and fixed on the Jigger or padded in the two-roller-padding machine. In the latter case the padding liquids are made up with 2 to 50 parts tannin and 1 to 25 parts tartar emetic per 1000 parts liquid.

Dyeing. The hydroextracted material is entered into a cold bath containing 1 to 5% acetic acid or 2 to 10% alum; it is well worked for some time and then the dyestuff-solutions are added in several portions. After ½ h the bath is slowly heated to 158° F, and the material dyed to pattern, whilst the temperature is generally raised to the boil.

Finally the cotton is rinsed, eventually soaped, hydroextracted, and dried.

Auramine conc., O, I, II.
Phosphine, all brands.
Azo Phosphine GO, BRO, pat.
Chrysoidine A cryst., C cryst., C extra cryst., R, **Vesuvine,** all brands, **Cutch Brown** D, G, **Dark Brown** M, MB.
Magenta, all brands, **Cerise,** all brands, **Grenadine,** all brands, **Maroon** O, extra, **Cardinal** R, G.
New Magenta O pat.
Safranine GGS, AN extra, O, conc., conc. B, **Methylene Violet,** all brands, **Methylene Heliotrope** O pat.
Rosolane pat., all brands.
Scarlet for Cotton O.
Methyl Violet, all brands, **Violet crystals** O.
Victoria Blue B.
Malachite Green, all brands, **Brilliant Green,** all brands.
Rosazeïne O, B, extra, B extra, G extra, 4G.
Methylene Green, all brands.
Methylene Indigo O, SS, **Thionine Blue** GO, **Methylene Blue,** all brands, **Marine Blue,** all brands, **Methylene Dark-blue** RBN, 3BN.
Fastblue for Cotton, all brands, **New Fastblue** 3R cryst.
Indamine Blue, all brands. **Ethyl Blue** BF, BD, RD pat.
Indophene Blue B, G, 2B, pat.
Methylene Grey, all brands, **New Methylene Grey** O, **Nigrisine** O.
Janus Blue G, B, R, pat., **Janus Darkblue** R, B, pat.
Janus Green B, G pat.
Janus Black O, I, II, pat., **Janus Grey** B, BB.
Janus Brown B, R, pat.

Janus Red B pat.
Janus Yellow R, G, pat.
Conc. Cotton Blue, all brands.
Pure Blue, all brands.
Chinablue, all brands.
Cotton Blue extra, OO.
Cotton Lightblue O, soluble.
Methyl Blue for Cotton MLB.

see also § 14.

11a. Basic Colours which are dyed in one bath.

(Method protected by letter's patent.)

The cold bath is prepared with 5 to 6 % acetic acid, then 1 to 2 % tannin, and finally the necessary amounts of dyestuff (up to 1 %) are added. The cotton is entered and worked for 1/4 h cold, then for 1/4 h at 104° F and for another 1/4 h at 140° F. Then it is lifted, rinsed, wrung out, and dried. The fastness is increased if the yarn is wrung after dyeing and treated in the first rinsing bath with 1/2 to 1 1/2 % tartar emetic. After giving some turns in this bath the yarn is rinsed a second time. Shading-off can be executed in the tartar emetic bath.

Auramine conc., O, I, II.
Phosphine, all brands.
Azo Phosphine GO, BRO, pat.
Chrysoidine A cryst., C cryst., C extra cryst., R, **Vesuvine,** all brands, **Cutch Brown** D, G, **Dark Brown** M, MB.
Magenta, all brands, **Cerise,** all brands, **Grenadine,** all brands. **Maroon** O, extra, **Cardinal** R, G.
New Magenta O pat.
Safranine GGS, AN extra, O, conc., conc. B, **Methylene Violet,** all brands. **Methylene Heliotrope** O pat.
Rosolane pat., all brands.
Scarlet for Cotton O.
Methyl Violet, all brands, **Violet crystals** O.
Victoria Blue B.
Malachite Green, all brands, **Brilliant Green,** all brands.
Rosazeïne, all brands.
Methylene Green, all brands.
Methylene Indigo O, SS, **Thionine Blue** GO, **Methylene Blue,** all brands, **Marine Blue,** all brands, **Methylene Darkblue** RBN, 3BN.
Fastblue for Cotton, all brands, **New Fastblue** 3R cryst.
Indamine Blue, all brands, **Ethyl Blue** BF, BD, RD, pat.
Indophene Blue B, G, 2B, pat.
Methylene Grey, all brands, **New Methylene Grey** O, **Nigrisine** O.
Janus Blue G, B, R, pat., **Janus Darkblue** R, B, pat.
Janus Green B, G, pat.
Janus Black O, I, II, pat., **Janus Grey** B, BB.
Janus Brown B, R pat.
Janus Red B, pat.
Janus Yellow R, G, pat.

12. Cotton Colours dyed in a diluted acid bath.

All colours mentioned below dye unmordanted cotton material with the addition of acid salts e. g. alum, acetate of zinc, fluoride of chrome, or diluted acids.

Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R, B, pat.
Janus Black O, I, II, pat.
Janus Green G, B, pat.
Janus Grey B, BB.
Janus Darkblue B, R, pat.
Janus Blue B, G, R pat.
Nigrisine O, **Methylene Grey,** all brands, **New Methylene Grey** O powder.
Indamine Blue N extra.
Victoria Blue B.
Safranine for light shades.

13. Direct dyeing Basic Colours.

(Method of dyeing protected by letter's patent.)

Method A.

I. Dyeing. The dyebath is acidified with a little acetic acid, then 5% sulphate of zinc and a portion of the dyestuff- solution are added. The previously boiled (cotton) material is entered at about 194° F, some turns are given and then the remainder of the dyestuff-solution is added in several portions. After $^1/_2$ h, 20% common salt or calc. Glauber's salt are added, and the material worked for $^1/_2$ h near the boil, then the steam turned off and the goods left in the bath for another $^1/_2$ h. Finally the material is rinsed, wrung or hydroextracted.

II. Fixing. The dyed cotton is taken into a cold bath containing 2 to 6% tannin or the equivalent amount of sumach leaves or sumach extract. After working cold for $^1/_4$ h, the cotton is lifted, 1 to 3% tartar emetic and 1,5 to 1,6% conc. sulphuric acid are added to the bath, the material is re-entered and worked cold for $^1/_4$ h, then for $^1/_4$ h at 122° F, and for another $^1/_4$ h at about 176° to 212° F. Finally the material is thoroughly rinsed.

Method B.

I. The Dyeing process remains the same as described under method A.

II. Fixing. 1. Bath: The dyed, rinsed, and hydroextracted cotton is worked for $^1/_4$ h at 122° F in a concentrated bath containing 2 to 6% tannin or the equivalent amount of other tannin products, and then left steeped for several hours or over night in the bath. It is then wrung or hydroextracted.

2. Bath: The tanned material is worked for $^1/_2$ to $^3/_4$ h in a cold fresh bath containing 1 to 3% tartar emetic, then well rinsed, eventually soaped and dried.

Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R, B, pat.
Janus Grey B, BB.
Janus Green G, B, pat.
Janus Blue G, R, B, pat., **Janus Darkblue** B, R, pat.
Janus Black O, I, II, pat.
Victoria Blue B.

For shading-off purposes the following colours are suitable when used in small amounts:

Methylene Blue, all brands.
Malachite Green, all brands.
Brilliant Green, all brands.
Safranine, all brands.
Methylene Violet, all brands.
Methylene Heliotrope O pat.
Rosolane pat., all brands.

14. Cotton Colours dyeing upon tin-or tin and tannin mordant.

The well boiled and bleached cotton is entered into a cold bath containing 0,1% to 1% tin salt (and a little muriatic acid to keep the bath clear). The material is worked for $^1/_2$ h, lifted, rinsed, and dyed cold with the necessary amounts of dyestuff and the addition of 1 to 2% acetic acid. The material is not rinsed after dyeing but at once wrung out and dried. For deep shades the material is at first mordanted with 2 to 3% tannin and then with tin mordant as described above, then rinsed and dyed in the same manner. For full shades 2 to 3% alum are added to the bath (in addition to the acetic acid), and the temperature raised to about 104° F. Shading-off with Methylene Blue, Malachite Green, Methyl Violet etc. can be executed in the same bath.

Conc. Cotton Blue RR, R, No. 1, No. 2, No. 2 double.
Cotton Lightblue O soluble.
Cotton Blue extra OO.
Methyl Blue for Cotton MLB.
China Blue No. 1, No. 2.

15. Cotton Colours dyed with alum and common salt.

The cotton is dyed in a concentrated bath containing 10% alum and 40% common salt at 104 to 122° F. The material is not

rinsed after dyeing, but wrung and then dried. Old baths can be used if properly replenished.

Brilliant Orange G.
Brilliant Croceïne R, B, 5B, blue shade, yellow shade.

16. Cotton Colours dyed in strong salt baths.

The dyebath is prepared with 30 to 60 parts common salt per 1000 parts liquid and the necessary amounts of dyestuff, and the cotton worked at 86° F for $^1/_2$ to $^3/_4$ h. After dyeing the cotton is wrung out and dried. Old baths are replenished and used again.

Eosine, all brands.
Erythrosine, all brands.
Phloxine, all brands.
Rose Bengale, all brands.

When after-treated with Solidogen A pat. the shades become fast to water (see § 18).

17. Cotton Colours dyeing upon oil-mordant.

The material is saturated with a solution of 100 parts Turkey red oil per 1000 parts water and dried for 12 h at 122° F. Then the cotton is dyed with the necessary amounts of dyestuff (cold to 122° F), eventually slightly rinsed or dried directly after dyeing.

All **Rosazeïnes;** for shading off purposes also **Auramines** and **Safranines.**

18. Cotton Colours which may be developed with Solidogen.

(Method protected by letter's patent).

I. Dianil Colours.

The developing bath is prepared with 2% muriatic acid, then 2 to 6% Solidogen A pat. are added. The dyed and rinsed material is entered and worked at the boil for $^1/_2$ h and then thoroughly rinsed.

II. Eosine etc.

The developing bath is prepared as described under I, but an addition of 50 to 70 parts common salt per 1000 parts liquid is required, and the bath heated to 167° F only.

If copper vessels are used 5 to 10 parts sulphocyanide of ammonia must be added to the bath before the other ingredients are added.

Dianil Orange G pat.
Dianil Scarlet G, 2R, pat.
Dianil Red R, 4B, 10B, **Dianil Claret** B, G.
Brilliant Dianil Red R, R conc., **Delta Purpurine** 5B.
Dianil Blue G, B, R, 2R, 3R, 4R, BX, pat.
Dianil Black CR, R, G, AC, CB, pat.
Dianil New Black LBI pat.
Dianil Indigo O, **Dianil Darkblue** R pat.
Primuline Red (Primuline O with β-Naphthol).
Eosine, all brands, **Erythrosine,** all brands, **Phloxine,** all brands, **Rose Bengale,** all brands.

19. Cotton Colours dyeing upon alumina mordant.

Alizarine Orange.
Alizarine Red, all brands.
Alizarine Claret R paste.
Alizarine Brown, all brands.
Ceruleine conc., S, S conc., paste A, paste SW.
Alizarine S pat.

Turkey Red upon cotton yarn.

a) Alizarine New Red No. I (dry mordant).

1. Boiling. The raw material is boiled with 3% calc. soda or silicate of soda 76.8° Tw and then washed. Big lots are best boiled in a closed vessel for 2 hours under pressure of 2 atm.

2. Oiling. After hydroextracting, the moist yarn is passed through a solution of 120 to 150 parts Turkey red oil 50% per 1000 parts liquid and then dried at 149° F for 12 h. This operation is eventually repeated. If dried yarns are manipulated, one passage through the oil-solution is sufficient.

3. Mordanting. 4000 parts sulphate of alumina (free from iron) are dissolved in 16000 parts water; and after cooling 450 parts calc. soda dissolved in 4000 parts water, and 100 parts chalk, made into a paste with water, are added; when the carbonic acid reaction has ceased, an addition of 300 parts acetic acid 50% is made; before use this concentrated mordant is diluted with water to 12° Tw. The oiled yarn is passed dry through the mordant at 86° F, then left to lie in a cistern for 3 h, and finally hydroextracted and dried below 104° F.

Instead of the above mordant, another one, made of commercial basic-alumina-carbonate and alumina acetate, is used. (This mordant is especially often employed in piece dyeing.) The yarn is mordanted with alumina acetate 7.2° Tw and the manipulations carried out as described above.

Acetate of alumina

is made as follows:

9000 parts	Sulphate of alumina (purest quality) are dissolved in
64350 parts	Water, free from iron; after dissolving,
2850 parts	Sulphuric acid 168½° Tw and
17400 parts	Acetic acid 40% are added. The mixture is well stirred and then
8900 parts	Basic-alumina-carbonate are added in several portions at 95 to 104° F; the latter dissolves readily under effervescence.
102500 parts.	

The solution is allowed to stand for a short time and then drawn off leaving a minute residue.

100000 parts „very stable" acetate of alumina 23.2° Tw „free from iron" are thus obtained which is diluted to 7 to 9° Tw.

4. Fixing. Per 1000 parts fixing liquid 5 parts chalk or 5 parts sodium phosphate are required. The dried, mordanted yarn is worked at 122° F for ½ h in this liquid and then thoroughly washed.

5. Dyeing. 8% Alizarine 20% are generally used. By combining Alizarine No. 1 (blue shade) and Alizarine 5 F (yellow shade) all current shades of Turkey Red are obtained. For water of 7½ degrees an addition of 10% acetate of lime 28.5° Tw and 1% tannin (both referring to the amount of Alizarine used) is made. The yarn is dyed cold for ¼ h, the bath heated during 1 h to 194° F, and the dyeing operation continued at this temperature for another ½ h. Then the yarn is quickly rinsed, hydroextracted and dried. The addition of 2% Turkey Red Oil (50%) (referring to the weight of the yarn) to the dyebath increases the brilliancy of the shade considerably.

6. Steaming. The yarn is steamed for 2 h under pressure of 1½ atm. If the yarn, after dyeing and hydroextracting, is put wet into the steaming apparatus, uneven results are often obtained, especially in manipulating big lots.

7. Soaping. The dyed yarn is soaped at 140° F; 2 parts soap per 1000 parts liquid being used. In order to obtain a purer red the yarn is boiled in a closed vessel for 1 h. — After washing the yarn is dried at a low temperature. To obtain a Red of greater brilliancy and fastness, the yarn is boiled in a closed vessel for 2 h under pressure of 2 atm. with 2 parts soap, 0,3 parts solvay soda and 0,1 part tin salt per 1000 parts water.

Alizarine New Pink. For pinks, bleached yarns are used which are oiled twice, the first time with 40 parts and the second time with 20 parts Turkey red oil 50% per 1000 parts liquid. After each oiling-operation the yarn is dried. Then the yarn is mordanted with acetate of alumina 4° Tw for pink, dried at 104° F. and fixed as described under „Red", then dyed cold for ½ h with ½ to 3% Alizarine blueish and 0,1 to 0,3% acetate of lime 29° Tw, and for another h. at 167° F. After rinsing the yarn is steamed for 2 h under pressure of 1½ atmospheres and finally soaped (with 2 parts soap per 1000 parts) at 140° F for ½ h.

Acetate of Alumina for Pink.

I. { 6 parts of Alum free from iron, dissolved in 20 parts hot Water
II. { 4 1/2 parts of Sugar of lead diss. in 10 parts of hot Water.

Solutions I and II are mixed hot; after allowing the precepitate to settle the clear solution is drawn off and, before use, made to twaddle at 4.4°.

Alizarine Claret Red is dyed upon New Red bottom with Alizarine Claret R, alone or in combination with a blue shade of Alizarine Red. By using some Alizarine Brown very dark Claret Reds can be obtained.

The manipulations of mordanting, dyeing etc. are the same as described under Aliz. Red.

b) Alizarine New Red No. 2 (wet mordant).

1. Boiling. The raw yarn is boiled with 3% calc. soda and then washed.

2. Oiling. The moist, hydroextracted yarn is oiled in a solution of 120 to 150 parts Turkey red oil 50% per 1000 parts liquid which is made to twaddle at 3° Tw by the addition of a solution of potash. This operation is eventually repeated and then the oiled yarn dried at 149° F within 12 h.

3. Mordanting. 3000 parts of sulphate of alumina, free from iron, are dissolved in 12000 parts of water; when cold 320 parts calc. soda dissolved in 3000 parts of water, are added. The concentrated mordant is diluted with water to 7.2° Tw and the dry, oiled yarn passed through it; then the yarn is left to lie in a vat for 24 h, and afterwards hydroextracted and fixed.

4. Fixing. For 1000 parts fixing liquid 15 parts chalk or 15 parts sodium phosphate are required. The hydroextracted and mordanted yarn is worked at 122° F for 1/2 h and then well washed.

5. Dyeing. 8% Alizarine 20% are generally used for dyeing. For water of 7 1/2 degrees of hardness an addition of 10% acetate of lime 29° Tw and 1% tannin (calculated upon the amount of Alizarine used) is made. The dyeing operation is started cold, after 1/4 h the bath is slowly (within 1/2 h) heated to the boil and boiling continued for another 1/2 h.

6. Softening. The dyed yarn is washed, hydroextracted and boiled in a closed vessel under pressure of 2 to 3 atm. for 2 h.

7. Soaping. After softening, the shade is embellished by boiling the material for 1 h under pressure of 1 atm. with soap (2 parts p. 1000). Then the yarn is washed and finally dried at a low temperature.

c) Mixed Alizarine Old Red.

1. Boiling. The yarn is first boiled with 3% of soda calc. and washed.

2. First Oiling. The moist, hydroextracted yarn is oiled with Tournant oil (100 parts per 1000). This solution is made up to 9° Tw with a solution of potash. After passing through this liquid the yarn is left to lie for 24 h and then dried within 12 h at 149° F.

3. Second Oiling. After drying, the yarn is oiled a second time with 40 parts of Tournant oil and 80 parts of Turkey red oil 50% per 1000 parts of liquid. The latter is made up with a solution of potash to 6° Tw. After hanging the oiled yarn in the open air for 4 h it is dried within 12 h at 149° F.

4. Third Oiling. The second oiling liquid is diluted with water and a potash solution to 5° Tw; the yarn is then passed through; again hung in the open air for 4 h, and finally again dried within 12 h at 149° F.

5. First Soaking. The dried material is soaked in a solution of potash of 1° Tw for 3 h at 86° F, then hydroextracted and dried at 149° F.

6. Second Soaking. The dried yarn is steeped in warm water of 86° F for 3 h, then washed and hydroextracted.

7. Sumaching. For every lb of yarn 3 to 4 oz of sumach leaves are required. The yarn is steeped in the sumach decoction (104° F) and after 6 h hydroextracted and then mordanted.

8. Mordanting. 4000 parts of alumina sulphate (free from iron) are dissolved in 16000 parts of hot water, and when cold a solution of 400 parts of soda calc. in 4000 parts of water is added. This mordant is made to twaddle at 7.2° Tw by diluting with water, then the yarn is passed through and left to lie for 24 h. Finally it is well washed.

9. Dyeing. Usually 9% Alizarine paste 20% are required for dyeing. For reds, which are perfectly fast to bleaching, Alizarine Red No. 1 is used. The mordanted yarn is dyed 1/4 h cold, then the dyeliquid heated to the boil within 1 1/2 h and boiling continued for 1/2 h.

10. Softening. 100 lbs of yarn (for yellow shade) are softened with 1 lb soda calc. 1 lb soap, and 3 to 4 oz tin-salt. For a blue shade only soap and soda are used. The dyed and washed material is then boiled for 6 h under pressure of 2 atm. and washed again. Reds fast to rubbing are produced by repeating this operation. Then the yarn is washed and dried at a low temperature.

For **Old Pink** the oil bottom remains unaltered, only the strength of the mordant is reduced to 4° Tw. In all other respects the manipulation remains the same as with Old Red; the yarn, however, is often softened twice, at first with soda and then with soap and soda.

Old Claret Red is manipulated in the same manner as Old Red, blue shade; for dyeing, however, Alizarine Claret R is used.

d) Sulphite Alizarine Red.

A simpler method of dyeing Alizarine Colours with sulphite salts for the production of Turkey Reds has been protected by Royal letters patent D.R.P. 128997. This method offers the advantage of yielding shades, which are distinguished for their greater fastness to rubbing. This process is especially applicable to bottoming mixed Reds and is also very suitable for the ordinary Turkey Red oil mordant, if the yarn is steamed directly after oiling.

I. Sulphite Red on mixed Red mordant.

1. First Oiling. The moist (boiled and hydroextracted) yarn is oiled in a solution of 100 parts Turkey Red Oil 60% per 1000 parts of liquid, and then dried for 12 h at 60° C.

2. Second Oiling. The dried, oiled yarn is passed through a solution of 150 parts Tournant Oil in 1000 parts of liquid. This solution is made up with potash to 9° Tw. The yarn is then dried for 12 h at 140° F.

3. First Soaking. The dried yarn is steeped for 3 h in a solution of potash of 9° Tw at 86° F, then hydroextracted and dried at 140° F.

4. Second Soaking. The yarn is steeped for 3 h in warm water of 86° F; then washed and dried.

5. Third Soaking. The second soaking process is repeated, then the yarn well washed and hydroextracted.

6. Dyeing. The yarn is dyed in the 30 fold amount of water. The bath contains:

4200 parts Sulphate of Alumina (pure)
3800 parts Sodium pyrosulphite powder 95%
15000 parts Acetate of Lime
8—10000 parts Alizarine paste 20%.

The amount of acetate of lime depends upon the hardness of the water.

The yarn is dyed 1/2 h cold, the temperature raised to the boil within 1 h; the yarn then worked 1/2 h at the boil, and finally rinsed and dried.

7. Steaming. The yarn is steamed under pressure of 1 atm. for 1 h.

8. Soaping. The yarn is soaped for 20 min. at 176° F with 1 part of soap per 1000 parts of liquid. This process can be omitted, but it tends to make the yarn softer and the shades purer.

II. Sulphite Red on steamed Red Oil mordant.

1. Oiling. The boiled and dried yarn is passed through a solution containing 150 parts Ammonia Turkey Red Oil 60% per 1000 parts of liquid, then wrung evenly and dried for 12 h at 140° F.

2. Steaming. The oiled and dried yarn is steamed for 1 h without pressure.

3. Dyeing. The dyeing operation, also the steaming and soaping is carried out as described above (under 6).

Good results are also obtained with this Sulphite process if the yarn is oiled twice with 100 parts of Turkey Red Oil 60% per 1000 parts of liquid, instead of oiling once and then steaming.

Directions for producing Turkey Red on piece goods.

1. Oiling. The oil bath contains 1000 parts of Turkey red oil 50% (which is neutralized with ammonia) and 4000 parts of water (free from lime). The pieces are passed through the bath once or twice, then dried and eventually steamed for 1 h under pressure of 1/2 atmosphere.

2. Mordanting. The material is mordanted with acetate of alumina 7.2° Tw. (as described on page 37 under New Red for yarn).

3. Fixing. The fixing bath contains 10 parts of chalk or 5 parts of sodium phosphate per 1000 parts of liquid; the pieces are worked in this bath at 113° F for 1/2 h and then well washed.

4. Dyeing. The pieces are dyed cold in the 30 fold amount of water (which is corrected according to its degree of hardness) with

10% Alizarine 20%,
1,5% Acetate of lime 29° Tw,
0,15% Tannin

for 1/4 h; the temperature is then raised to 158° F within 1 1/4 h and then the dyeing operation continued at 167° F for 1/2 h; finally the pieces are washed.

5. Oiling. The pieces are passed through a solution of 1000 parts of Turkey red oil 50% and 9000 parts of water (free from lime), then they are dried and steamed for 2 h under pressure of 1 1/2 atm.

6. Soaping. Finally the pieces are worked in a bath containing 2 parts of soap per 1000 parts water at 140° F for 20 min., then washed and dried.

Pink on piece goods is generally produced according to the so-called Erban-Specht method (see page 47).

To produce a **Claret Red upon piece goods** the latter are mordanted in the same manner as for „Red" and then dyed with Alizarine Claret R by itself or in combination with Alizarine Red. In order to obtain full and dark brownish claret reds with as little dyestuff as possible the addition of some Alizarine Brown is advisable.

Table for correcting the water,

containing the requisite amounts of acetate of lime and acetic acid in dyeing Alizarine Red shades, calculated for 100 l of water according to its degree of hardness.

Degrees of hardness		Acetate of lime 28° Tw	Acetic acid 12° Tw
1	1.25	65,4 cc.	
2	2.5	56,3 ,,	
3	3.75	47,2 ,,	
4	5	38,1 ,,	
5	6.25	27,2 ,,	
6	7.5	20,0 ,,	
7	8.75	1,09 ,,	4,5 cc.
8	10	1,8 ,,	9,0 ,,
9	11.25		13,5 ,,
10	12.50		18,0 ,,
11	13.75		22,5 ,,
12	15		27,0 ,,
13	16.25		31,5 ,,
14	17.50		36,0 ,,
15	18.75		40,5 ,,
16	20		45,0 ,,
17	21.25		49,5 ,,
18	22.50		54,0 ,,
19	23.75		59,5 ,,
20	25		64,0 ,,

20. Cotton Colours which dye upon an iron mordant.

The material is padded with 3 to 4 parts tannin per 1000 parts of liquid and then passed through a bath containing pyrolignite of iron 3° Tw; after rinsing, the cotton is dyed in the same manner as described under Turkey red. For light violets the material is at first passed through the bath which contains the pyrolignite solution of 3° Tw and then treated on the two roller padding machine with 7 to 10 parts of silicate of soda (of 53° Tw) per 1000 parts liquid at 122° F; the material is then washed and dyed.

Alizarine Red, all brands.
Solid Green O 50%.

21. Cotton Colours which dye upon alumina-iron-mordant,

For claret red shades which require only little iron, the yarn is either oiled, sumached, then mordanted with basic alumina sulphate (Old Red bottom), rinsed, and finally treated with iron liquid,

or it is treated first with alumina (as for New Red), washed, and then treated cold with tannin; after raising the temperature to 122° F. the yarn is rinsed and finally passed cold through a solution of pyrolignite of iron. The application of mixtures of alumina and iron mordants is only admissible on yarns if large amounts of iron are used (for lilac shades), whilst in piece dyeing mixtures of acetate of alumina and iron may be used. In this case the method which is well known in printing, can also be employed: Before oiling, the pieces are treated on the two roller machine with the mixed mordants, then hung up for a time and fixed with silicate of soda, sodium phosphate, chalk etc., and dyed; then oiled, and finally steamed (as for Red).

For yarns a simpler method can be employed:

I. Bath: The yarn remains, for 12 h., in a bath containing 20% sumach extract and is then hydroextracted.

II. Bath: The yarn is steeped for 12 h, in a bath containing basic alumina sulphate of 6—8° Tw and is then rinsed.

III. Bath: The yarn is worked, for 1/2 to 3/4 h, in a bath containing pyrolignite of iron of 1—3° Tw, then rinsed and hydroextracted.

The yarn is dyed as described under Turkey Red and oiled with 5% Red oil, then steamed under pressure of 1 to 1 1/2 atm. for 1 h, and finally soaped (2 parts soap per 1000 parts of liquid) at 140° F for 1/4 h.

Alizarine Red, especially the blue brands 2a bl. bl., No. 1, DBI, IBB, IB, IB new, DIB new.
Alizarine Claret R paste.
Solid Green O, 50%.

22. Cotton Colours which dye upon a chrome mordant.

Directions for dyeing 100 lbs of yarn.

Method A.

1. Boiling. The raw yarn is boiled with 3 lbs of soda and then washed.

2. Mordanting. The hydroextrated yarn is worked cold in Chrome Mordant GAI 19° Tw for 1/2 h, then steeped in this mordant for 12 h, and then hydroextracted. The liquid can be used again if properly replenished.

3. Fixing. The mordanted and hydroextracted yarn is fixed with 2% soda (20 parts solvay soda per 1000 parts water) at 122° F for 3/4 h, and then well washed.

4. Dyeing. The dyebath contains 15 lbs dyestuff (paste), which is previously dissolved in 6 1/2 lbs ammonia 25%, 5 Gall. water, and 2 to 3 oz. of tannin. The yarn is worked in the cold bath for 1/4 h, then 15 lbs acetic acid 12° Tw are added and the

yarn worked for another 1/4 h, then the temperature is slowly raised to the boil within 1 h and the dyeing operation continued at the boil for 1/2 h. If calcareous water is used, the carbonate of lime must be converted into acetate of lime with Acetic acid.

For Alizarine Blue, however, water which is free from lime must be employed. In this instance the dyebath contains:

15 lbs Alizarine Blue paste,
28 1/2 lbs Acetic acid 12° Tw,
17 lbs Ammonia 25%.

5. Soaping. The dyed and washed yarn is soaped with 5 to 10 lbs of soap at the boil for 1/2 h.

Method B.

1. Boiling. The raw yarn is boiled with 3 lbs soda and then washed and hydroextracted.

2. Oiling. The boiled and hydroextracted yarn is oiled with a solution of 100 parts Red oil 50% per 1000 parts liquid and then slowly dried at 149° F within 12 h.

3. Mordanting. The dried yarn is at first worked cold in Chrome Mordant GAI 19° Tw. for 1/2 h and then steeped in this mordant for 12 h; after hydroextracting the yarn is then treated as stated under Method A.

Method C.

(For dark shades, especially claret reds.)

The yarn which is boiled, washed and hydroextracted as described under Method A, is treated in a bath containing the 15 fold amount of water of 176° F (compared with the weight of the yarn) and 5 parts tannin or 25 parts sumach extract 20% per 1000 parts liquid; the yarn is worked at 176° F for 1/2 h, then the steam is turned off and the yarn left in the bath for about 12 h. After hydroextracting the yarn is at first worked cold in Chrome Mordant GAI 19° Tw for 1/2 h, then steeped in this mordant for 12 h, and finally hydroextracted and washed — The material is dyed and soaped as described under Method A. — The Method C permits of topping with basic colours simultaneously or afterwards.

Alizarine Yellow GG pat., N.
Mordant Yellow O.
Alizarine Orange N.
Alizarine Brown, all brands.
Alizarine Red, all brands.
Alizarine Claret paste R.
Alizarine Blue, all „S" brands.
Ceruleïne conc., S, S conc., SW paste.
Alizarine Green paste S pat.
Gallеïne, all brands.

Directions for producing Dark Blues fast to bleaching.

1. Boiling. 100 lbs raw cotton yarn are boiled with 3 lbs solvay soda under pressure of 2 atmospheres for 3 h and then thoroughly washed.

2. Oiling. The boiled, washed and hydroextracted yarn is oiled in a solution of 90 to 120 parts Sodium-Turkey red oil 50% per 1000 parts liquid, then wrung evenly and dried at 149° F for 12 h.

3. Treatment with tannin. The oiled and dried yarn is worked in a warm tannin-solution at 176° F for $^3/_4$ h and then steeped in this bath for 12 h and hydroextracted. The tannin-solution is made up with the 10 to 15 fold amount of water (compared with the weight of the yarn) and contains 5 parts of tannin per 1000 parts of liquid.

4. Chrome Mordant. The tanned and hydroextracted yarn is worked cold in a solution of chloride of chrome 19° Tw for 1 h and then steeped in this bath for 12 h. After hydroextracting, the yarn is washed (preferably in running water).

Both the chloride of chrome solution and the tannin mordant can be used again if properly replenished.

5. Dyeing. For dyeing, water free from lime must be employed; water of $2^1/_2$° hardness is permissible, but the carbonate of lime must be converted into acetate by adding acetic acid. Very calcareous water must be freed from lime before use. The dyebath contains per 100 lbs of yarn:

15 lbs Alizarine Blue F paste	or
$28^1/_2$ lbs Acetic acid 12° Tw	5 lbs Alizarine Blue SB Powder
17 lbs Ammonia 25%	5 lbs Acetic acid 12° Tw
$2^1/_2$—3 oz Tannin	$2^1/_2$—3 oz Tannin.

The yarn is worked cold for $^1/_4$ h, then the bath is slowly heated to the boil within 1 h and the yarn worked at the boil for $^3/_4$ h. Finally it is washed and hydroextracted.

6. Steaming. The dyed and washed yarn is steamed under pressure of 1 to $1^1/_2$ atm. for 2 h.

7. Soaping. After steaming the yarn is soaped at the boil for $^1/_2$ h, either in an open or in a closed vessel. According to the nature of the water 2 to 5 parts soap per 1000 parts water are required.

22a. Colours which are soluble in bisulphite.

These colours can be used in combination with bisulphite of chrome in the padding machine (one bath process) and are fixed by steaming. Ceruleine, however, is not so easily soluble as Alizarine Blue SB and Alizarine Green S.

Alizarine Blue SB.
Ceruleine S paste, SW, S conc.
Alizarine Green S pat.

23. Cotton Colours suitable for Erban-Specht's process.

(Method protected by letter's patent.)

The Alizarine dyestuffs are dissolved in water. free from lime, by means of ammonia or Dissolving Ether MLB, then diluted and mixed with neutral Turkey red oil. The well bleached cotton is impregnated with this liquid, then dried at 122 to 140° F and passed through a second bath which contains the required mordants (acetate of alumina, chrome, iron, lime). The material is wrung evenly or passed through squeezing rollers and then either dried or in the moist state steamed for 1 to 2 h with or without pressure; finally the cotton yarn is soaped, or softened.

Alizarine Yellow GG pat., R, N.
Alizarine Orange N.
Alizarine Red, all brands.
Alizarine Claret R paste.
Alizarine Brown, all brands.
Solid Green O, 50%.
Ceruleine paste A.
Alizarine Green S pat.

a. Pink on piece-goods and yarn.

Alizarine solution: 100 parts Alizarine, paste,
1300 ,, Water (free from lime),
200 ,, Ammonia 25%.

I. Bath:	1.	2.	3.	4.	5.
Water (free from lime)	1900 parts	1885 p.	1835 p.	1735 p.	1635 parts
Neutral-Turkey red oil 80% sol. 1:4	240 ,,	240 ,,	240 ,,	240 ,,	240 ,,
Alizarine solution	25 ,,	50 ,,	100 ,,	200 ,,	300 ,,

II. Bath:

Water	2170 parts	2165 parts	2160 parts	2150 parts	2136 parts
Acetic acid 12° Tw	3 ,,	3 ,,	3 ,,	3 ,,	3 ,,
Acetate of alumina 19° Tw	2,7 ,,	5,4 ,,	10,8 ,,	21,6 ,,	32,4 ,,
Acetate of lime 29° Tw	0,47,,	0,95,,	1,9 ,,	3,8 ,,	5,7 ,,

In order to obtain very blue shades of pink only one half of the given amounts of Acetic Acid and Acetate of lime (II. bath) are used.

III. Softening: 10000 parts Water
5 ,, Soda
1 ,, Tinsalt
5 ,, Soap
} 2 hs under pressure of 2 atmospheres.

Acetate of alumina 19° Tw.

{ 1908 parts Alum,
{ 2000 ,, Water,
{ 1590 ,, Acetate of lead,
{ 1600 ,, Water,

are dissolved separately and then mixed. After precipitating the sulphate of lead, and cooling

150 parts Soda crystals

are added; and the whole allowed to settle for 24 h; the solution is then drawn off and made to twaddle at 19° Tw.

If acetate of iron is used as a mordant, lilac shades are obtained.

b. Turkey red on cotton cloth.

The boiled or bleached goods are passed cold through the padding machine containing:

14 lbs 1 1/2 oz Alizarine red FH paste 20 %,
5 gall 5/8 nog. Water (free from lime),
3 pints Ammonia 25 %,
1 gall Turkey red oil 80 %.

After drying the pieces in the hotflue, they are passed cold through the mordant:

4 1/2 gall Water,
3/4 gall Acetate of alumina 15° Tw,
3 pints Acetate of lime 29° Tw.

Then the goods are dried again and steamed: for 1 h without pressure, for 1/2 h under pressure of 1 atmosphere, and for another 1/2 h under pressure of 2 atm. The pieces are then washed and soaped at the boil for 1/4 h (2 lbs soap per 10 gall water); finally they are washed again and softened under pressure af 2 atm. for 2 to 6 h with

10 gall Water,
1 oz Soap,
1 oz Soda crystals,
1/6—1/4 oz Tinsalt.

For heavier cloths (Moleskins, Flanelletes etc.) the baths are diluted with 1/4—1/3 of their volume. Instead of Ammonia or Sodium Turkey Red Oil the Monooxy Acid of Schmitz in Heerdt or Castor Oil Soap may be employed with advantage.

Acetate of Alumina 15° Tw.

{ 6 3/8 lbs Sulphate of Alumina are dissolved in
{ 6 lbs hot Water
{ 9 1/2 lbs Sugar of Lead are dissolved in
{ 9 lbs hot Water

and mixed. After letting the precipitate settle down, the solution is made to twaddle at 15° Tw before being used.

Acetate of Lime 28.4° Tw.

3½ lbs pure lime are slaked with
5 ,, Water and diluted with
15 ,, Water, and
12 ,, Acetic Acid of 12° Tw

are added, the whole left to stand for 1—2 days: then the clear alkaline solution drawn off and diluted with Acetic Acid until a slight acid reaction is noticeable. Before use the solution is made to twaddle 28.4° Tw.

C. Fancy shades.

The yarn (which must be bleached if light shades are required) is passed through Bath I (Alizarine solution) wrung evenly, dried at 140° F and then passed into the II bath (Mordant solution). After wetting it well, it is carefully and evenly wrung and then, either dried or in its moist state, steamed for 1—2 h without or with very slight pressure. The colours are thus developed.

Piece goods are treated on the padding machine in a similar manner.

The **colour solutions** are made up as follows:

for **light** shades

50 parts	dyestuff made into a paste with
450 ,,	Water,
8750 ,,	Water free from lime,
250 ,,	Ammon.25%(1:10),
500 ,,	Turkey Red Oil 80% (1:4).
10000 parts.	

for **dark** shades

800 parts	dyestuff made into a paste with
7200 ,,	Water free from lime,
300 ,,	Ammonia,
400 ,,	Dissolving Ether MLB,
400 ,,	Turkey Red Oil 80%.
9100 parts.	

When using Alizarine Brown and Ceruleine it is advisable to filter the solutions. For Solid Green O less dyestuff and correspondingly more Water is required (for dark shades: 320 parts Dyestuff and 7680 Water).

The **Mordant solutions** are prepared as follows:

for **light** shades

Alumina mordant.

9525 parts	Water,
250 ,,	Acetic Acid 12°Tw (1:10),
175 ,,	Acetate of Alumina 15° Tw,
50 ,,	Acetate of Lime 28.4° Tw.
10000 parts.	

for **dark** shades

6200 parts	Water,
1400 ,,	Acetate of Alumina 15° Tw.
400 ,,	Acetate of Lime 28.4° Tw.
8000 parts.	

Chrome mordant.

9638	parts	Water,	7100	parts	Water,
250	,,	Acetic acid 12° Tw 1:10,	700	,,	Acetate of chrome 32.4° Tw,
87	,,	Acetate of chrome 32.4° Tw,	200	,,	Acetate of lime 28.4° Tw.
25	,,	Acetate of lime 28.4° Tw.	8000	parts.	
10000	parts.				

Iron mordant (for Lilac shades).

9475	parts	Water,
250	,,	Acetic acid 12° Tw 1:10,
250	,,	Acetate of iron 15° Tw,
25	,,	Acetate of lime 28.4° Tw.
10000	parts.	

23a. Alizarine One Bath Colours.

In certain cases, especially for light shades and for those colours which require no Lime, the alkaline mordants may be added to the bath (in piece dyeing) so that the goods are only passed once through the padding liquid and are then steamed. In this case the shades may be embellished with suitable wool colours and Eosines, which are fixed by means of chrome.

10	parts	Alizarine Claret R (or 5 parts Alizarine Claret, and ½ part Fast Acid Violet R, B or Fast Acid Blue R),
895	,,	Water,
50	,,	Ammonia 1:10,
20	,,	Acetate of Soda 1:10,
25	,,	alk. Chrome mordant.
1000	parts.	

Alkaline Chrome Mordant.

200	parts	Ammonia,
267	,,	Water,
133	,,	Glycerine,
400	,,	sextuple Acetate of Chrome 32.4° Tw.
1000	parts.	

Solid Green O may also be used for the one bath method, but it produces a fast brown when employed (padded and steamed) as a self colour in an ammoniacal solution.

Directions.

The pieces (after being boiled in Soda or bleached) are passed through the padding liquids, which must be carefully prepared (as given below) and are then dried in the hotflue. Care must be taken to avoid rust-marks (especially in light shades) as the Iron lake of Solid Green produces dark, greenish spots.

After dyeing, the pieces are steamed for ¼—½ h according to the depth of the required shade, and finally washed and soaped

in the usual manner. Shades obtained with padding liquids which contain copper solutions are distinguished for their fastness to light.

Padding liquids.

120	parts	Solidgreen O are made into a paste with
2000	,,	Water, and mixed into
150	,,	Borax dissolved in
2000	,,	Water
		Then
50	parts	Turkey Red Oil diss. in
2000	,,	Water, and
150	,,	Acetate of chrome 32.4° Tw. diss. in
2000	,,	Water, are added and the whole

made up to 10000 parts.

40	parts	Alizarin Red No. I paste 20% and
150	,,	Borax diss. in
2000	,,	Water
120	,,	Solidgreen O paste
1000	,,	Water
50	,,	Turkey Red Oil,
2000	,,	Water
150	,,	Alkaline solution of copper
1500	,,	Water

made up to 10000 parts.

800	parts	Solidgreen O paste
2000	,,	Water
450	,,	Borax
2000	,,	Water
500	,,	Ammonia
50	,,	Turkey Red Oil
2000	,,	Water
150	,,	Alkaline solution of copper
2000	,,	Water

made up to 10000 parts.

120	parts	Solidgreen O paste
1000	,,	Water
150	,,	Borax
2000	,,	Water
20	,,	Alizarine-Yellow N powder
1500	,,	hot water
50	,,	Turkey Red Oil
2000	,,	Water
150	,,	Acetate of chrome 32.4° Tw.
2000	,,	Water

made up to 10000 parts.

120	parts	Solidgreen O paste
100	,,	Caustic soda 36° Tw.
2000	,,	Water
60	,,	Ceruleine conc.
200	,,	Caustic soda 36° Tw.
3000	,,	hot Water
50	,,	Turkey Red Oil
2000	,,	Water
250	,,	Acetate of chrome 32.4° Tw.
2000	,,	Water
225	,,	Alkaline solution of copper
2000	,,	Water

made up to 10000 parts.

Alkaline solution of copper.

1000	parts	Chloride of copper 76.6° Tw.
500	,,	Tartaric acid
1200	,,	Caustic soda 76.6° Tw.
400	,,	Glycerine.

24. Vat Colours.

1. Zinc dust Lime Vat.

11 lbs. Indigo MLB 20 % paste
2—2½ ,, Zinc dust Ia. Qual.
6—7 ,, Quick Lime Ia. Qual.

The Indigo paste is first mixed with the Zinc, (after having stirred the latter into 2½ Gall warm Water 122° F) and then with the slaked lime. The whole is left to stand for 5—6 h, but is stirred from time to time. This standard solution is added to the vat, which is sharpened with ½ lb Zinc dust and 1 lb Lime for every 100 Gall of water, and the material dyed in this vat.

2. Iron sulphate Lime Vat. (Vitriol Vat.)

5 lbs Indigo MLB 20 % paste
5 ,, Sulphate of Iron (free from copper)
6 ,, Quick Lime

The Sulphate of Iron is dissolved in hot water and added to the Indigo paste. Whilst continually stirring the slaked lime is added. The whole is left to stand for 5—6 h or over night, but is stirred from time to time. This standard solution is added to the vat, which is sharpened with 1 lb Sulphate of Iron and 2 lbs of lime for every 100 Gall of water, and the material dyed in this vat.

3. Hydrosulphite Vat.

5 parts Indigo MLB paste 20 % are mixed with
3 ,, hot Water, and to this mixture
8½ ,, Soda lye 76° Tw. added,

and the whole well stirred. After heating to 113° F., 25 parts Hydrosulphite 20° Tw. (directions as below) or 8 parts Hydrosulphite MLB 32.4° Tw. are added and the temperature kept at 113° F.

In the course of the reduction which takes place and which is tested in the usual way with a sheet of glass, more Hydrosulphite solution is added in several portions. The reduced Indigo ought to run off a sheet of glass as a yellow liquid, which oxydises in 20—30 sec.

The dye-vat is sharpened with 2 lbs Hydrosulphite solution 20° Tw. for every 100 gall of water.

Instead of preparing a Hydrosulphite Vat the Indigo MLB Vat I pat. 20 % can be employed with great advantage. In this case the special preparation of a standard solution is dispensed with. The vat is sharpened with 10—15 lbs Hydrosulphite 20° Tw. or 3—4 lbs Hydrosulphite MLB 32.4° Tw. for every 100 gall of water, then the Indigo MLB Vat I pat. and the necessary amount of soda lye is added, the liquid well stirred and the dyeing operation carried out as usual.

Preparing the Hydrosulphite sol. of 19—20° Tw.

100 parts Bisulphite of 71.4° Tw. are diluted with 225 parts cold water, and in the course of ½ h 8¾ parts Zinc dust stirred into this solution. The whole, which is stirred from time to time is left to stand for 4—5 h, and then mixed with 11½ parts Lime, slaked in 30 parts water. After allowing the sediment to settle, 7 parts Soda lye of 36° Tw.

are added to the clear solution; the Hydrosulphite, which is now ready for immediate use is kept in well closed vessels in a dark room.

Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

25. Colours produced upon the fibre by a process of oxydation.

Aniline Black, Primuline-Chloride of Lime-Yellow.

Aniline Black.

1. One bath black. The bath is prepared with
5% Aniline Oil, 12% Muriatic Acid, 6% Bichrome, or
3,6% Aniline Oil, 3,6% Muriatic Acid, 2% D. O. V, 7,8% Bichrome (Soda), 0,5% Copper Sulphate. The goods are entered cold, worked for 1 h, then the bath is raised to the boil in another hour, and the goods dyed at the boil for 1/2 h. Then they are well rinsed and soaped at the boil (eventually some (1%) Logwood Extract may be added to the soap bath).

2. Oxydation Black.
The concentrated bath of 15° Tw. contains p. 1000 parts.
126 parts Aniline salt, 40 parts Chlorate of Soda, 150 parts Acetate of Alumina 21.6° Tw., 5.7 parts Chloride of Ammonia, 3 parts Sulphate of Copper.
The dye-liquid is made to twaddle 12° Tw; and is refreshed and kept stable by additions with a standard solution of 15° Tw.
The goods are impregnated, evenly wrung, opened out, dried and oxydised.
They are then treated for 1/2 h in a bath (140° F) containing 2,5% Bichrome, 0,5% Aniline Salt, 0,2% Sulphuric Acid 168 1/2° Tw., then well rinsed and finally soaped.

Primuline-Chloride of Lime-Yellow.

The yarn is dyed in the usual manner with Primuline O, rinsed, and then treated for 1/2 h in a bath (77° F) containing pro 100 Gall 1/2 Gall Chloride of Lime-solution of 15° Tw.
Afterwards the yarn is well rinsed.
An increase of the temperature of the Chloride of Lime bath produces redder shades.

26. Colours produced upon the fibre by condensation.

Nitroso Blue, prepared with Nitroso Base M 50% paste and Resorcine or Tannoxyphenol. (comp. Cotton printing.)

27. Insoluble Azo colours produced direct upon the fibre.

Compare directions for Cotton printing, which contain particulars as to the dyeing of solid shades on piece goods.

For yarn dyeing only Azophor Red is of importance.

Azophor Red on yarn.

The yarn is boiled in Soda or Soda lye, then washed, hydroextracted and dried.

1. Grounding:

a. for yellowish Reds { 20—25 parts β-Naphthol, 28—30 parts Soda lye 36° Tw. 60—75 parts Sodium Turkey Red Oil,

b. for bluish Reds { 20—25 parts Beta Naphthol R, 40—50 parts Soda lye 36° Tw. 60—75 parts Sodium Turkey Red Oil

per 1000 parts grounding liquid.

The well prepared and dried yarn is treated in 2 lb. lots in a tureen containing about 10 gall. Grounding liquid. After being well kneaded, the yarn is wrung evenly, or each lot hydroextracted separately. For each following lot $^3/_4$ litres of grounding liquid is added to the tureen and after hydroextracting, the yarns are dried at 104—122° F.

2. Developing.

4488—5600 grammes Azophor Red PN pat. are made into a paste and dissolved with 30 litres cold water in an upright barrel containing a tap (for letting off the liquid) as near the bottom as possible. After $^1/_2$—1 h the clear solution can be drawn off. The froth, which has risen to the top and thus remained in the cask is then stirred up with 10 litres water and after some time this solution added to the first solution which now contains 40 litres Azophor Red solution A. Before use 10 litres of solution B are slowly added to A.

This consists of 2—2 $^1/_2$ litres Soda lye and 6—7 $^1/_2$ litres Water. The developing liquid therefore contains about 50 litres.

The tureen is half filled with this developing liquid and half with cold water. The naphtholated yarn is immersed in this solution in 2 lb. lots, and then wrung out over the tureen. The latter is replenished for each subsequent lot with $^3/_4$ litres developing liquid. The yarn is left to lie for about 1 h, and then rinsed in cold water.

3. Soaping.

The soap bath contains for yellow shades of Red 1—2 parts soap p. 1000 parts, and for blue shades of Red 2 parts soap, and $^1/_4$—$^1/_2$ parts Soda p. 1000 parts. The yarns are soaped for 10—15 min. at 140° F washed and dried.

Azophor Red produces brighter shades on bleached yarn; the yarn may also be bleached after dyeing, which enhances the brilliancy of the Red.

28. Sulphide Colours.

The goods are dyed for 1 h. at 176° F with dyestuff-solution and the addition of 10, 20, 30 parts Common salt or calc. Glauber's salt p. 1000 parts according to the depth of shade required. They are then well rinsed and fixed with suitable metal salts at 140° F (or even at a higher temperature) in order to increase the fastness properties. It is advisable to use soft water for dyeing.

Melanogen G and T pat.
,, **Blue** B pat.
Thiogene Brown R pat.

Fixing.

1. For **Melanogen** G and T pat.:
   a. 2—4% Sulphate of Copper,
   b. 2—4% Sulphate of Nickel,
   c. 2—3% Sulphate of Zinc and 1—2% Sulphate of Copper.
2. For **Melanogen Blue** B pat:
   a. 2—5% Sulphate of Zinc,
   b. 2—5% Alum,
   c. 1—2% Sulphate of Cadmium,
   d. 1—2% Sulphate of Nickel,
   e. 1—4% Sulphate of Copper,
   f. 2—5% Fixing Salt M.
3. For **Thiogene Brown** R pat.:
   a. 2—3% Copper Sulphate,
   b. 1—2% Copper Sulphate and 2—3% Bichrome,
   c. 3—4% Bichrome.

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b) Cotton Colours classified according to special properties.

1. Cotton Colours fast to bleaching.

The following colours may be boiled and bleached (together with undyed material), without being destroyed.

Alizarine Red No. 1 paste 20% on Alumina or Alumina-Iron or Iron-Mordant as **Old Red, Claret-Red** or **Violet.**
Alizarine Blue, all brands on Oil-Tannin-Chrome Mordants.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Oxydation Aniline Black.
Alizarine Orange N paste, **Alizarine Yellow** GG pat., on Chrome Mordant.
Primuline, chlorinated.

2. Cotton Colours perfectly fast to washing.

The following Colonrs may be washed in hot soap and soda, without changing their shades materially nor bleeding into white.

Alizarine Orange N paste, on Alumina and Chrome Mordants.
Alizarine Red paste 20 %, all brands, on Alumina-, Chrome-, Iron- and mixed Mordants.
Alizarine Claret R paste, on Alnmina- and Chrome Mordant.
Alizarine Brown, all brands, on Alumina- and Chrome Mordant.
Alizarine Blue, all brands, on Chrome Mordant.
Alizarine Darkblue S, on Chrome Mordant.
Alizarine Green S, on Chrome mordant.
Ceruleïne, all brands, on Chrome and Alumina Mordants.
Galleïne paste A, on Chrome Mordant.
Solid Green O, as Bistrebrown without Mordant, on Chrome and Iron Mordant.
Indigo MLB powder, pat.
Indigo MLB extra (99—100 %), pat.
Indigo MLB'G powder, pat.
Indigo MLB paste 20 %, pat.
Indigo MLB Vat I 20 %, pat.
Indigo White MLB 40 %, pat.
Aniline Black (one bath and Oxydation Black), pnre or with **Melanogen Blue** B pat., **Dianil Black** CR or PR pat. as a bottom.
Primuline O, chlorinated.
Melanogen Blue B pat.
Melanogen G, T pat.
Thiogene Brown R pat.
Cresotine Yellow G, **Dianil Fastbrown** B, **Dianil Brown** 3GO, **Dianil Black** N, R, treated with Copper sulphate, Bichrome and Sulphuric acid.

3. Cotton Colours, which stand a fair amount of washing and soaping.

Besides those colonrs which were enumerated nnder 2, the following dyestnffs withstand washing and soaping fairly well.

a) Alizarines:

Alizarine Yellow R and GG pat., on Chrome Mordant.

b) Colonrs, produced on the fibre:

Orange: Meta-Nitraniline (Azophor Orange) and **β-Naphthol.**
Red: Paranitraniline (Azophor Red) and **β-Naphthol** or **β-Naphthol** R.
Claret Red: α-Naphthylamine and **β-Naphthol.**
Blue: Dianisidine (Azophor Blue) and **β-Naphthol.**
Nitroso Blue.

c) Basic Colours, on Antimony-Tannin mordant or fixed after dyeing.

Auramine, all brands.
Janus Yellow G, **Janus Brown** B, R pat.
Rosazeïne 4G pat.
Safranine, all brands.
Methylene Violet 3R A extra, 2RA, 2RN, BN.
Janus Red B pat.
Methylene Heliotrope O pat.
Methyl Violet 2B, 6B, **Violet crystals** O.
Victoria Blue B.
Methylene Blue, all brands, **Marine Blue**, all brands, **Methylene Darkblue** RBN, 3BN, **Methylene Indigo** O, SS.
Thionine Blue GO.
Ethyl Blue BF pat., **Indamine Blue N** extra, NB extra.
Indophene Blue B, G pat.
Janus Blue R, G, pat., **Janus Darkblue** R, B, pat.
Methylene Green O, extra yellow conc., GG.
Janus Green G, B, pat., **Janus Black** I pat.
Brilliant Green, all brands, **Malachite Green**, all brands.
Methylene Grey, all brands, **New Methylene Grey** G powder.
Nigrosine, all brands.

d) Direct dyeing Colours.

Oxydianil Yellow O, **Dianil Yellow** 2R, 3G, pat., fixed with Chrome or Chrome-copper.
Dianil Direct Yellow S, **Cresotine Yellow** G, **Dianil Fast-Brown** B, fixed with Chrome or Chrome-Copper.
Primuline O developed with Azophor Red or Azophor Orange, also diazotised and developed with Ammonia, Phenol, Resorcine or β-Naphthol.
Primuline O, developed with β-Naphthol and treated with Solidogen A pat.

4. Cotton Colours which are fast to water.

Besides those dyestuffs which were enumerated under 2 and 3, the following colours are fast to water.

a) Basic Colours.

Azophosphine GO pat.
Janus Yellow R pat.
Phosphine, all brands.
Chrysoidine, all brands.
Vesuvine, all brands.
Cutch Brown D, **Dark Brown** M, **Brown** A,
Scarlet for Cotton O.
Magenta, all brands.
New Magenta O, P pat.
Cerise G, R, **Grenadine**, all brands, **Maroon** extra.
New Fast Blue 3R cryst., **Fastblue for cotton**, all brands.
Methyl Violet, all brands.

b) Direct Colours.

Dianil Yellow R pat., **Dianil Orange** F pat., **Dianil Brown** 3GO. B, BD, D, R, G, M, **Dianil Japonine** G, dyed direct.
Dianil Blue G, B, R, 2R, 3R, 4R, BX, pat., developed with Chrome.
Dianil Darkblue 3R. pat., dyed direct.
Dianil Indigo O pat., treated with copper or fixed with Chrome-Copper.
Dianil Black pat., all brands. dyed direct.
Dianil Claret Red G, B, treated with Solidogen.

c) Resorcine Colours.

Eosine, Erythrosine, Phloxine, Rose Bengale, Eosine Scarlet, Cyanosine, all brands, fixed with Chrome or treated with Solidogen.

5. Cotton Colours fast to perspiration.

All colours with exception of:

Brilliant Orange } all brands
Brilliant Croceine }
Eosine, all brands
Erythrosine, all brands
Phloxine, all brands
Rose Bengale, all brands
} without Solidogen after-treatment.

6. Cotton Colours fast to acids.

Fast to boiling in acid are:

Alizarine Red, all brands, on Old red mordant.
Alizarine Blue, all brands, on Oil, Tannin and Chrome mordant.
Ceruleine, all brands, on Oil, Alumina or Oil-Chrome mordant.
Alizarine Orange N paste on Chrome mordant.
Aniline Black.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Solidgreen-Bistre.
Primuline, chlorinated
Primuline Red, fixed with Solidogen, or developed by the other well known methods.
Melanogen Blue B pat.
Melanogen T, G, pat.
Thiogene Brown R pat.
Cresotine Yellow G.
Dianil Brown 3GO. } chromed in an acid bath.
Dianil Fast Brown B }
Dianil Black CR, R, G, N, pat. }

Fairly fast to boiling in acid are:

a) Basic dyestuffs:

Auramine, all brands.
Safranine, all brands.
Janus Brown B pat.
Methylene Blue BB conc., **Thionine Blue** GO.
Indamine Blue N, NB extra, **Ethyl Blue** BF pat.
New Fast Blue 3R cryst.
Indophene Blue B, G, pat.
Janus Blue G, R, pat.
Methylene Green extra yellow, **Methylene Grey,** all brands.
Methylene Heliotrope O.

b) Dianil dyestuffs:

All colours treated with Solidogen, with exception of **Dianil Red** 4B, **Dianil Claret Red** B, G.

Dianil Orange N, **Toluylen Orange** R
Dianil Brown, all brands
Dianil Darkblue R, 3R pat.
Dianil Black, all brands pat.
} after treated with Azophor Red.

Dianil Brown 3GO
Dianil Japonine G, **Dianil Fastbrown** B
Dianil Darkblue R, 3R pat.
Dianil Black CR pat.
} after treated with Copper.

7. Cotton Colours which stand crabbing and boiling in acids.

The following dyestuffs are suitable for warps and fancy styles in half wool dyeing.

Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Aniline Black.
Primuline O, chlorinated, diazotised and developed, diazotised, developed and treated with Solidogen A pat.
Melanogen Blue B pat.
Melanogen T, G, pat., **Thiogene Brown** R, pat.
Methylene Grey, all brands, **New Methylene Grey** G, **Ethyl Blue,** BF pat. on Tannin mordant.
Janus Yellow R pat., **Janus Brown** B, R, pat., **Janus Blue** R, G, pat., fixed.
Cresotine Yellow G, **Dianil Brown** 3GO, **Dianil Fastbrown** B, **Dianil Black** CR, N, R, G, pat., chromed in an acid bath.

8. Cotton Colours fast to ironing.

The following dyestuffs stand hot ironing without changing their shade.

Phosphine, all brands, **Azophosphine** GO, BRO, pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine**, all brands, **Cutch Brown** D, G, **Darkbrown** M, MB, **Magenta**, all brands, **New Magenta** O pat., **Cerise**, all brands, **Grenadine**, all brands, **Maroon** O, extra, **Cardinal** R, G.
Cotton Scarlet O.
Safranine, all brands, **Methylene Violet**, all brands, **Methylene Heliotrope.**
Rosolane O pat.
Methyl Violet, all brands with exception of 4 R and 5 R, **Violet crystals** O, **Malachite Green**, all brands, **Brilliant Green**, all brands, **Victoria Blue** B.
Rosazeïne 4 G pat.
Conc. Cotton Blue, all brands, **Pure Blue**, **China Blue**, all brands, **Methyl Blue** for Cotton MLB, **Methylene Blue**, all brands, **Thionine Blue** GO, **Indamine Blue** N extra. **Ethyl Blue** BF, **Methylene Indigo** O, SS, **Methylene Darkblue** RBN, 3 BN.
Methylene Green, all brands.
Fast Blue for Cotton, all brands, **New Fast Blue** 3 R cryst.
Methylene Grey, all brands, **New Methylene Grey** O, **Nigrisine** O.
Janus Yellow G, R, pat.
Janus Brown R. B, pat.
Janus Red B pat.
Janus Blue G, R, pat., **Janus Green** G, B, pat.
Janus Black I pat.
Primuline O chlorinated, also diazotised and developed.
Oxy Dianil Yellow O.
Dianil Yellow 3 G, G, R pat., **Dianil Direct Yellow** S, **Cresotine Yellow** G, **Aurophenine** O.
Dianil Orange G pat., N, **Toluylene Orange** R.
Dianil Scarlet G, 2 R, pat., **Dianil Red** R, 4 B, 10 B.
Brilliant Dianil Red R, R conc., **Deltapurpurine** 5 B, **Dianil Green** G pat.
Dianil Blue G, B, R, 2 R 3 R, 4 R, E, ET, BX, pat.
Dianil Darkblue R, 3 R, pat. with exception of Azophor developed shades.
Dianil Black R, G, CR, T, CB, AC, HW, RN extra pat., PR, PG, **Dianil Newblack** LBI pat.
Dianil Brown 3 GO, 2 G, G, R, BD, D, B, **Dianil Fastbrown** B.
Alizarine Yellow GG pat. N, R.
Alizarine Orange N, **Alizarine Brown**, all brands.
Alizarine Red, all brands, **Alizarine Claret** R paste.
Alizarine Blue, all „S" brands, **Alizarine Darkblue** S, **Alizarine Green** S paste.
Ceruleïne conc., S, S conc., paste SW.
Galleïne, all brands.
Solidgreen O 50%.

Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Aniline Black.
Nitrosoblue.
Para Nitraniline Red, Meta Nitraniline Orange, Dianisidine Blue
Melanogen Blue B pat.
Melanogen G, T, pat.
Thiogene Brown R pat.

9. Cotton Colours fast to steaming.

Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Aniline Black.
Solidgreen Bistre.
Alizarine Colours.
Basic Colours on Tannin-Antimony Mordant.
Janus Colours, dyed on a mordant and fixed after dyeing.
Dianil Colours fixed with metal-salts, developed with Azophor- or Naphthol.
Melanogen Blue B pat., **Melanogen** G, T, pat.
Thiogene Brown R pat.
Paranitraniline Red.
Metanitraniline Orange.
Naphthylamine Claret.
Dianisidine Blue.
Nitrosoblue.

10. Cotton Colours fast to milling.

The following dyestuffs stand the milling process without changing their shades nor bleeding.

Alizarine Yellow GG pat., Chrome Mordant.
Alizarine Orange, all brands, Chrome and Alumina Mordant.
Alizarine Red, all brands, Alumina, Chrome, Iron and mixed Mordants.
Alizarine Claret R paste, **Alizarine Brown,** Alumina and Chrome Mordant.
Alizarine Blue, Alizarine Darkblue, Alizarine Green S, all brands, Chrome Mordant.
Ceruleïne, all brands, Alumina and Chrome Mordant.

Galleïne, all brands, Chrome Mordant.
Solidgreen Bistre, Chrome and Iron Mordant.
Nitrosoblue.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Aniline Black.
Primuline O, chlored.
Cresotine Yellow G
Dianil Brown 3GO
Dianil Fastbrown B
Dianil Black CR, G, N, R pat. } chromed in an acid bath.
Melanogen Blue B, pat., **Melanogen** G, T, pat.
Thiogene Brown R pat.

Fairly fast to milling are:

Janus Yellow G pat., **Janus Brown** B, R, pat.
Methylene Heliotrope O.
Indamine Blue N, NB extra.
Ethyl Blue BF pat.
Janus Blue R, G, pat.
Indophene Blue B, G, pat.
Methylene Grey, Methylene Green all brands.
Janus Green G, B, pat.
Methylene Violet 3RA extra.
Primuline O, developed.
Dianil Brown BD, R, 3GO, **Dianil Fastbrown** B, **Dianil Japonine** G, Chrome-Copper Development.
Dianil Darkblue R, 3R, pat., **Dianil Black** CR pat., treated with copper or developed with Azophor Red or Naphthol.
Dianil Black R, G, N, E, T, pat., developed.

In light shades also direct shades of:

Dianil Yellow, Dianil Direct Yellow S, **Dianil Blue, Dianil Brown,** all brands.

11. Cotton Colours fast to Chlorine.

The following dyestuffs withstand the process of chlorinating with Chloride of lime, as is required for certain trades.

Alizarine Red No. 1, on Alumina-, Iron- and Alumina-Iron Mordant.
Alizarine Orange on Chrome Mordant.
Alizarine Yellow R, GG, pat. on Chrome Mordant.
Alizarine Blue F, SB, A, **Alizarine Darkblue,** on Chrome Mordant.
Aniline Black.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.

Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Primuline O, chlored.
Dianil Direct Yellow S, **Oxydianil Yellow** O.
Aurophenine O.
Metanitraniline Orange.
Paranitraniline Red.
Naphthylamine Claret.

12. Cotton Colours fast to stoving.

Oxydianil Yellow O.
Aurophenine O, **Cresotine Yellow** G, **Dianil Direct Yellow** S.
Primuline O, chlorinated.
Dianil Orange G, pat., N, **Toluylene Orange** R, **Dianil Brown** 3GO, R, BD, **Dianil Fast Brown** B, **Dianil Black** CR, N, pat., **Dianil Darkblue** R, 3R, pat. developed with Azophor.
Melanogen Blue B pat.
Melanogen G, T, pat.
Thiogene Brown R, pat.

13. Cotton Colours fast to rubbing and mangling.

Primuline O, and all **Dianil Colours**, (dyed direct, or developed with Azophor or Naphthol, or fixed with Metal salts or Solidogen) are perfectly fast to rubbing and mangling. Likewise:

Melanogen Blue B pat., **Melanogen** T, G, pat.
Thiogene Brown R pat.
Aniline Oxydation Black.
Nitroso Blue.
Solidgreen-Bistre.

Fairly fast to rubbing and mangling are:

Alizarine Colours on Old Red Oil grounding with Alumina, Chrome, Iron or mixed mordants; also the following basic colours on Tannin mordant (or aftertreated with Tannin):

Auramine, all brands.
Phosphine, Azophosphine pat., all brands.
Chrysoidine, all brands.
Janus Yellow G pat.
Rosazeïne, all brands.
Safranine, all brands.
Methylene Violet, Methylene Heliotrope O, **Methylene Blue, Thionine Blue**, all brands.
Ethyl Blue BF pat.

New Fast Blue 3R cryst., **Fast Blue for Cotton,** all brands.
Indamine Blue N extra, NB extra.
Indophene Blue B, G, pat.
Janus Blue R, G, pat., **Janus Darkblue** R, B, pat., **Janus Green** G, B, pat.
Methylene Green, Methylene Grey, all brands.

14. Cotton Colours fast to light.

The following dyestuffs are distinguished for their great fastness to light.

Alizarine Yellow R, GG pat. on Chrome Mordant.
Alizarine Orange on Alumina- and Chrome Mordants.
Alizarine Red, all brands, on all Mordants.
Alizarine Claret R paste, on all Mordants.
Alizarine Blue, all brands, on Chrome Mordant.
Alizarine Green S, on Chrome Mordant.
Alizarine Brown, all brands, on Chrome- and Alumina Mordants.
Ceruleïne, all brands, on Chrome- and Alumina Mordants.
Solidgreen paste 50% on Iron Mordant.
Aniline Black.
Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.
Primuline O, chlorinated.
Oxydianil Yellow O.
Cresotine Yellow G, after treated with copper, **Aurophenine** O.
Melanogen Blue B pat., treated with Cadmium, Nickel, Copper or Fixing Salt M.
Melanogen G, T, pat.
Thiogene Brown R pat.
Methylene Green, all brands.

The following dyestuffs are very fast to light.

a) Mordant Colours.

Galleïne, all brands, on Chrome Mordant.

b) Insoluble Azo Colours developed upon the fibre.

Paranitraniline Red.
Dianisidine Blue.
Solidgreen Bistre.

c) Basic Colours.

Auramine, all brands.
Phosphine, all brands.
Janus Yellow G, R, pat.

Rosolane pat., all brands.
Safranine, all brands.
Methylene Violet, Methylene Heliotrope O, **Methylene Blue, Thionine Blue,** all brands, **Methylene Indigo** O, SS.
Ethyl Blue BF, BD, RD, pat.
New fast Blue 3R cryst., **Fastblue for cotton,** all brands.
Indamine Blue N extra, NB extra.
Indophene Blue B, G, pat.
Janus Blue R, G, B, pat.
Methylene Grey, all brands, **New Methylene Grey** O, **Nigrisine** O.

d) Direct Colours.

Dianil Yellow 3G pat., after treated with Copper.
Dianil Yellow R, 2R, pat.
Dianil Direct Yellow S, **Cresotine Yellow** G.
Dianil Orange G pat., N, **Toluylene Orange** R.
Dianil Blue G, B, R, 2R, 4R, pat., after treated with Copper.
Dianil Darkblue R, 3R, pat., after treated with Copper or developed with β-naphthol.
Dianil Black R, G, T, E, RN extra, pat., direct or developed.
Dianil Black CR pat., treated with Chrome and Copper.
Dianil Brown 3GO, 2G, **Dianil Fastbrown** B, **Dianil Japonine** G, direct or treated with Chrome or Copper.
Dianil Brown 3GO, treated with Azophor.

e) Sulphide Colours.

Melanogen Blue B pat., treated with Alumina, Zinc or Chrome.

C. SILK DYEING.

a. Silk Colours classified according to their method of dyeing.

1. Silk Colours, dyeing in acidified boiled off liquor.

The dyebath is prepared with the required amount of Sulphuric or Acetic Acid, then the boiled off liquor (50—100 parts per 1000) is added and finally the colour solution poured into this bath. The silk is entered at 86—104° F the temperature slowly raised to 203° F and the dyeing operation carried on until the bath is nearly exhausted. After dyeing the material is rinsed and lustred in a weak acid bath.

Piece material is generally dyed in an acid bath without the addition of boiled off liquor.

a) With sulphuric acid.

Acid Magenta, all brands, **Acid Maroon** O, **Acid Cerise** O, **Orseilline** R and B.
Acid Violet 4RS, 3RS, 3RA, R conc. new, N, 5BF, 7BN.
Methyl Blue for Silk MLB, for cotton MLB, **Opal Blue** superior, **Blue** for Silk T conc., T, greenish, No. 99, KR, **Opalblue** blue shade, **Bleu de Lyon** O, R, spirit.
Victoria Blue B.
Acid Green, all brands.
Patentblue A, V, superior, L, N, pat.
Keton Blue 4BN sol., 4BN powder, pat.
Violamine G, R, A2R, B, 3B, pat.
Fastblue, all brands, **Blackblue** O, **Black Black** O, **Fastdarkblue** R.
Nigrosine No. 1—4, D spirit., **Silk Grey** O, R fast to water.
Chinoline Yellow O.
Naphthol Yellow S.
Flavazine S, L, T.
Azo Yellow conc., **Victoria Yellow** conc.
Orange No. 4, G, No. 2, **Brilliant Orange** O, G, R.
Fast Brown O, yellow shade, **Azo Brown** V.
Scarlet, all brands, **Scarlet** 6R cryst.

Diamond Scarlet for Silk G, **Scarlet** for Silk O, G, 2G.
Brilliant Croceïne, all brands, **Fastred** O, S, **Brilliant Crimson** O.
Amaranth O, **Victoria Rubine** O, **Claret Red** G, R, B, 3B.
Amido Naphthol Black 4B, 4B extra, 6B, S.

b) With acetic acid.

Auramine, all brands, pat.
Phosphine new.
Vesuvine conc., 3R superior, 4BG conc., extra yellow.
Magenta large cryst., small cryst., **Maroon** O, **Cerise** G, **Grenadine** O, **Cardinal** R.
New Magenta O pat.
Safranine, all brands.
Malachitegreen cryst. extra, **Brilliantgreen** cryst. extra.
Methyl Violet, all brands.
Violet crystals O.
Methylene Blue BB extra, BB conc., BB, R, 2R, 6R.
Methylene Green O, G, 2G, 3G, extra yellow, extra yellow conc.
Primula R, B, **Methylene Violet** 2RA, 2RN, BN, pat.
Rosolane T, O, BO, R paste, B paste.
Victoria Blue B.
Methylene Grey O, NF.
Eosine extra spirit. sol., **Cyanosine** O spirit. sol.
Eosine extra AG, BB, **Erythrosine** yellow shade, blue shade, extra blue shade N, blue shade N, extra N, yellow shade N, **Phloxine** GA extra, BA extra, G, O, 2B, 5B, **Rose Bengale** G, B.
Rosazeïne O, B, extra, B extra, 4G, 4G extra, pat.
Violamine R, B, 3B, A2R, pat.
Patentblue A, V, N, G, L, superior, pat.
Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Dianil Yellow R, 2R, 3G, pat.
Aurophenine O.
Dianil Orange G pat., N.
Dianil Red 4B, **Brilliant Dianil Red** R, **Delta Purpurine** 5B.
Dianil Blue G, B, R, pat.
Dianil Brown 3GO, R, BD.

2. Silk Colours dyeing in a neutral (or alkaline) soap bath.

The bath is prepared with Olive Oil Soap (10—12 parts per 1000) and the colour solution added. After having raised the temperature to the boil, the silk is dyed for $^1/_8$—$^3/_4$ h. (It is advisable to boil the bath up once more during this time.) Then the material

is rinsed in water, which ought to be free from lime, and soured with Muriatic or Sulphuric Acid at 140—176° C.

Alkaline Blue R conc., 2B, 4B, 6B.
Alkaline Blue 2OL, 4C, 7C.
Methyl Alkali Blue MLB.
Alkaline Violet O.

3. Silk Colours dyeing on a mordant.

The silk is first boiled off, then washed at 86—104° F with clean water and dried. It is then steeped for 12—24 h in the mordant which consists of

Nitrate Mordant 15° Tw. or of
Chloride of Chrome S 34° Tw.

After mordanting, the Silk is well washed in clean water, (free from lime if possible) and then dyed. The dyeliquid consists of boiled off liquor diluted in equal parts with water. The Alizarine Colours are stirred into this bath (cold). The silk material is entered cold, then the temperature slowly raised to the boil and the dyeing operation carried out for about 2 h; the temperature ought to remain for at least 1 h at 194—210° F.

After dyeing, the silk is well washed in water which ought to be free from lime, hydroextracted and then soaped in a neutral soap bath (5—7 parts of soap per 1000 parts of liquid) for ½ h at the boil, then washed again and finally lustred with Tartaric or Acetic Acid. It is advisable to add to the last bath (lustring) some Olive Oil, previously boiled with a little Soda. Boiled off liquor containing Tin (originated by material which was prepared with Tin solutions) ought never to be used.

The Nitrate mordant for light shades can be diluted to 3-7.4° Tw. Care must be taken to get the silk wetted through with the mordant, before it is steeped over night, for the places, which have not been moistened sufficiently, will remain white in the subsequent dyeing process.

Alizarine Yellow GG paste pat., R paste.
Alizarine Orange paste.
Alizarine Red RX, S, SDG, 4BN paste 20%.
Alizarine Claret paste R.
Alizarine Brown paste.
Alizarine Blue DNX paste.
Ceruleïne paste A.
Galleïne paste A.

4. Primuline.

The Silk is dyed for 1 h at the boil in a bath which is made acid with Acetic Acid and contains 10% **Primuline** O.

It is then rinsed and diazotized for $^1/_2$ h cold with

3% Nitrite of Soda
5% Sulphuric Acid 168$^1/_2$° Tw.

Then rinsed again, and developed cold for $^1/_2$ h with

1.2% Beta Naphthol
1% Soda lye 77° Tw.,

rinsed again and soaped $^1/_2$ h at the boil with 5 parts of Olive Oil soap per 1000 parts of water. Finally the material is lustred with Acetic Acid.

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b) Silk colours classified according to different properties.

1. Silk Colours which equalize on tin-weighted material.

Magenta large cryst., small cryst., **New Magenta** O pat.
Malachite Green cryst. extra, **Brilliant Green** cryst. extra.
Methyl Violet B, 6B, R, 5R, **Primula** R, B.
Violet cryst. O, **Victoria Blue** B.
Methylene Blue BB extra, BB conc., BB, R, 6R, **Methylene Green** O, G, 2G, 3G, extra yellow, extra yellow conc.
Safranine, all brands, **Methylene Violet** 2RA, 2RN, BN.
Rosolane T, O, BO, R paste, B paste.
Coalblack O, I and II.
Rosazeïne, all brands.
Eosine extra spirit., **Cyanosine** O spirit.
Eosine extra, AG, BB, **Erythrosine** yellow shade, blue shade, extra blue shade N, blue shade N, extra N, yellow shade N, **Phloxine** GA extra, BA extra, G, O, 2B, 5B, **Rose Bengale** G, B.
Violamine pat., all brands.
Alkaline Blue R conc., 2B, 4B, 6B, 2OL, 4C, 7C, **Methyl Alkaline Blue** MLB.
Patent Blue V, superior, L, N, pat.
Fast Darkblue R.
Chinoline Yellow O.
Naphthol Yellow S.
Flavazine S, L, T.
Azo Yellow conc.
Orange G, No. 2, **Brilliant Orange** O, G, R.
Diamond Scarlet for Silk G, **Scarlet** for Silk O, G, 2G.
Scarlet G, R—6R, B extra, for Silk.
Fast Red O, **Brilliant Crimson** O, **Amaranth** O.
Brilliant Croceïne, all brands.

2. Silk Colours which equalize on material weighted before or after dyeing with gallic acid.

Auramine conc., **Phosphine** new.
Vesuvine conc., 3R superior, 4BG conc., extra yellow.
Magenta large cryst., small cryst., **Maroon** O, **Cerise** G, **Grenadine** O, **Cardinal** R.
New Magenta O pat.
Methyl Violet B, 6B, R, 5R, **Primula** R, B, **Violet** cryst. O.
Methylene Blue BB extra, BB conc., BB, R, 6R, **Methylene Green** O, G, 2G, 3G, extra yellow, extra yellow conc., **Methylene Violet** 2RA, 2RN, BN.
Safranine conc.
Rosolane O, B, BO, B paste, R paste.
Methylene Grey O, NF.
Rosazeine O, B, extra, B extra, 4G, 4G extra, pat.
Scarlet for Silk, G, 2G, O, **Scarlet** B extra, **Diamond Scarlet** for Silk G.
Fastred O.

3. Silk Colours, which excel as regards equalizing.

Magenta large cryst., small cryst., **New Magenta** O pat.
Malachite Green cryst. extra, **Brilliant Green** cryst. extra.
Methyl Violet B, 6B, R, 5R, **Primula** R, B.
Violet cryst. O.
Victoria Blue B.
Methylene Blue BB extra, BB conc., BB, R, 6R, **Methylene Green** O, G, 2G, 3G, extra yellow, extra yellow conc.
Safranine, all brands, **Methylene Violet** 2RA, 2RN, BN.
Rosolane T, O, BO, R paste, B paste.
Coalblack O, I and II.
Rosazeïne, all brands.
Eosine extra spirit., **Cyanosine** O spirit.
Eosine extra, AG, BB, **Erythrosine** yellow shade, blue shade, extra blue shade N, blue shade N, extra N, yellow shade N, **Phloxine,** all brands, **Rose Bengale** G, B.
Violamine pat., all brands.
Alkaline Blue R conc., 2B, 4B, 6B, 2OL, 4C, 7C, **Methyl Alkaline Blue** MLB.
Fast Darkblue R.
Chinoline Yellow O.
Naphthol Yellow S.
Flavazine S, L, T.
Azo Yellow conc.
Orange G, No. 2, **Brilliant Orange** O, G, R.
Diamond Scarlet for Silk G, **Scarlet** for Silk O, G, 2G.
Scarlet G, R–6R, B extra, for Silk.
Brilliant Crimson O, **Amaranth** O.
Brilliant Croceïne, all brands.

4. Silk Colours for shading off logwood black.

Auramine conc.
Magenta large cryst., small cryst., **New Magenta O.**
Methyl Violet, all brands.
Methylene Blue BB extra, BB conc., BB, **Methylene Green** O, G, GG, 3G, extra yellow, extra yellow conc.
Alkaline Blue R conc., 2B, 4B, 6B, 2OL, 4C, 7C, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O.

5. Silk Colours for dyeing white.

Methyl Violet 2B chem. pure, 6B chem. pure.
Rosolane, all brands.
Bleu de Lyon spirit., **Blue** No. 1 spirit.

6. Silk Colours which stand the boiling off process.

Victoria Blue B.
Primuline O, devel. with Beta Naphthol.
Alizarine Yellow GG pat. paste, R paste, (only on Chrome Mordant).
Alizarine Orange paste.
Alizarine Red RX, S, SDG, 4BN paste 20%.
Alizarine Claret R paste.
Alizarine Brown paste.
Alizarine Blue DNX paste.
Ceruleïne paste A.
Galleïne paste A.

7. Silk Colours which stand boiling in water.

Alizarine Yellow GG paste pat., R paste (only on Chrome Mordant).
Alizarine Orange paste.
Alizarine Red RX, S, SDG, 4BN paste 20%.
Alizarine Claret R paste.
Alizarine Brown paste.
Alizarine Blue DNX paste.
Ceruleïne paste A.
Galleïne paste A.
Primuline O, devel. with Beta Naphthol.

8. Silk Colours which stand rain.

Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Dianil Yellow R, 2R, 3G, pat.
Dianil Blue R, B, G, pat.
Alizarine Yellow GG paste pat., R paste, only on Chrome Mordant.
Alizarine Orange paste.
Alizarine Red RX, S, SDG, 4NB paste 20%.
Alizarine Claret R paste.
Alizarine Brown paste.
Alizarine Blue DNX paste.
Ceruleïne paste A.
Galleïne paste A.
Violamine, all brands.
Bleu de Lyon O spirit., R spirit.
Primuline O, developed with Beta Naphthol.

Further all **basic Colors** and **Fastred** O, treated with **Tannin.**

9. Silk Colours wich stand soaping at 140° F.

Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Alizarine Yellow GG paste pat., R paste, (only on Chrome Mordant).
Alizarine Orange paste.
Alizarine Red RX, S, SDG, 4NB paste 20%.
Alizarine Claret R paste.
Alizarine Brown paste.
Alizarine Blue DNX paste.
Primuline O, developed with Beta Naphthol.

10. Silk Colours which stand light well.

Rosazeïne, all brands.
Violamine G, R, 2R, A2R, B, 3B, pat.
Patentblue A, V, N, L, superior, pat.
Methyl Blue for Silk MLB, for Cotton MLB, **Opal Blue** superior, blue shade, **Bleu de Lyon** O spirit, R spirit.
Blue for Silk 99, KR, T conc., T, green shade.
Fastdarkblue R.
Flavazine S, L, T.
Azo Yellow conc., **Victoria Yellow** conc.

Orange G, No. 2, **Brilliant Orange** G, O, R.
Scarlet G, R—6R, B extra, M old, M new, for silk, 2G, O, **Diamond Scarlet** for Silk A.
Fastred O, **Brilliant Crimson** O, **Amaranth** O.
Brilliant Croceïne, all brands.
Alizarine Yellow GG paste pat., R paste (only on Chrome Mordant).
Alizarine Orange paste.
Alizarine Red RX, S, SDG, 4NB paste 20%.
Alizarine Claret R paste.
Alizarine Brown paste.
Alizarine Blue DNX paste.
Ceruleïne paste A.
Galleïne paste A.

11. Silk Colours which stand light well on tin weighted material.

Violamine, all brands, pat.
Fastdarkblue R.
Dianil Yellow R, RR, pat.
Orange G, No. 2.
Scarlet for Silk, O, G, GG, **Diamond Scarlet** for Silk G.
Scarlet G, R, 5R, B extra, for silk.
Fastred O, **Brilliant Crimson** O, **Amaranth** O.
Brilliant Croceïne, all brands.

12. Silk Colours fast to stoving.

Rosolane T, O, BO, R paste, B paste.
Methyl Violet B, 6B, R, 5R.
Victoria Blue B.
Janus Yellow G, R, pat., **Janus Red** B pat.
Rosazeïne pat., all brands.
Eosine extra AG, extra BB, extra spirit, **Cyanosine** O spirit, **Phloxine** GA extra, BA extra, G, O, 2B, 5B, **Erythrosine** yellow shade, blue shade, extra blue shade N, blue shade N, extra N, yellow shade N, **Rose Bengale** G, B.
Violamine, all brands, pat.
Acid Violet 5BF, 3RA, 7BN.
Alkaline Blue R conc., 2B, 4B, 6B, 2OL, 4C, 7C, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O.
Patentblue A, N, B, pat. **Cyanine** B pat., **Ketone Blue** 4BN solution pat.
Fastblue G extra, O, 5R, extra, **Black Blue** O, **Black Black** O, **Fastdarkblue** R.
Chinoline Yellow O, **Naphthol Yellow** S.
Flavazine S, L, T.
Azo Yellow conc.

Orange G, No. 2, **Brilliant Orange** O, G, R.
Scarlet G, R, 4 R, **Scarlet** cryst. 6 R.
Brilliant Croceïne, all brands, **Brilliant Crimson** O.
Scarlet for Silk Q, G, 2 G, **Diamond Scarlet** for Silk G.

13. Silk colours which stand topping in an acid bath.

All **basic colours** after-treated with tannin.

All **Alizarine Colours, Alizarine Yellow** GG paste pat. and R paste only on Chrome mordant.

Primuline Red (Primuline O and Beta Naphthol) topped in an Acetic Acid bath.

D. HALF WOOL DYEING.

(Cotton and Wool Union fabrics.)

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1. Wool Colours, which leave cotton threads perfectly white.

Dyed in an Acid bath:

Acid Magenta, all brands, **Acid Violet** 4 RS, 3 RS.
Acid Green, all brands.
Patentblue V, N, L, LL, superior, pat., **Cyanine** B pat., **Keton Blue** 4 BN pat.
Naphthalene Green V, conc., pat., **Naphthalene Blue** B, B extra, D, pat.
Chinoline Yellow O.
Naphthol Yellow S, SE.
Flavazine T.
Orange G.
Scarlet R—6 R, **Scarlet** 6 R cryst.
Victoria Rubine O, G. **Naphthol Red** O.
Victoria Scarlet RR, 3 R, 4 R, 5 R, 6 R, **New Coccine** O.
Archil Substitute G pat.
Alkaline Fastred R pat., **Azo Acid Carmine** B pat.
Azo Acid Magenta G, 6 B.
Chromotrope G, 2 R, 2 B, 6 B, 8 B, 10 B, pat.
Victoria Violet 4 BS, 8 BS, pat., **Azo Acid Blue** B pat.
Azo Acid Black B, G, 3 BL, 3 BL extra, BL, GL, TL conc., TL extra, pat.

Dyed in an Acid bath and developed with Fluoride of Chrome:

Acid Alizarine Blue BB pat.
Acid Alizarine Green G pat.
Mordant Yellow O.
Alizarine Red 1 WS.

Dyed in an Acid bath and developed with Bichrome:

Chromogen I pat.
Chromotrope FB, F 4 B, 8 B, 10 B, S, pat.]
Acid Alizarine Grenade R.
Mordant Yellow O.
Alizarine Red 1 WS.

The white becomes purer, as the bath is made more acid. It is also of importance to rinse the goods directly after dyeing and then to hydroextract and dry them, in order to prevent the colour from bleeding into the cotton.

2. Dianil Colours, which dye wool and cotton alike in a Glauber's salt bath.

Dianil Yellow 3G, R, RR, pat., **Aurophenine** O.
Dianil Orange N.
Dianil Red R, 4B, 10B, **Dianil Claret Red** G, B, **Delta Purpurine** 5B.
Dianil Blue BX pat., **Dianil Indigo** O pat.
Dianil Black N, E, pat.
Dianil Brown 3GO, 3R, **Dianil Copper Brown** O.

3. Dianil Colours which dye the cotton deeper than the wool in a Glauber's salt bath.

Dianil Orange G pat.
Dianil Brown R, BD, G, B, D, M, **Dianil Fastbrown** B.
Dianil Blue G, B, R, 2R, 3R, 4R pat.
Dianil Darkblue R, 3R. pat.
Dianil Black PR, PG, CR, HW, pat.
Dianil New Black LBI pat.

4. Dianil Colours which dye the wool deeper than the cotton in a Glauber's salt bath.

Dianil Yellow G, **Cresotine Yellow** G.
Toluylene Orange R.
Dianil Scarlet G, 2R, pat.
Brilliant Dianil Red R, R conc.
Dianil Black T pat.
Dianil Green G pat.

5. Dianil Colours, which dye wool a different shade from cotton in a Glauber's salt bath.

Dianil Brown 5G.
Dianil Japonine G.
Dianil Blue E, ET, pat.
Dianil Black AC, CB, R, RN extra pat.

6. Wool Colours, which dye in a neutral Glauber's salt bath and are suitable for shading off the wool.

Alkaline Blue, all brands.
Acid Violet 5 BF, 5 BFI, 7 BN, N, **Neutral Violet** O.
Fast Acid Violet A 2 R, R, B, pat., **Fast Acid Blue** R, R conc., pat., **Acid Rosamine** A pat.
Rosazeïne O, B, extra, B extra, pat.
Patentblue A pat.
Naphthalene Green V, conc., pat.
Fastblue, all brands.
Victoria Yellow O, double, conc., **Azo Yellow** O, conc.
Orange No. 4, No. 2.
Fastred O.
Scarlet B extra.
Blue for Halfwool B pat.
Amidonaphthol Black 4 B, 4 B extra, 6 B, S.
Chrome Black B, T, pat.
Acid Alizarine Grey G pat.
Acid Alizarine Brown B.

Directions for dyeing union fabrics in a Glauber's salt bath:

A concentrated dyebath is prepared with 50 % Glauber's salt and the required amount of dyestuff. The well wetted material is entered at 122° F and the temperature raised to nearly boiling point. At this temperature the cotton is dyed to pattern; then the shading off colours which might be required for the wool, are added and the latter dyed to pattern — eventually heating the bath to the boil.

7. Janus Colours which dye wool and cotton alike.

Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Janus Green G pat.
Janus Black O, I, pat.

8. Janus Colours which dye cotton deeper than wool.

Janus Brown B pat.
Janus Grey B, BB pat.

9. Janus Colours, which dye wool deeper than cotton.

Janus Green B pat.
Janus Blue R, G pat.

10. Basic and Acid Colours which may be used together with Janus Colours for shading off purposes.

Rosazeïne O, B, extra, B extra, pat.
Victoria Blue B.
Methyl Violet 170, 2B, 6B chem. pure.
Brilliant Green cryst. extra.
Malachite Green cryst. extra.
Patentblue V pat., **Cyanine** B pat.
Flavazine T pat.

Directions for dyeing union fabrics with Janus Colours in an acid bath:

A concentrated dyebath is prepared for **dark shades** with about 2% Sulphuric Acid and the solution of the required dyestuffs. The goods are entered at 140° F and dyed to shade after raising the temperature to nearly boiling point. Through violent boiling the wool is dyed deeper, while a lower temperature favours the cotton more.

For **light shades** the bath is prepared with 3—4% Hydrochloric Acid, 2% Fluoride of Chrome and the requisite dyestuff solutions. The material is entered at nearly boiling point and dyed to pattern at the boil. In case the wool turns out too light a small addition of Glauber's salt is made.

11. Janus Colours which are suitable for dyeing the cotton in previously Acid dyed union fabrics.

Janus Yellow G pat.
Janus Brown R, B pat.
Janus Red B pat.
Janus Blue G, R, pat.
Janus Green G, B, pat.
Janus Grey B, BB, pat.
Janus Black I, II, O, pat.

Directions for dyeing the cotton cold in acid dyed union goods with Janus Colours.

The concentrated bath is prepared cold with 4% Muriatic Acid and the dyestuff solutions. The well rinsed material is entered and worked for 15 min., then double or treble as much Tannin as dyestuff is added and the goods worked for another 1/4 h. In order to fix the colours perfectly (for light shades) half as much Tartar Emetic as Tannin is added to the dyebath or (for dark shades) added to the rinsing bath.

12. Colours, which dye the cotton at a low temperature only slightly tinting wool.

Dianil Black PR, PG, R, CR pat.
Dianil Blue G, B, R, pat.
Dianil Yellow 2R pat., **Dianil Orange** G pat.
Dianil Brown R.
Melanogen Blue B pat.
Melanogen G, T, pat.
Thiogene Brown R pat.

13. Basic Colours which are suitable for shading off cotton in union fabrics on a tannin mordant.

Auramine conc., O, I, II, pat.
Azo Phosphine GO pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine,** all brands.
Magenta, all brands, **New Magenta** O pat.
Methyl Violet, all brands.
Malachite Green, all brands, **Brilliant Green,** all brands.
Methylene Green O, extra yellow, extra yellow conc., G, 2G, 3G.
Methylene Blue, all brands.
Thionine Blue GO, **Marine Blue** BI, RI, 2R.
Methylene Heliotrope O, **Methylene Violet** RRA, BN, RRA conc., 3RA extra.
Methylene Grey NF, O.
Safranine, all brands.
Rosazeïne O, B, extra, B extra, 4G, 4G extra, pat.

E. HALF SILK DYEING.

(Cotton and Silk fabrics.)

The dyebath is prepared with

2 parts Olive Oil Soap
0,2 parts Soda
5 parts Common Salt

and the requisite amounts of dyestuff per 1000 parts.

The goods are entered at 122—140° F, then the temperature raised to nearly boiling point and the dyeing process finished in $^{3}/_{4}$ h. Then the goods are rinsed and either (lustred) brightened with a little Acetic or Muriatic Acid, or, in case it is necessary to top the colours, topped at 122—140° F in a bath which is acidified with Acetic or Muriatic Acid, and finally lustred.

1. Dyestuffs which dye cotton and silk alike.

Aurophenine O.
Cresotine Yellow G.
Dianil Brown 3GO.
Janus Yellow R, G, pat.
Janus Brown R pat.
Janus Red B pat.

2. Dyestuffs, which dye cotton deeper than silk.

Dianil Yellow 2R, 3G, pat.
Dianil Orange N, **Toluylenorange** R.
Deltapurpurine 5B, **Brillant Dianil Red** R.
Dianil Red R, 4B, 10B.
Dianil Blue 2R, 4R, pat.
Dianil Brown G, B, BD, M, R, D, **Dianil Fastbrown** B.
Dianil Darkblue 3R pat.
Dianil Black CR pat.

3. Dyestuffs which dye silk deeper than cotton.

Dianil Yellow G, R pat.

4. Dyestuffs, which dye cotton almost exclusively.

Dianil Direct Yellow S.
Oxydianil Yellow O.
Dianil Orange G pat.
Dianil Blue G, B, R, pat.
Dianil Darkblue R pat.

5. Dyestuffs which dye silk, leaving cotton white.

Acid Magenta extra, **Acid Maroon** O.
Acid Violet 3RS.
Acid Green conc.
Patentblue V pat., **Keton Blue** 4BN solution, 4BN powder, pat.
Naphthol Yellow S.
Flavazine S, T.
Azo Yellow conc., **Orange** No. 2.
Scarlet R, 6R.
Victoria Rubine O, **Fastred** S.

6. Dyestuffs which are suitable for topping.

a) For silk.

Acid Magenta extra, **Acid Maroon** O, **Acid Cerise** O.
Acid Violet, all brands.
Methyl Blue for Silk MLB, **for Cotton** MLB.
Opalblue blue shade, superior sol.
Blue for Silk T, T conc., greenish, No. 99, KR.
Acid Green conc
Patentblue A, V, pat.
Keton Blue 4BN sol., 4BN powder, pat.
Violamine, all brands, pat.
Fastblue, all brands, **Blackblue** O, **Black Black** O, **Fast-darkblue** R.
Nigrosine No. 1—4.
Chinoline Yellow O, conc.
Naphthol Yellow S.
Flavazine S, T.
Azo Yellow conc.
Orange G, No. 2, **Brilliant Orange** O, G, R.
Fastbrown O, yellow shade.
Scarlet G, R, 6R, B extra, **Scarlet** 6R cryst.
Rosazeine, all brands.

Diamond Scarlet for Silk G, **Scarlet for Silk** O, G, 2G.
Brilliant Croceïne yellow and blue shade, R, B, BB, 3B, 5B, **Fastred** O, S, **Brilliant Crimson** O.
Amaranth O.
Amido Naphthol Black 4B, 4B extra, 6B, S.

b) For cotton.

Auramine O, conc., pat.
Phosphine new.
Chrysoidine A cryst., C cryst., C extra cryst.
Vesuvine conc., 3R superior, 4BG conc., extra yellow.
Magenta, large cryst., small cryst., **Cerise** G, **Grenadine** O, **Cardinal** R, **Maroon** O, **New Magenta** O pat.
Methyl Violet, all brands, **Violet crystals** O, **Primula** R, B.
Brilliant Green cryst. extra, **Malachite Green** cryst. extra.
Safranine conc., **Methylene Violet** 2RA, 2RN, BN.
Methylene Blue BB extra, BB conc., BB, R, 6R.
Methylene Green O, G, GG, 3G, extra yellow, extra yellow conc.
Methylene Grey O, NF.
Rosazeïne O, B, extra, B extra, 4G, 4G extra, pat.

F. FABRICS OF WOOL AND SILK.

1. Acid Colours which dye wool almost exclusively.

The dyebath is prepared with about 10% Acetic Acid and the required dyestuff solutions. The goods are entered at nearly boiling point and dyed for 1—1½ h at the boil. For very dark shades 1% of Sulphuric Acid may be added in order to exhaust the bath. The shades ought to be dyed a little fuller (deeper) than the pattern in order to allow for the cleansing process. The cleansing bath contains per 1000 Gall of liquid 1 Gall of Acetate of Ammonia. The goods are worked for about 20 min., until the silk effects appear sufficiently clean. In many instances it is sufficient to clean the silk in a bath containing water of 140° F. only.

Acid Magenta, all brands, **Acid Violet** 3RS, 4RS.
Azo Acid Carmine B pat., **Alkaline Fastred** R pat.
Chromotrope 2R, 2B, 6B, 8B, 10B, pat.
Victoria Violet 4BS. 8BS, pat., **Azo Acid Blue** B pat.
Naphthol Yellow S,
Flavazine T.
Orange G.
Scarlet 6R, **Scarlet** 6R crystals.
Victoria Rubine O, **Naphthol Red** O.
Victoria Scarlet 3R, 4R, 5R, 6R.
New Coccine O, **Amaranth** O, E.

2. Chrome developing Colours, which scarcely tint the silk.

The dyebath is prepared with 10% Acetic Acid, 10% Glauber's salt and the requisite amounts of dyestuff. The goods are entered at nearly boiling heat and boiled for 1 h. Then 3% Bichrome (for Acid Alizarine Blue BB 3% Fluoride of Chrome) are added and the shade developed by boiling for another ¾ h. The silk effects are cleansed in the manner described in No. 1 or the goods are soaped, after rinsing, in a hot bath containing 2 parts soap per 1000 parts.

Chromotrope 6B, 8B, 10B, FB. F4B, pat.
Acid Alizarine Blue BB pat.

3. Dianil Colours which dye wool and silk alike in a neutral Glauber's salt bath.

The dyebath is prepared for dark shades with about 30% Glauber's salt, for light shades with about 10% Glauber's salt and the goods dyed at the boil. If the silk is dyed too light, the bath is cooled down a little and the material worked for some time at the lower temperature, or some more dyestuff is added, which will be mainly taken up by the silk.

Dianil Yellow 3G, R, 2R pat, **Dianil Orange** G pat.
Dianil Brown 3GO, R, BD.
Dianil Claret Red G, B, **Dianil Red** 4B.
Dianil Blue G, B, R, 2R, 3R, 4R pat.
Dianil Black CR, N, R, E, pat.

4. Colours which dye wool and silk in an Acid bath alike or nearly alike.

The dyebath is prepared with 4% Sulphuric Acid and 10% Glauber's salt and the requisite amounts of dyestuff. The goods are entered hot and the wool dyed to pattern at the boil. Then the steam is turned off and the silk dyed exactly to pattern with basic colours as stated in No. 5. If the wool is kept decidedly lighter than the pattern, then the bath may be cooled down to 140° F and the silk be dyed to shade with dyestuffs as stated in No. 4, which will be mainly taken up by the silk at a lower temperature.

The Resorcine Colours are not dyed with Glauber's salt and Sulphuric Acid but with 10% Acetic Acid.-Alkaline Blues are dyed with Borax and Soap or with Sodium Phosphate and Soap, then rinsed and, in a fresh bath, soured off with Sulphuric Acid.

Eosine, all brands, **Erythrosine,** all brands, **Phloxine,** all brands, **Rose Bengale,** all brands.
Rosazeïne O, B extra, B extra pat.
Acid Rosamine A pat., **Fast Acid Violet** A2R, R, B, pat., **Fast Acid Blue** R, R conc., pat., **Opal Blue,** all brands, **Blue for Silk,** all brands.
Acid Violet N, 5BF, 5BFI, 7BN.
Alkaline Blue, Bleu de Lyon, Soluble Blue, all brands.
Patent Blue V, N, superior, L, LL, B, G conc., A, pat.
Fastblue, all brands, **Fast Darkblue,** R.
Azo Yellow O, conc.
Victoria Yellow O, double conc.
Orange No. 2, 4, 4LL, RR.
Scarlet M new, B extra.
Brilliant Croceïne, all brands, **Fastred** O.

5. Basic Colours which dye the silk in wool and silk fabrics in an Acid bath.

Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine,** all brands.

Azo Phosphine GO pat.
Magenta, all brands, **New Magenta** O pat.
Methyl Violet, all brands.
Brilliant Green, all brands, **Malachite Green,** all brands.
Methylene Blue, all brands.
Methylene Green, all brands.
Safranine, all brands, **Methylene Violet** 2RA, 3RA, BN, **Methylene Heliotrope** O.

6. Colours which dye silk in a cold Acid bath without noticeably staining wool.

Auramine O, I, II, conc., pat.
Janus Yellow G, R, pat.
Janus Brown R, B, pat.
Janus Red B pat.
Janus Blue G, R, pat., **Janus Green** G, B, pat.
Janus Grey B, 2B, **Janus Black** O, I, II, pat.
Safranine, all brands, **Methylene Violet** 2RA, 3RA, **Methylene Heliotrope** O.
Rosolane O, T.
Methylene Blue, all brands, **Methylene Green** extra yellow.
Rosazeïne O, B, extra, B extra, 4G, 4G extra, pat.
Fast Acid Eosine G pat., **Fast Acid Phloxine** A pat., **Fast Acid Magenta** G pat., **Violamine** G, A2R, R, B, 3B, pat.
Acid Magenta, all brands, **Acid Violet** 3RS, 4RS, 7BN.
Naphthalene Green V, conc., pat.
Methyl Blue for Cotton MLB, **Pure Blue,** all brands, **Blue for Silk,** all brands.
Brilliant Croceïne, all brands.
Scarlet 5R.
Victoria Rubine O, **Naphthol Red** O, **Amaranth** O, E.

G. JUTE (COCOA-NUT FIBRE, PIASSAVA).

1. Colours which dye Jute in a neutral bath.

The Jute is cleansed before dyeing with Soda and if necessary bleached in a bath containing Sodium Hypochlorite of 4° Tw.

The Jute is dyed at 185—194° F in a neutral bath or with an addition of Alum or Common Salt.

Auramine conc., O, I, II.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine** 4BG conc., 3R superior.
Phosphine extra, O, **Yellow for Leather** O, G, GG.
Azo Phosphine GO, BRO, pat.
Red for Leather O, R, G, **Brown for Leather** O, **Saffian Red** O, **Piassava Brown** O.
Magenta large cryst., small cryst., **Cerise** G, R, **Grenadine** O, R, RR, **Russia Red** D, 5001, **Maroon** O, extra, **Cardinal** R, G.
New Magenta O pat.
Safranine O, conc., **Scarlet for Cotton** O.
Fastred O.
Methyl Violet, all brands.
Malachite Green cryst. extra, **Brilliant Green** cryst. extra.
Methylene Blue, all brands, **Methylene Green,** all brands.
Indamine Blue N extra, NB.
Fast New Blue 3R cryst., **Fastblue for Cotton** R, BB, 4B.
Coalblack I, II, III.
Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Janus Blue G, B, R, pat., **Janus Green** G, B, pat.
Janus Black O, I, II, pat.

2. Colours, which dye Jute in an Alum bath.

Cotton Lightblue O, **Pure Blue** conc., **Conc. Cotton Blue** No. 1, No. 2, R, **Blue** for Linen and Jute.
Azo Yellow conc.
Orange G, **Brilliant Orange** G, O, R.

Fast Blue O, R, 5B, **Black Blue** O, **Black Black** O, **Nigrosine** No. 1, 2, 3, 4, **Black for Feathers.**
Azo Yellow conc.
Victoria Yellow conc.
Orange No. 2, No. 4, G, **Brilliant Orange** G, O, R.
Fast Brown O. yellow shade.
Scarlet G, R, RR, 3R, 4R, 5R, 6R, B extra.
Brilliant Croceine yellow and blue shades, R, B, BB, 3B, 5B.
Fast Red O, **Claret Red** G, B, R.
Amido Naphthol Black 4B, 4B extra, 6B, S.

3. Colours which dye in an Acetic Acid bath.

Rosolane O, BO, T.
Rosazeïne O, 4G pat.
Eosine extra AG, extra BB.
Erythrosine yellow shade, blue shade, yellow shade N, blue shade N.
Phloxine G, O, 2B, 5B.
Rose Bengale G, B.

K. DYEING OF ARTIFICIAL FLOWERS.

1. Colours which dye in a neutral bath.

The flowers are dyed in a neutral or slightly acidified bath at the boil and then before being perfectly dried rubbed with Oil or Glycerine.

Auramine conc., O, I, II.
Chrysoïdine A cryst., C. cryst., C extra cryst., **Vesuvine** 4BG conc., 3R superior.
Phosphine extra, O, **Yellow for Leather** O, G, GG.
Azophosphine GO, BRO, pat.
Red for Leather O, R, G, **Brown for Leather** O.
Magenta large cryst., small cryst., **Cerise** G, R, **Grenadine** O, R, RR, **Russia Red** D, 5001, **Maroon** O, extra, **Cardinal** R, G.
New Magenta O pat.
Safranine O, conc., **Methylene Violet** 3RA extra, RRA, BN.
Methyl Violet, all brands.
Malachite Green cryst. extra, **Brilliant Green** cryst extra.
Methylene Blue, all brands, **Methylene Green**, all brands.
New Fast Blue 3R cryst., **Fastblue for Cotton** R, BB, 4B.
Coalblack II.
Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Janus Blue G, B, R, pat., **Janus Green** G, B, pat.
Janus Black O, I, II, pat.

2. Colours which dye in an Acetic Acid bath.

Rosolane O, BO, T.
Rosazeïne O, 4G pat.
Eosine extra AG, extra BB.
Erythrosine yellow shade, blue shade, yellow shade N, blue shade N.
Phloxine G, O, 2B, 5B.
Rose Bengale G, B.

L. BUTTONS OF VEGETABLE IVORY.

Before dyeing the buttons are boiled for 1—2 h in water. They are dyed for 1—2 h at the boil in a neutral bath. For dark shades it is necessary to mordant the buttons with Tannin and Tartar Emetic.

Auramine conc., O, I, II, pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine** 4 BG conc., 3 R superior.
Phosphine extra, O, **Yellow for Leather** O, G, R, **Brown for Leather** O.
Magenta large cryst., small cryst., **Cerise** G, R, **Grenadine** O, R, RR.
Maroon O, extra, **Cardinal** G, R.
New Magenta O pat.
Safranine conc., O, **Methylene Violet** 3 RA extra, RRA, BN.
Malachite Green cryst. extra, **Brilliant Green** cryst. extra.
Methyl Violet 2 B chemic. pure, 6 B chemic. pure.
Methylene Blue, all brands, **Methylene Green,** all brands.
New Fast Blue 3 R cryst., **Fastblue for Cotton** R, BB, 4 B.
Methylene Grey O, NF.

M. DYEING OF LEATHER.

1. Colours which dye tanned leather in a neutral bath.

The tanned hides in lots af two for each dyeing, are steeped for 5—10 min. into a neutral or slightly acidified bath of 104—115° F or the colour solutions (115° F warm) are brushed on to the hides.

Auramine conc., O, I, II, pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine** 4 BG conc., 3 R superior.
Phosphine extra, O, P, superior, **Yellow for Leather** O, G, GG, **Red for Leather** O, R, G, **Brown for Leather** O, **Brown** A, **Saffian Red** O.
Azo Phosphine GO, BRO, pat.
Magenta large cryst., small cryst., **Cerise** G, R, **Grenadine** O, R, RR, **Russia Red** D, 5001, **Maroon** O, extra, **Cardinal** G, R.
New Magenta O pat.
Safranine conc., O.
Methyl Violet 2 B chemic. pure, 6 B chemic. pure.
Malachite Green cryst. extra, **Brilliant Green** cryst. extra.
Methylene Blue, all brands, **Methylene Green,** all brands.
New Fast Blue 3 R cryst., **Fastblue for cotton** R, BB, 4 B.
Methylene Grey O, NF.
Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Janus Blue B pat., **Janus Green** G pat.
Janus Black I.
Leather Black T, TM, 5068.

2. Colours which dye tanned leather in a weak Sulphuric Acid bath.

Acid Magenta extra, **Orseilline** R, B, **Acid Cerise** O, **Acid Maroon** O.
Bleu de Lyon RR, **Pure Blue** O conc., **Conc. Cotton Blue** No. 2, **China Blue** No. 2.
Acid Green conc.
Patentblue V, A, pat.
Fastblue O, R, 5 B, **Nigrosine** No. 1, 2, 3, 4, O spirit.

Azo Yellow conc., **Victoria Yellow** conc.
Orange No. 2, No. 4, G, **Brilliant Orange** G, O, R.
Solid Brown O, yellow shade.
Scarlet G, R, RR, 3R, 4R, 5R, 6R, B extra.
Brilliant Croceïne yellow shade, blue shade, R, B, 2B, 3B, 5B.
Fastred O, **Claret Red** G, R, B.

3. Colours which dye tanned leather in a weak Acetic Acid bath.

Eosine extra AG, extra BB.
Phloxine O, G, 5B.
Red Y, YB.
Rosazeïne O, 4G pat.

4. Colours which dye alum-prepared leather in a neutral bath.

The alum-prepared hides are dyed at 115° F in lots of two, after removing the superfluous Alum by rinsing; or the colours are brushed on (Colour solutions of 115° F).

Auramine conc., O, I, II, pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine** 4BG conc., 3R superior.
Phosphine extra, O, P, superior, **Yellow for Leather** O, G. GG, **Red for Leather** O, R, G, **Brown for Leather** O, **Brown** A, **Saffian Red** O.
Azophosphine GO, BRO, pat.
Magenta large cryst., small cryst., **Cerise** G, R, **Grenadine** O, R, RR, **Russia Red** D, 5001, **Maroon** O, extra, **Cardinal** R, G.
New Magenta O pat.
Safranine conc., O.
Methyl Violet 2B chemic. pure, 6B chemic. pure.
Malachite Green cryst. extra, **Brilliant Green** cryst extra.
Methylene Blue and **Methylene Green,** all brands.
New Fast Blue 3R cryst., **Fast Blue for Cotton** R, BB, 4B.
Methylene Grey O, NF.
Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown R pat.
Janus Blue B pat., **Janus Green** G pat.
Janus Black I pat.
Leather Black T, TM, 5068.

5. Colours which dye alum-prepared leather in a weak Sulphuric Acid bath.

Acid Magenta extra, **Orseilline** R, B, **Acid Cerise** O, **Acid Maroon** O.

Bleu de Lyon RR, **Pure Blue** O, conc., **Conc. Cotton Blue** No. 2, **China Blue** No. 2.
Acid Green conc.
Patentblue V, A, pat.
Fastblue O, R, 5B, **Nigrosine** No. 1, 2, 3, 4, O spirit.
Azo Yellow conc., **Victoria Yellow** conc.
Orange No. 2, No. 4, G, **Brilliant Orange** G, O, R.
Solid Brown O, yellow shade.
Scarlet G, R, RR, 3R, 4R, 5R, 6R, B extra.
Brilliant Croceïne yellow shade, blue shade, R, B, 2B, 3B, 5B.
Fastred O, **Claret Red** G, R, B.

6. Colours which dye alum-prepared leather in a weak Acetic Acid bath.

Eosine extra AG, extra BB.
Phloxine O, G, 5B.
Red Y, YB.
Rosazeïne O, 4G pat.

7. Colours which dye chromed leather in a weak Acetic Acid bath.

Chromed hides are best dyed in drums at 158—176° F for about $^1/_2$ h.
Acid Magenta extra, **Orseilline** R, B, **Acid Cerise** O, **Acid Maroon** O.
Bleu de Lyon RR, **Pure Blue** O conc., **Conc. Cotton Blue** No. 2, **China Blue** No. 2.
Acid Green conc.
Patentblue V, A, pat.
Fastblue O, R, 5B, **Nigrosine** No. 1, 2, 3, 4, O spirit.
Azo Yellow conc., **Victoria Yellow** conc.
Orange No. 2, No. 4, G, **Brilliant Orange** G, O, R.
Solid Brown O, yellow shade.
Scarlet G, R, RR, 3R, 4R, 5R, 6R, B extra.
Brilliant Croceïne yellow shade, blue shade, R, B, 2B, 3B, 5B.
Fastred O, **Claret Red** G, R, B.

8. Colours which dye chromed leather in a weak Acetic Acid bath.

Eosine extra AG, extra BB.
Phloxine O, G, 5B.
Red Y, YB.
Rosazeïne O, 4G pat.

9. Colours which dye Chromed leather in an alkaline or in an ordinary salt bath.

Dianil Yellow 3G, R, 2R, pat.
Dianil Orange G pat.
Dianil Brown R.
Dianil Blue G, B, pat.
Chrome Leather Brown No. 1—4.
Leather Black C, E, pat.

10. Colours which dye Chromed leather in a neutral bath.

When using the colours stated below, it is necessary to pass the chromed hides through a weak Sumach solution for 10—15 min. at 104—113° F before dyeing.

Auramine conc., O, I, II, pat.
Chrysoidine A cryst., C cryst, C extra cryst., **Vesuvine** 4BG conc., 3R superior.
Phosphine extra, O, P, superior, **Yellow for Leather** O, G, GG.
Azophosphine GO, BRO, pat.
Red for Leather O, G, R. **Brown for Leather** O, **Brown** A, **Saffian Red** O.
Magenta small cryst., large cryst., **Cerise** G, R, **Grenadine** O, R, RR, **Maroon** O, extra, **Cardinal** G, R. **Russia Red** D, 5001.
New Magenta O pat.
Safranine conc., O.
Methyl Violet 2B, 6B chem. pure.
Malachite Green cryst. extra, **Brilliant Green** cryst. extra.
Methylene Blue, all brands, **Methylene Green,** all brands.
New Fast Blue 3R cryst., **Fastblue for Cotton** R, BB, 4B.
Janus Yellow G, R, pat.
Janus Brown R pat.
Janus Red B pat.
Janus Blue B pat., **Janus Green** G pat.
Janus Black I pat.
Leather Black T, TM, 5068.

N. COLOURS SUITABLE FOR LAKE AND PIGMENT MANUFACTURING.

1. Colours which are precipitated with Barium Chloride.

Directions: 10 lbs Alum, $2^1/_2$ lbs Soda calc., about 2 lbs Colour, $10^1/_2$—13 lbs Barium Chloride.

Fast Acid Violet A 2 R, R, B, pat., **Fast Acid Magenta** G pat.
Acid Violet N, 5 BF.
Alkaline Blue, all brands, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O.
Opalblue, red shade, blue shade, green shade, extra green shade, **Blue,** blueish, red shade, **Purple Blue** O, **Cloth Blue** O, **Full Blue** O, **China Blue** R, No. 1, 2, **Guernsey Blue** O, **Soluble Blue,** all brands, **Bleu de Lyon,** all brands, **Laundry Blue** O, **Navy Blue** V.
Conc. Cotton Blue, all brands, **Pure Blue,** all brands, **Opal Blue** superior, **Cotton Blue** extra, OO. **Methyl Blue for Cotton** MLB, **Cotton Light Blue** O, sol.
Acid Green, all brands.
Patent Blue pat., all brands, **Keton Blue** 4 BN powder, 4 BN solution, pat., **Patent Green** V, O, pat.
Naphthalene Green V, conc. pat.
Fastblue, all brands, **Nigrosine** No. 1, 2, 3, 4.
Naphthol Yellow S, SL, SE.
Azo Yellow conc., O, R, **Victoria Yellow** O, double, conc.
Orange O, No. 2, No. 4, LL, RRL, **Brilliant Orange** G, O, R, **Fast Orange** O.
Scarlet, all brands, **Scarlet** 6 R cryst., **Brilliant Lake Scarlet** G, R, 2 R, **Lake Red** P.
Paper Scarlet, all brands.
Brilliant Crimson O, **Clothred** O, **Fastred** O, **Claret Red** G, O, R, **Solid Brown** L, yellow shade.
Acid Alizarine Blue BB pat.
Dianil Yellow 3 G, G, R, 2 R, pat., **Dianil Orange** G pat.
Dianil Red 4 B, **Dianil Claret Red** G, B.
Dianil Scarlet G, 2 R, pat.
Dianil Brown, all brands.
Dianil Blue G, B, R, pat.
Dianil Black pat., all brands.

2. Colours which are precipitated with lead-salts.

Directions: 30 lbs Alumina Hydrate, 20 lbs Barytes, about 1 1/2 lbs Colour, 1 lb Nitrate of lead.

All colours mentioned under 1; also:

Uranine O, N.
Eosine, all brands.
Erythrosine, all brands.
Phloxine, all brands.
Rose Bengale G, B.

3. Colours which are precipitated with Solidogen.

Directions: 10 lbs Alumina Hydrate, 1/2 lbs Colour, 4/10 lbs Solidogen A pat.

All colours mentioned under 1 and 2.

4. Colours which are precipitated with Tannin or Tannin-Tartar Emetic.

Auramine conc., O, I, II, pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine,** all brands, **Cutch Brown** D, G, **Darkbrown** M, MB, **Phosphine** extra, new, P, superior.
Magenta, all brands, **Acetate of Magenta, Cerise** G, R, **Grenadine** O, R, RR, **Maroon** O, extra.
New Magenta O, P, pat.
Methyl Violet, all brands, **Peacock Blue** P.
Malachite Green, all brands. **Brilliant Green,** all brands.
Victoria Blue B.
Rosazeïne O, B, extra, B extra, pat.
Safranine conc., conc. B, G, GS.
Methylene Blue, all brands.
Coalblack O, I, II.

5. Colours which are precipitated direct upon silicates (Green earth, Clay, Ochre).

Directions: 50 lbs green earth, about 1 lb Colour.

Auramine conc., O, I, II, pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine,** all brands, **Cutch Brown** D, G, **Darkbrown** M, MB, **Phosphine** extra, new, P, superior.

Magenta, all brands, **Acetate of Magenta**, **Cerise G**, R, **Grenadine** O, R, RR, **Maroon** O, extra.
New Magenta O, P, pat.
Methyl Violet, all brands, **Peacock Blue** P.
Malachite Green, all brands, **Brilliant Green**, all brands.
Victoria Blue B.
Rosazeïne O, B, extra, B extra, pat.
Safranine conc., conc. B, G, GS.
Methylene Blue, all brands.
Coalblack O, I, II.

6. Colours which are precipitated upon Alumina substrate.

a) Rosaniline Dyestuffs.

Directions: 80 lbs Alumina hydrate, 20 lbs Blanc Fixe, about 2 lbs Colour.

Alkaline Blue, all brands, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O.
Opal Blue red shade, blue shade, green shade, extra green shade, **Blue** red shade, blueish, **Purple Blue** O, **China Blue** R, No. 1, No. 2, **Guernseyblue** O, **Soluble Blue**, all brands, **Bleu de Lyon**, all brands, **Pure Blue**, all brands.

b) Alizarine Colours.

Directions: 75 lbs Phosphate of soda, 20 lbs soda calc., about 35 lbs Alizarine paste, 10 lbs Turkey Red Oil, 5 lbs Acetate of lime.

Alizarine 1B new, 2A bl. bl., RX, SDG, 5F.
Alizarine Orange N.
Alizarine Brown, all brands.
Ceruleïne paste A, **Galleïne** paste R.

c) Azarine.

Directions: 8¾ lbs Phosphate of soda, 5¾ lbs Soda calc., 5 lbs Turkey Red Oil, 2 lbs Stannate of soda, 25 lbs Alum, about 1 lb Azarine S.

Azarine S.

7. Colours produced during the precipitation.

Directions: 100 parts β-Naphthol solution, 2½ parts Phosphate of soda, 100 parts Diazo- or Azophor-solution.

β-Naphthol-solution: 1½ parts β-Naphthol, 3 parts Soda lye 33° Tw., made up to 100 parts.

Diazo-solution: 1.4 parts Paranitraniline, 12 parts Water, 0.754 parts Sodium nitrite, cooled with ice to 39° F. Then, whilst stirring, add 2.2 parts Hydrochloric acid 36° Tw. After allowing to settle, the solution is filtered and made up to 100 parts.

Azophor-solution: 5.6 parts Azophor Red PN pat., 50 parts Water; solution after allowing to stand for $^1/_2$—1 h, is filtered; remaining particles are dissolved in more water and the whole made up to 100 parts.

β-Naphthol, **β-Naphthol** R, **β-Naphthol** RL, developed with:
Paranitraniline extra, **Meta Nitraniline, Nitrotoluidine, Nitrophenetidine, o-Anisidine.**
Amidoazobenzol, Amidoazotoluol.
α-Naphthylamine, Naphthylamine salt S, **β-Naphthylamine.**
Benzidine Base, Tolidine Base, Dianisidine Base.
Azophor Red PN, AB pat.
Azophor Orange MN pat.

O. PAPER DYEING.

a) The dyeing of paper in pulp.

After having worked the material for some time in the pulping machine, the very diluted colour-solutions are added (likewise fixing ingredients if required). Sulphate of Alumina or Alum, which are used for precipitating resin-soap, are also the fixing agents for the dyestuffs. It is advisable not to add these in excess to the pulp viz not to produce a too acid reaction. If colours of different series are used for dyeing — which often happens — care must be taken to have the colour of the one series properly and evenly worked in, before adding a colour of a second series.

Colours, which are suitable for dyeing paper pulp:

Basic Colours.

Auramine conc., O, I, II, pat.
Chrysoïdine A cryst., C cryst., C extra cryst.. **Vesuvine,** all brands, **Cutch Brown,** all brands, **Dark Brown,** all brands, **Phosphine** extra, new, P, superior.
Magenta, all brands, **Acetate of Magenta, Cerise** G, R, extra conc., **Maroon** O, extra, **New Magenta** O, P, pat.
Methyl Violet, all brands, **Brilliant Green,** all brands, **Malachite-Green,** all brands, **Peacock Blue** P.
Coalblack O, I, II.
Methylene Blue, all brands.
Victoria Blue B.
Safranine O, conc., AN extra, GGS, conc., B, GO.
Rosazeïne O, B, OG, extra, B extra, G extra, 4G extra, pat.
Janus Yellow G, R, pat.
Janus Red B, pat.
Janus Brown R, B, pat.
Janus Blue R, G, pat., **Janus Green** B, G, pat., **Janus Grey** B, BB.
Janus Black O, I, II, pat.

Acid Colours.

Uranine O soluble, DO.
Eosine, all brands.
Erythrosine, all brands.

Phloxine, all brands.
Rose Bengale, all brands.
Fast Acid Violet R, B, A 2R, pat.
Acid Violet, all brands.
Alkaline Blue, all brands, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O.
Opal Blue red shade, blue shade, green shade, **Blue** red shade, blueish, TB, 120RMA, Grb. V, **Purple Blue** O, **Cloth Blue** O, **China Blue** R, No. 1, No. 2, **Guernsey Blue** O, **Soluble Blue**, all brands, **Laundry Blue** O, **Full Blue** O, **Navy Blue** V, **Bleu de Lyon**, all brands.
Conc. Cotton Blue, all brands, **Pure Blue** O, conc., double conc., double conc. R., **Opal Blue** superior soluble, **Cotton Lightblue** O soluble, **Cotton Blue** extra, OO, **Methyl Blue** for **Cotton** MLB.
Emperor Blue O, **Paper Blue**, all brands.
Fast Pure Yellow CHO, CH extra.
Naphthol Yellow S, SL, SE, **Paper Yellow** MT.
Azo Yellow conc., O, R, **Victoria Yellow** O, double, conc., **Metanil Yellow** extra.
Orange, all brands, **Brilliant Orange** O, G. R.
Scarlet G, GRII, GVL, RRL, GRL 95, R, RR, 3R, 5R, **Paper Scarlet**, all brands, **Brilliant Croceïne** 8B.
Cloth Red O, **Fastred** O, S.
Solid Brown O, yellow NP, L.
Claret Red, all brands.

Direct dyeing Colours.

Dianil Yellow 3G, G, R, 2R, pat.
Oxydianil Yellow O, **Paper Yellow** O.
Dianil Orange G, R, pat., N.
Delta Purpurine 5B, **Brilliant Dianil Red** R.
Dianil Red R, 4B, 10B, **Dianil Claret Red** G, B.
Dianil Scarlet G, 2R, pat.
Dianil Blue G, B, R, 2R, 4R, BX, pat., **Dianil Darkblue** R, 3R, pat.
Dianil Brown, all brands, **Dianil Fastbrown** B.
Dianil Black, pat., all brands.
Dianil New Black LBI pat.
Directblack II.

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b) The dyeing of paper (ready made).

This operation is carried out in the following manner: The paper is passed first through the dyestuff-solution, then through several rollers in order to squeeze out all superfluous liquid and finally dried over hot cylinders.

For this process only colours of one series are suitable for mixed shades.

Basic Colours.

Auramine conc., O, I, II, pat.
Phosphine extra, new, P, **Vesuvine,** all brands.
Magenta, all brands, **Acetate of Magenta, Cerise** extra conc., **New Magenta** O, P, pat.
Methyl Violet, all brands.
Brilliant Green, all brands, **Malachite Green** cryst. extra.
Coalblack O, I, II.
Methylene Blue, all brands.
Victoria Blue B.
Safranine O, conc., AN extra, GGS, conc. B, GO.
Rosazeïne O, B, OG, extra, B extra, G, pat.
Janus Yellow R, G, pat.
Janus Brown B, R, pat.
Janus Red B pat.
Janus Blue R, G, pat., **Janus Green** B, G, pat.
Janus Grey B, BB, pat., **Janus Black** O, I, II, pat.

Acid Colours.

Fast Pure Yellow CHO, CH extra.
Naphthol Yellow S, SL, SE, **Paper Yellow** MT, **Victoria Yellow** O, double, conc.
Orange G, No. 2, 2L, No. 1, O, No. 64, R, RR, **Brilliant Orange** O, G, R.
Scarlet, all brands, **Scarlet** 6R cryst., **Paper Scarlet,** all brands, **Brilliant Croceïne** 8B.
Solidbrown O soluble, yellow shade, NF, L.
Claret Red, all brands.
Uranine O soluble, DO.
Eosine, all brands.
Erythrosine, all brands.
Phloxine, all brands.
Rose Bengale, all brands.
Fast Acid Eosine G pat., **Fast Acid Phloxine** A pat., **Fast Acid Magenta** G pat.
Fast Acid Violet R, B, A2R, pat.
Acid Magenta O, extra, M.
Acid Violet, all brands.
Alkaline Blue, all brands, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O, **Blue** red shade, blueish, TB, 120RMA, **Purple Blue** O, **Cloth Blue** O, **China Blue** R, No. 1, No. 2, **Guernsey Blue** O, **Soluble Blue,** all brands, **Bleu de Lyon** O, R, RR, **Opal Blue** red shade, blue shade, green shade, **Laundry Blue** O, **Full Blue** O, **Navy Blue** V.
Conc. Cotton Blue RR, R, No. 1, No. 2, No. 2 double, **Pure Blue** O, conc., double conc. R, **Opal Blue** sup. sol., **Paper Blue** 8928, 8929, No. 30, **Cotton Light Blue** O, **Cotton Blue** extra, OO, **Methyl Blue for Cotton** MLB, **Emperor Blue** O.
Acid Green, all brands.
Patentblue pat., all brands, **Keton Blue** 4BN solution, 4BN powder, pat.
Patent Green O, V, VS, pat.
Fastblue, all brands, **Nigrosine** No. 1, 2, 3, 4, A, R.

Direct dyeing colours.

Dianil Yellow 3G, G, R, 2R, pat.
Oxydianil Yellow O, **Paper Yellow** O.
Dianil Orange G, R, pat.
Dianil Red 4B, **Dianil Claret Red** G, B.
Dianil Scarlet G, 2R, pat.
Dianil Blue G, B, R, 2R, 4R, RX, pat., **Dianil Darkblue** R, 3R, pat.
Dianil Brown, all brands.
Dianil Black, pat., all brands.
Dianil New Black LBI pat.
Direct Black II.

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c) Colours, suitable for paper, classified according to their properties.

1. Colours fast to light.

Basic Colours.

Janus Yellow R, G pat.
Janus Red B pat.
Janus Brown B, R, pat.
Janus Blue R, G pat.
Janus Green B, G, pat.
Janus Grey B, BB pat.
Janus Black O, I, II pat.

Acid Colours.

Fast Acid Violet R, B, A2R, pat.
Acid Violet, all brands.
Alkaline Blue, all brands, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O, **Blue** red shade, blueish, TB, 120RMA, **Purple Blue** O, **Cloth Blue** O, **China Blue** R, No. 1, No. 2, **Guernsey Blue** O, **Soluble Blue,** all brands, **Bleu de Lyon** O, R, RR, **Opal Blue** red shade, blue shade, green shade, **Laundry Blue** O, **Full Blue** O, **Navy Blue** V.
Conc. Cotton Blue RR, R, No. 1, No. 2, No. 2 double, **Pure Blue** O, conc., double conc., double conc. R, **Paper Blue** 8928, 8929, No. 30, **Opal Blue** sup. sol., **Cotton Light Blue** O, **Cotton Blue** extra, OO, **Methyl Blue for Cotton** MLB, **Emperor Blue** O.
Acid Green, all brands.
Patent Blue pat. all brands, **Keton Blue** 4BN solution, 4BN powder, pat.
Patentgreen O, V, VS, pat.
Fastblue, all brands, **Nigrosine** No. 1, 2, 3, 4, A. R.

Fast Pure Yellow CHO, **CH** extra.
Paper Yellow O, MT.
Azo Yellow conc., O, R.
Orange, all brands, **Brilliant Orange** O, G, R.
Scarlet, all brands, **Brilliant Croceïne** 8 B.
Paper Scarlet, all brands.
Clothred O, **Fastred** O, S.
Solid Brown O, yellow shade, NT, L.
Claret Red, all brands.

Direct dyeing Colours.

Dianil Yellow 3 G, G, R, 2 R, pat.
Oxydianil Yellow O, **Paper Yellow** O.
Dianil Orange G, R, pat.
Dianil Red 4 B, **Dianil Claret Red** G, B, **Dianil Scarlet** G, 2 R, pat.
Dianil Blue G, B, R, 2 R, 4 R, BX, pat., **Dianil Darkblue** R, 3 R, pat.
Dianil Brown, all brands.
Dianil Black, pat., all brands.
Dianil New Black LBI pat.
Directblack II.

2. Colours which are suitable for granite papers (incl. blotting paper).

Dianil Yellow 3 G, G, R, 2 R, pat.
Oxydianil Yellow O.
Dianil Orange G, R, pat., N.
Brilliant Dianil Red R, **Delta Purpurine** 5 B.
Dianil Red R, 4 B, 10 B, **Dianil Claret Red** G, B.
Dianil Scarlet G, 2 R, pat.
Dianil Blue G, B, R, 2 R, 4 R, BX, pat., **Dianil Darkblue** R, 3 R, pat.
Dianil Brown, all brands.
Dianil Green P, G, pat.
Dianil Fastbrown B.
Dianil Black pat., all brands.
Dianil New Black LB I pat.
Direct Black II.

3. Colours, which are suitable for Ingrain paper.

Amongst the dyestuffs which are especially adapted to dyeing the wool fibres black — (for ingrain papers) — are

Chrome Black B pat. and
Acid Alizarine Black R pat.

Our special dyeing instructions for the production of these effects are to be had on application.

R. COLOURS SUITABLE FOR SOAP DYEING.

Soap is dyed according to 2 methods:

a) hot. The Colour solutions are added direct into the refining pan, which contains the liquid melted soap;

b) cold. The Colour-solutions are added to the thin, dry soap-shavings. This mixture is worked in the mixing machine, until the whole is dyed uniformly.

The colours suitable for method "a" are limited in number, since not all dyestuffs withstand the boiling in the alkaline soap solution equally well. In most cases however the colouring effects which disappear in boiling become again apparent on cooling.

Vesuvine 4BG conc.
Safranine AN extra, conc. B.
Ethyl Blue BF pat.
Rosazeïne O, B, extra, B extra.
Fast Acid Violet A2R pat.
Acid Violet 5BF.
Patent Blue L, A, V, pat., **Keton Blue** 4BN powder, 4BN solution, pat.
Chinoline Yellow O.
Victoria Yellow conc., double, O, **Azo Yellow** conc., O, R.
Orange No. 4, No. 2, 2L, No. 64, **Brilliant Orange** G, O, R.
Scarlet, all brands.
Brilliant Croceïne R, B, 2B, PL, 3B, 5B.
Solid Brown L, **Fastred** O.
Soap-Pink O.
Soap-Violet B.
Soap-Brown I, II, G.
Soap-Green B, G.
Transparent Green O.
Transparent Violet O.
Transparent Brown O.

S. COLOURS SUITABLE FOR INK MAKING.

a) Aniline inks, multiplex inks.

Magenta, extra yellow small cryst., small cryst. double refined, extra yellow.
New Magenta O pat.
Methyl Violet, all brands.
Brilliant Green cryst. extra, **Malachite Green** cryst. extra.
Rosazeïne O, B, extra, extra B.
Coalblack O, I, II.
Eosine extra.

b) Colours for shading Gallnut inks.

Patentblue L, A, V, pat.
Keton Blue 4BN powder pat.
Acid Green conc. D, conc. S, conc. M, M.
Naphthalene Green V pat.
Nigrosine No. 1, 2, 3, 4.
Dianil Black R, G, pat.

T. COLOURS SUITABLE FOR STRAW AND STRAW FABRICS.

The straw is boiled for 2 h in water free from lime before dyeing. The straw is then entered into a cold bath, this raised slowly — within $^3/_4$ h — to the boil, and the material boiled for 1 h.

1. Colours which dye in a neutral bath.

Auramine conc., O, I, II, pat.
Phosphine extra, O, **Yellow for Leather** O, G, GG, **Red for Leather** O, G, R, **Brown for Leather** O.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine,** all brands.
Magenta, all brands, **Cerise** G, R, **Grenadine** O, R, RR, **Maroon** O, extra, **Cardinal** G, R.
New Magenta O pat.
Safranine GGS, AN extra, O, conc., conc. B, **Methylene Violet** 3RA extra, RRN, BN.
Brilliant Green cryst. extra, **Malachite Green** cryst. extra.
Methyl Violet, all brands.
Methylene Blue, all brands, **Methylene Green,** all brands.
New Fast Blue 3R cryst., **Fast Blue for Cotton,** all brands.
Coalblack, all brands.

2. Colours which dye in a weak Acetic Acid bath.

Auramine conc., O, I, II, pat.
Chrysoïdine A cryst., C cryst., C extra cryst., **Vesuvine,** all brands.
Saffian Red D, **Brown** A.
Safranine, all brands.
Fluorescent Violet B.
Brilliant Green cryst. extra, **Malachite Green** cryst. extra.
Methyl Violet, all brands.

Rosazeïne O, B, O extra, B extra, 4G. 4G extra, pat.
Methylene Blue, all brands, **Methylene Green,** all brands.
New Fast Blue 3R cryst., **Fastblue for Cotton,** all brands.
Janus Yellow G, R, pat.
Janus Red B pat.
Janus Blue B pat., **Janus Green** G pat.
Janus Brown B, R, pat.
Janus Black I pat.
Leather Black T, TM, No. 5068.
Azo Yellow conc., **Orange** No. 4, G.

U. CALICO PRINTING.

a) Colours classified according to their mode of fixing.

1. Colours fixed with Tannin.-Basic dyestuffs.

Auramine, all brands, pat.
Phosphine, all brands, **Leather Yellow** O, G, GG, **Leather Red** O, **Safian Red** O, **Leather Brown** O, **Brown** A.
Azo Phosphine GO and BRO, pat.
Chrysoidine A cryst., C cryst., C extra cryst., **Vesuvine, Cutch Brown,** all brands, **Dark Brown** M, MB.
Magenta, all brands, **Acetate of Magenta, Cerise,** all brands, **Grenadine,** all brands, **Maroon** O, extra, **Cardinal** R, G.
New Magenta O pat.
Safranine, all brands, **Azine Scarlet** G conc. pat., **Cotton Scarlet** O, **Methylene Violet,** all brands, **Methylene Heliotrope** O pat.
Methyl Violet, all brands, **New Violet,** all brands, **Fancy Violet** O.
Star Violet O, **Violet crystals** O, **Primula** R, B.
Victoria Blue B.
Malachite Green, Brilliant Green, all brands.
Rosazeïne 4G, 4G extra.
Methylene Blue, all brands, **Methylene Indigo** O, SS, **Thionine Blue** GO, **Marine Blue,** all brands, **Methylene Darkblue** 3BN, RBN.
Methylene Green, all brands.
Ethyl Blue BF, BD, RD, pat., **New Ethyl Blue** B, R, **Indamine Blue,** all brands, **Indophene Blue,** all brands, pat.
New Fast Blue 3R cryst., **Fast Blue for Cotton,** all brands.
Blue for printing B paste, **Induline for printing** B powder, R powder, R sol. I. **Acetinduline** R sol., R sol. new.
Methylene Grey, all brands, **New Methylene Grey** G, **Nigrisine** O.
Coal Black, all brands, **Leather Black** T, TM, No. 5068.
Janus Yellow G, R, pat.
Janus Red B pat.
Janus Brown B, R, pat.
Janus Blue, all brands, pat., **Janus Darkblue** B, R, pat.
Janus Green G, B, pat.
Janus Black O, I, II, pat., **Janus Grey** B, BB.

2. Colours fixed with Metal salts.

a. Forming lakes, which are fast to soaping. (Mordant Colours.)

Alizarine Yellow GG, R, N, **Mordant Yellow** O, as a chrome lake.
Alizarine Orange, as an alumina and chrome lake.
Alizarine Red, all brands, as alumina, chrome and iron lakes.
Alizarine Brown, all brands, as alumina and chrome lakes.
Alizarine Grenade R, as alumina and chrome lakes.
Alizarine Blue, all „S" brands, as chrome and nickel lakes.
Alizarine Green S, as chrome and nickel lakes.
Ceruleine, all brands, as chrome lakes.
Solid Green O paste 50%, as chrome, chrome-copper, and iron lake.

b. Forming lakes of inferior fastness to washing.

(Used very rarely for prints, and employed only for such articles as have not to undergo any washing process.)

Eosine, Erythrosine, Rose Bengale, Phloxine, all brands.
Rosazeïne, O, B, OG, extra, B extra, G.
Alkaline Blue, all brands, **Methyl Alkaline Blue** MLB, **Alkaline Violet** O.
Soluble Blue, Opal Blue, all brands, **Pure Blue** O, **Full Blue** O.
Patent Blue, all brands, pat., **Cyanine** B pat., **Keton Blue** 4BN sol. pat.
Acid Violet N, 5BF.
Fast Acid Violet A 2R, R, B, pat., **Fast Acid Eosine** G pat., **Fast Acid Phloxine** A pat., **Fast Acid Magenta** G pat.
Brilliant Orange G, **Orange** G, R.
Victoria Scarlet GG, R, 3R, 5R, 6R.
Scarlet R, 2R, 6R, GRI.
Victoria Rubine O, **Solid Brown** O.

3. Direct dyeing colours.

(Fixed without any mordants; aftertreated some times with Solidogen A pat.)

Primuline O.
Oxy Dianil Yellow O, **Aurophenine** O, **Dianil Direct Yellow** S.
Cresotine Yellow G.
Dianil Yellow, all brands, pat.
Dianil Orange G pat., N, **Toluylene Orange** R.
Dianil Red R, 4B, 10B, **Dianil Claret Red** B, G.
Brilliant Dianil Red R, R conc., **Delta Purpurine** 5B.

Dianil Scarlet G, 2R, pat., **Dianil Blue**, all brands, pat., **Dianil Indigo** O pat., **Dianil Darkblue** R, 3R, pat.
Dianil Green G pat.
Dianil Brown, all brands, **Dianil Japonine** O, **Dianil Copper Brown** O, **Dianil Fast Brown** B.
Dianil Black, all brands, pat., **Dianil New Black** LBI pat.

4. Colours fixed with albumen or caseine.

All colours mentioned under 1, 2 and 3, but rarely used;

All pigment colours such as **Chrome Yellow**, **Chrome Orange**, **Discharge Red lake**, **Chrome Green**, **Ultramarine** etc.

5. Vat Colours.

Indigo MLB powder, pat.
Indigo MLB extra (99—100%), pat.
Indigo MLB/G powder, pat.
Indigo MLB paste 20%, pat.
Indigo MLB Vat I 20%, pat.
Indigo White MLB 40%, pat.

6. Colours produced upon the fibre by a process of oxidation.

Aniline Black (Aniline Oil and Salt).
Solidgreen-Brown (Dinitro Resorcine).

7. Colours produced upon the fibre by a process of condensation.

Nitroso Blue (**Nitroso dimethyl Aniline**, **Nitroso diethyl Aniline** and **Resorcine** [Oxyphenol] or **Tannoxyphenol** R pat., or **β-Naphthol** or **Dioxynaphthalene** 2:7 [Oxynaphthol]).

8. Insoluble Azo-Colours produced upon the fibre (Ice-Colours).

Produced with **β-Naphthol**, **α Naphthol**, **β-Naphthol** R, **Naphthol** D and the Diazo and Tetrazo-compounds of: **Metanitraniline**, **Paranitraniline**, **Nitrotoluidine**, **Nitrophenetidine**, **Benzidine**, **Tolidine**, **Dianisidine**, **Amidoazobenzol**, **Amidoazotoluol**, **α-Naphthylamine**, **β-Naphthylamine**, **Azophor Red** PN pat., **Azophor Orange** MN pat., **Azophor Blue** D pat., **Azophor Black** S pat.

9. Sulphur Colours.

Melanogen Blue B pat.
Melanogen G, T pat.
Thiogen Brown R pat.

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b) Colours, arranged according to their mode of application.

1. Colours, developed by steaming.

These colours are printed on bleached or on Oil prepared material.

Preparing. 30—50 parts neutral Turkey Red Oil (Sodium or Ammonia Salt) dissolved in 1000 parts.

Steaming. The printed goods are usually steamed for 1—1 1/2 h without pressure either in a closed or open (Continuous) apparatus. Before steaming the goods properly, they are often just passed through the Mather-Platt quick steaming apparatus.

Operations after printing. The colours which are developed by steaming require mostly several other operations in order to be thoroughly fixed:

a) Tartar Emetic bath. This bath is necessary for all basic colours fixed with Tannin. 5—20 parts Tartar Emetic per 1000 parts liquid are required with varying additions of Soda and Chalk to neutralize free acids. A roller cistern is used for this bath, through which the goods pass for about 1/2 minute at 86—140° F. Instead of Tartar Emetic, other Antimony Salts may be employed.

b) Chalk bath. This answers the purpose of neutralizing free acids. The goods are passed for 1/2 minute at 86—140° F through this bath, which contains 20 parts of Chalk per 1000 parts of liquid.

c) Chrome bath. This bath is used for the developing of Aniline blacks or of such shades, as contain Cutch. The goods are passed through the cold or lukewarm bath for 1/2 min.; the bath contains 2—10 parts Bichrome per 1000 parts liquid, likewise mostly some Soda.

d) Malting bath. In order to remove all starchy matter from the goods, they are often malted. This operation is carried out for 1/4—1/2 h at 86—122° F, the goods passing in rope form through the bath containing 20—50 parts of malt per 1000 parts of liq.

e) Soap bath. All steamed goods are soaped after having been treated with Tartar Emetic or Chalk, in rope form or on the continuous broad washing machine. The soap used for this operation must be a good neutral Olive Oil soap. The temperature of the baths is varied according to the colours and requirements of the

trade from lukewarm to boiling. Likewise the amount of soap is varied from 1—5 parts per 1000 parts.

In modern print works which have to cope with very large quantities these different operations are combined and the goods passed in full width through continuous machines.

In order to produce pure whites the goods are finally chlorinated and blued.

The typical recipes for preparing printing pastes (steam-colours) are:

1. Basic Dyestuffs.

20	parts	Methylene Blue DBB conc.
50	,,	Acetic Acid 12° Tw.
20	,,	Acetine
178	,,	Water
600	,,	Thickening St. T. (page 126)
30	,,	Glycerine
2	,,	Tartaric Acid
100	,,	Acetic Acid Tannin sol. 1:1.
1000	parts.	

According to this recipe all soluble basic colours may be employed. Of the Methylene Blue and Green brands the so-called D-brands, which are free from Zinc, ought to be used, especially for dark shades. The amount of Tannin is varied according to the strength of the printing colour and quality of the Tannin. For the colour-bases, New Ethyl Blue R and B, 6 parts (instead of 2 parts) of Tartaric Acid are used and the water added after making up the paste.

Instead of Acetine and Tartaric Acid, Ethyl Tartaric Acid can be used (20—30 parts).

For the Induline bases, which do not dissolve easily the following directions are to be observed:

Blue for Printing R powder.

20	parts	Blue for Printing R powder dissolved with
80	,,	Ethyltartaric Acid 22° Tw. on the water bath
600	,,	Acid Starch paste (page 126)
100	,,	Acetic Acid 9° Tw.
100	,,	Water
50—100	,,	Acetic Acid Tannin sol. 1:1
1000	parts.	

Acetinduline R sol.

600	parts	Acid Starch paste (page 126)
100	,,	Acetic Acid 6° Tw.
100	,,	Acetinduline R sol.
80	,,	Acetic Acid Tannin sol. 1:1
120	,,	Water
1000	parts.	

Instead of Ethyltartaric Acid, Acetine may be used for dissolving. In like manner as Blue for Printing, Induline for Printing R and B powder may be used.

The goods printed with basic dyestuffs are steamed without pressure for 1—1½ h, then passed through Tartar Emetic, washed, malted and soaped.

2. Dyestuffs fixed with metal salts.

Alizarine Red.

120	parts	Alizarine Red paste 20%
105	,,	Water
550	,,	Thickening for Red (page 127)
94	,,	Nitrate Mordant 18° Tw
40	,,	Acetate of Lime 29° Tw
28	,,	Nitro Hydrochlorate of Tin 106° Tw 1:10
63	,,	Tartaric Acid 1:10
1000	parts.	

Alizarine Red on unprepared cloth.

504	parts	Thickening for Red (see p. 127)
50	,,	Para Soap PN
120	,,	Aliz. Red paste 20%
56	,,	Acetate of lime 26° Tw
110	,,	Sulphocyanide of Alumina 18° Tw
30	,,	Acetate of Alumina 18° Tw
100	,,	Oxalate of Tin 9° Tw
30	,,	Tartaric Acid 1:6
1000	parts.	

Alizarine Red with Chrome.

150	parts	Aliz. Red paste 20%
190	,,	Water
500	,,	Thickening for Red (see p. 127)
100	,,	Acetate of Chrome 32° Tw
60	,,	Acetate of Lime 29° Tw
1000	parts.	

Alizarine Pink.

20	parts	Alizarine Red 20% paste
326	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
40	,,	Acetic Acid 12° Tw
30	,,	Glycerine
20	,,	Nitrate Mordant 18° Tw
14	,,	Acetate of Lime 29° Tw
50	,,	Tartaric Acid 1:10
1000	parts.	

Alizarine Violet.

10	parts	Aliz. Red No. 1 paste 20%
398	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
50	,,	Acetic Acid 12° Tw
10	,,	Acetate of Lime
2	,,	Yellow Prussiate
30	,,	Water
1000	parts.	

Alizarine Orange with Alumina.

150	parts	Alizarine Orange paste 20%
600	,,	Thickening for Red (see p. 127)
40	,,	Acetic Acid 12° Tw
120	,,	Nitrate Mordant 18° Tw
40	,,	Acetate of Lime 29° Tw
50	,,	Tartaric Acid 1:10
1000	parts.	

Alizarine Orange with Chrome.

100	parts	Alizarine Orange paste 20%
255	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
30	,,	Tournant Oil
30	,,	Glycerine
80	,,	Acetate of Chrome 32° Tw
5	,,	Tartaric Acid
1000	parts.	

Alizarine Claret with Alumina.

200	parts	Alizarine Claret R paste
40	,,	Water
600	,,	Thickening for Red (see p. 127)
100	,,	Nitrate Mordant 18° Tw
60	,,	Acetate of Lime 26° Tw
1000	parts.	

Alizarine Claret with Chrome.

200	parts	Alizarine Claret R paste
150	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
150	,,	Acetate of Chrome 32° Tw.
1000	parts.	

Alizarine Brown.

100	parts	Alizarine Brown paste
260	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
30	,,	Tournant Oil
30	,,	Glycerine
80	,,	Acetate of Chrome 32° Tw
1	,,	Tartaric Acid
1000	parts,	

Alizarine Yellow.

100	parts	Alizarine Yellow GG paste pat. or R paste, or 20 parts N powder
320—400	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
80	,,	Acetate of Chrome 32° Tw
1000	parts.	

Alizarine Blue SB powder.

20—70	parts	Alizarine Blue SB powder
460—360	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
20—70	,,	Acetate of Chrome 32° Tw
1000	parts.	

Alizarine Blue SB paste.

60—210	parts	Alizarine Blue SB paste
420—220	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
20—70	,,	Acetate of Chrome 32° Tw
1000	parts.	

Alizarine Green S paste.

150	parts	Alizarine Green S paste
280	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
60	,,	Bisulphite of Chrome 32° Tw
15	,,	Bisulphite of Nickel 32° Tw
1000	parts.	

Ceruleine S powder.

40	parts	Ceruleine S powder pat.
360	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
100	,,	Acetate of Chrome 32° Tw
1000	parts.	

Ceruleine S paste.

200	parts	Ceruleine S paste pat.
200	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
100	,,	Acetate of Chrome 32° Tw
1000	parts.	

Ceruleine conc.

40	parts	Ceruleine conc.
210	,,	Water
100	,,	Bisulphite of Soda 66° Tw let stand over for three days
550	,,	Wheat Starch-Tragacanth Thickening (see p. 126)
100	,,	Acetate of Chrome 32° Tw
1000	parts.	

Steam colours, prepared from Alizarines, are printed mostly on material, which is prepared with Turkey Red Oil (30—50 parts Turkey Red Oil per 1000); they are then steamed for 1—1½ h mostly, without pressure; passed through Chalk, washed and finally soaped.

For Eosines and Acid Colours the following directions are to be observed:

Eosine with Chrome.

20—30	parts	Eosine
320—280	,,	Water
600	,,	Thickening for Red (page 127)
60—90	,,	Acetate of Chrome 32° Tw.
1000	parts.	

This recipe answers for all brands of Eosine, Phloxine, Erythrosine, Rose Bengale etc.

Scarlet with Alumina.

30	parts	Scarlet
370	,,	Water
500	,,	Wheat Starch-Tragacanth Thickening (page 126)
100	,,	Acetate of Alumina 27° Tw
1000	parts.	

Applicable for almost all Azo Colours.

Alkaline Blue with Chrome.

5—40	parts	Alkaline Blue
505—350	,,	Water
450	,,	Weath Starch-Tragacanth Thickening (see p. 126)
25—100	,,	Acid Turkey Red Oil
15—60	,,	Bisulphite of Chrome 32° Tw.
1000	parts.	

Applicable for all soluble Rosaniline Blue Sulphonic Acids.

All these colours are printed on bleached material, steamed and scarcely ever washed.

3. Direct dyeing Colours.

40	parts	Dianil Brown
440	,,	Water
500	,,	Gum Tragacanth 60:1000
20	,,	Sodium Phosphate
1000	parts.	

This recipe answers for all Dianil Colours. They are steamed for 1 h and washed.

4. Colours fixed with Albumen.

Eosine.

30	parts	Eosine
170	,,	Water
500	,,	Gum Tragacanth 60:1000
300	,,	Albumen sol. 1:1
1000	parts.	

Applicable for all Phtalic Acid Colours.

Alizarine Red lake.

30—50	parts	Lake
440—350	,,	Water
450	,,	Tragacanth 60:1000
80—120	,,	Albumen sol. 1:1
1000	parts.	

Safranine.

10—20	parts	Safranine
380	,,	Water
450	,,	Tragacanth 60:1000
150	,,	Albumen 1:1
1000	parts.	

This recipe is used for the production of light and brilliant shades with Basic Colours.

Dianil Colours.

20—70	parts	Dyestuff	} boiled, then cooled and mixed with:
730—580	,,	Water	
200	,,	British Gum powder	
50—150	,,	Albumen 1:1	
1000	parts.		

The so produced prints are steamed for 1 h without pressure and then washed.

5. Indigo.

Before printing the material is prepared with a solution of (200—300 parts per 1000) grape sugar, and then dried well (though not rapidly).

25—150	parts	Indigo MLB paste 20%
175—0	,,	Water
800	,,	Alkaline Thickening
0—15	,,	Soda lye 77° Tw
1000	parts.	

Alkaline Thickening.

100	parts	Wheat Starch
300	,,	British Gum
1800	,,	Soda lye 77° Tw.

The printing rollers ought to be engraved deeply and no great pressure (weight) ought to be put on in printing.

After printing the material is carefully dried, then steamed for $^1/_4$—$^1/_2$ min. in the Mather-Platt at nearly 212° F, without permitting any air to enter the apparatus; then well washed, soured if necessary, and again rinsed in running water.

6. Colours produced upon the fibre by a process of oxydation.

Aniline Black.

Steam Aniline Black with Prussiate:

500	parts	Tragacanth (60 : 1000)
94	,,	Aniline Salt
5	,,	Aniline Oil
25	,,	Chlorate of Soda
150	,,	Water
50	,,	Yellow Prussiate
176	,,	Water
1000	parts.	

This Black can be developed by steaming for a short time in a Mather-Platt; but it also withstands a longer steaming process, especially after having been passed through a quick-steaming chamber, and through ammonia. It can therefore be combined with other steam-colours. After printing, the material is passed through a chrome bath (page 116), then washed, and eventually soaped.

Steam Aniline Black with Chromate of Lead.

60	parts	Wheat-starch
545	,,	Water
120	,,	Chrome Yellow paste 37—58% after mixing well, and boiling
125	,,	Chloride of Ammonia
25	,,	Chlorate of Soda are added to the lukewarm mixture; when cold,
125	,,	Aniline Salt are added.

The material is steamed with, or without pressure, washed and soaped.

7. Colours produced upon the fibre by a process of condensation.

Nitroso Colours.

These colours are printed upon bleached material, carefully dried, (care must be taken, lest the printed pieces touch the hot

drying plates) and steamed in the Mather-Platt with steam of 210—212° F for 2½—5 min. After steaming, the colour must be properly developed, and the white must be pure and not yellowish. The material is then passed in the usual manner through Tartar emetic, washed and soaped.

Nitroso Blue MD.

600	parts	Acid Starch (page 126)
20	,,	Glycerine
24	,,	Nitroso Base M 50%
100	,,	Water
8	,,	Muriatic Acid 36° Tw
15	,,	Dioxynaphthalene 2.7
50	,,	Acetic Acid 12° Tw
27	,,	Water
60	,,	Oxalic Acid 1:10
60	,,	Acetic Acid Tannin sol. 1:1
36.5	,,	Sodium Phosphate 1:5
1000	parts.	

Nitroso Blue AD.

600	parts	Acid Starch (see p. 126)
20	,,	Glycerine
14,4	,,	Nitroso Base A
100	,,	Water
7,1	,,	Hydrochloric Acid 36° Tw
15	,,	Dioxynaphthalene 2,7
50	,,	Acetic Acid 12° Tw
37	,,	Water
60	,,	Oxalic Acid 1:10
60	,,	Acetic Acid Tannin solution 1:1
36,5	,,	Sodium Phosphate 1:5
1000	parts.	

Nitroso Blue MR.

600	parts	Acid Starch (see p. 126)
20	,,	Glycerine
26	,,	Nitroso Base M 50% paste stirred with
20	,,	Water
8,7	,,	Hydrochloric Acid 36° Tw
20	,,	Resorcine dissolved in
150	,,	Water
		are added and mixed with the Acid Starch. Then
6	,,	Oxalic Acid dissolved in
60	,,	Water
60	,,	Acetic Acid Tannin Solution 1:1
		are added, and before use add slowly
40	,,	Sodium Phosphate 1:5
1000	parts.	

Nitroso Blue MR shaded.

600	parts	Acid Starch (see p. 126)
20	,,	Glycerine
20	,,	Nitroso Base M 50% paste are stirred with
20	,,	Water and
6.7	,,	Hydrochloric Acid 36° Tw
15	,,	Resorcine dissolved in
118	,,	Water
		are added and mixed with the Acid Starch.
		Then add:
6	,,	Oxalic Acid dissolved in
60	,,	Water
2	,,	Violet crystals O
1	,,	Methylene Blue DB
30	,,	Water
20	,,	Acetic Acid 9° Tw
60	,,	Acetic Acid Tannin Solution 1:1.
		Before use
33	,,	Sodium Phosphate 1:5 are slowly added
1000	parts.	

Nitroso Blue TO.

I	600	parts	Acid Starch (see p. 126)
	20	,,	Glycerine
II	24	,,	Nitroso Base M 50% paste
	8	,,	Hydrochloric Acid 36° Tw
	152	,,	Water
	30	,,	Tannoxyphenol R dissolved on the water bath
	60	,,	Hot Water
			No. 2 is stirred into No. 1, then
	60	,,	Oxalic Acid 1:10
			and before use
	36,3	,,	Sodium Phosphate 1:5
			are added
1000	parts.		

Nitroso Blue TO shaded.

I	600	parts	Acid Starch (see p. 126)
	20	,,	Glycerine
II	20	,,	Nitroso Base M 50% paste
	6,8	,,	Hydrochloric Acid 36° Tw
	70	,,	Water
	25	,,	Tannoxyphenol R dissolved on the water bath
	70	,,	Hot Wasser
			No. 2 is stirred into No. 1, then add:
	60	,,	Oxalic Acid 1:10
			and after cooling completely
	2	,,	Violet crystals O
	1	,,	Methylene Blue DBB
	60	,,	Acetic Acid 12° Tw
	102	,,	Water.
			Before use add slowly whilst stirring well:
	33	,,	Sodium Phosphate 1:5
1000	parts.		

Nitroso Green.

600 parts Acid Starch (see below)
20 ,, Glycerine
13 ,, Nitroso Base M 50% paste are stirred with
47 ,, Water
4,3 ,, Hydrochloric Acid 36° Tw
Then add:
10 ,, Resorcine dissolved in
70 ,, Water
After dissolving add:
6 ,, Oxalic Acid dissolved in
60 ,, Water
5 ,, Methylene Green O
13 ,, Auramine O
1 ,, Brilliant Green cryst. extra
38 ,, Acetic Acid 9° Tw
40 ,, Water
20 ,, Acetine
80 ,, Acetic Acid Tannin sol. 1:1.
Before use add slowly
20 ,, Sodium Phosphate 1:5
1000 parts.

Thickenings.

Acid Starch.

2490 parts Wheat-starch
6600 ,, Water
2000 ,, Acetic Acid 12° Tw
} Boiled for 10 min.

Used for dark printing-colours, with basic dye-stuffs.

Wheat-starch Tragacanth-Thickening.

225 parts Wheat-starch
600 ,, Water
2100 ,, Tragacanth (60:1000)
} Boiled for 1/2 h

Used for slightly acid colours, with Mordant dye-stuffs.

British Gum Thickening.

500 parts British Gum powder
500 ,, Water.

Flour-Tragacanth Thickening.

2100 parts Wheat Flour
4500 ,, Water
3000 ,, Tragacanth (60:1000)
450 ,, Acetic Acid 12° Tw.
Boil well.

Thickening St. T.

1200 parts Wheat Starch
6400 ,, Water
1800 ,, Tragacanth (60:1000)
800 ,, Acetic Acid 12° Tw.
Boil for 1/4 h.

Used for light printing colours and for such which do not equalize well.

Thickening for Red.

1500	parts	Wheat Starch
300	,,	Wheat Flour
10000	,,	Water
500	,,	Tragacanth (60:1000)
700	,,	Acetic Acid 12° Tw.
		Boil for 10 min. and add cold
1000	,,	Tournant Oil

Used for Alizarine Red colours.

Thickening TN.

1500	parts	Wheat Starch
3100	,,	Water
3100	,,	Acetic Acid 12° Tw
1500	,,	Tragacanth (60:1000)
750	,,	Tournant Oil
10000	parts.	

For 1 h. at 140° F.

2. Prints which are not steamed.

1. Colours produced upon the fibre by a process of oxydation.

Aniline Oxydation-Black.

100	parts	Wheat Starch	Boiled, and added hot:
500	,,	Water	
75	,,	Chlorate of Soda.	
		When cold, add:	
115	,,	Aniline Oil	
100	,,	Muriatic Acid 36° Tw	
100	,,	Water.	
		And before use, add:	
12	,,	of Vanadium Sol. 1:1000	
1000	parts.		

Vanadium Sol. 1:1000. 10 parts Vanadate of Ammonia are dissolved in 100 parts of Hydrochloric acid 34° Tw and about 400 parts of Water; then 5 parts of Glycerine added, and the Solution heated until it has changed its colour from yellowish green to blue. The whole is made up to 10000 parts. The printing-colour is reduced by 3:1, and printed upon bleached material, hung in the oxydation room for 24 hours, then chromed for 3 minutes at 122° F with bi-chrome solution (5:1000), washed, and soaped.

2. Insoluble azo-colours produced on the fibre. (Ice colours).

a) Printing of thickened Naphthol-solutions and subsequent developing in Diazo-Solutions.

This method of producing insoluble azo-colours, by which very good results are obtained, is still sometimes used for simple styles. The colour described as below is printed and dried well though not quickly, in order to prevent the Naphthol from sublimating.

Naphthol printing-colour A

(for Paranitraniline and Azophorred).

30	parts	β-Naphthol
380	,,	Hot Water
60	,,	Soda-lye 36° Tw
500	,,	Tragacanth 60:1000
30	,,	Para-Soap PN
1000	parts.	

Naphthol printing-colour B

(for Alphanaphthylamine Claret-red).

30	parts	β-Naphthol
410	,,	Hot Water
60	,,	Soda lye 36° Tw
500	,,	Tragacanth 60:1000
1000	parts.	

These prints are then developed in Diazo solutions of Paranitraniline, α-Naphthylamine, etc. (described on pages 145 and 146), washed and soaped.

b) Printing of thickened Diazo-solutions on Naphthol-prepared material.

The cloth is padded, with grounding liquids described as below, dried in the hot-flue, or over the drying-cylinder, printed with Diazo printing-colours, dried, washed and soaped.

Naphthol Grounding.

For Naphthol Grounding, the following ingredients are used: β-Naphthol, β-Naphthol R (for bluish Para-red); Naphthol D (for Dianisidine Blue, fast to perspiration), and α-Naphthol (occasionally as an addition to β-Naphthol Groundings). Furthermore, Parasoap or Turkey red oil for oil mordants, likewise sometimes Antimony compounds and occasionally Alumina are used.

If the material is dried over the drying cylinder, it is advisable to add Antimony salts to the Naphthol Grounding. According to Dr. Lauber and Dr. Caberti, the addition of Alkaline Antimony-oxide Solution to Naphthol groundings prevents the impregnated material from turning brown, in drying over hot metal, or in lying in the air before dyeing.

The most important Naphthol Groundings are:

Naphthol Grounding for Para-Red and Metanitraniline Orange.

	1.	2.
β-Naphthol	25 parts	— parts
β-Naphthol R	— ,,	25 ,,
Hot Water	200 ,,	200 ,,
Soda Lye 36° Tw	40 ,,	50 ,,
Para Soap PN	25 ,,	25 ,,
	make up to 1000 parts.	1000 parts.

Grounding No. 2 is used for very blue reds.

Naphthol Grounding for α-Naphthylamine Claret-Red, Benzidine, and Tolidine-Puce.

	3.
β-Naphthol	25 parts
Water	200 ,,
Soda Lye 36° Tw	40 ,,
Tragacanth (60:1000)	75 ,,
Water	500 ,,
	Dilute to 1000 parts.

For dark claret shades with α-Naphthylamine Claret Red, the following grounding is used:

Naphthol Grounding.

	4.
β-Naphthol	22 parts
α-Naphthol	3 ,,
Soda Lye 36° Tw	40 ,,
Hot Water	200 ,,
Tragacanth (60:1000)	50 ,,
	Dilute to 1000 parts.

The following groundings are especially applicable for cylinder-drying; No. 5 for Paranitraniline, No. 6 for α-Naphthylamine.

	5.	6.
β-Naphthol	25—30 parts	30 parts
Soda Lye 36° Tw	40—45 ,,	45 ,,
Hot Water	100 ,,	100 ,,
Hydrate of Alumina 50%	20 ,,	— ,,
Soda Lye 36° Tw	15 ,,	— ,,
Neutral Para Soap PN	25 ,,	— ,,
Hot Water	200 ,,	200 ,,
Tragacanth (60:1000)	80 ,,	80 ,,
Tartar Emetic powder	3 ,,	3 ,,
Glycerine	30 ,,	30 ,,
Hot Water	100 ,,	100 ,,
	Dilute to 1000 parts.	1000 parts.

Naphthol Grounding for Dianisidine Naphthol Blue and Azophor Blue.

	7.	8.
β-Naphthol	25 parts	— parts
Naphthol D	— ,,	25 ,,
Water	200 ,,	200 ,,
Soda Lye 36° Tw	50 ,,	50 ,,
Para Soap PN	50 ,,	50 ,,
Sodium Acetate cryst.	15 ,,	15 ,,
Water	500 ,,	500 ,,
	Dilute to 1000 parts.	1000 parts.

Naphthol Grounding for Azophor Black.

	9.
β-Naphthol	30 parts
Soda Lye 36° Tw	75 ,,
Tragacanth (60:1000)	100 ,,
	Dilute to 1000 parts.

Naphthol Grounding for mixed Diazo compounds.

	10.
β-Naphthol	30 parts
Soda Lye 36° Tw	60 ,,
Para Soap PN	25 ,,
Tragacanth (60:1000)	35 ,,
Sodium Acetate cryst.	30 ,,
	Dilute to 1000 parts.

Diazo printing-colours.

In order to lessen the tendency of Diazo solutions to decompose in printing, the following precautions are necessary:

1. Diazo printing colours must be prepared in small amounts, and the Acetate of Soda, which is necessary to neutralize the free mineral acid, must be added to the colour immediately before printing.
2. Small copper "furnishing boxes" (chassis) with a false bottom must be used, which allow the Diazo solution to be cooled with cold water, or better still, with ice.
3. For colours, which froth considerably, the chassis may be replaced by a so-called "doctor-box", because thus only a small portion of the colour is exposed, and this, moreover, is constantly replenished.
4. The Naphthol grounding must be made to react very alkaline, or acetate of Soda must be added to it; in the latter case, the addition of sodium acetate to the printing colour, can be dispensed with.
5. In order to prevent the decomposed particles from sticking in the engraving, a revolving brush is advantageously attached to the furnishing box.

The Diazo printing colours are generally prepared by thickening the Diazo solutions with suitable thickening ingredients, and neutralizing the free mineral acids (which hinder the coupling) with Acetate of Soda, or Soda lye.

The best thickening ingredient for Diazo printing colours, as regards shade and stability of the colours is Tragacanth thickening. Flour-Tragacanth, and Wheat-Starch-Tragacanth thickening, which are cheaper, also give good results, whilst Gum, Dextrin, and also British gum, have a decomposing influence upon Diazo-solutions.

Diazotizing without ice. This mode of working is to be recommended where it is difficult to obtain ice, or where the latter can only be used sparingly. In this instance, two standard colours are prepared, the one containing the Nitrite solution, and the other, the Diazotizing base, together with the required amount of acid. These two are mixed immediately before printing; the thickening moderates and regulates the reaction, whereby the Diazotizing is less subject to accidents. The standard colours can be kept for any length of time.

Since the introduction of the Azophor Colours (stable Diazo compounds), the printing with Diazo colours has become considerably simplified. These colours can be worked without any particular precaution; no ice is required, and the printing colour, if carefully made, can be printed without any noticeable difference, even in hot rooms.

After printing, the goods are well dried; they must, however, not stand long over the heating-plates of the drying chamber, nor remain long on the drying-cylinders. — The goods are then washed. In order to prevent some loose diazo compounds from tinting the white, it is advisable to have a surplus of Naphthol on the material; or the printing colours must be pretty well diluted (reduced). If the printed pieces are hung overnight in a warm place, or passed quickly through the Mather-Platt (a longer steaming deteriorates the shade), a surplus of diazo-solution is destroyed. The simplest and surest way is, to pass the printed and dried pieces quickly through a hot, slightly acid bath, and then to finish washing in the washing machine. — Instead of the acid bath, boiling soap, or a hot diluted Naphthol solution may also be used. — After washing, the goods are generally soaped, washed again, and dried.

The most important printing colours are made up according to the following directions:

Paranitraniline Red.

For the preparation of Para-Red printing colour, Paranitraniline extra powder and Azophor-Red PN pat. are used on groundings 1, 2 and 5 (p. 129).

Paranitraniline-Red Printing Colour I.
(Diazotizing by means of dissolving in acid.)

22	parts	Paranitraniline are dissolved in
120	,,	Hot Water, and
35.2	,,	Hydrochloric Acid 36° Tw; then cooled, and
200	,,	Ice and Water, and at 32° F
42	,,	Nitrite solution (290:1000) added. The whole is made up to
500	,,	filtered and mixed
with 500	,,	Tragacanth (60:1000) and before use
30—40	,,	Acetate of Soda crystals are added
1000	parts.	

Paranitraniline Red Printing Colour II.
(Diazotising from Nitrite paste.)

22	parts	Paranitraniline are made into a paste with
42	,,	Nitrite Solution (290:1000) and
80	,,	Cold Water, then stirred slowly into a mixture of
250	,,	Ice and Water and
35.2	,,	Hydrochloric Acid 36° Tw. Then left to stand for ¼ h, filtered, made up to
500	,,	and mixed with
500	,,	Tragacanth (60:1000). Before use
30—40	,,	Sodium Acetate cryst. are added
1000	parts.	

Printing Colour prepared with Azophor Red PN pat.

90	parts	Azophor Red PN pat. are dissolved in
350	,,	Water, left to stand for ½ h, filtered and neutralised with
40	,,	Soda Lye 36° Tw diluted with
100	,,	Water. This solution is mixed with
500	,,	Tragacanth (60:1000)
1000	parts.	

Metanitraniline Orange.

For the preparation of this colour m-Nitraniline and Azophor Orange MN pat. are used on groundings 1, 2 and 5 (page 129).

Printing Colour prepared with m-Nitraniline.

28	parts	m-Nitraniline are dissolved in
200	,,	Hot Water and
44	,,	Hydrochloric Acid 36° Tw and cooled whilst stirring well. Then
100	,,	Ice are added, and slowly at about 32 to 42° F
52	,,	Nitrite solution (290:1000). After ¼ h the whole is made up to
500	,,	and filtered
400	,,	of this Diazo Solution are thickened with
500	,,	Tragacanth (60:1000) and before printing
30—40	,,	Sodium Acetate cryst. and
60	,,	Water are added
1000	parts.	

Printing Colour prepared with Azophor Orange MN pat.

90	parts	Azophor Orange MN pat. are dissolved in
350	,,	Water, left to stand for ½ h, filtered and the filtrate gradually neutralised by means of
40	,,	Soda Lye 36° Tw diluted with
100	,,	Water. This solution is mixed with
500	,,	Tragacanth (60:1000)
1000	parts.	

α-Naphthylamine Claret.

For the preparation of α-Naphthylamine Claret the following products are used: α-Naphthylamine Base, α-Naphthylamine Hydrochl. 36% paste, and α-Naphthylamine Salt S powder; the last named is well adapted for diazotising without ice. Naphthol Groundings 3, 4 and 6 (pages 129).

α-Naphthylamine Printing Colour prepared with Base.

20	parts	α-Naphthylamine Base are dissolved in
200	,,	Hot Water and
12.2	,,	Hydrochloric Acid 36° Tw, cooled and then
150	,,	Ice and
24.5	,,	Hydrochloric Acid 36° Tw are added. At 32° F
37.4	,,	Nitrite Solution (290:1000) are slowly added whilst stirring. The whole is left to stand for 10 min. made up to
500	,,	filtered and stirred into
500	,,	Tragacanth (60:1000). Before use
40	,,	Sodium Acetate cryst. are added
1000	parts.	

α-Naphthylamine Printing Colour prepared with α-Naphthylamine Hydrochl. 36% paste.

70	parts	α-Naphthylamine Hydrochl. 36% paste are made into a paste with
100	,,	Water
300	,,	Ice and
29	,,	Hydrochloric Acid 36° Tw, at 32° F gradually mixed with
37.5	,,	Nitrite Solution (290:1000) and left to stand for 10 min. The whole is made up to
500	,,	filtered and mixed with
500	,,	Tragacanth (60:1000). Before use
40	,,	Sodium Acetate cryst. are added
1000	parts.	

α-Naphthylamine Printing Colour prepared with α-Naphthylamine Salt S powder.

28	parts	α-Naphthylamine Salt S powder are made into a paste with
100	,,	Cold Water, then
200	,,	Ice and
14.4	,,	Sulphuric Acid 168½° Tw
100	,,	Ice are added. At about 32° F
37.5	,,	Nitrite Sol. (290:1000) are slowly added, and after 10 min. the whole is made up to
500	,,	and mixed with
500	,,	Tragacanth (60:1000). Before use
40	,,	Sodium Acetate cryst. are added
1000	parts.	

α-Naphthylamine Printing Colour without Ice.

I	28 parts	α-Naphthylamine Salt S powder are made into a smooth paste with
	100 ,,	Water and thickened with
	250 ,,	Wheat Starch-Tragacanth Thickening (page 126)
	100 ,,	Water and
	20 ,,	Sulphuric Acid 168 1/2° Tw are added
II	250 ,,	Wheat Starch-Tragacanth Thickening (page 126)
	37.4 ,,	Nitrite Sol. (290:1000)
	215 ,,	Water
		II is slowly added to I, whilst stirring well, and before use
	40—50 ,,	Sodium Acetate cryst. are added
	1000 parts.	

Dianisidine Naphthol Blue.

The products used are the following:

Dianisidine Salt dry
Dianisidine Salt paste 80 %
Dianisidine Sulphate
Dianisidine Base
Azophor Blue D pat., on
Naphthol Groundings 7 and 8 (page 130)

Dianisidine Salt Printing Colour.

16.5 parts	Dianisidine Salt dry are made into a paste with
10 ,,	Hydrochloric Acid 36° Tw and
45 ,,	Hot Water and cooled with
300 ,,	Ice Water. At 32—42° F
28 ,,	Nitrite Solution (290:1000) are added and the whole made up to
500 ,,	
350 ,,	of the Diazo Solution thus obtained
500 ,,	Flour-Tragacanth Thickening (page 126)
36 ,,	Chloride of Copper 77° Tw and
120 ,,	Water are made up to
1000 parts.	

The 16.5 parts Dianisidine Salt dry in the above recipe can be replaced by 20,5 parts Dianisidine Salt paste 80 %, or 12.5 parts Dianisidine Base. When working with the Base 15 parts Hydrochloric Acid 36° Tw are used instead of 10 parts.

Printing Colour prepared with Azophor Blue D pat.

36 ,,	Azophor Blue D pat. dissolved in
300 ,,	Water, filtered and made up to
350 ,,	which are stirred into
600 ,,	Flour-Tragacanth Thickening (page 126)
50 ,,	Chloride of Copper 77° Tw and
4 ,,	Chromic Acid cryst. are added
1000 parts.	

Benzidine Brown.

Benzidine Base and Sulphate are used on Naphthol Grounding 3 (page 129).

Benzidine Base Printing Colour.

14.4	parts	Benzidine Base are dissolved at the boil in
150	,,	Water and
16	,,	Hydrochloric Acid 36° Tw. After cooling
200	,,	Ice and
27.2	,,	Hydrochloric Acid 36° Tw are added and at 32° F gradually
41.6	,,	Nitrite Solution (290:1000). After 5 to 10 min. the whole is made up to
500	,,	and mixed with
500	,,	Tragacanth (60:1000). Before use
42	,,	Sodium Acetate cryst. are added
1000	parts.	

Tolidine Brown.

Tolidine Brown is a little faster to light than Benzidine Brown and is produced with Tolidine Base. Naphthol Grounding 3 (page 129).

The printing colour is prepared in the same way as stated under Benzidine Brown, only the 14.4 parts Benzidine Base are replaced by 17 parts Tolidine Base.

Blue Red O.

Blue Red O (Nitrophenetidine 25%) is used for producing Pink printing colours upon Naphthol grounding. Naphthol groundings No. 1 and 2 are suitable for this purpose (page 129). The base is diazotized without ice at a temperature of 68—77° F.

If light shades are printed on material, which has been grounded with concentrated Naphthol solutions it is necessary to make the printing colours sufficiently acid, to counteract the superfluous alkali contained in the grounding, which might give rise to unevenness of the prints.

Diazo solution:

146	parts	Blue Red O (Nitrophenetidine 25%) are carefully mixed with
66	,,	Nitrite solution (290:1000) and
40	,,	Water and then slowly added at 77° F to a mixture of
80	,,	Muriatic Acid 36° Tw and
250	,,	Water. The whole, when dissolved, is made up to
1000	parts	and filtered.

This Diazo solution is distinguished for its stability.

	Light pink.	Dark pink.
Diazosolution	150 parts	500 parts
Tragacanth 60:1000	600 ,,	500 ,,
Water	150 ,,	— ,,
Acetic Acid 12° Tw	100 ,,	— ,,
Acetate of Soda cryst.	20 ,,	50 ,,
	1000 parts	1000 parts

Azophor Black.

A printing colour containing Azophor Black S pat. is mostly used for 2 or multicoloured styles. If it is printed together with a white Resist, the latter must be applied after the Black, so as not to impair it.

In preparing the printing colour Acetic Acid is used for dissolving the Azophor Black, and, instead of Acetate of Soda, caustic Soda is used for neutralizing the mineral acid. Azophor Black S printed upon a grounding containing Tragacanth (page 129) produces fuller blacks than is possible to obtain on a grounding prepared with Para Soap. If the engraving of the printing rollers is very deep, the colour must be reduced, as brownish blacks are obtained, it this precaution is not taken. It is also advisable to thicken the printing colour considerably.

Azophor Black printing colour.

80 parts Azophor Black S pat. are dissolved in
65 ,, Acetic Acid 12° Tw and
195 ,, Water; then
80 ,, Soda lye 36° Tw and
80 ,, cold Water are added and the whole thickened with
500 ,, Flour Tragacanth Thickening (page 126)
1000 parts.

Before printing the colour is filtered.

3. Dyed effects, dyed print effects, and padded effects.

1. Basic Colours.

Dyed effects page 31.

2. Mordant Colours.

The mordants of Alumina, Iron and Chrome (both as separate mordants or mixtures) are printed or padded mostly together with Oxydation Aniline Black and then the fixed mordants are dyed.

a) Alumina Mordant.

Printing Colour.

80	parts	Wheat Starch
38	,,	Water
50	,,	burnt Starch
800	,,	Acetate of Alumina $10^1/_2{}^\circ$ Tw
16	,,	Olive Oil
16	,,	Turpentine
1000	parts.	Boiled, cooled and filtered.

Alumina Mordant (padding liquid).

A solution of Acetate, Sulphate or basic Sulphate of Alumina of 9—12° Tw is used for padding.

The addition of small amounts of Tin compounds to the printing paste or padding liquid makes the shade yellower and the red appears more brilliant. After printing or padding the mordant is fixed by hanging the pieces in the Oxydation-chamber (97° F heat and 90° F humidity). This will at the same time develop any Oxydation Aniline Black, which might have been printed along with the mordant colour.

The latter can also be fixed by passing the pieces through the Mather-Platt quick steaming apparatus and then through an Ammonia chamber. Then the material is "boiled off" (degummed).

For this purpose Chalk, Silicate of Soda, Phosphate of Soda or sometimes cow-dung are used in varying proportions.

Likewise Malt, especially for the second boiling-off bath, offers advantages.

Degumming bath No. 1 (Boiling-off bath).

20	parts	Silicate of Soda 32° Tw	per 1000 parts liquid.
2	,,	Phosphate of Soda Cryst.	
10	,,	Malt	

The pieces are passed through this bath at 140° F for 2 min. and are then washed. Then follows

Degumming bath No. 2 (Boiling-off bath)

in which the goods are malted for 10 min. and then well washed.

In order to obtain a brilliant red together with a pure white several precautions must be observed: The material must be well bleached. (To prove this the unprinted parts of the pieces are dyed with some Alizarine: no marks or cloudy places must become apparent). The mordant must be properly fixed by the hanging and degumming process; and the white must be well cleansed through washing in clean water.

The goods are then dyed with Alizarine Red, with certain additions to the dye bath, such as Tannin, Glue, Sumach, Blood, Albumen, Turkey Red Oil etc., which partly increase the beauty and depth of the Red, partly favourably influence the purity of the white.

Dye bath (for 100 lbs of material).

7 1/2	lbs	Alizarine Red paste 20%
3/4	,,	Tannin
3/4	,,	Glue
2 1/2	,,	Turkey Red Oil
1	,,	Chalk
250	Gall	Water.

The pieces are treated cold for 10 min. then the temperature raised in 10 min. to 104° F; in further 10 min. to 140° F and the goods worked at 140° F for 50 min. Then they are washed, treated for 10 min. at 140° F in a bath containing 20 parts bran per 1000 parts liquid, washed again and dried.

In order to convert the brownish Alizarine Lake into the brilliant Turkey Red shade, the pieces are oiled with Turkey Red Oil, dried, steamed and finally soaped.

Oiling. 50 parts of Turkey Red Oil per 1000 parts of liquid. To this bath are added sometimes certain amounts of Oxalate of Ammonia or Arseniate of Soda, in order to produce a purer white.

40	Gall	Water
4	lbs	Ammonia Turkey Red Oil 60%
6	oz	Oxalic Acid
6	Gall	Water neutralized with Ammonia and made up to
50	Gall.	

Steaming: 1 h under pressure of 1 1/2 atm.

Soaping: 10 min. at 140° F with 2 parts of soap per 1000 of liquid. After soaping the goods are sometimes passed through chlorine gas in order to purify the white.

Suitable for Alumina printing and dyeing styles are: **Alizarine Orange, Alizarine Red, Alizarine Brown, Alizarine Claret.**

b) Chrome Mordant.

The white, bleached material is passed twice through the light-Chrome Mordant on the 2 roller padding machine and then, without drying, passed through a 3% solution of Soda at 140—176° F. After this it is washed and dried.

Upon this slightly chrome-mordanted material Discharge White (page 155) and Dark Chrome Colour are printed; then the pieces are steamed for an hour under slight pressure and finally well washed.

Light-Chrome Mordant.

80	parts	Chrome Mordant GAII 64° Tw
920	,,	Water
1000	parts.	

Dark Chrome printing Colour.

750	parts	Thickening TN (page 127)
250	,,	Acetate of Chrome 32° Tw
1000	parts.	

Dye bath.

The dyebath is prepared for 100 lbs of material with 3 lbs Alizarine Orange paste and the 50 fold amount of water. The pieces are dyed with a little Acetic Acid cold for 1/4 h, the temperature is then raised within 3/4 h to the boil and the goods boiled until the colour is properly developed. Then they are washed, and soaped in the usual manner.

For dark blotches the Mordant is made stronger according to requirements.

Chrome Mordant GAII for dark effects.

200	parts	Chrome Mordant GAII 64° Tw
30	,,	Glycerine
770	,,	Water
1000	parts.	

Another Chrome Mordant, which is easily fixed is Horace Koechlin's so-called Alkaline Chrome Mordant.

250	parts	Acetate of Chrome 32 1/2° Tw
320	,,	Caustic Soda 71 1/2° Tw
10	,,	Glycerine 52 1/2° Tw
420	,,	Water
1000	parts.	

The pieces are padded with this mordant, rolled up, left to lie for several hours and then well washed.

Besides the above mordants, Chrome Bisulphite is sometimes used.

The firm of Rolffs & Co. hold a patent for producing fast dark blue effects upon mixed Chrome-Iron mordants (D.R.P. 97686): The pieces are mordanted in the usual manner with alkaline Chrome-mordant, then passed through Ferrous or Ferric oxide-mordant, dried and oxidised (by hanging); the Iron mordant fixed with Chalk or Silicate of Soda and finally the pieces dyed with blue Mordant-Colours. The usual discharge colours (page 155) produce coloured effects upon these blues. Since the Iron-mordant has a tendency to darken the colours, very cheap and fast effects are produced by this method. If Alizarine Brown is used for dyeing, very dark, full and at the same time cheap browns are obtained which are distinguished for their fastness to light and washing.

The following colours are suitable for Chrome printing and dyeing styles:

Alizarine Orange, all brands
Alizarine Red, all brands, excepting the "S" brands.
Alizarine Claret R.
Alizarine Brown, all brands.
Alizarine Blue, all the S (Bisulphite) brands.
Alizarine Green S, powder and paste.
Alizarine Yellow GG, R, N.
Mordant Yellow O.
Ceruleine, all the S (Bisulphite) brands.
Galleine, all brands.

c) Iron Mordant.

The most used Iron mordant, which is applied either by itself or in conjunction with Alumina and Chrome Mordants, is Pyrolignite of Iron, to which are sometimes added small amounts of Arsenic Compounds (Arsenic Glycerine) or of Chloride of Ammonia.

The following colours are suitable for dyeing upon Iron Mordants:

Alizarine Red, all brands, with exception of the "S" brands, **Solid Green** O paste 50%.

Iron Mordant dyed with Solid Green O.

Iron Mordant.

300	parts	Pyrolignite of Iron 21½° Tw
500	,,	Water
80	,,	Acetic Acid 12° Tw
100	,,	Acid Starch (page 126)
20	,,	Chloride of Ammonia
1000	parts.	

The well bleached material is padded with the Iron mordant, dried in the hotflue, and printed with Discharge White (page 157). After hanging the pieces for 24 h at 89° F (28° humidity) in the Oxidation Chamber (or passing them through the Mather-Platt quick steaming apparatus) they are treated for 3 min. at 140° F in a bath containing 20 parts Phosphate of Soda and 30 parts of Chalk per 1000 parts, then well washed and finally dyed with 6—10% Solid Green O paste 50%. It is best to use water free from lime for dyeing and to heat the bath (without the addition of Acid) within 1 h to the boil and to boil for ½ h. In order to obtain a pure white the pieces are washed after dyeing in the usual manner, treated with bran, soaped and chlorinated.

Alumina-Iron Mordant.

870	parts	Acetate of Alumina 9.8° Tw
100	,,	Pyrolignite of Iron 15° Tw
30	,,	Glycerine
1000	parts.	

Chrome-Iron Mordant.

80	parts	Chrome Mordant GAII 64° Tw
120	,,	Pyrolignite of Iron 15° Tw
30	,,	Glycerine
1000	parts.	

The padded pieces are treated exactly as described for Alumina and Chrome Mordants (pages 137—139).

d) Steam padding colours, prepared with Mordant Dyestuffs.

1. Colours which are fixed in a second bath with the mordant.

(Erban-Spechts Method page 47.)

2. Colours which are fixed in the same bath with the mordant.

The padding liquid contains besides the mordant colours the necessary mordants. In order to obtain level shades it is advisable to add to the padding liquid certain dissolving ingredients such as Alkalies, Borax, Glycerine, Turkey Red Oil etc.

The material is padded, dried in the hotflue, printed with Resist Colours (page 156 157), dried again, steamed for 1 h without pressure, washed and soaped. If Steam Aniline Black is printed along with the other Colours, it is to be made rather more acid (Tartaric Acid is generally used for this purpose) on account of the Alkali contained in the padding liquid. Before steaming for 1 h these pieces are passed through the Mather-Platt.

Mode-colour.

30	parts	Alizarine Yellow N powder
21	,,	Alizarine Red No. 1 paste
3.5	,,	Alizarine Green S paste
850	,,	Water
22	,,	Borax
100	,,	Acetate of Chrome 32° Tw
1000	parts.	

Fraise-Colour.

60	parts	Alizarine No. 1
20	,,	Ammonia
25	,,	Glycerine
50	,,	Tragacanth (60 : 1000)
815	,,	Water
30	,,	Acetate of Chrome 32° Tw
1000	parts.	

Solid Green-Bistre.

Alkaline Solid Green solutions, padded on cotton material and steamed, produce brown shades, which can be shaded off with Alizarine Colours (together with Acetate of Chrome) and are discharged by means of the Sulphite Resist Colours (page 157).

Solid Green solutions are prepared with Borax, Ammonia, and Caustic Soda. For light and medium shades Borax acts as a sufficiently strong dissolving agent. Dark shades require the presence of Ammonia or Caustic Soda. To these solutions can be added Alizarine Colours and Acetate of Chrome, for fixing The addition of an alkaline Copper solution increases the fastness to light considerably.

Padding liquids.

I.

120	parts	Solid Green O paste are stirred into
2000	,,	Water and then added to a solution of
150	,,	Borax and
2000	,,	Water. To this are added
50	,,	Turkey Red Oil
2000	,,	Water and
150	,,	Acetate of Chrome 32° Tw
2000	,,	Water
10000	parts.	

II.

120	parts	Solid Green O paste
2000	,,	Water
150	,,	Borax
2000	,,	Water
50	,,	Turkey Red Oil
1000	,,	Water
150	,,	Acetate of Chrome 32° Tw
2000	,,	Water
150	,,	Alkaline Copper Solution
2000	,,	Water
10000	parts.	

III. (shaded).

80	parts	Solid Green O paste
66	,,	Soda Lye 36° Tw
2000	,,	Water
40	,,	Ceruleine conc.
132	,,	Soda Lye 36° Tw
2000	,,	Hot Water
35	,,	Turkey Red Oil
1000	,,	Water
170	,,	Acetate of Chrome 32° Tw
1000	,,	Water
150	,,	Alkaline Copper Solution
1000	,,	Water
10000	parts.	

IV.

800	parts	Solid Green O paste
2000	,,	Water
450	,,	Borax
2000	,,	Water
500	,,	Ammonia
50	,,	Turkey Red Oil
2000	,,	Water
150	,,	Alkaline Copper Solution
2000	,,	Water
10000	parts.	

Alkaline Copper Solution.

1000	parts	Copper Chloride 77° Tw
500	,,	Tartaric Acid
1200	,,	Soda Lye 77° Tw
400	,,	Glycerine.

Eosines, padded with Chrome-mordants.

The bleached material is padded with the padding liquids; dried; if required printed with Steam-aniline black by itself or together with White discharges containing Tartaric Acid; steamed for 1 h without pressure; washed and slightly soaped.

Padding Liquid.

3	parts	Eosine
100	,,	Water
100	,,	Gum Solution (1:1)
750	,,	Water
30	,,	Chrome Acetate 32° Tw
1000	parts.	

In this mannerall Eosines, Phloxines, Rose Bengales etc. can be used.

3. Direct dyeing Colours.

Dyed effects page 25.

Padding liquids. In order to fix padding liquids prepared of Direct dyeing colours, Phosphate of Soda is used. After padding, the pieces are either dried over cylinders only or sometimes slightly steamed.

Padding Liquid.

2	parts	Colouring matter
50—100	,,	Tragacanth (60:1000)
7—10	,,	Phosphate of Soda
make up to 1000	parts	

4. Indigo.

Dyed effects page 52.

5. Colours produced upon the fibre by a process of oxidation.

Aniline Black padding liquid.

The bleached or boiled material is padded on the padding machine; dried in the hotflue; printed if required with Resists, (Prud'hommes Black styles, page 168 & 169), steamed for 2 min. in the Mather-Platt; passed through a Chrome bath (5 Bichrome per 1000) at 122° F for 1—1½ min.; washed and dried. Instead of the Chrome bath, to which some Soda is mostly added, also a Silicate of Soda-bath may be used.

84	parts	Aniline Salt
40	,,	Tragacanth (60:1000)
5	,,	Aniline Oil
220	,,	Water
54	,,	Yellow Prussiate
280	,,	Water
30	,,	Chlorate of Soda
320	,,	Water
1000	parts.	

6. Colours produced upon the fibre by a process of condensation.

Resorcine Blue MR.

For Resorcine Blue padding styles the goods are padded; then dried in the hotflue; printed if required with Resist Colours (page 169); steamed for 2—3 min. in the Mather-Platt powerful steam (210—212° F); passed through Tartar Emetic; washed and slightly soaped. The steamed pieces are finished off by passing at full width through the fixing and washing bath and over the drying machine. If there is no hotflue at hand, the pieces after having been padded with the Nitroso liquid, may also be dried carefully and not too quickly over the drying cylinder. In this case a suitable White Resist may be printed upon the unpadded material.

The following materials are used for producing Resorcine-Blues: Nitroso Base M paste and Resorcine or Tannoxyphenol R pat.

Padding liquids.

a) Resorcine.

Unshaded:

240	parts	Nitroso Base M 50% paste
500	,,	lukewarm Water
80	,,	Hydrochloric Acid 36° Tw
		stir well and add the cold solution of:
160	,,	Resorcine
160	,,	Water
		then:
600	,,	Tannin dissolved in Water 1:1
600	,,	Oxalic Acid sol. 1:10
		stir the obtained solution into:
1000	,,	Gum Tragacanth (60:1000)
		make up to 8000 parts and add before use slowly:
80	,,	Sodium Phosphate cr.
		dissolved in
2000	,,	Water
10000	parts.	

Shaded:

	200	parts	Nitroso Base M 50% paste
	500	,,	lukewarm Water
	70	,,	Hydrochloric Acid 36° Tw
			stir well and add the cold solution of:
I	100	,,	Resorcine
	100	,,	Water
			then:
	600	,,	Acetic Acid Tannin sol. 1:1
	600	,,	Oxalic Acid sol. 1:10
	600—1000	parts	Gum Tragacanth 60:1000
II	200	parts	Glycerine
	100	,,	Shading Blue B
	2000	,,	hot Water

pour solution I into the cold solution II. make up to
8000 parts and before use add slowly:
60 ,, Phosphate of Soda cr.
2000 ,, Water
10000 parts.

b) Tannoxyphenol.

240 parts Nitroso Base M 50% paste
5000 ,, Water
80 ,, Muriatic Acid 36° Tw
mix well, then add the hot solution of:
300 ,, Tannoxyphenol R } after dissolving on the
1000 ,, boiling Water } water bath
and:
600 ,, Oxalic Acid sol. 1:10
make up with cold water to:
9000 ,, and before use add slowly
and whilst stirring constantly:
80 ,, Phosphate of Soda, dissolved in
1000 ,, cold water
10000 parts.

7. Insoluble Azo Colours produced upon the fibre (Ice-Colours).

The material is padded with Naphthol Groundings as described on page 129 and 130 then dried in the hotflue or over drying cylinders and finally dyed in the developing baths.

Paranitraniline Red.

Naphthol Grounding 1, 2, 5 (see page 129).

a) By dissolving in acid.

14 parts Paranitraniline powder extra, dissolve in
60 ,, Boiling Water and
22 ,, Hydrochloric Acid 36° Tw; whilst cooling stir well, in order to precipitate the paranitraniline in very fine particles, then add
100 ,, Ice, and at 32—36° F add
26 ,, Sodium Nitrite solution (290 parts per 1000 parts water). — After frequent stirring, filter and before use add
30 ,, Sodium Acetate, and dilute with water to
1000 parts.

b) As Nitrite paste.

14	parts	Paranitraniline extra, make into a paste with
10	,,	Warm Water, then cool and add
26	,,	Sodium Nitrite solution (290 parts per 1000 parts water). Whilst stirring continuously the whole is gradually added to a mixture of
22	,,	Hydrochloric Acid 36° Tw and
200	,,	Ice-water and Ice. — After frequent stirring, filter, and before use add
30	,,	Sodium Acetate, and dilute with water to
1000	parts.	

Azophor Red PN pat.

Naphthol Grounding 1, 2 and 5 (see page 129)

56	parts	Azophor Red PN, make into a smooth paste with
400	,,	water; let stand for ½ hour, and when dissolved filter and neutralize with
25	,,	Caustic Soda 36° Tw diluted with
100	,,	Water; then add
500	,,	Water
1000	parts.	

α-Naphthylamine Claret.

Naphthol Grounding 3, 4 and 6 (see page 129).

From α-Naphthylamine Base

14,3	parts	α-Naphthylamine Base are dissolved in
300	,,	Hot Water and
10	,,	Hydrochloric Acid 36° Tw. Cool and add
20	,,	Hydrochloric Acid 36° Tw and
200	,,	Ice. Cool to about 32° F and add gradually whilst stirring well
26	,,	Sodium Nitrite solution (290 parts per 1000 parts Water). Then filter and before use add
30	,,	Sodium Acetate cryst. and dilute with cold water to
1000	parts.	

From α-Naphthylamine Hydrochloride paste 36%.

50	parts	α-Naphthylamine Hydrochloride paste 36%, make into a paste with
50	,,	cold Water, add
200	,,	Ice. Then add slowly at 32° F
20	,,	Hydrochloric Acid 36° Tw
26	,,	Sodium Nitrite sol. (290 parts per 1000 parts Water) and filter after 10 to 15 minutes. Before use add
30	,,	Sodium Acetate cryst. and dilute to
1000	parts.	

From α-Naphthylamine Salt S powder.

19,2	parts	α-Naphthylamine Salt S powder, make carefully into a paste with
200	,,	cold Water, and add
10	,,	Sulphuric Acid 168° Tw
200	,,	Ice. Then add slowly whilst stirring well at about 32° F
26	,,	Sodium Nitrite sol. (290:1000). Let stand ¾ h filter, and thicken with
100	,,	Tragacanth (60:1000). Before use add
30	,,	Sodium Acetate cryst. and dilute to
1000	parts.	

Benzidine (or Tolidine) Brown.

Naphthol Grounding 3 (see page 129).

18	parts	Benzidine Base (or 210 parts Tolidine Base); dissolve in
20	,,	Hydrochloric Acid 36° Tw and
100	,,	Boiling Water. Cool slowly and add
200	,,	Ice and
34	,,	Hydrochloric Acid 36° Tw. Cool to 32—40° F and add slowly
52	,,	Sodium Nitrite sol. (290 parts per 1000 parts Water). After 15 min. filter, and before use add
40	,,	Sodium Acetate cryst., thicken with
100	,,	Tragacanth (60 : 1000) and dilute with water to
1000	parts.	

Dianisidine-Naphthol Blue (from Dianisidine Salt).

Naphthol Grounding 7 and 8 (see page 130).

Medium Blue.

8,3	parts	Dianisidine Salt, dry; make into a paste with
5	,,	Hydrochloric Acid 36° Tw and
20	,,	Hot Water. Cool by adding
100	,,	Ice Water, and at 32—40° F add
14	,,	Sodium Nitrite sol. (290 parts per 1000 parts Water). After 10 min. filter and mix, whilst stirring, with
75	,,	Flour-Tragacanth Thickening (s.p.126). Add
30	,.	Cupric Chloride 77° Tw and before use
2	,,	Chromic Acid dissolved in water. Dilute to
1000	parts.	

Azophor Blue D pat.

Naphthol Grounding 7 and 8 (see page 130).

Medium Blue.

25	parts	Azophor Blue D pat., dissolve in
800	,,	Water, filter and thicken with
75	,,	Flour-Tragacanth Thickening (s.p.126). Add
30	,,	Cupric Chloride sol. 77° Tw and
1	,,	Chromic Acid dissolved in Water. Dilute to
1000	parts.	

The Copper Chloride solution 77° Tw can be substituted with advantage by Copper solution N, 100 parts of which equal 40 parts of the Copper Chloride.

Copper solution N.

160	parts	Copper Chloride solid
42.6	,,	Copper Acetate cryst.
80	,,	Sodium Nitrite cryst.
66	,,	Acetic Acid
1000	parts.	

Mixed Diazo-compounds.

The Azophor Colours can be used for producing mixed shades; they are more suitable for this purpose than the ordinary Diazo-solutions on account of their greater stability.

Developing bath for Brown.

20	parts	Azophor Red PN pat.
20	,,	Azophor Black S pat. are made into a paste with water and diluted to
500	,,	
50	,,	Tragacanth 60:1000 are added; then slowly
30	,,	Acetate of Soda cryst.;
300	,,	Water;
15	,,	Soda Lye 36° Tw; and before dyeing
30	,,	Copper Solution N (see above) and
70	,,	Water are added
1000	parts.	

Developing bath for Blue.

10	parts	Azophor Blue D pat.
15	,,	Azophor Black S pat. are made into a paste with water and diluted to
500	parts.	— Then
50	,,	Tragacanth 60:1000 and
40	,,	Acetate of Soda cryst.
300	,,	Water are added, and finally before dyeing
30	,,	Copper Solution N (see above) and
70	,,	Water
1000	parts.	

8. Sulphur Colours.

For producing Discharge effects upon Melanogen Blue the pieces are dyed as described on page 55 either in rope form or on the Jigger in a concentrated bath; a good blue is obtained with:

5% Melanogen Blue B pat
2% Soda calc. with the addition of
20 parts of Common Salt or Glauber's Salt to every 1000 parts of liquid.

The pieces are dyed at 176—194° F for 1 h, then rinsed and fixed. Small amounts of basic dyestuffs may be added to the fixing bath for shading purposes.

	I.	II.	III.	IV.
Alum	4%	4%	—	—
Fixing Salt M	—	—	4%	4%
Acetic Acid 12° Tw.	2%	2%	2%	2%
Violet cryst. O	0,25%	0,1%	0,25%	0,15%
Brilliant Green cryst. extra	—	0,1%	—	0,05%

The colour is fixed at a temperature of at least 140° F in ½ h, then the pieces are washed and dried over clean drying cylinders. The discharge effects are produced according to directions given on page 178.

4. Resist and Discharge Colours.

1. Resists and Discharges for basic dyestuffs.

a) Discharge effects upon tannin mordanted material, which is to be dyed afterwards with basic dyestuffs, by means of strong alkali-discharges.

The bleached material is padded in a warm Tannin-bath 140° F containing 15—20 parts of Tannin per 1000 parts of liquid, then dried in the hotflue; fixed in the usual manner with Tartar Emetic (10 parts per 1000), washed well, dried, and finally printed with Discharge White.

The drying after passing the pieces through Tannin can be dispensed with, if the goods remain lying rolled up wet for several hours, before fixing with Tartar Emetic.

Discharge White printing paste (Standard).

25	parts Wheat Starch powder
75	,, British Gum
900	,, Soda lye 77° Tw
1000	parts heated to 194° F.

Reducing paste.

250	parts British Gum
750	,, Water
1000	parts.

According to the depth of the engraving the standard discharge colour is reduced from 2:1 to 1:2. If the pieces, which have been printed with the alkali-discharge-white, are printed before steaming with Steam-Aniline-Black, the latter will also be discharged at those places, that contain the alkali-white-discharge; (this acting as a Resist for the developing of the Black). After printing and drying, the pieces are passed for ½—1 min. through the Mather Platt quick steaming apparatus at 210—212° F, then through Sulphuric Acid of 2° Tw and finally washed.

In order to obviate „doctor-streaks" it is advisable to pad the pieces before printing with Chloride of Ammonia (10—20 parts

per 1000) or to add this amount of Chloride of Ammonia to the Tartar Emetic bath. In this case, however, the pieces are not washed, but dried straight off.

The dyebath contains glue solution, Sulphate of Alumina and Tartar Emetic and the 40—50 fold amount of water of the weight of the pieces. These additions act very favourably upon the depth and beauty of the dyed shade and also especially upon the purity of the discharged white.

The dyebath is heated to the boil within 1 h and boiling continued for $^1/_2$ h. Then the pieces are well washed, quickly soaped at 140° F and chlorinated with a Chloride of Lime solution of $^1/_2$—$^3/_4$° Tw.

Colours suitable for dyeing discharged Tanniu-mordanted material.

Auramine, all brands, pat.
Phosphine, all brands, } only in small quantities.
Azo Phosphine GO, pat. }
Magenta, all brands, **Acetate of Magenta, Cerise, Grenadine** all brands.
New Magenta O, pat.
Safranine, Methylene Violet, all brands.
Methylene Heliotrop O.
Methyl Violet, New Violet, all brands.
Fancy Violet O, **Violet crystals** O, **Primula** R, B.
Malachite Green, Brilliant Green, all brands.
Rosazeine, all brands.
Methylene Blue, Marine Blue, all brands.
Thionine Blue GO, **Methylene Indigo** O, SS, **Methylene Darkblue** RBN, 3BN.
Methylene Green, all brands.
New Fast Blue 3R cryst., **Fastblue for Cotton,** all brands.
Methylene Grey, all brands, **New Methylene Grey** G, **Nigrisine** O.
Janus Blue G, B, R pat., **Indophene Blue** G, B, 2B, pat.

NB. Janus Blues and Indophene Blues tint the discharged places at first, but if the passage through Chlorine and the soaping operation are repeated a pure White is obtained.

Dyebath for 10 lbs of material.

3 oz Methylene Heliotrop O,
$^1/_2$ oz Methylene Blue DBB extra conc.
$^1/_2$ oz Methylene Green extra yell. conc.
1 lbs Glue solution 1:10
1$^1/_2$ oz Sulphate of Alumina
5—8 oz Tartar Emetic,
30 Gall Water.

b) Tartar Emetic Resists.

Applicable to all basic dyestuffs (series 1, page 113).

Resisting ingredients: Antimony Compounds either by themselves or together with Zinc Salts.

The white material (or pieces, which have been dyed with direct Colours) is printed with the Resist Colour; then printed or padded with basic dyestuffs (containing some tannin). Then steamed for 1 h without pressure, finally passed through Tartar Emetic, washed and soaped.

Tartar Emetic Resist.

250	parts	British Gum 1 : 1
100	,,	Water
250	,,	China Clay
200	,,	Sodium Tartar Emetic
200	,,	Sulphate of Zinc
1000	parts.	

Coloured Tartar Emetic Resists are produced by adding to the above Resist: Chrome Yellow, Chrome Orange, Guignet Green, together with some Albumen and Ammonia.

Resist, containing Oxalate of Antimony.

500	parts	Gum sol.
150	,,	Antimony Oxalate
20—50	parts	Citric Acid
330—300	parts	Water
1000	parts.	

This strong Resist has also resisting power for Alizarine-steam Colours, which might have been employed along with the other dyestuffs.

If the Tartar Emetic Resists are mixed with Tin Discharge Colours, these combined Antimony Tin-printing pastes can be used for producing discharge effects upon material, which has been dyed with direct dyeing Colours.

c) Discharge effects, by means of oxidising Discharge Colours.

With Chlorate discharges white and coloured effects are obtained on certain Tannin Colours. The well bleached material is padded with a liquid containing 15—20 parts (per 1000) of Tannin at 140° dried; the Tannin is then fixed in the usual manner with Tartar Emetic 5—10 parts per 1000, and after washing the material dyed with basic dyestuffs. Chlorate Discharges printed upon thus dyed material produce white effects. For coloured effects Discharge lakes with Albumen solution are added to the Chlorate Discharge paste, or also certain basic colours, which withstand the oxidising action of the Chlorate paste. (Table 179).

According to the strength of the Chlorate Discharge the pieces are steamed either in the Mather Platt for 1—3 min. or for a longer time in the steam box.

In order to prevent the fibre from becoming tender and also to obtain a good discharge, it is advisable to alter the guiding rollers of the steaming apparatus, in a manner, that the pieces scarcely touch the hot copper rollers. This is more fully described on page 175 under „Tannin Resist styles of the insoluble Azo Colours".

After steaming, the pieces are washed, then passed through a bath (104° F) containing 10 parts of Caustic Soda 77° Tw per 1000, washed again and dried. This operation acts favourably upon the purity of the white.

The following Chlorate Discharges are suitable for discharging Tannin Colours (Chlorate of Alumina being especially recommended for dark shades).

Chlorate Discharge.

300	parts	British Gum powder
420	,,	Water
200	,,	Chlorate of Soda
50	,,	Yellow Prussiate
30	,,	Citrate of Ammonia 52½° Tw.
1000	parts.	

Chlorate Discharge (Vanadium).

250	parts	British Gum powder
500	,,	Water
10	,,	Red Prussiate
200	,,	Chlorate of Soda
30	,,	Citric Acid
10	,,	Vanadium sol. 1:100 (page 127)
1000	parts.	

Alumina-Chlorate Discharge I.

220	parts	British Gum powder
50	,,	Water
20	,,	Red Prussiate
150	,,	Chlorate of Soda
560	,,	Chlorate of Alumina 42° Tw
1000	parts.	

Alumina-Chlorate Discharge II.

150	parts	Chlorate of Soda
200	,,	Chlorate of Barium
250	,,	Water
40	,,	Flour. Boil and add at 122° F
130	,,	Sulphate of Alumina
120	,,	Water. Then add cold
110	,,	Red Prussiate
1000	parts.	

Chlorate of Alumina 42° Tw.

I	200	parts	Sulphate of Alumina	dissolve hot
	130	,,	Water	
II	300	,,	Chlorate of Barium	
	350	,,	Water.	

I and II are mixed, cooled down, drawn off and made to twaddle at 42°.

The following Tannin Colours are discharged by the Chlorate Discharge pastes.

In dark shades.

Auramine, all brands, pat.

Chrysoidine, Vesuvine, Cutch Brown, Dark Brown, Leather Brown, Leather Black, Coal Black, all brands, **Brown** A; these dyes cannot be especially recommended on account of the great alteration which they undergo by the subsequent treatment (alkaline baths, dry chlorine).

Azo Phosphine GO pat., **Phosphine** and **Yellow for Leather,** all brands.

Magenta, all brands, **Acetate of Magenta, New Magenta** O, pat.

Cerise, Grenadine, Maroon, Cardinal, all brands.

Brilliant Green, Malachite Green, all brands.

Methyl Violet, **New Violet**, all brands.
Violet crystals O, **Fancy Violet** O, **Star Violet** O.
Victoria Blue B.
Ethyl Blue, all brands.
Janus Yellow G, R, pat., **Janus Red** B pat., **Janus Blue** R, G, pat.
Indophene Blue R, G, pat.

In medium and light shades.

Rosazeine, all brands.
Safranine, **Methylene Violet**, all brands.
Methylene Heliotrope O.
Methylene Blue, all brands, **Thionine Blue GO**, **Methylene Indigo**, all brands.
Methylene Green, all brands.
Methylene Grey, all brands.
Janus Green B, pat., **Janus Grey** B, BB, **Janus Darkblue** R, pat.

On easily dischargeable light grounds several colours, which are only discharged with difficulty, can be added to the Chlorate Discharge paste for producing a coloured effect f. i. Methylene Blue. Oxydianil Yellow withstands even very strong Chlorate Discharges and is therefore especially suitable for this purpose. Also Safranine, Rosazeine 4G, Methylene Heliotrop O may be used.

d) Discharge-effects by means of reducing discharges.

Zinc-dust discharges.

The following colours are destroyed by a Zinc-dust discharge print.

Azophosphine, Magenta, Methyl Violet, Violet crystals, Malachite Green, Brilliant Green.

These discharges, however, do not produce a pure white, and are therefore more suitable for coloured discharge-effects. For this purpose, are added to the zinc-dust discharge:

Auramine, Phosphine, Rosazeine, Safranine, Methylene Heliotrop, Methylene Blue, Ethyl Blue, Methylene Green, Primuline.

The material is dyed in the usual manner on tannin mordant; then printed with a coloured discharge; steamed under slight pressure for one hour; passed through cold, diluted sulphuric acid, (1—2 parts per 1000); washed and dried.

Coloured discharge.

20	parts	of colour
130	,,	Water
50	,,	Ethyl-Tartaric acid 22° Tw, add cold
400	,,	British gum-thickening 1 : 1, finely ground with
300	,,	Zinc-dust; into the whole, are stirred slowly, whilst cooling
100	,,	Bi-sulphite of Sodium 66½° Tw
1000	parts.	

Sulphite discharges.

Several colours dyed on tannin mordant in light shades can be discharged with sulphite colours:

Brilliant Green, Malachite Green, Methylene Blue, Methylene Green, Magenta, New Magenta, Azo Phosphine.

Sulphite white Discharge I.

550	parts	Sulphite of Potassium 91° Tw.
250	,,	British gum
200	,,	Water
1000	parts.	

In order to produce coloured discharge effects, the following dyestuffs may be added to the Sulphite white Discharge:

Auramine, Phosphine, Methyl Violet, Safranine, Methylene Heliotrop, Methylene Violet, Victoria Blue, Ethyl Blue, Rosazeine.

If free alkali is added to the Sulphite white Discharge, even Auramine, and Rosazeine 4G can be discharged.

Sulphite white Discharge II.

550	parts	Sulphite of Potassium 91° Tw
130	,,	Sulphocyanide of Potassium
50	,,	Soda Lye 77° Tw
250	,,	British Gum
20	,,	Water
1000	parts.	

The Sulphite Discharges are printed on the dyed material, the latter then steamed for 1—3 minutes in the Mather-Platt, washed, and chlorinated.

Protoxide of Tin-sodium Discharge.

The Discharge white described on page 158 can be used for the following colours in light shades:

Auramine, Azo Phosphine GO, Rosazeine, Magenta, Methyl Violet (reddish brands), **Malachite Green, Brilliant Green;** whereas **Victoria Blue** and **Safranine** resist the Discharge well.

Sodium Discharge.

For this purpose, caustic soda 76.6° Tw, thickened with British gum and Wheat-starch (see Alkaline Thickening on page 158), is used. Still better results are obtained, if the dyed material is either prepared before printing with a Glucose solution, or the glucose is added to the printing-paste.

The sodium Discharge acts similarly to the Protoxide of Tin sodium Discharge.

2. Resist and Discharge-effects on mordant colours.

a) Discharging the mordants with organic acids and subsequent dyeing.

White Discharge on alumina-mordanted material.

In order to produce a Discharge-effect on an Alumina mordant, Alumina padding-liquid, described on page 137 is used; the padded and dried material is then printed with Discharge white, which contains principally citric or tartaric acid, either alone, or mixed with their alkali salts, or sometimes acid sulphate; the mordant is then fixed as described on pages 137 and 138, by hanging, or short steaming, and boiling-off. The further treatment resembles that described on page 137.

Discharge White.

800 parts Gum Solution 1:1
100 ,, Tartaric Acid
100 ,, Citric Acid
1000 parts.

The following colours are used for dyeing discharged alumina mordants:

Alizarine Orange, all brands.
Alizarine Red, all brands with exception of "S" brands.
Alizarine Brown paste.
Alizarine Claret R paste.

White discharge on chrome-mordanted material.

The material is prepared with light chrome-mordant, as described on pages 138 and 139; the white Discharge is then printed together with the dark chrome colour, and the pieces dyed with Alizarine colours, as described previously.

Discharge White I.

1000 parts Gum solution 1:1
10 ,, Citric acid
9 ,, Tartaric Acid.

In order to discharge dark shades, Discharge white II, or Discharge white V, (page 157) is used.

Discharge White II.

1000 parts Gum solution 1:1
90 ,, Citric Acid
60 ,, Tartaric acid.

After printing, the pieces are steamed for 5 minutes, then passed through soda, 30 parts per 1000 parts, at 122° F. well washed, and dyed.

For dyeing discharged chrome mordants, the colours mentioned on pages 139 and 140, also Solid Green O are used.

White Discharge on Iron mordant dyed with Solid Green.

The material is padded with the iron mordant (page 140), then printed with Discharge white, fixed in the usual manner, and dyed with Solid Green O 50 % or with Alizarine colours.

b) Resists under Alizarine Steam-colours.

The ingredients used for Resists are: citric acid, tartaric acid, oxalic acid, and their alkali salts, also oxalate of antimony, the latter is also suitable for Resists under Tannin colours. The resist-colours are mostly printed on cloth prepared with Turkey red oil, then over-printed with Alizarine colours. The pieces are then steamed for 1—1½ hours without pressure, passed through chalk, washed and soaped.

Resists for Steam Alizarine Pink and Steam Alizarine Violet.

300	parts	British Gum
600	,,	Water
30	,,	Citric acid
50	,,	China Clay
20	,,	Citrate of Soda 48° Tw
1000	parts.	

c) Discharging the steam padding-liquids prepared from mordant colours.

The steam padding-effects which are produced as described on pages 47—51, and page 140, according to the one- or two-bath method, with Alizarine colours, can be discharged with organic acids, or their alkali salts, also with oxalate of antimony, or lastly, with oxidizing Discharges.

The Discharge made with oxalate of Antimony can serve simultaneously for Resist under Tannin colours. The oxidizing Discharges are especially employed for Alizarine chrome padding colours.

The strength of the Discharge is regulated by the depth of the dyed shades.

The Discharges are printed on the padded material, which is then steamed, either in the Mather-Platt, or in a closed steam-box, and finally washed and soaped in the manner usually employed for Alizarine steam-colours.

Discharge White I.

800	parts	Gum Solution 1:1
100	,,	Tartaric Acid
100	,,	Citric Acid
1000	parts.	

To be applied in the reduced state ½—¼.

Discharge White II.

700	parts	British Gum Thickening 1:1
200	,,	Soda Lye 67° Tw
100	,,	Citric Acid
1000	parts.	

Discharge White III.

850	parts	Gum Solution 1:1
150	,,	Oxalate of Antimony
1000	parts.	

Discharge White IV.

840	parts	Gum Solution 1:1
120	,,	Oxalate of Antimony
40	,,	Tartaric Acid
1000	parts.	

The following Discharge White V produces a very pure White even under Aniline Black.

Discharge White V.

200	parts	British Gum
600	,,	Sulphite of Potassium 90° Tw heat and add cold
200	,,	Citrate of Ammonia 46° Tw
1000	parts.	

Besides the Chlorate Discharges given on page 152, the following discharge, prepared with Discharge Salt I and II, can be used:

Discharge White VI.

400	parts	Gum Solution 1:1
120	,,	Sodium Chlorate
408	,,	Discharge Salt I (M. L. B.)
72	,,	Discharge Salt II (M. L. B.)
1000	parts.	

Steam padding-colours prepared with Solid Green O, are discharged with Sulphite Discharges. The Discharges are printed on the Solid Green padded material, steamed for one hour without pressure, well washed, and soaped. For coloured resists, direct-dyeing colours, or chrome-lakes of mordant colours, such as Alizarine Blue SB, and Ceruleine, are suitable.

Discharge White.

100	parts	Kaoline made into a paste with
83	,,	Water
375	,,	Sulphite of Potassium 90° Tw
75	,,	Bisulphite of Soda 64° Tw stirred into
250	,,	British Gum powder
117	,,	Citrate of Soda 53° Tw
1000	parts.	

Coloured Discharges for Solid Green-Brown.

Aurophenine O	30 parts	— parts	— parts
Diamine Pure Blue	— ,,	20 ,,	9 ,,
Dianil Yellow 3G	— ,,	— ,,	20 ,,
Water	445 ,,	455 ,,	446 ,,
British Gum powder	300 ,,	300 ,,	300 ,,
Sulphite of Potassium 90° Tw	190 ,,	190 ,,	190 ,,
Bisulphite of Soda 64° Tw	35 ,,	35 ,,	35 ,,
	1000 parts.	1000 parts.	1000 parts.

d) Discharging Mordant Colours.

Discharging Turkey Red by means of Chloride of Lime.

The dyed material is printed with thickened organic Acids: Citric, or Arsenic and Citric Acid for Discharge White; Citric Acid and Lead salts for Discharge Yellow; Tartaric Acid and a solution of Prussian Blue in Oxalic Acid for Discharge Blue. By mixing Discharge Yellow and Blue, Discharge Green is obtained. After printing, the goods are passed through a series of cisterns, the first of which contains strong Chloride of Lime solution (100 parts Chloride of Lime per 1000 parts of water), and the others running water. After the passage through Chloride of Lime, which effects the discharging, the Yellow and Green are developed in a luke-warm weak Chrome bath. Instead of Citric, Oxalic and Tartaric Acid, Lactic Acid may be used with advantage (C. F. Boehringer & Sons, Nieder Ingelheim a. Rh.).

Discharging Turkey Red by means of the Glucose-alkali method.

This process is founded upon the Schlieper-Baum Discharge styles (Indigoprints upon Turkey Red).

1. Preparing the goods, dyed with Turkey Red, with a strong Glucose solution, and drying.
2. Printing strong alkaline Colours.

For White: Concentrated Caustic Soda is thickened with Dextrine, and Sodium Protoxide of Tin and Silicate of Sodium added.

Discharge White.

100 parts	Tin Salt Ia cryst are added at a temperature not exceeding 95° F to
700 ,,	Alkaline Thickening, then
200 ,,	Silicate of Soda 72—77° Tw are added
1000 parts.	

Alkaline Thickening.

26 parts	Wheat Starch
78 ,,	British Gum
896 ,,	Soda Lye 100° Tw
1000 parts.	

For Blue: To the above Discharge White Indigo paste is added. For Yellow: The above Discharge White is mixed with Sodium-Lead Oxide. For Green: Mixture of Yellow and Blue.

After printing the goods are well dried and at once steamed in the Mather Platt with powerful steam for 2—3 min. The steamed pieces are then passed through a boiling bath of Sodium Silicate (20 per 1000); washed, chromed in an acidified Chrome bath, washed again and dried.

In order to simplify the method, the preparation with Glucose can be dispensed with if the Glucose is added to the Discharge pastes. These discharge colours, however, are only stable for a short time.

Discharging Mordant Colours by means of Chlorate Discharge.

Alizarine Colours dyed upon Chrome mordanted material can be discharged by printing Chlorate Discharges (page 152), the pieces are then steamed for 1—3 min. in the Mather-Platt, passed through Chalk, washed and soaped.

The chrome-lakes of the following colours can be discharged by Chlorate Discharges:

Alizarine Orange, all brands.
Alizarine Red, all brands (with the exception of the „S" brands).
Alizarine Claret R paste.
Alizarine Brown, all brands.
Alizarine Blue, all „S" brands, powder and paste.
Alizarine Green S, powder and paste.
Galleine, all brands.
Ceruleine, all brands.
Solid Green O 50% paste.

3. Discharging direct Colours.

a) Tin Salt Discharges.

The following Dianil Colours are discharged:

a) white discharge effect:

Cresotine Yellow G, **Aurophenine** O, **Dianil Orange** N, **Dianil Red** R, 4B, 10B, **Brilliant Dianil Red** R, **Delta Purpurine** 5B, **Dianil Claret Red** G, B, **Dianil Brown** 3GO, 2G, BD, **Dianil Blue** 2R, R, B, G, pat., **Dianil Darkblue** R pat., **Dianil Black** B, R, G, pat. Eventually with Solidogen-aftertreatment.

b) coloured discharge effect:

All Dianil Colours with exception of the Dianil Yellows.

The bleached material is dyed in the usual manner, printed with white or coloured Tin Discharges and steamed. The steaming is varied from 3—10 min. or even longer, according to the depth of the original shade and to the strength of the Discharge. Discharges

containing Tin Salt and free Acid, besides the required amount of Acetate of Tin, must not be steamed too long and always with care, lest the fibre is affected. In most cases the Mather Platt quick steaming apparatus is used for this purpose. The longer the steaming lasts the more the white is changed towards yellow. Then the pieces are washed and, to improve the white, slightly soured if this is possible.

In many cases it is advisable to pass the steamed goods through a Solidogen solution. This aftertreatment improves on the one hand the fastness to Acids (Dianil Red 4B) and on the other hand the fastness to washing (Dianil Blue); moreover the white is improved and in some cases the beauty of the shade enhanced. This aftertreatment is best executed at full width.

Tin salt White Discharges.

White Discharge I.

450	parts	Acid Starch (page 126)
275	,,	Tin Crystals Ia
75	,,	Acetic Acid 12° Tw
125	,,	Acetate of Soda Cryst.
75	,,	Tragacanth 60:1000.
1000	parts.	

Suitable for short steaming.

White Discharge II.

80	parts	Wheat Starch
80	,,	Water
250	,,	Dextrine
550	,,	Acetate of Tin 32° (page 162)
40	,,	Citric Acid
1000	parts.	

Suitable for longer steaming.

White Discharge III.

110	parts	Wheat Starch
850	,,	Acetate of Tin 32° (page 162)
50	,,	Acetic Acid 12° Tw
1000	parts.	Boil well.

Suitable for long steaming. To improve the white which has the tendency to turn yellow after steaming, the material must be soured in the usual way.

White Discharge IV.

400	parts	Acid Starch (page 126)
100	,,	Tragacanth (60:1000)
240	,,	Tin crystals Ia
110	,,	Water
100	,,	Sulphocyanide of Ammonia
50	,,	Citric Acid 36° Tw
1000	parts.	

Even when reduced, No. IV discharges very effectually and produces a very good white.

White Discharge V.

40	parts	Wheat Starch
290	,,	Water
100	,,	British Gum
320	,,	Protoxide of Tin paste
150	,,	Tartrate of Ammonia 32° Tw.
100	,,	Sal-Ammoniac.
1000	parts.	

Protoxide of Tin paste.

I	695	parts	Tin crystals Ia dissolved in
	10000	,,	Water
II	475	,,	Soda
	10000	,,	Water.

Stir II into I, wash the precipitate once, filter by decanting and make up to 2000 parts.

Tartrate of Ammonia 32° Tw.

1000	parts	Tartaric Acid are dissolved in
1500	,,	Hot Water, and to this are added at 86° F
1000/1200	parts	Ammonia. (The solution is alkaline).

Make up with water to 32° Tw.

White Discharge V can also be used for long steaming and may be employed to produce coloured discharges containing lakes which are fixed with albumen.

Coloured Tin Salt Discharges.

1. With basic dyestuffs.

The following colours can be added to the discharge pastes:

Auramine, Phosphine, Magenta, Methyl Violet, Brilliant Green, Malachite Green, Methylene Blue, Marine Blue, Methylene Grey, Methylene Heliotrop, Ethyl Blue, Rosazeine 4G pat., Victoria Blue.

Coloured Discharge No. I.

30	parts	Colouring matter
230	,,	Acetic Acid 9° Tw
250	,,	Acid Starch (page 126)
40	,,	Tartaric Acid
150	,,	Acetic Acid Tannin Solution 1 : 1. Then add
300	,,	Standard White
1000	parts.	

Standard White.

368	parts	Acetate of Tin 32° Tw
148	,,	British Gum
74	,,	Gum Solution 1 : 1
37	,,	Citric Acid
40	,,	Water. Boil for 10 min. then add
222	,,	Tin cryst. Ia. Stir for 5 min.; after cooling add
37	,,	Sodium Acetate cryst.
74	,,	Water
1000	parts.	

Acetate of Tin 32° Tw.

1000 parts	Tin crystals Ia	}	dissolved hot.
800 ,,	Acetic Acid 9° Tw		
1000 ,,	Sugar of Lead	}	,, ,,
800 ,,	Acetic Acid 9° Tw		

The Tin solution is poured into the Lead solution the precipitate cooled and filtered, and the clear solution made up with Acetic Acid 9° Tw to 32° Tw. Another method is to dissolve Protoxide of Tin (commercial paste) in Acetic Acid Anhydride.

2. With Pigment Colours.

Coloured Discharge No. 2.

200 parts	Chrome Yellow paste
100 ,,	Albumen 1:1
700 ,,	Discharge White V (page 161)
1000 parts.	

Solidogen aftertreatment.

The discharged pieces are passed after steaming at full width for 1/2 min. through a bath containing 20 parts Solidogen A pat. and 5—10 parts of Muriatic Acid 36° Tw per 1000; they are then washed, eventually passed for 1/2 min. through a weak, cold soda bath (5—10 parts per 1000) and washed again.

b) Zinc dust discharges.

The following Dianil Colours are discharged with Zinc dust discharges:

a) white Discharge effects are produced upon all colours named under "a" for Tin Discharges (page 159).

b) coloured Discharge effects are obtained upon all colours named under "b" page 159.

The Zinc dust discharges are superior to Tin Discharges on account of their more energetic action and because they do not impair the cotton fabric at all. On the other hand the selection of colours suitable for producing coloured Zinc dust Discharges is considerably more limited than those suitable for coloured Tin Discharges. Moreover the Zinc dust discharges are liable to stick in the engraving and only the finest powder, pasted with water, is suitable for printing. It is necessary to use brush-furnishers in printing. The Zinc Dust discharges are made up with Zinc Dust, Bisulphite and Gum or Dextrine thickening and contain mostly additions of Glycerine, Soda-solution, Ammonia or other ingredients which increase the stability of the printing colour, viz Formic Aldehyde, Acet aldehyde, Aceton.

White Discharge I.

250 parts	Zinc Dust, finest powder
500 ,,	Gum Solution 1:1
50 ,,	Glycerine
50 ,,	Ammonia
150 ,,	Sodium Bisulphite 66° Tw
1000 parts.	

White Discharge II.

250	parts	Zinc Dust finest powder
200	,,	Gum solution 1 : 1; grind thoroughly and add whilst cooling
400	,,	Sodium Bisulphite 66° Tw. After the reaction has taken place, add
30	,,	Soda
70	,,	Water
50	,,	Glycerine are added
1000	parts.	

White Discharge III.

250	parts	Zinc Dust finest powder
230	,,	Gum Solution 1 : 1, grind thoroughly and add whilst cooling
400	,,	Sodium Bisulphite 66° Tw
70	,,	Formaldehyde 40%
50	,,	Glycerine
1000	parts.	

The following dyes may be added to the coloured zinc dust discharges: **Oxydianil Yellow** O, **Phosphine, Safranine Methylene Heliotrop** and **Rosazeine.**

c) Oxidation Discharges.

The following Dianil Colours can be discharged with Chlorate Discharges:

All Dianil Colours with the exception of **Dianil Yellow** and **Oxydianil Yellow**, a pure white is produced with **Cresotine Yellow. Toluylene Orange** R, **Dianil Orange** N, **Brilliant Dianil Red, Delta Purpurine** 5B, **Dianil Red, Dianil Claret Red** and **Dianil Blue.**

All Chlorate Discharges given on page 152 can be used. For coloured effects the following colours may be added to the Chlorate Discharge paste:

Methylene Blue, Rosazeine 4G pat., **Oxydianil Yellow** O.

4. Discharges and Resists for Indigo.

On all Indigo dyed Blues discharge or resist effects can be produced. In rare cases the mercerizing effect of strong alkalies is also made use of. These so called mercerized effects are produced by printing before vat-dyeing the material.

a) Indigo Discharge effects.

Indigo dyed material is discharged mostly by a process of oxidation; the following ingredients, together with caustic alkalies, are employed: Chromates, Chlorates, Bromates and Red Prussiate salts.

1. Chromate Discharge.

In using Chromates, Chromic Acid is liberated in passing the printed goods through Acid. This has a most energetic and destroying influence upon Indigo blue, but impairs the fibre at the same time, by converting it into Oxycellulose. In order to obviate this, organic substances are added to the hot acid bath: Alcohol, Glycerine, Leiogomme etc. which mitigate the Chromic Acid reaction to a certain extent. Oxalic Acid acts in a similar manner and is therefore almost always added to the Acid bath. It regulates the discharging and counteracts the superfluous Chromic Acid.

A considerable advantage is offered by Chromate Discharges, in as much as they can be used for the production of brilliant coloured Discharge effects on Indigoblue: Chrome Yellow, Chrome Orange, Vert Guignet, Vermillion, Ochre, Soot, also a series of lakes fast to acids and chrome can be used for this purpose; they are fixed with Albumen, which is coagulated and made sufficiently stable when passing the goods through the hot acid bath.

The Potassium or Sodium Bichromate, which is mostly used for these Discharges, is neutralized with Soda, caustic Soda or Ammonia. A slight surplus of ammonia is rather beneficial, since it enhances the consistency of the printing colours prepared with Albumen; in order to avoid frothing, some Turpentine is added to the pastes.

These albumen colours are liable to stick in the engraving, and therefore brush-furnishers are to be used; moreover the colours must be well ground and sieved.

The amount of Bichrome is regulated by the depth of the original blue shades and by the depth of the engraving. Coloured Discharges do not require as much discharging ingredient as White Discharges.

The following recipe is an example for a

Standard White Discharge.

180	parts	Bichrome
376	,,	hot Water, neutralized with
64	,,	Soda calc; then
280	,,	burnt starch
200	,,	Water
1100	parts.	

Heated to 140° F, cooled and sieved.

Coloured Discharge for Medium Blue.

300	parts	Discharge Pigment
400	,,	Thickening for Discharges
300	,,	Tragacanth (60:1000)
1000	parts.	

Thickening for Discharges.

{ 320	parts	Tragacanth (60:1000)
{ 100	,,	Bichromate of Potassium
{ 130	,,	Hot Water;
		after dissolving add
50	,,	Ammonia 25% and when cold
400	,,	Blood Albumen sol. 1:1
1000	parts.	

As Discharge Pigments Chrome Yellow, Vermillion, Ochre, Vert Guignet and the commercial discharging lakes can be used.

For dark Indigo shades with Melanogen Blue bottom the following discharges may be employed:

White Discharge.

200	parts	Bichrome
470	,,	Water
80	,,	Solvay Soda
250	,,	British Gum
1000	parts.	

Yellow Discharge.

550	parts	Chrome Yellow paste
150	,,	Tragacanth (60:1000)
150	,,	Albumen 1:1
150	,,	Yellow Chromate of Soda
1000	parts.	

Red Discharge.

550	parts	Discharge Red Lake
150	,,	Tragacanth (60:1000)
150	,,	Albumen 1:1
150	,,	Yellow Chromate of Soda
1000	parts.	

After printing and drying the material is passed through the Acid bath at 140° F.

Acid bath.

50	parts	Sulphuric Acid 168 1/3° Tw
50	,,	Oxalic Acid cryst.
1000	,,	Water.

The pieces are then washed well and dried.

For coloured effects upon Indigo discharge styles, the insoluble Azo Colours are also suitable. They are applied according to the Chromate or Prussiate discharging method. When using the former, the Indigo dyed material is naphtholated, the Chromate Discharge containing the Diazo Compounds printed, and the pieces then soured. Of the Diazo Compounds, that of the Amido-azo-benzene, (pat. Dr. W. Elbers) and that of the Para-nitro-diazo-benzene are suitable for this purpose: the latter especially in its stable form: Azophor Red PN pat.

Naphtholgrounding.

25 parts β-Naphthol R
50 ,, Soda Lye 36° Tw
25 ,, Para Soap PN
make up to 1000 parts.

Discharge Red printing paste A.

270 parts Tragacanth (60:1000)
180 ,, Sodium Bichromate
550 ,, Azophor Red sol. 224:1000
1000 parts.

Azophor Red-solution 224:1000.

224 parts Azophor Red PN pat.
600 ,, Water. After dissolving filter and add
100 ,, Soda Lye 36° Tw
300 ,, Water.

In order to produce a pure White on Indigo by means of Chromate Discharges, together with insoluble Azo-Colours, the detrimental effect of Chromic Acid upon Beta Naphthol must be counteracted. For this purpose the pieces are washed before souring, until all the superfluous Beta Naphthol is removed and it is also necessary to use insoluble Chromates as discharging ingredients.

Camille Kurz and Felix Kunert have founded a method upon using a Naphtholgrounding containing Bichrome and White and Coloured Discharges containing sugar of lead. We, however, recommend the direct application of insoluble Chromates, especially the addition of Barium Chromate to the White and Coloured Discharges.

The Indigo dyed goods are naphtholated and printed with Discharge Colours containing Barium Chromate; then after drying the superfluous Naphthol is removed by carefully rinsing the pieces in diluted Ammonia (40 parts per 1000) and water; then the material is passed for 20 seconds through the Acid bath (50 parts Muriatic Acid 32½° Tw and 50 p. Oxalic Acid in 1000 parts of liquid) at 176° F; then well washed and finally soaped in order to cleanse the Discharge Colours.

Chrome Discharge White B.

150 parts Tragacanth (60:1000)
250 ,, Water and
600 ,, Barium Chromate 80% paste are finely ground
1000 parts.

Chrome Discharge Red B.

200 parts Tragacanth (60:1000),
100 ,, Water
300 ,, Barium Chromate 80% paste
400 ,, Azophor Red Sol. 224:1000, as above
1000 parts.

2. Chlorate-Discharge.

The Chlorate Discharge is principally used if white effects only are to be produced; it is especially employed for heavy designs, since it is less liable to form Oxycellulose than the Chromate Discharge. In order to mitigate the oxidising reaction, part of the Chlorate is replaced by Bromate. The Indigo is destroyed in this method by steaming in the Mather-Platt and the Discharge pastes contain a certain amount of Red or Yellow Prussiate as carrier of the oxygen. The most powerful discharge is prepared with the very labile Alumina Chlorate. Additions of organic Acids or their Alkali or Ammonia salts act favourably upon the white; but care must be taken to avoid the slightest surplus of acid, since this will easily corrode the cotton fibre.

The Chlorate Discharges described on page 152 are suitable for printing upon Indigo bottom. Their strength must he regulated by and the pastes be reduced according to the depth of the shade.

We also wish to point out that several lake manufacturers make coloured steam-discharges, which produce very good results.

3. Prussiate-Discharge.

The Prussiate Discharge is only applicable to light and medium Indigo blues. This method is founded upon printing thickened Red Prussiate upon the material and passing the latter subsequently through caustic soda. If this method is combined with the production of insoluble Azo Colours, very brilliant and fast coloured discharges are obtained on Indigo bottom. For this purpose the Diazocompounds of p-Nitraniline, m-Nitraniline, Nitrotoluidine and Alpha Naphthylamine are suitable. The Indigo dyed material is padded with Naphthol-solution, dried, printed with the Discharge, passed for 10 seconds through a cold Discharging bath and finally washed and dried.

Naphthol grounding.

25	parts	Beta Naphthol
50	,,	Soda Lye 36° Tw
25	,,	Para Soap PN
1000	parts.	

Discharge Red P.

400	parts	Paranitraniline Diazo solution (28 : 1000)
400	,,	Wheat Starch-Tragacanth Thickening (p. 126)
160	,,	Red Prussiate, finely powdered,
40	,,	Sodium Acetate crystals.
1000	parts.	

Discharging bath.

10000	parts	Soda Lye 22° Tw
100	,,	Solvay Soda.

b) Indigo Resist Styles.

Resist styles are produced under Indigo by printing the Resist Colours (reserving pulps) and subsequently dyeing the pieces in the

Vat. The Resists contain oxidizing ingredients: coppersalts in conjunction with lead salts and also mechanical resisting agents such as Chinaclay, Barium Sulphate, fats etc. etc. together with thickenings made from Gum (in rarer cases Burnt Starch or Flour Thickening are also used). Besides White Resists also Yellow and Orange Resists are obtained by dyeing the printed white lead Resist with Chromates or by a subsequent treatment in a hot Lime bath. If the goods are slightly blued before printing, the White Resist will produce a light blue, the Yellow Resist a green effect upon a dark blue ground.

The pieces are mostly starched before printing; after dyeing they are dried and then soured and washed in the usual manner.

White Resist I.

360	parts	Gum sol. 1:1
30	,,	Acetate of Copper
30	,,	Sulphate of Copper
120	,,	Nitrate of Copper
60	,,	Water
400	,,	Sulphate of lead paste 66%
1000	parts.	

White Resist II.

200	parts	Flour } boiled; when luke warm add
585	,,	Water }
180	,,	Sulphate of Copper
25	,,	Nitrate of Copper
10	,,	Tournant Oil
1000	parts.	

If white and coloured effects are to be produced under Indigo, which is fixed by the Glucose process, the material is first prepared with Glucose, and then colours printed upon it, which contain finely divided sulphur flowers.

White Resist.

600	parts	Gum sol. 1:1
400	,,	Sulphur flowers
1000	parts.	

The further treatment of the material is described on page 123.

5. Resist effects upon colours which are produced on the fibre by a process of oxidation.

Steam Aniline Black Resist styles.

(Prudhomme Black).

Resist effects under Aniline Black are produced with alkaline reducing agents: caustic alkalies, their Carbonates, Silicates, Sulphites, Oxide of Zinc, Carbonate of Magnesia, Sulphocyanides.

For coloured Resists are employed:

1. Basic Colours of series No. 1 (page 113) fixed with Tannin, or, without Tannin, with the addition of Acetate of Zinc, Zinc Oxide (and eventually Albumen).

2. Direct Colours of series No. 3 (page 114).

3. Colour lakes and pigment Colours fixed with Albumen.

The white and coloured Resists are printed either upon the undeveloped padded black, or upon the white material before padding.

Aniline black padding liquid and the treatment of the material are described on page 143.

Resists upon undeveloped padded Aniline Black.

White Resist.

500	parts	Tragacanth (60:1000)
150	,,	Sodium Acetate cryst.
100	,,	Bisulphite of Soda 66° Tw
250	,,	Water
1000	parts.	

Coloured Pigment Discharges.

500	parts	Pigment
220	,,	Tragacanth (60:1000)
150	,,	Albumen 1:1
130	,,	Sodium Acetate cryst.
1000	parts.	

Coloured Discharge I.

20	parts	Colouring Matter
100	,,	Water
200	,,	Acetic Acid 12° Tw
450	,,	Acid Starch (page 126)
30	,,	Glycerine
200	,,	Oxide of Zinc paste 1:1
1000	parts.	

Suitable for all basic dyes.

Oxide of Zinc paste 1:1.

500	parts	Oxide of Zinc
500	,,	Water
1000	parts.	

Coloured Discharge II.

20	parts	Colouring Matter
200	,,	Water
400	,,	Tragacanth (60:1000)
200	,,	Acetate of Zinc cryst.
200	,,	Albumen 1:1.

Resists under Aniline Black.

White Resist.

70	parts	Oxide of Zinc
309	,,	Water
75	,,	British Gum powder
165	,,	Tragacanth (60:1000)
56	,,	Soda Lye 36° Tw
30	,,	Sulphocyanide of Ammonia 32° Tw
295	,,	Sodium Acetate cryst.
1000	parts.	

Coloured Resist.

20	parts	Colouring Matter
180	,,	Water
760	,,	Zinc paste
40	,,	Acetate of Soda cryst.
1000	parts.	

Suitable for all basic dyes.

Zinc paste.

105	parts	Wheat Starch
25	,,	British Gum
715	,,	Water
155	,,	Oxide of Zinc
1000	parts.	

6. Resist effects upon colours, which are produced upon the fibre by a process of condensation.

Nitroso Blue Resist Styles.

For the production of Nitroso Blue Resist styles the goods are padded as described on page 144, dried in the hotflue; printed with the Resists (as below); steamed for 2—3 min. in the Mather-Platt at 210—212° F; passed through an Antimony bath; washed and soaped.

The Resists contain either Sulphites or Tin Salts, for coloured effects basic colours are used.

White Resists.

Sulphite White Resist.

300	parts	British Gum powder
700	,,	Sulphite of Potassium 91° Tw
1000	parts.	Heat on the water bath.

Alkaline Sulphite White Resist.

240	parts	British Gum powder
560	,,	Sulphite of Potassium 91° Tw
120	,,	Soda Lye 91° Tw
80	,,	Water
1000	parts.	

White Underprint.

220	parts	British Gum powder
400	,,	Water
60	,,	Sodium Tartar Emetic
170	,,	Glue sol. 1:2
110	,,	Tin Cryst. Ia. after cooling add
40	,,	Acetate of Soda cryst.
1000	parts.	

This Resist, is printed upon white material and withstands the passage through the padding liquid and subsequent drying over cylinders.

Coloured Resists.

Sulphite Resists.

Rosazeine 4 G pat.	—	pts.	—	pts.	—	pts.	32	pts.	—parts.					
Auramine O pat.	30	,,	24	,,	15	,,	5,6	,,	—	,,				
Malachite Green cr. ext.	—	,,	—	,,	15	,,	—	,,	—	,,				
Safranine O	—	,,	—	,,	—	,,	16	,,	—	,,				
Acridine Orange NO	—	,,	6	,,	—	,,	—	,,	—	,,				
Methylene Blue DR	—	,,	—	,,	—	,,	—	,,	30	,,				
Water	320	,,	320	,,	320	,,	297	,,	320	,,				
Glycerine	30	,,	30	,,	30	,,	30	,,	30	,,				
Antimony Thickening I	500	,,	500	,,	500	,,	500	,,	500	,,				
Sulphite of Potassium 91° Tw	120	,,	120	,,	120	,,	120	,,	120	,,				
	1000	pts.	1000	pts.	1000	pts.	1000	pts.	1000	pts.				

Tin Salt Resist.

Auramine O pat.	20	pts.	—	pts.	—	pts.	20	pts.	—	pts.				
Acridine Orange NO	10	,,	2	,,	—	,,	—	,,	—	,,				
Safranine AN extra	—	,,	8	,,	18	,,	—	,,	—	,,				
Rosazeine 6 G	—	,,	—	,,	6	,,	—	,,	—	,,				
Thioflavine T	—	,,	—	,,	6	,,	—	,,	—	,,				
Malachite Green cr. ext.	—	,,	—	,,	—	,,	10	,,	—	,,				
Methylene Blue DR	—	,,	—	,,	—	,,	—	,,	30	,,				
Water	220	,,	240	,,	220	,,	220	,,	220	,,				
Antimony Thickening II	500	,,	500	,,	500	,,	500	,,	500	,,				
Standard Discharge White	250	,,	250	,,	250	,,	250	,,	250	,,				
	1000	pts.	1000	pts.	1000	pts.	1000	pts.	1000	pts.				

Antimony Thickening I.

40	parts	Wheat Starch
300	,,	British Gum
335	,,	Water
250	,,	Tragacanth (60 : 1000)
75	,,	Antimonin (Boehringer)
1000	parts.	

Antimony Thickening II.

840	parts	Acid Starch (page 126)
80	,,	Antimonin (Boehringer)
80	,,	Acetic Acid 12° Tw
1000	parts.	

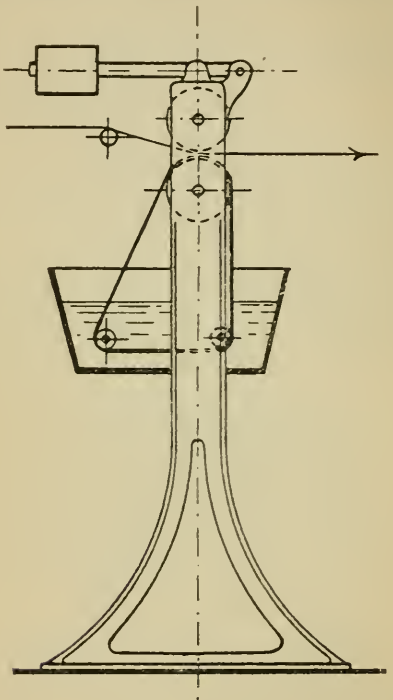
Discharge White Standard.

250	parts	Acid Starch (page 126)
500	,,	Tin Salt Ia. cryst.
200	,,	Sulphocyanide of Ammonia
50	,,	Acetic Acid 12° Tw
1000	parts.	

7. Resist and Discharge effects upon insoluble Azo Colours produced on the fibre.

a) Resist Styles.

Production of white and coloured Resists by printing upon Naphtholground Resist colours, containing Tin salt, Sulphites, Tannin or Phenolalkali, and subsequent dyeing with Diazo- or Tetrazo-solution.



The pieces are naphtholated as described on page 128 printed and then dried carefully (in order to avoid corrosion of the fibre through Tin salt). Then they are passed through the developing bath (described on page 145) on the padding machine, washed

and soaped, or soured in order to improve the white, in the usual manner. In rare cases the Resists are printed on white material, the latter then naphtholated in the printing machine and finally dyed with Diazo solution.

In order to obtain even results as regards shade (depth and beauty) and as regards the printed effect (purity of the white or coloured resists), also in order to prevent the printed colours from staining the blotch, the dyeing apparatus ought to be carefully designed.

The apparatus consists of:

1. Squeezing rollers with a small furnishing box containing 1 or 2 guiding rollers. The lower squeezing roller is wrapped and ought to dip slightly into the developing liquid. In this case the pieces are passed with the face upwards through the squeezing rollers, the top one of which is not wrapped and in some cases contains a brush arranged length-wise.

2. An arrangement for letting the pieces pass over a system of guiding rollers in the air, so as to allow the Azo Colours to form themselves.

3. A system of roller cisterns containing perforated spray-pipes, Acid bath and water tanks.

Another arrangement of the padding machine which answers well for covered designs (Tannin Resist-Blue Red styles) is to be seen from the sketch on page 172.

The developing liquid is supplied by a loose endless felt-band, which runs over 2 guiding rollers in the dye-liquid and passes creaseless through the 2 wrapped squeezing rollers.

The most important Resists for Azo Colour styles are: Tin, Sulphite and Tannin-Resists.

1. Tin Resists.

Protoxide salts of Tin, especially the commercial Tin crystals, excercise a most energetic resisting action upon Diazo-compounds, which are easily split by them.

Since several organic Acids (Tartaric, Citric, Oxalic Acid) also act as resisting ingredients and at the same time cleanse the white obtained with Tin salt Resists, they are mostly added to the latter. It is important to use only the best Tin Crystals which have no yellowish appearance and are easily soluble. In order to increase the resisting action of Tin salt colours, some mechanically resisting ingredients such as China Clay, Glue, Paraffin, Wax are added to them.

Tin salt or Acetate of Tin Resists can be mixed with the following colours for the production of coloured effects:

1. Basic Colours with or without tannin e. g. **Auramine, Brilliant Green, Malachite Green, Methyl Violet, Methylene Blue, Marine Blue, Ethyl Blue, Victoria Blue, Phosphine, Rosazeine** 4G pat.

2. Dyestuffs which form a vat, when reduced, such as **Discharge Blue** BZ.

3. Pigment Colours such as **Chrome Yellow, Chrome Orange, Guignet Green.**

White Resists.

White Resist I.

580	parts	Acid Starch (page 126)
335	,,	Tin crystals Ia
33	,,	Citric Acid
52	,,	Water
1000	parts.	

White Resist II.

250	parts	Acid Starch (page 126)
250	,,	Tin crystals Ia
50	,,	Tartaric Acid
350	,,	Glue Solution 1:2
100	,,	China Clay
1000	parts.	

White Resist III.

700	parts	Thickening A
200	,,	Tin cryst. Ia
100	,,	Water
1000	parts.	

Thickening A.

300	parts	British Gum powder
300	,,	Water
300	,,	Glue solution 1:2, are boiled and
100	,,	White Bees' Wax added
1000	parts.	

Glue Solution 1:2

333	parts	Glue are soaked in
500	,,	Water and after addition of
167	,,	Acetic Acid 12° Tw dissolved by boiling. The quantity evaporated by the boiling is replaced by dilute acetic acid.
1000	parts.	

Coloured Resists.

a) With basic dyes.

	Yellow	Green	Blue
Auramine conc. pat.	30 parts	10 parts	—
Brilliant Green cryst. extra	— ,,	10 ,,	—
Marine Blue BI	— ,,	— ,,	20 parts
Acetic Acid 6° Tw	210 ,,	190 ,,	190 ,,
Acid Starch (page 126)	450 ,,	500 ,,	500 ,,
Tartaric Acid	50 ,,	50 ,,	50 ,,
Glycerine	50 ,,	50 ,,	50 ,,
Acetic Acid Tannin sol. 1:1	90 ,,	60 ,,	60 ,,
Tin crystals Ia	150 ,,	— ,,	—
Acetate of Tin 32° Tw	— ,,	150 ,,	150 ,,

b) With pigment colours.

Chrome Yellow Resist.

300	parts	Chrome Yellow 50% paste
100	,,	Glycerine
60	,,	Water
200	,,	Tragacanth (60:1000)
40	,,	Tartaric Acid
300	,,	Tin crystals Ia
1000	parts.	

2. Sulphite Resists.

Sulphite Resists are prepared with concentrated solutions of Potassium Sulphite or of Sodium Bisulphite neutralized with Ammonia; they are thickened with British Gum, Dextrine or Gum. The Potassium Sulphite is generally preferred to the other Sulphites on account of its easy solubility.

The Sulphite Resists produce a purer, less yellowish White under Paranitraniline and Azophor Red than Tin Resists, moreover there is no danger of corroding the fibre. On the other hand a better White is produced under α-Naphthylamine Claret Red with Tin salt than with Sulphite Resists.

The most important Sulphite Resists are:

White Resist IV.

250	parts	British Gum powder	dissolve hot
750	,,	Sulphite of Potassium 91° Tw	dissolve hot
1000	parts.		

White Resist V.

280	parts	Thickening A (page 174)
80	,,	Britishgum
560	,,	Sulphite of Potassium 91° Tw, heat and add
80	,,	Oxide of Tin, powder
1000	parts.	

For the production of Coloured Resists, pigment colours are used, e. g.:

Blue Resist U.

300	parts	Ultramarine powder are finely ground with
20	,,	Glycerine and
180	,,	Water. Then
100	,,	Tragacanth (60:1000)
150	,,	Albumen (1:1) and
250	,,	Sulphite of Potassium 91° Tw are added
1000	parts.	

3. Tannin Resists.

Tannin is a very energetic Resist and is therefore used for producing coloured Resists on Naphthol grounding, fast to washing. The firm of Rolffs & Co. in Siegburg hold a patent D.R.P. No. 113238

for this application. — The coloured Tin Resists (described previously) produce effects, which are decidedly inferior as regards depth of shade and fastness to washing on account of the lake formation which takes place within the printing paste; therefore the Tannin Resist with its energetic resisting action, altho'no Tin salt is used, presents a considerable improvement upon the old Resist process.

A dark, fast Blue Resist is produced upon Naphthol-bottom with the following Tannin Resist Colour:

Tannin Resist Blue.

30	parts	Ethyl Blue BD pat.
5	,,	Marine Blue BI
5	,,	Violet Crystals O
100	,,	Acetic Acid 6° Tw
150	,,	Water
40	,,	Tartaric Acid
550	,,	Acid Starch (page 126)
120	,,	Acetic Acid Tannin Solution (1:1)
1000	parts.	

In order to fix these Tannin Resists it is advisable to dry the pieces well before, and to hang them after printing, in a warm room, or to steam them in the Mather-Platt before developing in the Diazo-bath.

Since the depth of the Azo-colours is unfavourably influenced by steaming the naphtholated and printed material before developing, (especially if the material touches the hot copper rollers in the Mather-Platt apparatus), it is advisable to cover or partly cover these copper rollers with wooden strips, (lengthways); which reduces the drawback to a minimum.

After steaming, the goods are developed in the Diazo-bath; the apparatus sketched on page 172 is most suitable for this purpose. Instead of printing the tannin colours on Naphthol bottom, the following process may be applied: the acid tannin colours are printed on white material, and steamed from $^1/_2$—1 hour; then the goods are padded with naphthol solution (without having been washed), and developed in the Diazo-bath.

The naphthol solution is mostly padded in the printing machine, and it is advisable to pass the goods, especially thin material, face downwards through the machine.

b) Discharge-Styles.

Certain insoluble Azo colours can be discharged with white and coloured discharges; two methods are applicable:

1. Discharging with Protoxide of Tin colours.

2. Discharging with Glucose and Alkali.

The discharge colours generally produce more brilliant, and faster effects than Tin-salt resists; especially by means of the alkali-discharge, the Turkey-red discharge styles can be imitated.

1. Tin-Discharge.

Insoluble Azo Colours produced on the fibre withstand the action of concentrated Protoxide of Tin discharges, but Henry Schmid succeeded in 1896, in producing pure white and coloured discharge effects, by adding to the Tin discharge certain ingredients, which exercise an energetic solving influence upon these colours.

The following preparations are used for this purpose.

Discharge White PN pat.
Discharge Blue PN pat.
Discharge Blue PPN pat.
Discharge Yellow PN pat.
Discharge Green PN pat.

These discharges are suitable for Azo Colours made from: p-Nitraniline, m-Nitraniline, Nitro-Toluidine, Nitro-Phenetidine, β-Naphthylamine and Amido-Azo-Benzene, but they do not discharge those produced with α-Naphthylamine, Benzidine, Tolidine and Dianisidine.

The printing-colours are prepared in the following manner:

Discharge White.

50 parts Wheat Starch (powder)
30 ,, British Gum
1000 ,, Discharge White PN pat.

After stirring well, the whole is heated on the water-bath and sieved.

Discharge-Blue, Yellow and Green, are mixed in the same manner.

The colours which are reduced according to requirements, are printed upon the dyed material (a brush furnishing-case is best used), well dried, (in order to avoid bleeding), and steamed in the Mather-Platt for 5—7 min. with powerful hot steam, which must be free from air.

Discharge White ought to produce a pure white effect directly after steaming. — Oxydation aniline black, which might have been printed along with the discharge, is developed before steaming, by hanging the pieces in the oxydation-room. After steaming, the goods are passed through acid-baths (muriatic acid $^3/_4$ to $1^1/_2{}^\circ$ Tw) in order to remove Tin compounds and reduction-products, or eventually through a weak acid chloride of lime solution, which produces a very pure white, and increases the brilliancy of the Para-red, which may have suffered somewhat in steaming. — For goods which contain, besides the white Discharge, Aniline Black, or Discharge-Blue, the following treatment in a system of roller cisterns is suitable:

1. Cistern: 35 parts muriatic acid 32° Tw per 1000 parts of liquid at 140° F for $^1/_2$ minute, squeezing.
2. Cistern: Cold water; system of spray-pipes; squeezing.
3. Cistern: Warm acidified Chrome-bath (3 parts bichromate of soda and 35 parts of muriatic acid 32° Tw per 1000) at 140° F for $^1/_2$ minute; squeezing.
4. Cistern: 35 parts muriatic acid 32° Tw per 1000 parts at 140° F, $^1/_2$—1 minute, then well washing and drying.

If the acid treatment is not made sufficiently effective, small amounts of chrome-oxide are fixed upon the discharged places, and these tint the white greenish. The last acid bath may also be applied to the pieces in rope-form.

For multi-coloured styles, containing yellow and green, neither the chloride of lime-bath, nor the treatment with chrome has been found suitable; for these styles, a tartar-emetic bath, such as is employed for tannin-colours, with subsequent thorough washing, has shewn the best results (washing in running water is preferable, in order to quickly re-oxidize the reduced blue and green colours). Likewise Peroxide of Hydrogen by itself, or together with some soap-solution, or small quantities of acid has been found suitable for the after-treatment of multi-coloured discharge-prints.

During the washing and drying operation, the reduced and colourless discharge blue and green colours are oxidized to the blue and green tin lake.

2. Alkali-glucose Discharge.

According to a patent, which has been granted Messrs. Schlaepfer, Wenner & Co. in Salerno (D.R.P. No. 98796): "a method for discharging Paranitraniline-red with grape-sugar, and strong caustic lye, in the presence of Glycerine, Phenol &c", Paranitraniline-red is padded with a strong solution of grape-sugar 25° Tw, dried over cylinders, and printed with discharge-colours. After drying, the pieces are steamed for one minute, in the Mather-Platt quick-steaming apparatus, with very hot, powerful steam, which ought to be free from air; then passed at full width through sulphuric acid 9° Tw, washed, soaped, and chromed, if required, so as to develop the blue and green.

Discharge White.

70	parts	light burnt Starch
170	,,	Glycerine
100	,,	Gum solution 1:1
530	,,	Soda lye 106° Tw
130	,,	Glucose sol. 53° Tw
1000	parts.	

Discharge Yellow.

525	parts	Lead paste
475	,,	Discharge White
1000	parts.	

Lead paste.

265	parts	Litharge
165	,,	Glycerine
570	,,	Soda Lye 106° Tw
1000	parts.	

Discharge Blue.

270	parts	Alkaline Indigo paste
730	,,	Standard Discharge
1000	parts.	

Alkaline Indigo paste.

350	parts	Indigo MLB powder finely ground with
650	,,	Soda Lye 66° Tw
1000	parts.	

Standard Discharge.

55	parts	light burnt Starch
140	,,	Water
180	,,	Glycerine
95	,,	Gum sol. (1:1)
530	,,	Soda Lye 106° Tw
1000	parts.	

Green is produced by mixing Discharge Blue and Discharge Yellow without glucose.

8. Discharge effects upon sulphur-colours.

Shades which have been produced with sulphur-colours, especially with Melanogen Blue B pat. (page 148) can be discharged by means of the chlorate discharge. Alumina-chlorate discharges (page 152) are especially suitable for this purpose.

Indigo blues on Melanogen-Blue bottom can also be discharged with chlorate discharge, or by means of the chromate discharge, given on page 164.

9. Table shewing the dischargeable qualities of cotton colours.

1. Colours discharged to a pure white, even in dark shades.
2. Colours discharged white in light shades.
3. Colours, not discharged white, but suitable for bright coloured discharges.
4. Colours not discharged white, suitable only for dark coloured discharges.
5. Colours not discharged at all, and therefore suitable for additions to coloured discharge-pastes.

Dyestuff	Tin Discharge	Zinc Discharge	Chlorate Discharge	Sulphite of Potassium Discharge	Observations
Auramine	5	4—5	1	4—5	
Phosphine	5	4—5	1—2	4—5	
Azophosphine	2—3	2	1	3—4	
Chrysoidine	2—3	2	1—2*	3—4	* Shade is changed by a treatment with Soda.
Vesuvine	2—3	2	2*	4	* do.
Cutch Brown	3	2	2—3*	4	* do.
Dark Brown	4	2—3	2—3*	4	* do.
Magenta	5	2—3	1	1—2	
Cerise	5	2—3	2	3—4	
Grenadine	5	2	2	3—4	
Maroon	5	2	2	3—4	
New Magenta	5	2—3	1	1—2	
Safranine	5	5	1—2	5	
Methylene Violet	5	4—5	1—2	4—5	
Methylene Heliotrope	5	4—5	2—3	4—5	
Methyl Violet	5	2—3	1	5	

Dyestuff	Tin Discharge	Zinc Discharge	Chlorate Discharge	Sulphite of Potassium Discharge	Observations
Violet crystals	5	2—3	1	5	
Victoria Blue	5	2—3	1	5	
Malachite Green	5	2—3	1	2—3	
Brilliant Green	5	2—3	1	2—3	
Rosazeine	5	5	1—2	4	Alkaline Potassium Sulphite Discharge 1—2.
Rosazeine 4G	5	5	1—2	3—4	
Methylene Blue	5	3—4	2—3	2—3	
Marine Blue	5	2—3	1—2	4	
Methylene Green	5	3—4	2	2—3	
Ethyl Blue	5	4—5	1—2	5	
Indophene Blue	4*	4*	1—2	4*	* Discharged red.
New Fast Blue	4—5	2—3	2—3*	3—4	* Shade is changed by a treatment with Soda.
Fast Blue for Cotton	4—5	2—3	2—3*	3—4	* do.
Methylene Grey	5	4—5	1—2	3—4	
Janus Yellow	4—5	4—5	1—2	5	
Janus Red	2	2	1—2	4	
Janus Brown	4	3	2—3	4—5	
Janus Blue	4*	4*	1—2	4*	* Discharged violet to red.
Janus Dark-blue	4*	4*	2—3	4*	* Discharged red.
Janus Green	4*	4*	3	4*	* Discharged violet.
Janus Black	4*	4*	4	4—5*	* do.

Dyestuff	Tin Discharge	Zinc Discharge	Chlorate Discharge	Sulphite of Potassium Discharge	Observations
Janus Grey	4*	4*	1—2	4*	* Discharged violet.
Cotton Light-blue	4—5	1	1	1	
Methyl Blue for Cotton	4—5	1	1	1	
Alizarine Yellow GG	4	4	4—5	4	
Alizarine Yellow R	4	4	4	3—4	
Alizarine Orange Alumina Mordant	4—5*	4*	2—3	5	* Discharged grey.
Alizarine Orange Chrome Mordant	4—5*	4—5*	2—3	5	* do.
Alizarine Red Alumina Mordant	4—5	4—5	2	5	Can be discharged to a pure white (1) as Turkey Red with the Chloride of Lime Vat as well as with the Glucose-alkali process.
Alizarine Red Chrome Mordant	4—5*	5*	1—2	5	* Discharged grey.
Alizarine Brown	4—5*	4	2—3	5	* do.
Alizarine Claret Alumina Mordant	4—5*	4	1—2	5	* do.

Dyed upon mordanted material.

Dyestuff	Tin Discharge	Zinc Discharge	Chlorate Discharge	Sulphite of Potassium Discharge	Observations
Alizarine Claret Chrome Mordant	4—5*	4—5	2—3	5	* Discharged grey
Alizarine Blue	4—5	4—5	2	4—5	
Alizarine Green	4—5	5	2—3	4—5*	* Discharged violet
Ceruleine	5	5	2—3	4—5	
Cresotine Yellow	1—2	2	1	4—5	
Aurophenine	1	2	2—3	4—5	
Oxydianil Yellow	5	5	5	5	
Dianil Yellow	4—5	4—5	4—5	4—5	
Dianil Orange	4—5	4—5	2—3	3—4	
Dianil Orange N	1—2	3	2	4—5	
Toluylene Orange R	2	3	1—2	5	
Dianil Red R	1	2	2—3	3—4	
Dianil Red 4B	1	1	2—3	4—5	
Dianil Red 10B	1	2	2—3	4	
BrilliantDianil Red R	1—2	3	2	4—5	
Delta Purpurine 5B	1—2	3	2	4—5	
Dianil Claret Red	1—2	1—2	2-3	4*	* Discharged a yellowish red
Dianil Blue	1—2	1—2	2	2-3	

Dyed upon mordanted material.

To obtain pure discharges it is advisable to develop with Solidogen after discharging.

Solidogen development after discharging produces purer effects.

Dyestuff	Tin Discharge	Zinc Discharge	Chlorate Discharge	Sulphite of Potassium Discharge	Observations
Dianil Dark. blue	2	1—2	2—3	3—4	Solidogen development after discharging produces purer effects.
Dianil Brown	2	2	2—3	4—5	
Dianil Fast Brown B	2-3	2-3	2—3	4	
Dianil Black	2—3	2	2-3	3	
Dianil Black N, CR, PG	3—4	4	3—4	4	
Melanogen Blue	3	3—4	1*	3-4	* Shade is changed by steaming and by treating with soda.
Melanogen	3—4	4	2*	4-5	* do.
Thiogen Brown	4	4	3—4	5	Chrome Discharge 1, Prussiate Discharge 1.
Indigo	4	4	1	5	

V. COTTON YARN PRINTING.

1. Bleaching the yarn.

Almost all yarns, which are to be printed, must be bleached, unless the print effect is produced upon dyed material. The yarns, packed in bags, are boiled in clean water for 3—4 h in a closed vessel under pressure of $1^1/_2$—2 atm., then the steam is turned off and the yellowish boiling-off liquor let off, while fresh water is sprayed over the yarns in a continuous stream. In this manner the boiling-off liquor is quickly removed from the yarn and the formation of boil-spots avoided. After watering the yarns are immersed for 6—7 h into a clear Chloride of Lime bath of 1—$1^1/_2$° Tw, then soured with Sulphuric Acid and well washed in the washing machine. Finally the yarns are carefully dried.

2. Preparing the printing Colours.

a) Basic Colours. In preparing the printing pastes, a starch-emulsion and then the solution of the dyestuffs in Acetic Acid and $^1/_2$ litre Water are added to the Tragacanth thickening 60:1000. After boiling this mixture well, and then somewhat cooling it, the Tannin Acetic Acid solution 1:1 is added and the whole made up to 1 Kilo. If the paste is cooled down too far, when the Tannin solution is added, the Tannin lake of the dyestuffs will be precipitated within the paste, which makes the colour unsuitable for printing. The printing colour is sieved before use.

b) Alizarine Colours. Starch, Acetic Acid and Tragacanth are well boiled; and stirred till perfectly cool; then the colour, pasted with water, is added; then the mordant stirred into the paste and the whole made up to 1 litre; finally the colour is strained through a sieve or cloth.

c) Aniline Black. Starch, Aniline Salt and Water are boiled; when lukewarm, Chlorate of Potassium and Chloride of Ammonia are added; the mixture stirred till perfectly cold and Copper Sulphite (pasted with Water) added. The whole is made up to 1 litre and sieved.

The yarns are printed on an Iron-machine or on the mangle. The former machine is employed for small, fine designs, while the mangle is used for heavy prints. The printing colours are made in a similar manner for both machines, but for mangle-printing the colours are kept thinner, and the addition of starch can be dispensed with.

Multi-coloured effects on yarn are produced on the two or more coloured-printing machine. The printing pastes have the same consistency as those for mangle-printing.

Since the yarn printing machines carry more colour on to the material than the calico printing machines, and the prints consist mostly of light effects, all printing colours must be kept rather weaker than those used in Calico printing.

3. Printing recipes.

a) For the iron machine.

The following recipes have produced good results in practice:

Red.

570	parts	Water
50	,,	Wheat Starch
175	,,	Tragacanth (60:1000)
75	,,	Acetic Acid 30%
10	,,	Alizarine RX 40%
20	,,	Alizarine 2RG 40%
50	,,	Acetate of Lime 15° Tw
50	,,	Acetate of Alumina 18° Tw
1000	parts.	

Printed upon oil prepared yarn (2—3 lbs neutralised Turkey Red Soda Oil per 100 lbs of yarn), dried, steamed 3/4 h, soaped at 158—176° F with 2 parts neutral soap in 1000 parts water, and washed.

Blue.

728	parts	Water
46	,,	Wheat Starch
175	,,	Tragacanth (60:1000)
25	,,	Alizarine Blue SB powder
26	,,	Acetate of Chrome 32 1/2° Tw
1000	parts.	

Printed upon unprepared yarn, dried, and steamed for 1 h.

Brown.

625	parts	Water
43	,,	Wheat Starch
160	,,	Tragacanth (60:1000)
25	,,	Acetic Acid 30%
60	,,	Alizarine Orange N paste
8	,,	Alizarine Blue SB powder
4	,,	Alizarine Yellow R paste
75	,,	Acetate of Chrome 32 1/2° Tw
1000	parts.	

Printed upon unprepared yarn, dried, and steamed for 1 h.

Aniline Black.

70	parts	Wheat Starch
882	,,	Water
30	,,	Aniline Black
15	,,	Chlorate of Soda
3	,,	Vanadium sol. (page 127)
1000	parts.	

Printed, dried, aired for 12 h in a hot chamber at 86 to 95° F and developed for 1/2 h with 2 to 3 parts white lime (chalk) per 1000 parts lukewarm water (68° F), well washed and dried. If the black is printed on a dyed bottom, soda is to be preferred to lime in developing.

Pink.

686	parts	Water
43	,,	Wheat Starch
160	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
1	,,	Safranine conc.
5	,,	Tartaric Acid
5	,,	Acetic Acid Tannin sol. 1:1
1000	parts.	

Printed, dried, steamed for 1/2 h, then immersed in a luke warm tartar emetic bath (2 parts per 1000 parts water), and finally washed.

Claret.

642	parts	Water
43	,,	Wheat Starch
160	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
5	,,	Methylene Violet 3RA extra
5	,,	Safranine conc.
5	,,	Tartaric Acid
40	,,	Acetic Acid Tannin solution 1:1
1000	parts.	

Directions as for Pink.

Grey.

661	parts	Water
43	,,	Wheat Starch
160	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
2	,,	Ethyl Blue BF pat.
4	,,	Methylene Grey NF powder
5	,,	Tartaric Acid
25	,,	Acetic Acid Tannin solution 1:1
1000	parts.	

Directions as for Pink.

Violet.

675	parts	Water
35	,,	Wheat Starch
160	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
5	,,	Methyl Violet BB
5	,,	Tartaric Acid
20	,,	Acetic Acid Tannin solution 1:1
1000	parts.	

Directions as for Pink.

Light Blue.

689	parts	Water
41	,,	Wheat Starch
160	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
1	,,	Thionine Blue GO
5	,,	Tartaric Acid
4	,,	Acetic Acid Tannin sol. 1:1
1000	parts.	

Directions as for Pink.

Methylene Blue.

694	parts	Water
35	,,	Wheat Starch
135	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
5	,,	Methylene Blue DBB extra
1	,,	Marine Blue RI
5	,,	Tartaric Acid
25	,,	Acetic Acid Tannin solution 1:1
1000	parts.	

Directions as for Pink.

b) For the mangle.

These printing colours are made thinner and their consistency in comparison with those given under a) is reduced. After printing, the yarns are finished off as stated above. Red is printed on oil mordanted yarn, all other colours on unprepared material.

Red.

675	parts	Water
120	,,	Tragacanth (60:1000)
75	,,	Acetic Acid 30%
10	,,	Alizarine RX 40%
20	,,	Alizarine 2RG 40%
50	,,	Acetate of Lime 15° Tw
50	,,	Acetate of Alumina 18° Tw
1000	parts.	

Brown.

635	parts	Water
135	,,	Tragacanth (60:1000)
40	,,	Acetic Acid 30%
80	,,	Alizarine Orange N paste
10	,,	Alizarine Blue SB powder
100	,,	Acetate of Chrome $32^1/_2°$ Tw
1000	parts.	

Black.

620	parts	Water
125	,,	Tragacanth (60:1000)
50	,,	Acetic Acid 30%
175	.	Noir reduit
30	,,	Acetate of Chrome $32^1/_2°$ Tw
1000	parts.	

Blue.

843	parts	Water
125	,,	Tragacanth (60:1000)
15	,,	Alizarine Blue SB powder
17	,,	Acetate of Chrome $32^1/_2°$ Tw
1000	parts.	

Green I.

610	parts	Water
135	,,	Tragacanth (60:1000)
50	,,	Acetic Acid 30%
100	,,	Alizarine Yellow GG paste
5	,,	Methylene Blue DBB extra
100	,,	Acetate of Chrome $32^1/_2°$ Tw
1000	parts.	

Green II.

665	parts	Water
150	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
8	,,	Methylene Green extra yellow conc.
8	,,	Auramine conc. pat.
5	,,	Tartaric Acid
64	,,	Acetic Acid Tannin sol. 1:1
1000	parts.	

Violet.

725	parts	Water
150	,,	Tragacanth (60:1000)
100	,,	Acetic Acid 30%
2	,,	Marine Blue BI
2	,,	Methylene Violet 2RA conc.
5	,,	Tartaric Acid
16	,,	Acetic Acid Tannin sol. 1:1
1000	parts.	

W. WOOL PRINTING.

a) Colours classified according to their mode of fixing.

1. Basic Colours.

Basic Colours are printed with a small amount of Acetic or other Organic Acids. Considerable quantities of Acids obviate a thorough fixing and also affect unfavourably the sharp outlines of the printed effect. These Colours are sometimes printed with additions of Tannin to the pastes in order to obtain effects which are faster to washing (for white goods); additions of Chloride of Tin or Bisulphite are rarely made. Materials, which undergo none or only a very slight chlorination, are sometimes printed with basic Colours. But the fastness of these colours (Methylene Blue) to light on woollen material is so small that their employment must be very limited.

Basic Colours are used however to a greater extent in combination with Acid Colours and Wood Extracts.

Auramine conc., O, I, II, pat.
Phosphine, all brands.
Azo Phosphine GO, BRO, pat.
Chrysoidine A cryst., C cryst., C extra cryst., **Vesuvine,** all brands, **Cutch Brown** D, G, **Dark Brown** M, MB.
Magenta, all brands, **Cerise,** all brands, **Grenadine,** all brands, **Maroon** O, extra, **Cardinal** R, G.
New Magenta O pat.
Safranine GGS, AN extra, O, conc., conc. B, **Methylene Violet,** all brands, **Methylene Heliotrope** O pat.
Rosolane pat., all brands.
Cotton Scarlet O.
Methyl Violet, all brands, **Violet cryst.** O.
Victoria Blue B.
Malachite Green, Brilliant Green, all brands.
Methylene Green, all brands.
Methylene Indigo O, SS, **Thionine Blue** GO, **Methylene Blue,** all brands, **Marine Blue,** all brands, **Methylene Dark-blue** RBN, 3BN.
Fast Blue for Cotton, all brands, **New Fast Blue** 3R cryst.
Indamine Blue, all brands, **Ethyl Blue** BF, BD, RD pat.
Indophene Blue B, G, 2B, pat.

Methylene Grey, all brands, **New Methylene Grey** O, **Nigrisine** O.
Janus Blue G, B, R pat., **Janus Darkblue** R, B pat.
Janus Green B, G, pat.
Janus Black O, I, II pat., **Janus Grey** B, BB.
Janus Brown R, B pat.
Janus Red B pat.
Janus Yellow R, G, pat.

2. Resorcine Colours.

These colours are seldom printed with Acids and mostly employed neutral or alkaline. The following ingredients are added to the printing pastes: Acetate of Soda, Phosphate of Soda, Soda, Ammonia, Oxalate of Ammonia, Tin Crystals.

Uranine, all brands.
Eosine, all brands.
Erythrosine, all brands.
Phloxine, all brands.
Rose Bengale, all brands.
Rosazeine, all brands.

3. Acid Colours.

These Colours are most suitable for wool printing on account of their fastness properties, simple application, and their very brilliant and full shades. They are mostly printed with Acid, and seldom applied neutral or alkaline. Acid ingredients are: Acetic Acid, Tartaric, Oxalic, Citric Acid, also their Ammonia salts, which in steaming give off the Ammonia and set free the Acid; likewise Alumina Salts, (Alum and Sulphate of Alumina) and Chloride of Tin. Alumina Salts are also sometimes used in order to convert colours, which equalize with difficulty and which are precipitated in the printing paste in a crystaline form by strong organic Acids, into fine precipitates, which are fixed as such in steaming (Scarlet B extra).

In other cases viz if the colour-acid is very insoluble and therefore liable to produce printing pastes which work badly, neutral additions or such as generate the Acid in steaming only (Oxalate of Ammonia) or even slightly alkaline additions are made. For light shades, especially if these are mixtures of several colours, small amounts of Ammonia often act favourably as regards equalizing.

The fastness to water of several Acid Colours f. i. Azo Acid Blue and Black, is unfavourably affected by the presence of alkaline salts. Therefore the addition of these salts to finishing pastes or the washing of the printed and steamed material in alkaline water (Soap, Soda) must be avoided.

Acid Magenta, all brands, **Acid Cerise** O, II, **Acid Maroon** O, **Maroon** S, **Orseilline** R, B.

Soluble Blue, Bleu de Lyon, Guernsey Blue, Opal Blue, Blackley Blue, all brands, **Cloth Blue** O, **Full Blue** O, **Marine Blue** V, **Cotton Blue,** all brands, **Pure Blue,** all brands, **Cotton Light Blue** O sol., **China Blue** R, 1, 2, **Alkaline Blue,** all brands, **Alkaline Violet** O.

Acid Violet 3RA, 4RS, 3RS, II, R conc. new, N, 5BF, 5BFI, 7BN, **Neutral Violet** O.

Acid Green O, D, M, conc., conc. D, conc. M, II, **Acid Green solution** 5 times conc.

Patent Blue V, M, B, N, superior, J1, J2, J3, L, G, C, A, AJI, pat.

Cyanine B, B conc., pat.

Keton Blue 4BN sol., 4BN powder, pat.

Patent Green O, V, VS, pat.

Naphthalene Green V, conc , pat., **Naphthalene Blue** R, B extra, D, pat.

Indigo Substitute B, BS, WE, B extra, BS extra, pat., **Patent Marine Blue** pat.

Acid Rosamine A pat.

Fast Acid Red A pat.

Fast Acid Violet B, R, A2R, pat.

Fast Acid Blue R, R conc., pat.

Fast Acid Eosine G, G extra, pat., **Fast Acid Phloxine** A, A extra, pat.

Fast Acid Magenta G pat.

Fast Blue O sol., R, RR, 3R extra, 5R No. 60, D, G extra, 5B, greenish, extra greenish, 9845, **Black Blue** O, **Black Black** O, **Fast Dark Blue** R, **Nigrosine** I, II, III, IV, A.

Azo Acid Magenta G, B pat., **Azo Acid Carmine** B pat., **Alkali Fast Red** R, B pat.

Amido Naphthol Red G, 6B.

Chromotrope G, 2R, 2B, 6B, 7B, 8B, 10B, pat.

Archil Substitute G pat.

Victoria Violet 4BS, 8BS pat., **Azo Acid Blue** B pat.

Azo Acid Black B, R, G, GR, GL, BL, 3BL, 3BL extra, TL conc., TLII, TL extra, pat., **Naphthol Black** D, **Azo Black** O.

Amido Naphthol Black 4B, 4B extra, 6B, S, **Alphyle Blue Black** O.

Chinoline Yellow O, extra.

Naphthol Yellow S, SE.

Azo Yellow conc., O, R, **Victoria Yellow** O, double, conc., **Metanil Yellow** extra.

Flavazine S, L, T.

Orange No. 4, No. 4LL, G, No. 2, 2L, No. 1, O, No. 64, R, RR, **Brilliant Orange** O, G, R.

Solid Brown O, yellow shade, NT, L, **Azo Brown** V, **Naphthol Brown** O.

Scarlet G, GRII, R, RR, 3R, 3R extra, 3R sup., 4R, 5R, 6R, B extra, M old, M new, GL, RL, 2RL, 3RL, **Brilliant Lake Scarlet** G, R, 2R, **Scarlet** 6R cr.

New Coccine O, **Coccinine** O, B.

Victoria Scarlet 3G, 2G, G, R, 2R, 2RB, 3R, 4R, 5R, 6R, RX, RRX, 3RX.

Brilliant Croceine yellow shade, blue shade, R, B, BB, 3B, 5B.

Roccelline N, **Fast Red** O, S, SOO.
Brilliant Crimson O, B, **Brilliant Rubine** O, **Victoria Rubine** O, G.
Amaranth O, E.
Cloth **Red** O, **Fast Claret Red** O, **Naphtho Rubine** O, **Naphthol Red** O.
Claret Red G, R, B, 3B, G extra, R extra, B extra, O.

4. Mordant Colours.

These colours, which are distinguished for greater fastness than the Acid Colours, are principally used in slubbing and wool-yarn printing. For Wool prints they are used only, if very great fastness to light and washing is required (flag-printing). The brilliancy of the so produced effects is however considerably inferior to that of the acid colours and therefore the latter are often used for shading the mordant Colours.

The printing colours are prepared with Acetic, Oxalic etc. Organic Acids, with the addition of metal salts: Fluoride and Acetate of Chrome, Alumina salts etc.

After printing, the colours are fixed by steaming for 1—2 h.

Alizarine Orange, all brands.
Alizarine Red, paste and powder, all brands.
Alizarine Red 1WS.
Alizarine Claret R paste.
Alizarine Brown paste, all brands.
Alizarine Blue, all "S" (Bisulphite) brands.
Alizarine Green S, paste and powder.
Alizarine Yellow R, N, GG pat.
Mordant Yellow O.
Galleine, all brands.
Ceruleine, all "S" (Bisulphite) brands.
Acid Alizarine Green G pat.
Acid Alizarine Blue BB, GR pat.
Chromotrope 2R, 2B, 6B, 8B, 10B, S, pat.
Vigoureux Yellow I.
Vigoureux Red I.
Vigoureux Brown I.
Vigoureux Black I pat.
Vigoureux Grey I pat.

Chromotrops, which dye wool direct (compare the notes under Acid Colours) are converted into considerably bluer and faster lakes (fast to light, washing and milling) if applied together with metal-mordants.

5. Direct Dyeing Colours.

The direct colours can be printed on wool, but have a very limited application, since all the shades obtained with them are

surpassed in brilliancy and fastness by those produced with Acid Colours. They are fixed with Phosphate of Soda.

Oxydianil Yellow O, **Aurophenine** O, **Cresotine Yellow** G.
Dianil Yellow, all brands, pat., **Dianil Direct Yellow** S.
Dianil Orange G pat., N, **Toluylene Orange** R.
Dianil Red R, 4B, 10B, **Dianil Claret Red** B, G.
Dianil Scarlet G, 2R, pat., **Brilliant Dianil Red** R, **Delta Purpurine** 5B.
Dianil Blue, all brands, pat., **Dianil Indigo** O pat.
Dianil Green G pat.
Dianil Dark Blue R, 3R, pat.
Dianil Brown, all brands, **Dianil Japonine** O, **Dianil Copper Brown** O, **Dianil Fast Brown** B.
Dianil Black, all brands, pat., **Dianil New Black** LBI pat.

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b) Colours, classified according to their suitability for different applications.

1. Printing of pieces.

a) Operations before printing.

Before printing the pieces must be suitably prepared in order to make the wool fibre more adapted to taking up the colour.

The preparation of the goods consists of: I. Bleaching, II. Chlorinating, III. Treating with Stannates.

I. Bleaching.

The process used most generally for bleaching wool is founded upon the application of Sulphurous Acid, in its gaseous form (burning sulphur in closed stoves) or in the form of Sodium Bisulphite. In the latter case the pieces, which must have been properly cleansed in alkaline baths, and then washed and squeezed, are passed alternately through Bisulphite and Muriatic Acid baths, or they are padded with a diluted solution of Sodium Bisulphite and steamed for a short time.

Another process, which is often combined with the Bisulphite method, is founded upon the application of Peroxide of Hydrogen. In this case the pieces are impregnated with a diluted Peroxide of Hydrogen solution before being passed through the Bisulphite and then washed after being left to lie for a night.

II. Chlorinating.

After bleaching, the goods are washed, squeezed and passed through a very diluted, strongly acidified Chloride of lime solution; they are then again washed and squeezed.

The Chloride of lime solution must be kept weak and the length of time during which the pieces pass through it, must be so regulated, that there is no danger of making the goods look yellow. Moreover a surplus of Acid ought always to be present in the Chlorine-bath, in order to prevent the fabric from appearing yellow after steaming.

III. Mordanting with Stannates.

The chlorinated material is passed through a solution of Stannate of Soda (about 4½—9° Tw) and then the Tin mordant fixed in a weak acid bath. The pieces are then well washed and dried.

For muslin de laine, which is mostly used for print styles, the following series of processes is suitable.

1. Bleaching: 1 part Bisulphite cryst. dissolved in 3 parts Water. After padding the pieces are steamed for 5 min., washed and squeezed.

2. Chlorinating: 100 parts cold Water
   2 ,, Chloride of Lime sol. 32½° Tw
   3 ,, Muriatic Acid 36° Tw.

The pieces are passed through this liquid for 15—20 sec. The bath is refreshed, according to its getting weakened, with about the double amounts of Chloride of lime and Muriatic Acid in the same volume of Water. Then washing and squeezing.

3. Tin Mordanting.

a) Stannate bath: Stannate of Soda sol. 4½° Tw. One passage; squeezing.

b) Acid bath: 100 parts cold Water
   1½ ,, Muriatic Acid 36° Tw.

All these baths are applied in roller cisterns. The chlorinating apparatus must be built from material which withstands Acid and Chlorine and must be provided with a ventilator.

The order of the operations may be altered and the mordanting with Stannate of Soda can be dispensed with. The most important operation is the treatment with Chlorine.

A good bleach with alternate Chloride of lime and Bisulphite baths is carried out in the following manner:

1. The pieces are washed for ½ h in rope form in hot water and then
2. soaped for ½ h at 140° F (2 parts per 1000 liq.).

After well rinsing, and squeezing, the goods are passed continuously through

1. Bisulphite 13½° Tw
2. Chloride of Lime 2.8° Tw
3. Bisulphite 13½° Tw
4. Chloride of Lime 2.8° Tw
5. Sulphuric Acid 2.8° Tw.

The pieces are squeezed between each separate immersion by means of squeezing rollers attached to the cisterns. They are then

rolled up and left to lie over night. Then washed, dried, passed through Glycerine and dried.

The last operation makes the wool fibre more adapted to taking up the printed colour and also acts favourably for the subsequent steaming process (Glycerine being very hygroscopic).

Another method is to treat the goods with Stannate first and then to chlorinate them.

The cleansed and squeezed pieces are passed twice through Stannate of Soda 9° Tw; then for 15 sec. at full width through Sulphuric Acid 2° Tw; then through Hypochloric Acid 1.4° Tw; finally they are washed and dried on a frame.

b) Direct print on Woollen cloth.

Woollen goods are printed direct either by block or by machine.

Machine printing is carried on continuously (Rouleaux) or also disconnectedly like block printing. Since in the Rouleaux machines there are no so-called rapports, the colours used for this purpose need not to equalize as well as colours used for block printing. Therefore nearly all Wool Colours are suitable for machine printing.

1. Machine printing.

For heavy patterns (blotch-prints) the rollers must be deeply engraved and the cylinder properly wrapped ("lapped"). It is very important not to dry the pieces too sharply, but to let them enter the steambox rather damp.

For this purpose the goods are sprinkled slightly before printing and then after printing wrapped into wrappers (end cloths) without drying; or they are slightly dried and then hung up in a damp place; or they are rolled into moist wrappers, containing 5—12% or more moisture, which is ascertained by their weight.

The steaming operation is generally carried out without pressure in wooden steam boxes; but iron or brick steaming apparatus may also be used, if care is taken, that the steam enters the apparatus moist.

This is obtained by letting the steam pass through a moistening apparatus (an iron cylinder partly filled with water) and also through a water tank attached to the bottom of the steam box. The colours turn out the brighter and fuller, the more moisture is present in steaming.

To judge the steam pressure each steaming apparatus ought to contain a water-gauge, and the pressure ought never to rise above 5—10 ccm.

It is advisable moreover, in order to prevent the steam pressure from rising suddenly, to affix a simple valve between the steambox and the steam pipe, which can automatically close the entrance (water-valve). The goods are steamed for 1—2 h. according to the depth of the design and the colours.

In many cases, especially for light (floral or conventional designs) the pieces are slightly dried, after printing, steamed for 1 h with moist steam; then moistened by wrapping them in damp end cloths or by hanging them in a damp, cool place; and finally steamed again for another 1/2 h.

After steaming the pieces are rinsed, if possible in running water. Care must be taken not to soil the white with some of the colour, which is being washed off. The soiling takes place easier, if soft or warm water is used for washing. If only soft and rather warm water (in summer) is obtainable, then it is necessary to add certain salts (Common, Glauber's salts etc.) to the washing cisterns.

Basic Colours.

	1.	2.
Colouring Matter	20 parts	20 parts
Acetic Acid 12° Tw	100 ,,	100 ,,
Water	100 ,,	100 ,,
Tragacanth (60:1000)	500 ,,	500 ,,
British Gum	150 ,,	150 ,,
Tartaric Acid	20 ,,	20 ,,
Water	110 ,,	70 ,,
Acetic Acid Tannin sol. 1:1	—	40 ,,
	1000 parts.	1000 parts.

Suitable for all basic dyes.

Orange.

30 parts Colouring Matter
210 ,, Water
650 ,, Gum Solution
30 ,, Oxalic Acid
80 ,, Water
1000 parts.

For all brands of Orange and Brilliant Orange.

Scarlet.

30 parts Colouring Matter
300 ,, Water
500 ,, Tragacanth (60:1000)
100 ,, British Gum
20 ,, Tartaric Acid
50 ,, Acetate of Alumina 15° Tw
1000 parts.

For all brands of Scarlet and Victoria Scarlet.

Scarlet 6R cryst.

10 parts Colouring Matter
270 ,, Water
500 ,, Tragacanth (60:1000)
150 ,, Dark burnt Starch
20 ,, Tartaric Acid
50 ,, Acetate of Alumina 15° Tw
1000 parts.

Amaranth.

30	parts	Colouring Matter
210	,,	Water
500	,,	Tragacanth (60:1000)
150	,,	British Gum
30	,,	Oxalic Acid,
80	,,	Water
1000	parts.	

Suitable for Amaranth, Naphthol Red and Victoria Rubine.

Scarlet B extra.

40	parts	Scarlet B extra
500	,,	Cold water
300	,,	British Gum, boil and add hot:
50	,,	Alum powder
110	,,	Water
1000	parts.	

Chromotrop.

30	parts	Colouring Matter
220	,,	Water
500	,,	Tragacanth (60:1000)
100	,,	British Gum
30	,,	Oxalic Acid
20	,,	Tartaric Acid
100	,,	Water
1000	parts.	

Suitable for Chromotrop 2R, 2B, 6B, 8B, 10B. An addition of Alumina or Chrome salts renders the shade considerably darker. (See Mordant Colours page 192).

Rosazeine.

40	parts	Colouring Matter
75	,,	Acetic Acid 9° Tw
125	,,	Hot Water
610	,,	Gum Solution, when cooled down add:
10	,,	Oxalic Acid
20	,,	Oxalate of Ammonia
20	,,	Tin Chloride 142° Tw
100	,,	Water
1000	parts.	

Suitable for all brands of Rosazeine.

Eosine.

	1.	2.
Colouring Matter	10 parts	10 parts
Water	100 ,,	100 ,,
Sodium Phosphate	—	40 ,,
Gum Solution 1:1	730 ,,	730 ,,
Soda	10 ,,	—
Tin crystals Ia	—	20 ,,
Water	150 ,,	100 ,,
	1000 parts.	1000 parts.

Suitable for all brands of Eosine, Erythrosine, Phloxine, Rose Bengale, Rosazeine, Uranine. The addition of Tin Crystals produces

bright shades of a yellowish tinge, which bleed less into white, than those obtained with soda. Sodium Acetate may be used instead of Sodium Phosphate.

Acid Violet.

	1.	2.	3.
Colouring Matter	30 parts	30 parts	30 parts
Water	150 ,,	150 ,,	150 ,,
Gum solution 1:1	650 ,,	650 ,,	650 ,,
Oxalic Ocid	— ,,	10 ,,	30 ,,
Sulphate of Alumina	30 ,,	30 ,,	— ,,
Water	140 ,,	130 ,,	140 ,,
	1000 parts.	1000 parts.	1000 parts.

Suitable for all brands of Acid Violet, Acid Green, Fast Acid Violet, Fast Acid Blue, Fast Acid Phloxine, Fast Acid Eosine and Fast Acid Magenta.

Flavazine T, S, L.

	1.	2.
Colouring Matter	40 parts	40 parts
Water	200 ,,	200 ,,
Gum sol. 1:1	600 ,,	600 ,,
Alum	30 ,,	— ,,
Oxalic Acid	15 ,,	10 ,,
Oxalate of Ammonia	— ,,	20 ,,
Tin Chloride 142° Tw	— ,,	20 ,,
Water	115 ,,	110 ,,
	1000 parts.	1000 parts.

Induline.

40 parts Colouring Matter
400 ,, Boiling Water
400 ,, Tragacanth (60:1000)
110 ,, British Gum
50 ,, Ammonia
1000 parts.

For all brands of Induline and Fast Blue.

Alkaline Blue.

30 parts Colouring Matter
150 ,, Hot Water
600 ,, Gum solution 1:1
60 ,, Oxalic Acid
160 ,, Water
1000 parts.

Suitable for all brands of Alkaline Blue, Soluble Blue, Full Blue, Opal Blue, Cotton Blue, Pure Blue, &c.

Patent Blue.

30 parts Colouring Matter
230 ,, Water
600 ,, Gum solution 1:1
20 ,, Oxalic Acid
20 ,, Tartaric Acid
100 ,, Water
1000 parts.

Suitable for Patent Blue, Cyanine and Indigo Substitute.

Azo Acid Black.

60	parts	Colouring Matter
20	,,	Glycerine
360	,,	Boiling Water
150	,,	British Gum powder
350	,,	Tragacanth (60:1000)
20	,,	Turpentine
40	,,	Oxalic Acid (or 50 parts Oxalate of Ammonia)
1000	parts.	

Suitable for all Azo Acid Blacks.

Chromotrop-Black I.

25	parts	Chromotrop S pat.
33	,,	Chromotrop 6 B pat.
1	,,	Patent Blue V pat.
1	,,	Victoria Yellow conc.
450	,,	Boiling Water
300	,,	British Gum powder, when cooled down, add;
100	,,	Neutral Chromate of Ammonia
50	,,	Chloride of Ammonia
20	,,	Glycerine
20	,,	Turpentine
1000	parts.	

Victoria Blue.

20	parts	Victoria Blue B
40	,,	Alcohol
160	,,	Water
600	,,	Gum sol. 1:1
20	,,	Oxalic Acid
40	,,	Oxalate of Ammonia
20	,,	Chloride of Tin solid
100	,,	Water
1000	parts.	

Victoria Violet.

40	parts	Colouring Matter
240	,,	Water
400	,,	Tragacanth (60:1000)
180	,,	Dark burnt Starch
40	,,	Oxalate of Ammonia
100	,,	Water
1000	parts.	

For Victoria Violet, Azo Acid Blue, Naphthalene Blue, Naphthalene Green

Chromotrop-Navy Blue.

25	parts	Chromotrop 6 B pat.
12	,,	Patent Blue V pat.
3	,,	Acid Violet N
240	,,	Boiling Water
650	,,	British Gum Thickening (page 212)
50	,,	Sulphate of Alumina
20	,,	Oxalic Acid
1000	parts.	

For Chromotrop 6 B, 8 B, 10 B.

Chromotrop-Black II.

56	parts	Chromotrop 6 B pat.
12	,,	Patent Blue V pat.
8	,,	Victoria Yellow conc.
434	,,	Water
350	,,	British Gum powder; boil, cool down, and add:
50	,,	Chloride of Ammonia
50	,,	Fluoride of Chrome
20	,,	Glycerine
20	,,	Turpentine
1000	parts.	

For Chromotrop 6 B, 8 B, 10 B.

Alizarine Red.

25	parts	Alizarine Red 1WS
555	,,	Boiling water
260	,,	British Gum
40	,,	Sulphate of Alumina
20	,,	Oxalic Acid
100	,,	Water
1000	parts.	

Alizarine Blue, shaded.

40	parts	Alizarine Blue SB
260	,,	Water
3	,,	Patent Blue A pat.
7	,,	Fast Acid Violet A 2 R pat.
30	,,	Alcohol
50	,,	Water
500	,,	Dark burnt Starch Thickening
30	,,	Tartaric Acid
80	,,	Acetate of Chrome $32^1/_2{}^\circ$ Tw
1000	parts.	

2. Block printing.

A very important point in block printing is the production of a smooth, even surface print, viz the "rapports" must not become visible on the printed effect. The less affinity a certain colour possesses for wool at the ordinary temperature the more level dyeing results will this colour generally produce. In order to gauge the equalizing property of a colour, a small strip of cloth is printed with the printing paste and then washed after a few minutes in clean water. The less colour remains on the fibre in washing, the better this dyestuff equalizes in steaming. Not all colours, which are suitable for machine printing can be used for printing blotch or conventional effects by block. The most important Colours for light floral and conventional designs are:

Auramine, Phosphine, Azophosphine.
Magenta, Methyl Violet, Brilliant Green, Malachite Green, Victoria Blue.

Uranine, Eosine, Phloxine, Erythrosine, Rose Bengale. Chinoline Yellow, Flavazine. Scarlet, Victoria Scarlet, Amaranth.

To block printing colours such ingredients are added as prevent the colours from rushing on too quickly and producing unlevel results. These additions (sometimes producing a lake-formation within the printing paste and thus retarding the dyeing) are: Bisulphite, Sodium Tungstate, Chloride of Tin, Tin Cryst. and Phosphate of Soda. Additions of Tin generally increase the fastness to water of the printed effect.

Besides the dyestuffs, named above as suitable for floral effects, the other colours mentioned as suitable for machine printing, can be used for dark shades.

The following recipes may serve as an instance for preparing light block printing pastes.

Eosine.

20	parts	Colouring Matter
230	,,	Water
600	,,	Gum sol. 1:1
40	,,	Acetate of Soda cryst.
60	,,	Water
20	,,	Tin cryst. Ia.
30	,,	Water
1000	parts.	

Phosphate of Soda may be used instead of Acetate, for all brands of Eosine, Phloxine, Erythrosine, Rose Bengale, Uranine.

Victoria Blue.

20	parts	Victoria Blue B
40	,,	Spirit
240	,,	Water
400	,,	Gum sol. 1:1
10	,,	Oxalic Acid.
20	,,	Oxalate of Ammonia
200	,,	Water
20	,,	Chloride of Tin 142° Tw
50	,,	Water
1000	parts.	

Fast Acid Eosine.

20	parts	Colouring Matter
155	,,	Boiling Water
250	,,	Gum
5	,,	Oxalic Acid
10	,,	Oxalate of Ammonia
10	,,	Chloride of Tin 142° Tw
100	,,	Water
450	,,	Thickening for Reductions
1000	parts.	

For all brands of Rosazeine, Fast Acid Eosine, Fast Acid Phloxine, Fast Acid Magenta.

Thickening for Reductions.

500	parts	Gum sol. 1 : 1
12	,,	Oxalic Acid
24	,,	Oxalate of Ammonia
24	,,	Chloride of Tin 142° Tw
24	,,	Tungstate of Soda
416	,,	Boiling Water
1000	parts.	

c) Discharge and Resist Prints on Woollen cloths.

For discharge prints the cloth is dyed with dischargeable colours and then the Tin or Zinc dust Discharge paste printed.

For Resist styles the Tin salt or Zinc dust colours are printed upon the material and the latter then over-printed with thickened Colour solution The Tin salt and Protoxide of Tin-Acetate-Discharges for Wool can be made considerably stronger than those applied to cotton and thus a better discharge effect and purer Whites are obtained. The following ingredients are used as additions to Tin salt Discharges: Tartaric, Citric, Oxalic Acid, Acetine; less frequently are added small amounts of Muriatic Acid, also Sulphocyanide of Ammonia and Acetate of Soda, the latter two additions being especially made to Coloured Discharges.

Tin Discharges.

The following colours are discharged with Tin salt:

a) Ground Colours for white effects.

Flavazine S, L, T, **Azo Yellow, Metanil Yellow** extra.
Orange No. 2, 4, G.
Scarlet, especially the bluish brands (see the tables on page 213).
Victoria Violet, Azo Acid Blue.

b) Ground Colours for coloured effects.

Naphthol Yellow S, SE.
Azo Yellow, all brands, **Flavazine** S, L, T.
Victoria Yellow, Metanil Yellow, all brands.
Chrysoine G.
Orange, all brands, **Brilliant Orange** extra.
Scarlet, Victoria Scarlet, all brands.
Scarlet 6 R cryst.. **New Coccine** O.
Coccinine O, B.
Brilliant Croceine, all brands.
Fast Red O, S.
Brilliant Crimson O.
Victoria Rubine O, **Amaranth O, Cloth Red** O.
Naphthol Red O, B.
Claret Red, all brands.
Victoria Violet, Azo Acid Blue, all brands.
Azo Acid Black, all brands.
Chromotrop 2 R, 2 B, 6 B, 8 B, 10 B (see tables on page 213).

The following colours can be used as coloured tin salt discharges:

All brands of **Auramine, Magenta, Cerise, Grenadine, Maroon, Phosphine, Methyl Violet, Brilliant Green, Malachite Green, Methyl Alkaline Blue, Alkaline Blue, Opal Blue, Full Blue, Purple Blue, Bleu de Lyon, Cotton Blue, Guernsey Blue, Acid Violet, Patent Blue, Cyanine, Naphthalene Blue, Naphthalene Green, Victoria Blue, Eosine, Phloxine, Rosazeine, Fast Acid Eosine, Fast Acid Phloxine, Fast Acid Magenta, Fast Acid Violet, Fast Acid Blue, Chinoline Yellow.**

Discharge White.

	1.	**2.**	**3.**
Acid Starch	500 parts	500 parts	500 parts
Acetic Acid 9° Tw	100 ,,	100 ,,	100 ,,
Tin salt Ia cryst.	225 ,,	225 ,,	225 ,,
Citric Acid	— ,,	— ,,	50 ,,
Acetate of Soda cryst.	— ,,	100 ,,	— ,,
Sulphocyanide of Ammonia	— ,,	— ,,	75 ,,
Water	175 ,,	75 ,,	50 ,,
	1000 parts.	1000 parts.	1000 parts.

Discharge Yellow.

60 parts	Chinoline Yellow O
150 ,,	Boiling Water
500 ,,	Acid Starch
200 ,,	Tin salt Ia cryst.
70 ,,	Acetate of Soda cryst.
20 ,,	Citric Acid
1000 parts.	

Discharge Pink.

40 parts	Rosazeine extra pat.
170 ,,	Boiling Water
500 ,,	Acid Starch
200 ,,	Tin salt Ia cryst.
70 ,,	Acetate of Soda cryst.
20 ,,	Citric Acid
1000 parts.	

Discharge Red.

80 parts	Eosine 2B
48 ,,	Phloxine O
182 ,,	Water
200 ,,	Gum solution 1:1, dissolve hot and add:
200 ,,	British Gum
200 ,,	Tin salt Ia cryst.
70 ,,	Acetate of Soda cryst.
20 ,,	Citric Acid
1000 parts.	

Discharge Blue, light.

10	parts	Victoria Blue B
200	,,	Water
500	,,	Acid Starch (page 126)
200	,,	Tin salt Ia cryst.
70	,,	Acetate of Soda cryst.
20	,,	Citric Acid
1000	parts.	

Discharge Blue, dark.

For Blue upon Red (upon woollen material dyed with 3% New Coccine O).

25	parts	Acid Violet N
40	,,	Alcohol
80	,,	Water
360	,,	Tragacanth (60:1000)
140	,,	Dark burnt Starch
40	,,	Fast Blue 5 B
150	,,	Water
30	,,	Oxalic Acid
75	,,	Water
60	,,	Tin salt Ia cryst.
1000	parts.	

Discharge Green.

40	parts	Naphthalene Green V pat.
170	,,	Acetic Acid 6° Tw
500	,,	Acid Starch (page 126)
200	,,	Tin salt Ia cryst.
70	,,	Acetate of Soda cryst.
20	,,	Citric Acid
1000	parts.	

Zinc dust discharges.

The following Colours can be discharged with Zinc Dust.

a) Ground Colours for White Discharges:

Victoria Yellow, all brands.
Orange No. 4, No. 2, G, **Brilliant Orange,** all brands.
Scarlet, all brands, especially the blue shades.
Victoria Scarlet, especially the blue shades.
New Coccine O, **Fast Red** O, S.
Claret Red, all brands, **Brilliant Crimson** O.
Victoria Rubine O, **Amaranth** O, **Naphthol Red** O.
Acid Magenta, all brands.
Alkaline Blue, all brands, **Methyl Alkaline Blue** MLB.
Guernsey Blue O, **Bleu de Lyon,** all brands, **Full Blue** O, **Purple Blue** O, **Blue** red shade, **Blue** blue shade.
Acid Green, all brands.
Patent Blue, all brands, pat., **Cyanine** B pat.
Keton Blue 4 BN, sol. and powder, pat.
Naphthalene Blue B pat., **Naphthalene Green** V, conc., pat.

b) Ground Colours for Coloured Discharges:

The colours mentioned under a) and the following dyes:

Naphthol Yellow S, SE.
Azo Yellow, all brands.
Scarlet G, **Scarlet** 6R cryst., **Scarlet** B extra.
Victoria Scarlet, yellowish brands.

Coloured Zinc dust discharges are obtained with **Chinoline Yellow, Safranine, Methylene Violet, Methylene Blue.**

The Zinc dust discharges produce a purer white than Tin salt discharges, and a series of colours which withstand Tin discharges are easily discharged with Zinc dust (cf. tables on page 213).

For preparing the Zinc dust discharge paste the best Zinc dust in its finest powder-from must be selected. In machine printing a brush furnisher must be used for Zinc dust Discharges, while there are no difficulties in working them for block-application. Furthermore care must be taken not to produce over-pressure in steaming Zinc dust discharges, since the latter injure the wool fibre if that is the case. The steaming operation must therefore be carried out most carefully, and is best regulated by an installation as described on page 195).

The preparation of Zinc dust discharges is considerably varied in practice. The more Bisulphite there is present, the better the discharge result will be; (but the more unstable becomes the printing paste).

In order to make the Bisulphite more stable within the printing paste, Formic Aldehyde, Acetaldehyde or Aceton are added to it.

Discharge White I.

300	parts	Zinc Dust finely powdered are ground with
500	,,	Gum solution 1:1
50	,,	Glycerine
100	,,	Bisulfite of Soda 64° Tw; after the reaction has taken place
50	,,	Ammonia are added
1000	parts.	

Discharge White II.

22	parts	Dextrine are dissolved in
500	,,	Bisulfite 66 1/2° Tw, cooled and
350	,,	Zinc Dust finely powdered are gradually added; further
28	,,	Soda calc.
100	,,	Glycerine
1000	parts.	

Discharge White III.

250	parts	Zinc Dust, finely powdered, are ground up with
200	,,	Gum solution 1:1 and slowly added whilst cooling:
400	,,	Bisulphite of Soda 66 1/2° Tw; when the reaction has taken place
30	,,	Soda
70	,,	Water
50	,,	Glycerine are added
1000	parts.	

Discharge White IV.

250	parts	Zinc Dust, finely powdered, are ground with
230	,,	Gum solution 1 : 1, and whilst cooling
400	,,	Bisulphite of Soda 66½° Tw are slowly added. When the reaction has taken place
70	,,	Formaldehyde 40% and
50	,,	Glycerine are added
1000	parts.	

Resist Printing Colour.

The following resist can be recommended:

540	parts	Gum solution 1 : 1
360	,,	Zinc Dust, finely ground
100	,,	China Clay
1000	parts.	

2. Wool yarn printing.

Wool yarns are printed in order to produce fancy effects in the manufacture of carpets, hosiery etc. The mode of working, as regards printing and finishing the yarns, is identical with the one described for piece goods.

Worsted, Carpet, Knitting and Zephyr yarns are used for this purpose; they are generally chlorinated before printing in order to make them take up the printed colour more readily.

Before printing the yarn is cleansed: it is steeped over night in water of 122° F. After this "scalding" operation the yarn is washed at 113° F with 3 parts of Soda and 4 parts of Soap per 100 parts; it is then stoved in its moist state for 5—6 h in the sulphur chamber; then well rinsed and chlorinated in the following manner:

100 parts of yarn are treated in a bath containing the 10—12 fold amount of water, to which are added 6 parts of Sulphuric Acid 168½° Tw. The yarn is worked for ¼ h and then gradually — within ¾ h — 12 parts of Chloride of Lime solution 1.4° Tw are added to the bath. The bath is kept cold throughout. Then the yarn is soured with 6 parts of Sulphuric Acid, well rinsed until all the acid is removed (Congo Red reaction) and finally slowly dried at 113—122° F.

If Glycerine is added to the last rinsing bath the adaptability of the fibre for taking up the printed colours is enhanced.

The selection of dyestuffs suitable for printing on yarn depends upon the purpose which the yarn is meant for: the fastness to light, washing, milling, acids and stoving being the principal guide in this choice. We beg to refer to the colours named on pages 12—24 and also to the classification of dyestuffs in the following chapter on Vigoureux printing (slubbing).

For Worsted yarns the following colours, fast to stoving and milling, are suitable.

Flavazine T, Oxy Dianil Yellow O, Rosazeine, Phloxine, Acid Rosamine A, Fast Acid Eosine G, Fast Acid Phloxine

A, **Fast Acid Magenta G, Fast Acid Violet, Fast Acid Blue, Acid Violet** 5BF, **Patent Blue** A, **Scarlet** 4R, **Alizarine Yellow** GGW, **Alizarine Blue** "S"-brands. **Vigoureux Black I, Vigoureux Grey, Vigoureux Red, Vigoureux Brown, Vigoureux Yellow.**

For Carpet yarns the following dyestuffs are principally used, on account of their fastness to light.

Flavazine S, L, T, **Victoria Yellow, Orange** G, R, **Brilliant Orange, Scarlet** 4R, B extra, **Victoria Scarlet, Brilliant Crimson, Cloth Red** O, **Chromotrop, Azo Acid Magenta, Azo Acid Carmine. Fast Acid Eosine, Fast Acid Phloxine, Fast Acid Magenta, Fast Acid Violet, Patent Blue, Naphthalene Green, Azo Acid Blue, Azo Acid Black** "L"-brands, **Mordant Yellow, Alizarine Yellow** GGW, **Alizarine Orange, Alizarine Claret, Alizarine Brown, Alizarine Blue** SB, **Alizarine Red** 1WS, and the **Vigoureux Colours.**

The yarns are mostly printed on the 2 or more colour printing machine or on the mangle, in rare cases the "iron machine" is used.

"Chine" prints for Iris-effects on Carpet yarns are generally produced by block. The colours are thickened with Tragacanth, Gum Arabic, British Gum or Leiogomme; Dextrine which has reducing properties is very rarely used. The most convenient thickening agent is Tragacanth, the consistency of which can be enhanced by an addition of British Gum or Gum Arabic.

After printing, the yarn is slightly dried, wrapped in moist linen or Jute end cloths, steamed for 1—2 h in very moist steam, well rinsed and finally soaped if required (1:1000).

Yellow I.

25	parts	Naphthol Yellow S
695	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
1000	parts.	

Yellow II.

20	parts	Flavazine T
550	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
10	,,	Oxalic Acid
20	,,	Alum
120	,,	Water
1000	parts.	

For Flavazine S, L and T.

Orange.

20	parts	Orange No. 2
670	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
10	,,	Oxalic Acid
20	,,	Alum
1000	parts.	

For all brands of Orange and Brilliant Orange.

Pink I.

10	parts	Rosazeine B extra
695	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
3	,,	Oxalic Acid
6	,,	Bichloride of Tin
6	,,	Oxalate of Ammonia
1000	parts.	

For all brands of Rosazeine, Fast Acid Eosine, Fast Acid Phloxine, Acid Rosamine, Fast Acid Violet.

Pink II.

10	parts	Eosine
200	,,	Water
200	,,	Tragacanth (60:1000)
40	,,	Phosphate of Soda
430	,,	Water
20	,,	Tin salt Ia crystals
100	,,	Water
1000	parts.	

For all brands of Erythrosine, Phloxine, Rose Bengale, Rosazeine.

Red.

20	parts	Scarlet 5R
670	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
10	,,	Oxalic Acid
20	,,	Alum
1000	parts.	

For all brands of Scarlet and Victoria Scarlet.

Green.

20	parts	Acid Green conc. D
690	,,	Water
60	,,	Acetic Acid 12° Tw
10	,,	Oxalic Acid
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
1000	parts.	

For all brands of Acid Green.

Blue I.

10	parts	Patent Blue V pat.
695	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
5	,,	Oxalic Acid
10	,,	Alum
1000	parts.	

For all brands of Patent Blue, Cyanine B, Naphthalene Blue B, Indigo Substitute, Alkaline Blue, Opal Blue, Full Blue, Cotton Blue, Pure Blue.

Blue II.

20	parts	Victoria Blue B
440	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Oxalic Acid
40	,,	Oxalate of Ammonia
20	,,	Chloride of Tin, solid,
200	,,	Water
1000	parts.	

Blue III.

40	parts	Induline 2N
700	,,	Water
200	,,	Tragacanth (60:1000)
40	,,	Ammonia
20	,,	Glycerine
1000	parts.	

Violet I.

30	parts	Acid Violet N
560	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
30	,,	Oxalic Acid
20	,,	Glycerine
100	,,	Water
1000	parts.	

For all brands of Acid Violet, Fast Acid Violet and Fast Acid Blue.

Violet II.

30	parts	Victoria Violet 4BS
670	,,	Water
200	,,	Tragacanth (60:1000)
20	,,	Glycerine
50	,,	Ammonia
30	,,	Oxalate of Ammonia
1000	parts.	

For Victoria Violet 4BS, 8BS, pat., Azo Acid Blue B pat.

Brown.

15	parts	Acid Violet N
15	,,	Orange No. 2
670	,,	Water
60	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
20	,,	Oxalic Acid
20	,,	Glycerine
1000	parts.	

Black I.

50	parts	Azo Acid Black TL
620	,,	Water
200	,,	Tragacanth (60:1000)
30	,,	Glycerine
50	,,	Ammonia
50	,,	Oxalate of Ammonia
1000	parts.	

For all brands of Azo Acid Black pat.

Black II.

40	parts	Vigoureux Black I pat.
593	,,	Water
50	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
32	,,	Sulphuric Acid 1:1
40	,,	Fluoride of Chrome
40	,,	Water
5	,,	Chlorate of Soda
1000	parts.	

Alizarine Yellow.

20	parts	Alizarine Yellow GGW powder, pat.
530	,,	Water
50	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
10	,,	Sulphuric Acid 168¹/₂° Tw
20	,,	Fluoride of Chrome
150	,,	Water
20	,,	Glycerine
1000	parts.	

Alizarine Brown.

150	parts	Alizarine Brown paste
480	,,	Water
50	,,	Acetic Acid 12° Tw
200	,,	Tragacanth (60:1000)
40	,,	Fluoride of Chrome
150	,,	Water
10	,,	Sulphuric Acid 168¹/₂° Tw
20	,,	Glycerine
1100	parts.	

Alizarine Red.

25	parts	Alizarine Red 1WS
495	,,	Boiling Water
200	,,	Tragacanth (60:1000)
40	,,	Sulphate of Alumina
20	,,	Oxalic Acid
200	,,	Water
20	,,	Glycerine
1000	parts.	

Alizarine Blue I.

66	parts	Alizarine Blue SB powder
534	,,	Water
200	,,	Tragacanth (60:1000)
10	,,	Tartaric Acid
150	,,	Water
20	,,	Fluoride of Chrome
20	,,	Glycerine
1000	parts.	

For all "S" brands of Alizarine Blue in powder.

Alizarine Blue II.

100	parts	Alizarine Blue S2R double
500	,,	Water
200	,,	Tragacanth (60:1000)
10	,,	Tartaric Acid
150	,,	Water
20	,,	Fluoride of Chrome
20	,,	Glycerine
1000	parts.	

For all "S" brands of Alizarine Blue in paste.

3. Printing of slubbing

(Vigoureux printing).

The preparing and the application of printing Colours and also the process of steaming remains almost exactly the same as for pieces. The Chlorinating and preparing operations are, however, in most cases dispensed with, since they impair the wool fibre of the slubbing material. According to the employment of the printed slubbing for different goods more mordant colours are used for slubbing prints than for ordinary piece goods. The best Chrome Mordant for fixing the Mordant Colours is Fluoride of Chrome. Before adding it to the printing colour (contained in a wooden vessel!) it is made into a paste with one quarter of its weight of cold water.

The addition of Tournant Olive Oil or Castor Oil to the printing colours enhances the consistency of the pastes and also the handle of the printed sliver. Colours, which are sensitive to copper f. i. the Vigoureux-colours require the addition of some Sulphocyanide of Ammonia. Since the Mordant Colours are fixed with difficulty on unprepared slubbing, the steaming operation has to be considerably lengthened:

The printed, moist slubbing is steamed for 1 h with powerful steam but without pressure, then cooled down for 1 h and finally steamed again for 1 h.

The steamed material remains lying over night, during which time the colours are "set" and darkened, and is then passed through the gill box in the usual manner.

The colours suitable for slubbing printing are classified as follows.

a) Suitable for men's goods:

Alizarine Red 1WS, **Alizarine Brown, Alizarine Orange, Ceruleine** S brands, **Alizarine Blue, Alizarine Green** S, **Alizarine Yellow** GG pat., N, **Mordant Yellow** O, **Acid Alizarine Blue** BB, GR pat., **Acid Alizarine Green** G pat., **Vigoureux Black** I pat., **Vigoureux Grey** I pat., **Vigoureux Brown** I, **Vigoureux Yellow** I, **Vigoureux Red** I.

For shading purposes the following dyes may be recommended:

Fast Acid Blue B pat. (1½—2%), **Acid Rosamine** A pat. (up to 1½%), **Fast Acid Violet** A 2 R, R, B, pat., **Keton Blue** 4 BN pat., **Patent Blue** A pat., **Acid Violet** 5 BF (up to ½%).

b) Suitable for ladies' cloths:

Fast Acid Violet, Fast Acid Blue, Acid Rosamine, Keton Blue, Patent Blue A, **Naphthalene Green, Naphthalene Blue, Indigo Substitute, Acid Violet** 5 BF, N, **Victoria Violet, Azo Acid Blue, Chromotrope** 2 R, 2 B, 6 B, 8 B, 10 B with Fluoride of Chrome, **Scarlet. Victoria Scarlet, Victoria Rubine, Amaranth, Naphthol Red, Fast Blue, Induline** 2 N, **Orange, Victoria Yellow, Chinoline Yellow, Flavazine, Rosazeine, Fast Acid Eosine, Fast Acid Phloxine, Fast Acid Magenta.**

Scarlet.

30	parts	Colouring Matter,
380	,,	Hot Water
500	,,	British Gum Thickening (page 212)
70	,,	Acetic Acid 9° Tw
20	,,	Oxalic Acid
1000	parts.	

For Orange, Scarlet, Scarlet B extra, Victoria Rubine etc.

Mordant Yellow.

40	parts	Mordant Yellow O are dissolved in
620	,,	Hot Water, and thickened with
200	,,	British Gum powder.
		After cooling down add
60	,,	Acetic Acid 9° Tw
40	,,	Fluoride of Chrome
40	,,	Oxalic Acid
1000	parts.	

Alizarine Orange.

200	parts	Alizarine Orange N paste
60	,,	Acetic Acid 9° Tw
400	,,	British Gum Thickening (page 212), are made into a paste and the following ingredients added:
60	,,	Pyroligneite of Iron 23° Tw
30	,,	Acetate of Lime 23° Tw
20	,,	Fluoride of Chrome
210	,,	Water
20	,,	Oxalic Acid
1000	parts.	

Alizarine Red 1WS
(upon Alumina).

50	parts	Alizarine Red 1WS
550	,,	Hot Water
200	,,	British Gum powder. After cooling down add:
60	,,	Acetic Acid 9° Tw
120	,,	Nitro-Acetate of Alumina 18° Tw
20	,,	Oxalic Acid
1000	parts.	

Alizarine Red 1WS
(upon Chrome).

50	parts	Alizarine Red 1WS
640	,,	Water
200	,,	British Gum powder. When cooled down add:
60	,,	Acetic Acid 9° Tw
30	,,	Fluoride of Chrome
20	,,	Oxalic Acid
1000	parts.	

Alizarine Brown.

200 parts Alizarine Brown paste
60 ,, Acetic Acid 9° Tw
700 ,, British Gum Thickening (as below). Make into a paste and add:
50 ,, Fluoride of Chrome
260 ,, Water
30 ,, Oxalic Acid

1000 parts.

Alizarine Blue.

50 parts Alizarine Blue SB powder
350 ,, Water
500 ,, Dark burnt Starch 2:1
20 ,, Oxalic Acid
80 ,, Acetate of Chrome 32½° Tw

1000 parts.

Alizarine Blue, shaded.

15 parts Patent Blue A pat.
475 ,, Boiling Water
250 ,, British Gum. Add when cold:
150 ,, Alizarine Blue S2R paste
60 ,, Fluoride of Chrome
15 ,, Water
15 ,, Tartaric Acid
20 ,, Tournant Oil

1000 parts.

Ceruleine.

400 parts Ceruleine B paste
120 ,, Water
400 ,, British Gum Thickening. Make into a paste and add:
50 ,, Oxalic Acid
30 ,, Fluoride of Chrome

1000 parts.

Vigoureux Colours.

50 parts Colouring Matter
522 ,, Hot Water
250 ,, British Gum
50 ,, Acetic Acid 12° Tw. Add when cold:
40 ,, diluted Sulphuric Acid (500 parts of 168½° Tw per 1000 parts water)
50 ,, Fluoride of Chrome
12,5 ,, Water
5 ,, Sodium Chlorate
20 ,, Tournant Oil
0,5 ,, Sulphocyanide of Ammonia

1000 parts.

For all Vigoureux Colours.

British Gum Thickening.

6 parts British Gum powder are well boiled in
10 ,, Water and cooled.

4. Table showing the dischargeable qualities of colours on wool and silk.

1. Colours discharged to a pure white, even in dark shades.
2. Colours discharged white in light shades.
3. Colours, not discharged white, but suitable for bright coloured discharges.
4. Colours, not discharged white, suitable only for dark coloured discharges.
5. Colours, not discharged at all, and therefore suitable for additions to coloured discharge pastes.

Colouring Matter	Tin Discharge	Zinc Discharge	Observations	Colouring Matter	Tin Discharge	Zinc Discharge	Observations
Auramine	5	2		Methyl Violet	5	4–5	
Phosphine	4	4		Violet crystals O	5	4–5	
Azo Phosphine	4	3–4		Victoria Blue	5	3–4	
Chrysoidine	3–4	2–3		Malachite Green	5	4–5	
Vesuvine	3–4	3		Brilliant Green	5	4–5	
Cutch Brown	3–4	3		Methylene Blue	4–5	4–5	
Dark Brown	3–4	3		Marine Blue	4–5	4–5	
Magenta	4–5	4–5		Methylene Green	4–5	4	
Cerise	4–5	4–5		New Fast Blue	5	4–5	
Grenadine	4–5	4–5		Fast Blue for Cotton	5	4–5	
Maroon	4–5	4–5		Methylene Grey	4–5	4	
New Magenta	4–5	4–5		Eosine	4–5	4	
Safranine	5	5		Erythrosine	4–5	4	
Methylene Violet	5	5					
Methylene Heliotrope	5	4					

Colouring Matter	Tin Discharge	Zinc Discharge	Observations
Phloxine	4–5	4	
Rose Bengale	4–5	4	
Rosazeine	4–5	4	
Rosazeine 4G	4–5	4–5	
Fast Acid Eosine	5	3–4	
Fast Acid Phloxine	5	3–4	
Fast Acid Red	4*	3	* Violet Discharge
Fast Acid Violet	5	4	
Fast Acid Blue	5	4	
Acid Magenta	4–5	1–2	
Acid Cerise	4–5	3	
Acid Maroon	4–5	3	
Alkaline Violet	4–5	1–2	
Alkaline Blue	4–5	1–2	
Methyl Alk. Blue	4–5	1–2	
Guernsey Blue	5	1–2	
Bleu de Lyon	5	1–2	
Purple Blue	5	1–2	
Full Blue	5	1–2	
Opal Blue	5	1–2	
Blue blue shade	5	1–2	

Colouring Matter	Tin Discharge	Zinc Discharge	Observations
Blue red shade	5	1–2	
Conc. Cotton Blue	5	1–2	
Pure Blue	5	1–2	
Cotton Light Blue	5	1–2	
Methyl Blue for Cotton	5	1–2	
Acid Green	4–5	1	
Naphthalene Green	4–5	1	
Naphthalene Blue	4–5	1–2	
Patent Blue	4–5	1	
Cyanine	4–5	1	
Keton Blue	4–5	1	
Fast Blue	4–5	3–4	
Induline 2N	4–5	3–4	
Chinoline Yellow	5	4–5	
Naphthol Yellow	3–4	3–4	
Flavazine	1–2	1–2	
Azo Yellow	1–2	2–3	
Victoria Yellow	2–3	1–2	
Metanil Yellow	1–2	1	

Colouring Matter	Tin Discharge	Zinc Discharge	Observations	Colouring Matter	Tin Discharge	Zinc Discharge	Observations
Orange	1—2	1		Azo Acid Magenta	4*	3—4	* Violet Discharge
Brilliant Orange	1—2	1		Amido Naphthol Red	1	2-3	
Scarlet G	2	1—2		Victoria Violet	2—3	1—2	
Scarlet 6R	2-3	1		Azo Acid Blue	2—3	1—2	
Scarlet B extra	2—3	1—2		Azo Acid Black B, R, G	3	3	
Scarlet crystals	2—3	1—2		Azo Acid Black L brands	3	3-4	
New Coccine	2—3	1—2		Am'do Naphthol Black	2—3	3	
Victoria Scarlet 3G-G	2—3	1—2		Chromotrope	2—3	2	
Victoria Scarlet R-6R	2—3	1		Alizarine Yellow GG paste	3	2—3	
Brilliant Croceine	2—3	1—2		Alizarine Yellow R paste	3	3	
Fast Red	2	1—2		Alizarine Orange (Alumina Mordant)	4*	4*	*Brown Discharge
Naphthol Red	2	1		Alizarine Orange (Chrome Mordant)	5*	5*	* do.
Brilliant Crimson	2	1—2		Alizarine Red (Alumina Mordant)	4-5*	5*	*Yellow Discharge
Amaranth	2	1		Alizarine Red (Chrome Mordant)	4-5*	5*	* do.
Victoria Rubine	2	1					
Cloth Red	2	1—2					
Claret Red	2—3	1					
Archil Substitute	2	1—2					
Alkali Fast Red	2	2—3					

Colouring Matter	Tin Discharge	Zinc Discharge	Observations	Colouring Matter	Tin Discharge	Zinc Discharge	Observations
Alizarine Claret (Alumina Mordant)	5	5		**Alizarine Brown**	5	5	
				Alizarine Blue	5	5	
Alizarine Claret (Chrome Mordant)	5	5		**Alizarine Green**	5	5	
				Ceruleine	5	5	

X. SILK PRINTING.

The Silk fibre resembles wool to such an extent as regards its affinity to most dyestuffs, that the printing of silk varies little from the printing of wool. Since the affinity of silk to the dyestuffs is rather greater, however, than that of wool, the preparation with Chlorine can be dispensed with.

Of those colours which are produced direct upon the fibre Nitroso Blue, Aniline Black, Solid Green Brown are likewise suitable for silk. These colours are obtained on silk as described for Half silk material under Z. The insoluble Azo Colours are not suitable for silk on account of rubbing.

All colours applied to silk must be fast to water.

a) Direct print.

The silk (in its natural state or weighted with Tin preparations) is printed as woven fabric or in the yarn. The following preparation produces good results as regards equalising and depth of shade.

Tin preparation.

The wet silk material is passed through Chloride of Tin 7.2° Tw on the padding machine, and remains lying rolled up for 1—2 h. It is then passed through a bath containing 50 parts Phosphate of Soda per 1000 liquid and after lying again for 1—2 h. is well washed and dried.

Colours suitable for direct prints on silk:

Basic Colours (page 189) with or without Tannin.

Mordant Colours (page 192), some of these (Aliz Yellow GG and R) may be applied without a mordant.

Resorcine Colours (page 190).

Acid Colours (page 190).

Direct dyeing Colours (page 192).

Nitroso Colours (page 115).

Aniline Black and Solid Green-Brown (page 115).

Before producing Nitroso Blue shades on silk, the material must be well cleansed and the printing colours must be prepared with a considerable surplus of Oxalic Acid.

The following recipes produce good results:

20	parts	Colouring Matter
360	,,	Water
100	,,	Acetic Acid 9° Tw
450	,,	Tragacanth (60:1000)
20	,,	Glycerine
20	,,	Tartaric Acid
30—60	parts	Water
1000	parts.	

For basic dyes fixed without tannin.

20	parts	Colouring Matter
490	,,	Water
450	,,	Tragacanth (60:1000)
20	,,	Tartaric Acid
20	,,	Glycerine
1000	parts.	

For acid dyes.

20	parts	Colouring Matter
360	,,	Water
100	,,	Acetic Acid 9° Tw
450	,,	Tragacanth (60:1000)
20	,,	Glycerine
20	,,	Tartaric Acid
30—60	parts	Acetic Acid Tannin sol. 1:1
1000	parts.	

For basic dyes fixed with tannin.

20	parts	Colouring Matter
620	,,	Water
300	,,	British Gum
60	,,	Acetic Acid 9° Tw
1000	parts.	

For direct dyes.

b) Discharge prints.

The silk material is dyed with dischargeable colours and then discharged with Tin salt or Zinc dust printing colours.

Tin salt discharges are liable to injure the fibre and are therefore less often used than Zinc dust discharges.

1. Tin salt Discharges.

The following colours are easily discharged with Tin Discharges.

a) Ground colours for white effects:

Victoria Yellow, Metanil Yellow, Orange No. 4, Nr. 2, G, **Scarlet** (particularly the blue brands), and those Dianil Colours which are also well dischargeable on cotton, see page 159.

b) Ground colours for coloured effects.

Naphthol Yellow, Azo Yellow, Victoria Yellow, Metanil Yellow, Orange No. 4, No. 2, G, **Brilliant Orange, Scarlet, Victoria Scarlet, Scarlet crystals, New Coccine, Brilliant Croceine, Amaranth, Fast Red, Brilliant Crimson, Victoria Rubine, Naphthol Red, Cloth Red, Claret Red, Chromotrope, Azo Acid Blue, Victoria Violet, Azo Acid Black,** and the Dianil dyes mentioned on page 159 under b).

Coloured Tin Discharges are obtained with:

Auramine, Magenta, Cerise, Grenadine, Maroon, Phosphine, Methyl Violet, Brilliant Green, Malachite Green, Methyl Alkaline Blue, Alkaline Blue, Opal Blue, Full Blue, Purple Blue, Bleu de Lyon, Cotton Blue, Guernsey Blue, Acid Violet, Patent Blue, Cyanine, Naphthalene Blue, Naphthalene Green, Victoria Blue, Chinoline Yellow.

White Discharge.

450	parts	Acid Starch (page 126)
120	,,	Tragacanth (60:1000)
125	,,	Tin salt Ia cryst.
230	,,	Water.
50	,,	Sulphocyanide of Ammonia
25	,,	Citric Acid 36° Tw.
1000	parts.	

Yellow Discharge.

30	parts	Auramine conc. pat.
140	,,	Water
700	,,	Gum Solution 1:1
90	,,	Tin salt Ia cryst.
25	,,	Sulphocyanide of Ammonia
15	,,	Citric Acid
1000	parts.	

Red Discharge.

30	parts	Rosazeine extra
5	,,	Auramine conc. pat.
135	,,	Water
700	,,	Gum Solution 1:1
90	,,	Tin salt Ia cryst.
25	,,	Sulphocyanide of Ammonia
15	,,	Citric Acid
1000	parts.	

Blue Discharge I.

30	parts	Acid Violet N
10	,,	Patent Blue V pat.
110	,,	Water
700	,,	Gum Solution 1:1
100	,,	Tin salt Ia cryst.
30	,,	Sulphocyanide of Ammonia
20	,,	Citric Acid
1000	parts.	

Blue Discharge II.

30	parts	Methyl Violet 2B
10	,,	Malachite Green cryst. ext.
110	,,	Acetic Acid 5.8° Tw
700	,,	Gum Solution 1:1
100	,,	Tin salt Ia cryst.
30	,,	Sulphocyanide of Ammonia
20	,,	Citric Acid
1000	parts.	

Green Discharge.

15	parts	Auramine O pat.
15	,,	Brilliant Green cryst. extra
70	,,	Acetic Acid 5.8° Tw
750	,,	Gum Solution 1 : 1
100	,,	Tin salt Ia cryst.
30	,,	Sulphocyanide of Ammonia
20	,,	Citric Acid
1000	parts.	

2. Zinc Dust Discharges.

The following colours are easily discharged with Zinc Dust Discharges.

a) Ground Colours for white effects.

Victoria Yellow, Orange No. 4, No. 2, G, **Brilliant Orange, Scarlet** (blue shades), **New Coccine, Victoria Scarlet** (blue shades), **Fast Red, Claret Red, Brilliant Crimson, Amaranth, Victoria Rubine, Naphthol Red, Methyl Alkaline Blue, Alkaline Blue, Opal Blue, Bleu de Lyon, Full Blue, Purple Blue, Guernsey Blue, Blue for Silk, Blue blueish, Blue red shade, Acid Magenta, Acid Green, Naphthalene Blue, Naphthalene Green, Patent Blue, Cyanine, Keton Blue, Flavazine S, L.**

b) Ground Colours for coloured effects:

The dyes mentioned under a) and: **Naphthol Yellow, Azo Yellow, Scarlet G, Scarlet crystals, Scarlet B extra, Victoria Scarlet** (yellow shades), **Chromotrop, Azo Acid Blue, Victoria Violet, Azo Acid Black B, R, G, Alkaline Violet, Acid Cerise.**

Coloured Zinc Dust Discharges are obtained with:

Chinoline Yellow, Safranine, Methylene Violet, Methylene Blue.

Discharge White I.

300	parts	Zinc Dust
500	,,	Gum Solution
50	,,	Glycerine
50	,,	Ammonia
100	,,	Bisulphite of Soda 66$^1/_2$° Tw
1000	parts.	

Discharge White II.

250	parts	Zinc Dust, finely powdered, are ground with
200	,,	Gum Solution 1 : 1. Whilst cooling
400	,,	Bisulphite of Soda 66$^1/_2$° Tw are added, and when the reaction has taken place :
70	,,	Formaldehyde 40 %
50	,,	Glycerine

Coloured Zinc Dust Discharge.

500 parts Standard White
300 ,, Gum Solution
20—40 parts Colouring matter
200 parts Water

Standard White.

200 parts Gum Solution 1:1 and
600 ,, Zinc Dust are finely ground, and whilst cooling
200 ,, Bisulphite of Soda 66½° Tw are added
1000 parts.

c) Resist prints.

For Resist styles Tin salt or Zinc dust Resists also Resin and Fat Resists are employed.

The Tin salt and Zinc dust Resists are printed upon the silk material and the latter then overprinted with thickened colour solutions. The colours suitable for this purpose are given under Nos. 1 and 2 on pages 218—220.

Resin and Fat Resists are frequently applied to silk fabrics. The latter are printed with the resist colours, dried, and then dyed in a cold bath. Finally the fat or resin is removed by passing the goods through a Benzene bath.

Zinc dust Resist.

540 parts Gum sol. 1:1
360 ,, Zinc dust finely ground
100 ,, China Clay
1000 parts.

Resin Resist.

650 parts Colophony
50 ,, Yellow wax
300 ,, Benzol
1000 parts.

Y. HALF WOOL PRINTING.

For printing half wool material the latter must be suitably prepared like wool fabrics and the colours properly selected and combined.

a) Preparing.

I. Cleansing and bleaching. The pieces must be well cleansed at 113° F. in a bath containing 4 parts soap and 6 parts Soda (Ammonia process); then washed and finally passed through a soda solution of $^3/_4$° Tw in order to remove all remnants of soap. They are then stoved with Sulphurous Acid, either by a continuous process or over night soured with diluted Sulphuric Acid (1:1000) and washed until all the Acid is removed (Congo Red reaction).

II. Chlorinating. The pieces pass at full width through a Chlorine bath, which is prepared with a solution of 26 parts Chloride of lime 9° Tw in 200 parts Water, and 15 parts Muriatic Acid 38° Tw in 200 parts Water. They are then washed until a solution of Congo Red shows that no trace of Acid is left in them.

III. Mordanting:

1st bath: The pieces are passed through a cold solution of Perchloride of Tin 4.5° Tw on the padding machine and remain rolled up for 2 h; they are then passed into the

2nd bath in a roller cistern: which contains 50 parts of Sodium Phosphate per 1000 parts. After washing and hydroextracting they are dried.

Basic, direct dyeing and acid colours are mostly used for printing; mordant colours are seldom employed. If the latter are employed they are used in connection with basic dyestuffs to ensure a better covering of the cotton fibre. Direct dyeing Colours are very suitable for padding together with Phosphate of Soda. The pieces are padded in the hot flue with the colour solutions and then overprinted with printing or discharging colours.

After printing, the pieces are moistened, steamed for 1 h with dry steam without pressure and carefully washed.

The preparation with Phosphate of Tin makes the aftertreatment with Tartar Emetic dispensable for basic colours.

b) Direct prints.

The following recipes are recommendable for direct prints.

20	parts	Colouring matter
80	,,	Alcohol or Acetic Acid 9° Tw
130	,,	Water
700	,,	Gum Solution 1:1
10—20	parts	Tartaric Acid
20—40	,,	Acetic Acid Tannin solution 1:1

For all basic dyestuffs.

20	parts	Conc. Cotton Blue R
140	,,	Acetic Acid 12° Tw
180	,,	Boiling water
600	,,	Gum Solution 1:1
20	,,	Tartaric Acid
40	,,	Acetic Acid Tannin Solution 1:1

For Alkaline Blue, Opal Blue, Full Blue, Pure Blue, Soluble Blue.

12	parts	Rosazeine extra
6	,,	Auramine conc. pat.
75	,,	Alcohol
142	,,	Water
725	,,	Gum Solution 1:1
30	,,	Acetic Acid Tannin Solution 1:1
10	,,	Tartaric Acid

20—40	parts	Colouring matter
380	,,	Water
400	,,	Tragacanth (60:1000)
100	,,	Burnt Starch
30	,,	Phosphate of Soda
60	,,	Water

For all Dianil Colours.

Black.

40	parts	Dianil Black G pat.
20	,,	Dianil Black N pat.
5	,,	Dianil Blue G pat.
5	,,	Dianil Yellow 3G pat.
20	,,	Phosphate of Soda
700	,,	Water, dissolve at the boil and add hot:
80	,,	Wheat Starch
40	,,	Dextrine
120	,,	Water

c) Discharge prints.

Discharge effects upon half wool pieces are obtained on dyed or padded material.

The easiest way of producing even results is by padding the material with suitably prepared colour solutions. With the following recipes good padding liquids for half wool materials are obtained.

Padding Liquids.

Yellow.

2½	parts	Dianil Yellow R pat.
900	,,	Water
50	,,	Tragacanth (60:1000)
10	,,	Phosphate of Soda
50	,,	Water.

Pink.

1	parts	Rosazeine 4G pat.
10	,,	Acetic Acid 6° Tw
935	,,	Water
50	,,	Tragacanth (60:1000)
5	,,	Acetic Acid Tannin sol. 1:1.

Heliotrope.

2½	parts	Methylene Heliotrope O
10	,,	Acetic Acid 6° Tw
980	,,	Water
50	,,	Tragacanth (60:1000)
10	,,	Acetic Acid Tannin sol. 1:1.

Brown.

10	parts	Dianil Brown 2G
900	,,	Water
50	,,	Tragacanth (60:1000)
10	,,	Phosphate of Soda
50	,,	Water.

Light Blue.

1.8	parts	Dianil Blue G pat.
0.75	,,	Patent Blue B pat.
900	,,	Water
50	,,	Tragacanth (60:1000
10	,,	Phosphate of Soda
50	,,	Water.

Medium Blue.

20	parts	Dianil Blue G pat.
900	,,	Water
50	,,	Tragacanth (60:1000)
20	,,	Phosphate of Soda
50	,,	Water.

Dark Blue.

50 parts Dianil Blue R pat.
800 ,, Water
50 ,, Tragacanth (60:1000)
30 ,, Phosphate of Soda
150 ,, Water

Green.

1 part Dianil Blue G pat.
5 parts Dianil Yellow 3G pat.
1.7 ,, Chinoline Yellow O
0.3 ,, Naphthalene Green V pat.
940 ,, Water
50 ,, Tragacanth (60:1000)
10 ,, Phosphate of Soda
50 ,, Water

Discharge Colours.

Discharge White.

200 parts Tragacanth (60:1000)
400 ,, Acid Starch (page 126)
180 ,, Sulphocyanide of Ammonia
200–300 parts Tin Salt Ia cryst.
20 parts Citric Acid

Discharge Pink.

80 parts Rosazeine 4G pat.
5 ,, Rosazeine extra
150 ,, Acetic Acid 6° Tw
500 ,, Gum Solution 1:1
50 ,, Sulphocyanide of Ammonia
160 ,, Tin salt Ia cryst.
10 ,, Citric Acid
50 ,, Acetic Acid Tannin Solution 1:1

Discharge Red.

75 parts Rosazeine 4G pat.
6 ,, Safranine AN extra
150 ,, Acetic Acid 6° Tw
400 ,, Gum Solution 1:1
Add cold:
60 ,, Persian Berry Extract 76° Tw
50 ,, Sulphocyanide of Ammonia
200 ,, Tin Salt Ia cryst.
60 ,, Acetic Acid Tannin Solution 1:1

Discharge Yellow.

30	parts	Auramine conc. pat.
100	,,	Water
80	,,	Acetic Acid 6° Tw
60	,,	Sulphocyanide of Ammonia
400	,,	Gum Solution 1:1
250	,,	Tin Salt Ia cryst.
15	,,	Citric Acid
60	,,	Acetic Acid Tannin Solution 1:1

Discharge Darkblue.

30	parts	Violet crystals O
30	,,	Victoria Blue B
15	,,	Brilliant Green cryst ext.
20	,,	Persian Berry Extract 76° Tw
175	,,	Acetic Acid 6° Tw
450	,,	Gum Solution 1:1
70	,,	Sulphocyanide of Ammonia
150	,,	Tin Salt Ia cryst.
60	,,	Acetic Acid Tannin Solution 1:1

Discharge Green,

20	parts	Brilliant Green cryst. extr.
10	,,	Auramine conc. pat.
154	,,	Acetic Acid 6° Tw
400	,,	Acid Starch (see p. 126)
16	,,	Citric Acid
80	,,	Sulphocyanide of Ammonia
240	,,	Tin Salt Ia cryst.
80	,,	Acetic Acid Tannin Solution 1:1

Z. HALF SILK PRINTING.

Fabrics containing cotton and silk are printed in a similar manner to ordinary cotton. Therefore all basic, mordant, and direct dyeing colours are suitable for this purpose. For shading off the silk, several Acid and Resorcine Colours are used.

On account of the cotton contained in the fabric, all Basic colours are prepared with Tannin, which enhances the fastness to washing.

The Resist and Discharge styles are the most important for half silk materials. The direct print is also used, and in that case carried out according to recipes given under Cotton and Silk printing.

The insoluble Azo colours, produced direct upon the fibre are not suitable for half silk fabrics, as they rub off too much. On the other hand good results are obtained with Solid Green-Brown as padded and resist styles according to the recipes given on pages 141 and 158.

Also Aniline Black is frequently used for Half silk printing.

Aniline Oxidation Black.

{ 120	parts	Aniline Black
{ 230	,,	Water
600	,,	Thickening for Black, add before use:
50	,,	Sulphide of Copper paste 20%.
1000	parts.	

Thickening for Black.

150	parts	Wheat Starch
100	,,	Tragacanth (60:1000)
180	,,	Burnt Starch
476	,,	Water
30	,,	Tournant Oil
2	,,	Magenta small cryst.
		Boil, and add when lukewarm
60	,,	Chlorate of Soda, add cold
2	,,	Sulphocyanide of Potassium
1000	parts.	

After printing and drying the goods are oxidised in the Oxidation room at 86—90° F until the black is properly developed and then they are passed through a Bichrome bath (5—10 parts per 1000) at 140° F and finally washed and soaped.

Dark Navy Blues are produced on Half silk fabrics with Nitroso Blue MR.

For print effects, obtained with Nitroso Blue MR, the material must be well cleansed and the padding liquids are to be prepared with considerably more Acid than is required for cotton; this is necessary in order to obtain a pure blue.

The goods are prepared as follows:

The material is washed in a lukewarm solution of Soda (5 per 1000), well rinsed, soured in a lukewarm Acid bath (5 parts of Muriatic Acid conc. per 1000) washed again and dried. The passage through Acid is necessary for the production of a good blue.

The best White effects are produced as Resist prints. The white Resist colour is first printed, then the material padded on the padding machine and finally carefully dried.

In place of padding rollers a solid honey-combed roller may be used and the Nitroso Blue printed on the printing machine.

The goods are steamed with powerful steam but without pressure for 5 to 15 min., then passed through an Antimony bath; washed and soaped and finished off in the usual manner.

The padding liquids are prepared by mixing the Nitroso base with Water and Muriatic Acid and stirring into the yellow mixture the lukewarm solution of Tannoxyphenol or Resorcine together with the solution of Tannin until the whole is perfectly dissolved. Then the Tragacanth is mixed with a solution of Oxalic Acid, and this mixture added to the above solution and the whole made up to 1000 parts.

White Resist.

170	parts	British Gum
195	,,	Water
130	,,	Glue solution 1:2
85	,,	Acetic Acid 12° Tw
250	,,	Tin Salt Ia. cryst.
170	,,	Tartaric Acid
1000	parts.	

Thickening
(for reducing the White Resist).

350	parts	British Gum
400	,,	Water
170	,,	Glue solution 1:2
80	,,	Acetic Acid 12° Tw
1000	parts.	

Padding Liquid.

	1.	2.
Nitroso Base M 50% paste	50 parts	50 parts
Hydrochloric Acid 36° Tw	16,7 ,,	16,7 ,,
Water	140 ,,	170 ,,
Tannoxyphenol R pat.	— ,,	63 ,,
Resorcine	33 ,,	— ,,
Hot Water	85 ,,	85 ,,
Tannin solution (1:1)	100 ,,	— ,,
Oxalic Acid sol. (1:10)	420 ,,	420 ,,
Tragacanth (60:1000)	100 ,,	100 ,,
make up to	1000 parts.	1000 parts.

Appendix.

Tables and methods of analysis.

Table of the Elements, their symbols and Atomic weight.

Oxygen, O = 16.

Aluminum	Al	27,1	Neodym	Nd	143,6
Antimony	Sb	120	Neonium	Ne	29
Argon	A	39,9	Nickel	Ni	58,7
Arsenic	As	75	Niobium	Nb	94
Barium	Ba	137,4	Nitrogen	N	14,04
Beryllium	Be	9,1	Osmium	Os	191
Bismuth	Bi	208,5	Oxygen	O	16,2
Boron	B	11	Palladium	Pd	106
Bromine	Br	79,96	Phosphorus	P	31
Cadmium	Cd	112,4	Platinum	Pt	194,8
Caesium	Cs	133	Potassium	K	39,15
Calcium	Ca	140	Praseodym	Pr	140,5
Carbon	C	12	Rhodium	Rh	103
Cerium	Ce	140	Rubidium	Rb	85,4
Chlorine	Cl	35,5	Ruthenium	Ru	101,7
Chromium	Cr	52,1	Samarium	Sa	150
Cobalt	Co	59	Scandium	Sc	44,1
Copper	Cu	63,6	Selenium	Se	79,1
Erbium	Er	166	Silicium	Si	28,4
Fluorine	F	19	Silver	Ag	107,93
Gadolinium	Gd	156	Sodium	Na	23,05
Gallium	Ga	70	Strontium	Sr	87,6
Germanium	Ge	72	Sulphur	S	32,06
Gold	Au	197,2	Tantalum	Ta	183
Helium	He	4	Tellurium	Te	127
Hydrogen	H	1,01	Thallium	Tl	204,1
Indium	In	114	Tin	Sn	118,5
Iridium	Ir	193	Titanium	Ti	48
Iodine	J	126,85	Thorium	Th	232,5
Iron	Fe	56	Thulium	Tu	171
Krypton	Kr	81,8	Tungsten	W	184
Lanthanum	La	138	Uranium	U	239,5
Lead	Pb	206,9	Vanadium	V	51,2
Lithium	Li	7,03	Xenon	X	128
Magnesium	Mg	24,36	Ytterbium	Yb	173
Manganese	Mn	55	Yttrium	Y	89
Mercury	Hg	203	Zinc	Zn	65,4
Molybdenum	Mo	96	Zirconium	Zr	90,7

2. Comparison of Thermometric scales.

Centigrade	Réaumur	Fahrenheit	Centigrade	Réaumur	Fahrenheit
+ 100	+ 80	+ 212	+ 54	+ 43,2	+ 129,2
99	79,2	210,2	53	42,4	127,4
98	78,4	208,4	52	41,6	125,6
97	77,6	206,6	51	40,8	123,8
96	76,8	204,8	50	40	122
95	76	203	49	39,2	120,2
94	75,2	201,2	48	38,4	118,4
93	74,4	199,4	47	37,6	116,6
92	73,6	197,6	46	36,8	114,8
91	72,8	195,8	45	36	113
90	72	194	44	35,2	111,2
89	71,2	192,2	43	34,4	109,4
88	70,4	190,4	42	33,6	107,6
87	69,6	188,6	41	32,8	105,8
86	68,8	186,8	40	32	104
85	68	185	39	31,2	102,2
84	67,2	183,2	38	30,4	100,4
83	66,4	181,4	37	29,6	98,6
82	65,6	179,6	36	28,8	96,8
81	64,8	177,8	35	28	95
80	64	176	34	27,2	93,2
79	63,2	174,2	33	26,4	91,4
78	62,4	172,4	32	25,6	89,6
77	61,6	170,6	31	24,8	87,8
76	60,8	168,8	30	24	86
75	60	167	29	23,2	84,2
74	59,2	165,2	28	22,4	82,4
73	58,4	163,4	27	21,6	80,6
72	57,6	161,6	26	20,8	78,8
71	56,8	159,8	25	20	77
70	56	158	24	19,2	75,2
69	55,2	156,2	23	18,4	73,4
68	54,4	154,4	22	17,6	71,6
67	53,6	152,6	21	16,8	69,8
66	52,8	150,8	20	16	68
65	52	149	19	15,2	66,2
64	51,2	147,2	18	14,4	64,4
63	50,4	145,4	17	13,6	62,6
62	49,6	143,6	16	12,8	60,8
61	48,8	141,8	15	12	59
60	48	140	14	11,2	57,2
59	47,2	138,2	13	10,4	55,4
58	46,4	136,4	12	9,6	53,6
57	45,6	134,6	11	8,8	51,8
56	44,8	132,8	10	8	50
55	44	131	9	7,2	48,2

Centigrade	Réaumur	Fahrenheit	Centigrade	Réaumur	Fahrenheit
+ 8	+ 6,4	+ 46,4	− 17	− 13,6	+ 1,4
7	5,6	44,6	18	14 4	− 0,4
6	4,8	42,8	19	15,2	2,2
5	4	42	20	16	4
4	3,2	39,2	21	16,8	5,8
3	2,4	37,4	22	17,6	7,6
2	1,6	35,6	23	18,4	9,4
1	0,8	33,8	24	19,2	11,2
0	0	32	25	20	13
− 1	− 0.8	30.2	26	20,8	14,8
2	1,6	28,4	27	21,6	16,6
3	2,4	26,6	28	22.4	18,4
4	3,2	24,8	29	23,2	20,2
5	4	23	30	24	22
6	4,8	21,2	31	24,8	23,8
7	5,6	19.4	32	25,6	25,6
8	6.4	17.6	33	26.4	27,4
9	7,2	15,8	34	27,2	29,2
10	8	14	35	28	31
11	8,8	12,2	36	28,8	32,8
12	9,6	10,4	37	29,6	34,6
13	10,4	8,6	38	30,4	36,4
14	11,2	6,8	39	31,2	38,2
15	12	5	40	32	40
16	12,8	3,2			

To convert the degrees in one scale into those of another, the following formulae are used:

°C to °R multiply by 4, divide by 5,
°C ,, °F ,, ,, 9, ,, ,, 5, add 32,
°R ,, °C ,, ,, 5, ,, ,, 4,
°R ,, °F ,, ,, 2, ,, ,, 4, ,, 32,
°F ,, °R subtract 32, multiply by 4, divide by 9,
°F ,, °C ,, 32, ,, ,, 5, ,, ,, 9.

3. Comparative Table of specific Gravities and Hydrometer Degrees, Beaumé and Twaddle.

Spec. Grav. at 59° F.	Degrees Beaumé	Degrees Twaddle	Spec. Grav. at 59° F.	Degrees Beaumé	Degrees Twaddle
1,000	0	0	1,225	26,4	45
1,005	0,7	1	1,230	26,9	46
1,010	1,4	2	1,235	27,4	47
1,015	2,1	3	1,240	27,9	48
1,020	2,7	4	1,245	28,4	49
1,025	3,4	5	1,250	28,8	50
1,030	4,1	6	1,255	29,3	51
1,035	4,7	7	1,260	29,7	52
1,040	5,4	8	1,265	30,2	53
1,045	6,0	9	1,270	30,6	54
1,050	6,7	10	1,275	31,1	55
1,055	7,4	11	1,280	31.5	56
1,060	8,0	12	1,285	32,0	57
1,065	8,7	13	1,290	32,4	58
1,070	9,4	14	1,295	32,8	59
1,075	10,0	15	1,300	33,3	60
1,080	10,6	16	1,305	33,7	61
1,085	11,2	17	1,310	34,2	62
1,090	11,9	18	1,315	34,6	63
1,095	12,4	19	1,320	35,0	64
1,100	13,0	20	1,325	35,4	65
1,105	13,6	21	1,330	35,8	66
1,110	14,2	22	1,335	36,2	67
1,115	14,9	23	1,340	36,6	68
1,120	15,4	24	1,345	37,0	69
1,125	16,0	25	1,350	37,4	70
1,130	16,5	26	1,355	37,8	71
1,135	17,1	27	1,360	38,2	72
1,140	17,7	28	1,365	38,6	73
1,145	18,3	29	1,370	39,0	74
1,150	18,8	30	1,375	39,4	75
1,155	19,3	31	1,380	39,8	76
1,160	19,8	32	1,385	40,1	77
1,165	20,3	33	1,390	40,5	78
1,170	20,9	34	1,395	40,8	79
1,175	21,4	35	1,400	41,2	80
1,180	22,0	36	1,405	41,6	81
1,185	22,5	37	1,410	42,0	82
1,190	23,0	38	1,415	42,3	83
1,195	23,5	39	1,420	42,7	84
1,200	24,0	40	1,425	43,1	85
1,205	24,5	41	1,430	43,4	86
1,210	25,0	42	1,435	43,8	87
1,215	25,5	43	1,440	44,1	88
1,220	26,0	44	1,445	44,4	89

Spec. Grav. at 59° F.	Degrees Beaumé	Degrees Twaddle	Spec. Grav. at 59° F.	Degrees Beaumé	Degrees Twaddle
1,450	44,8	90	1,660	57,4	132
1,455	45,1	91	1,665	57,7	133
1,460	45,4	92	1.670	57,9	134
1,465	45,8	93	1,675	58,2	135
1,470	46,1	94	1,680	58,4	136
1,475	46,4	95	1,685	58,7	137
1,480	46,8	96	1,690	58,9	138
1,485	47,1	97	1,695	59,2	139
1,490	47,4	98	1,700	59,5	140
1,495	47,8	99	1,705	59,7	141
1,500	48,1	100	1,710	60,0	142
1,505	48.4	101	1,715	60,2	143
1,510	48,7	102	1,720	60,4	144
1,515	49,0	103	1,725	60,6	145
1,520	49,4	104	1,730	60,9	146
1,525	49,7	105	1,735	61,1	147
1,530	50,0	106	1,740	61,4	148
1,535	50,3	107	1,745	61,6	149
1,540	50,6	108	1,750	61,8	150
1,545	50,9	109	1,755	62,1	151
1,550	51,2	110	1,760	62,3	152
1,555	51,5	111	1,765	62,5	153
1,560	51,8	112	1,770	62,8	154
1,565	52,1	113	1,775	63,0	155
1,570	52,4	114	1,780	63,2	156
1,575	52,7	115	1,785	63,5	157
1,580	53,0	116	1,790	63,7	158
1,585	53,3	117	1,795	64,0	159
1,590	53,6	118	1,800	64,2	160
1,595	53,9	119	1,805	64,4	161
1,600	54,1	120	1,810	64,6	162
1,605	54,4	121	1,815	64,8	163
1,610	54,7	122	1,820	65,0	164
1,615	55,0	123	1,825	65,2	165
1,620	55,2	124	1,830	65,5	166
1,625	55,5	125	1,835	65,7	167
1,630	55,8	126	1,840	65,9	168
1,635	56,0	127	1,845	66,1	169
1,640	56,3	128	1,850	66,3	170
1,645	56,6	129	1,855	66,5	171
1,650	56,9	130	1,860	66,7	172
1,655	57,1	131	1,865	67,0	173

4. Comparative Table of Degrees Beaumé and specific Gravity for liquids of higher specific Gravity than water.

Degr. Bé	Spec. Grav. at 54° F.	Degr. Bé	Spec. Grav. at 54° F.	Degr. Bé	Spec. Grav. at 54° F.	Degr. Bé	Spec. Grav. at 54° F.
0	1,0000	19	1,1516	38	1,3574	57	1,6529
1	1,0069	20	1,1608	39	1,3703	58	1,6720
2	1,0140	21	1,1702	40	1,3834	59	1,6916
3	1,0212	22	1,1798	41	1,3968	60	1,7116
4	1,0285	23	1,1896	42	1,4105	61	1,7322
5	1,0358	24	1,1994	43	1,4244	62	1,7532
6	1,0434	25	1,2095	44	1,4386	63	1,7748
7	1,0509	26	1,2198	45	1,4531	64	1,7960
8	1,0587	27	1,2301	46	1,4678	65	1,8195
9	1,0665	28	1,2407	47	1,4828	66	1,8428
10	1,0745	29	1,2515	48	1,4984	67	1,839
11	1,0825	30	1,2624	49	1,5141	68	1,864
12	1,0907	31	1,2736	50	1,5301	69	1,885
13	1,0990	32	1,2849	51	1,5466	70	1,909
14	1,1074	33	1,2965	52	1,5633	71	1,935
15	1,1160	34	1,3082	53	1,5804	72	1,960
16	1,1247	35	1,3202	54	1,5978		
17	1,1335	36	1,3324	55	1,6158		
18	1,1425	37	1,3447	56	1,6342		

5. Comparative Table of Degrees Beaumé and specific Gravity for liquids of lower specific Gravity than water.

Degr. Bé	Spec. Grav. at 54° F.	Degr. Bé	Spec. Grav. at 54° F.	Degr. Bé	Spec. Grav. at 54° F.	Degr. Bé	Spec. Grav. at 54° F.
10	1,0000	23	0,9183	36	0,8488	49	0,7892
11	0,9932	24	0,9125	37	0,8439	50	0,7849
12	0,9865	25	0,9068	38	0,8391	51	0,7807
13	0,9799	26	0,9012	39	0,8343	52	0,7766
14	0,9733	27	0,8957	40	0,8295	53	0,7725
15	0,9669	28	0,8902	41	0,8249	54	0,7684
16	0,9605	29	0,8848	42	0,8202	55	0,7644
17	0,9542	30	0,8795	43	0,8156	56	0,7604
18	0,9480	31	0,8742	44	0,8111	57	0,7565
19	0,9420	32	0,8690	45	0,8066	58	0,7526
20	0,9359	33	0,8639	46	0,8022	59	0,7487
21	0,9300	34	0,8588	47	0,7978	60	0,7449
22	0,9241	35	0,8538	48	0,7935	61	0,7411

6. Specific Gravity of solutions of Ammonia at 15° C. Lunge and Wiernik.

Specif Grav.	Per-cent NH_3	1 litre contains grms NH_3 at 15° C.	Correction for ± 1° C	Specif Grav.	Per-cent NH_3	1 litre contains grms NH_3 at 15° C.	Correction for ± 1° C.
		*				*	
1,000	0,00	0,0	0,00018	0,940	15,63	146,9	0,00039
0,998	0,45	4,5	0,00018	0,938	16,22	152,1	0,00040
0,996	0,91	9,1	0,00019	0,936	16,82	157,4	0,00041
0,994	1,37	13,6	0,00019	0,934	17,42	162,7	0,00041
0,992	1,84	18,2	0,00020	0,932	18,03	168,1	0,00042
0,990	2,31	22,9	0,00020	0,930	18,64	173,4	0,00042
0,988	2,80	27,7	0,00021	0,928	19,25	178,6	0,00043
0,986	3,30	32,5	0,00021	0,926	19,87	184,2	0,00044
0,984	3,80	37,4	0,00022	0,924	20,49	189.3	0,00045
0,982	4,30	42,2	0,00022	0,922	21,12	194,7	0,00046
0,980	4,80	47,0	0,00023	0,920	21,75	200,1	0,00047
0,978	5,30	51,8	0,00023	0,918	22,39	205,6	0,00048
0,976	5,80	56,6	0,00024	0,916	23,03	210,9	0,00049
0,974	6,30	61,4	0,00024	0,914	23,68	216,3	0,00050
0,972	6,80	66,1	0,00025	0,912	24,33	221,9	0,00051
0,970	7,31	70,9	0,00025	0,910	24,99	227,4	0,00052
0,968	7,82	75,7	0,00026	0,908	25,65	232,9	0,00053
0,966	8,33	80,5	0,00026	0,906	26,31	238,3	0,00054
0,964	8,84	85,2	0,00027	0,904	26,98	243,9	0,00055
0,962	9,35	89,9	0,00028	0,902	27,65	249,4	0,00056
0,960	9,91	95,1	0,00029	0,900	28,33	255,0	0,00057
0,958	10,47	100,3	0,00030	0,898	29,01	260,5	0,00058
0,956	11,03	105,4	0,00031	0,896	29,69	266,0	0,00059
0,954	11,60	110,7	0,00032	0,894	30,37	271,5	0,00060
0,952	12,17	115,9	0,00033	0,892	31,05	277,0	0,00060
0,950	12,74	121,0	0,00034	0,890	31,75	282,6	0,00061
0,948	13,31	126,2	0,00035	0,888	32,50	288,6	0,00062
0,946	13,88	131,3	0,00036	0,886	33,25	294,6	0,00063
0,944	14,46	136,5	0,00037	0,884	34,10	301,4	0,00064
0,942	15,04	141,7	0,00038	0,882	34,95	308,3	0,00065

The number of pounds of NH_3 per Gallon is found by dividing by 1000 the number in the column marked. *

7. Specific Gravity of caustic soda at 15° C. (Lunge).

Spec. Grav.	Degr. Bé	Degrees Twaddle	Per cent Na OH	Spec. Grav.	Degr. Bé	Degrees Twaddle	Per cent Na OH
1,007	1	1,4	0,61	1,220	26	44,0	19,58
1,014	2	2,8	1,20	1,231	27	46,2	20,59
1,022	3	4,4	2,00	1,241	28	48,2	21,42
1,029	4	5,8	2,71	1,252	29	50,4	22,64
1,036	5	7,2	3,35	1,263	30	52,6	23,67
1,045	6	9,0	4,00	1,274	31	54,8	24,81
1,052	7	10,4	4,64	1,285	32	57,0	25,80
1,060	8	12,0	5,29	1,297	33	59,4	26,83
1,067	9	13,4	5,87	1,308	34	61,6	27,80
1,075	10	15,0	6,55	1,320	35	64,0	28,83
1,083	11	16,6	7,31	1,332	36	66,4	29,93
1,091	12	18,2	8,00	1,345	37	69,0	31,22
1,100	13	20,0	8,68	1,357	38	71,4	32,47
1,108	14	21,6	9,42	1,370	39	74,0	33,69
1,116	15	23,2	10,06	1,383	40	76,6	34,96
1,125	16	25,0	10,97	1,397	41	79,4	36,25
1,134	17	26,8	11,84	1,410	42	82,0	37,47
1,142	18	28,4	12,64	1,424	43	84,8	38,80
1,152	19	30,4	13,55	1,438	44	87,6	39,99
1,162	20	32,4	14,37	1,453	45	90,6	41,41
1,171	21	34,2	15,13	1,468	46	93,6	42,83
1,180	22	36,0	15,91	1,483	47	96,6	44,38
1,190	23	38,0	16,77	1,498	48	99,6	46,15
1,200	24	40,0	17,67	1,514	49	102,8	47,60
1,210	25	42,0	18,58	1,530	50	106,0	49,02

8. Specific Gravity of Hydrochloric Acid at 15° C. compared with water at 4° C. and reduced to vacuum.

Spec. Grav. at $\frac{15°}{4°}$ (vacuum)	Degrees Beaumé	Degrees Twaddle	100 parts by weight contain in chem. pure acid		1 Litre contains Kg.	
			Percent H Cl	20° Acid Percent	HCl	Acid at 20° Bé
1,000	0,0	0,0	0,16	0,49	0,0016	0,0049
1,005	0,7	1	1,15	3,58	0,012	0,036
1,010	1,4	2	2,14	6,66	0,022	0,067
1,015	2,1	3	3,12	9,71	0,032	0,099
1,020	2,7	4	4,13	12,86	0,042	0,131
1,025	3,4	5	5,15	16,04	0.053	0,164
1,030	4,1	6	6,15	19,16	0,064	0,197
1,035	4,7	7	7,15	22,27	0,074	0,231
1,040	5,4	8	8,16	25,42	0,085	0,264
1,045	6,0	9	9,16	28,53	0,096	0,298
1,050	6,7	10	10,17	31,68	0,107	0,333
1,055	7,4	11	11,18	34,82	0,118	0,367
1,060	8,0	12	12,19	37,97	0,129	0,403
1,065	8,7	13	13,19	41,09	0,141	0,438
1,070	9,4	14	14,17	44,14	0,152	0,472
1,075	10,0	15	15,16	47,22	0,163	0,508
1,080	10,6	16	16,15	50,31	0,174	0,543
1,085	11,2	17	17,13	53,36	0,186	0,579
1,090	11,9	18	18,11	56,41	0,197	0,615
1,095	12,4	19	19,06	59,37	0,209	0,650
1,100	13,0	20	20,01	62,33	0,220	0,686
1,105	13,6	21	20,97	65,32	0,232	0,722
1,110	14,2	22	21,92	68,28	0,243	0,758
1,115	14,9	23	22,86	71,21	0,255	0,794
1,120	15,4	24	23,82	74,20	0,267	0,831
1,125	16,0	25	24,78	77,19	0,278	0,868
1,130	16,5	26	25,75	80,21	0,291	0,906
1,135	17,1	27	26,70	83,18	0,303	0,944
1,140	17,7	28	27,66	86,17	0,315	0,982
1,1425	18,0		28,14	87,66	0,322	1,002
1,145	18,3	29	28,61	89,13	0,328	1,021
1,150	18,8	30	29,57	92,11	0,340	1,059
1,152	19,0		29,95	93,30	0,345	1,075
1,155	19,3	31	30,55	95,17	0,353	1,099
1,160	19,8	32	31,52	98,19	0,366	1,139
1,163	20,0		32,10	100,00	0,373	1,163
1,165	20,3	33	32,49	101,21	0,379	1,179
1,170	20,9	34	33,46	104,24	0,392	1,220
1,171	21,0		33,65	104,82	0,394	1,227
1,175	21,4	35	34,42	107,22	0,404	1,260
1,180	22,0	36	35,39	110,24	0,418	1,301
1,185	22,5	37	36,31	113,11	0,430	1,340
1,190	23,0	38	37,23	115,98	0,443	1,380
1,195	23,5	39	38,16	118,87	0,456	1,421
1,200	24,0	40	39,11	121,84	0,469	1,462

Specific Gravity	Degrees Bé	100 parts contain at 0° C. gr. HNO_3	gr. N_2O_5	100 parts contain at 15° C. gr. HNO_3	gr. N_2O_5
1,000	0	0,0	0,0	0,2	0,1
1,007	1	1,1	0,9	1,5	1,3
1,014	2	1,2	1,9	2,6	2,2
1,022	3	3,4	2,9	4,0	3,4
1,029	4	4,5	3,9	5,1	4,4
1,036	5	5,5	4,7	6,3	5,4
1,044	6	6,7	5,7	7.6	6,5
1,052	7	8,0	6,9	9,0	7,7
1,060	8	9,2	7,9	10,2	8,7
1,067	9	10,2	8,7	11,4	9,8
1,075	10	11,4	9,8	12,7	10,9
1,083	11	12,6	10,8	14.0	12,0
1,091	12	13,8	11,8	15,3	13,1
1,100	13	15,2	13,0	16,8	14,4
1,108	14	16,4	14,0	18,0	15,4
1,116	15	17,6	15.1	19,4	16,6
1,125	16	18,9	16,2	20,8	17,8
1,134	17	20,2	17,3	22,2	19,0
1,143	18	21,6	18,5	23,6	20,2
1,152	19	22,9	19,6	24,9	21,3
1,161	20	24,2	20,7	26,3	22,5
1,171	21	25,7	22,0	27,8	23,8
1,180	22	27,0	23,1	29,2	25,0
1,190	23	28,5	24,4	30,7	26,3
1,199	24	29,8	25,5	32,1	27,5
1,210	25	31,4	26,9	33,8	28,9
1,221	26	33,1	28,4	35,5	30,4
1,231	27	34,6	29,7	37,0	31,7
1,242	28	36,2	31,0	38,6	33,1
1,252	29	37,7	32,3	40,2	34,5
1,261	30	39,1	33,5	41,5	35,6
1,275	31	41,1	35,2	43,5	37,3
1,286	32	42,6	36,5	45,0	38,6
1,298	33	44,4	38,0	47.1	40,4
1,309	34	46,1	39,5	48,6	41,7
1,321	35	48,0	41,1	50,7	43,5
1,334	36	50,0	42,9	52.9	45,3
1,346	37	51,9	44,5	55,0	47,1
1,359	38	54,0	46,3	57,3	49.1
1,372	39	56,2	48,2	59,6	51.1
1,384	40	58,4	50,0	61,7	52,9
1,398	41	60,8	52,1	64,5	55,3
1,412	42	63,2	54,2	67,5	57,9
1,426	43	66,2	56,7	70,6	60,5
1,440	44	69,0	59,1	74,4	63,8
1,454	45	72,2	61,9	78.4	67,2
1,470	46	76.1	65,2	83,0	71,1
1,485	47	80,2	68,7	87,1	74,7
1,501	48	84,5	72,4	92,6	79,4
1,516	49	88,4	75,8	96,0	82.3
1,524	49,5	90,5	77,6	98,0	84,0
1,530	49,9	92,2	79,0	100,0	85.7
1,532	50,0	92,7	79,5		
1,541	50,5	95,0	81,4		
1,549	51	97,3	83,4		

10. Specific Gravity of Sulphuric Acid.

(Lunge and Isler.)

Specific Gravity at $\frac{15°}{4°}$ C. (vacuum)	Degrees Bé	Degrees Twaddle	100 parts by weight contain in chem. pure acid — Percent H_2SO_4	1 litre contains in chem. pure acid — Kg. H_2SO_4	Specific Gravity at $\frac{15°}{4°}$ C. (vacuum)	Degrees Bé	Degrees Twaddle	100 parts by weight contain in chem. pure acid — Percent H_2SO_4	1 litre contains in chem. pure acid — Kg. H_2SO_4
1,000	0	0	0,09	0,001	1,195	23,5	39	26,68	0,319
1,005	0,7	1	0,83	0,008	1,200	24,0	40	27,32	0,328
1,010	1,4	2	1,57	0,016	1,205	24,5	41	27,95	0,337
1,015	2,1	3	2,30	0,023	1,210	25,0	42	28,58	0,346
1,020	2,7	4	3,03	0,031	1,215	25,5	43	29,21	0,355
1,025	3,4	5	3,76	0,039	1,220	26,0	44	29,84	0,364
1,030	4,1	6	4,49	0,046	1,225	26,4	45	30,48	0,373
1,035	4,7	7	5,23	0,054	1,230	26,9	46	31,11	0,382
1,040	5,4	8	5,96	0,062	1,235	27,4	47	31,70	0,391
1,045	6,0	9	6,67	0,071	1,240	27,9	48	32,28	0,400
1,050	6,7	10	7,37	0,077	1,245	28,4	49	32,86	0,409
1,055	7,4	11	8,07	0,085	1,250	28,8	50	33,43	0,418
1,060	8,0	12	8,77	0,093	1,255	29,3	51	34,00	0,426
1,065	8,7	13	9,47	0,102	1,260	29,7	52	34,57	0,435
1,070	9,4	14	10,19	0,109	1,265	30,2	53	35,14	0,444
1,075	10,0	15	10,90	0,117	1,270	30,6	54	35,71	0,454
1,080	10,6	16	11,60	0,125	1,275	31,1	55	36,29	0,462
1,085	11,2	17	12,30	0,133	1,280	31,5	56	36,87	0,472
1,090	11,9	18	12,99	0,142	1,285	32,0	57	37,45	0,481
1,095	12,4	19	13,67	0,150	1,290	32,4	58	38,03	0,490
1,100	13,0	20	14,35	0,158	1,295	32,8	59	38,61	0,500
1,105	13,6	21	15,03	0,166	1,300	33,3	60	39,19	0,510
1,110	14,2	22	15,71	0,175	1,305	33,7	61	39,77	0,519
1,115	14,9	23	16,36	0,183	1,310	34,2	62	40,35	0,529
1,120	15,4	24	17,01	0,191	1,315	34,6	63	40,93	0,538
1,125	16,0	25	17,66	0,199	1,320	35,0	64	41,50	0,548
1,130	16,5	26	18,31	0,207	1,325	35,4	65	42,08	0,557
1,135	17,1	27	18,96	0,215	1,330	35,8	66	42,66	0,567
1,140	17,7	28	19,61	0,223	1,335	36,2	67	43,20	0,577
1,145	18,3	29	20,26	0,231	1,340	36,6	68	43,74	0,586
1,150	18,8	30	20,91	0,239	1,345	37,0	69	44,28	0,596
1,155	19,3	31	21,55	0,248	1,350	37,4	70	44,82	0,605
1,160	19,8	32	22,19	0,257	1,355	37,8	71	45,35	0,614
1,165	20,3	33	22,83	0,266	1,360	38,2	72	45,88	0,624
1,170	20,9	34	23,47	0,275	1,365	38,6	73	46,41	0,633
1,175	21,4	35	24,12	0,283	1,370	39,0	74	46,94	0,643
1,180	22,0	36	24,76	0,292	1,375	39,4	75	47,47	0,653
1,185	22,5	37	25,40	0,301	1,380	39,8	76	48,00	0,662
1,190	23,0	38	26,04	0,310	1,385	40,1	77	48,53	0,672

Specific Gravity at $\frac{15^{\circ}}{4^{\circ}}$ C. (vacuum)	Degrees Bé	Degrees Twaddle	100 parts by weight contain in chem. pure acid	1 litre contain in chem. pure acid	Specific Gravity at $\frac{15^{\circ}}{4^{\circ}}$ C. (vacuum)	Degrees Bé	Degrees Twaddle	100 parts by weight contain in chem. pure acid	1 litre contains in chem. pure acid
			Percent H_2SO_4	Kg. H_2SO_4				Percent H_2SO_4	Kg. H_2SO_4
1,390	40,5	78	49,06	0,682	1,595	53,9	119	68,05	1,085
1,395	40,8	79	49,59	0,692	1,600	54,1	120	68,51	1,096
1,400	41,2	80	50,11	0,702	1,605	54,4	121	68,97	1,107
1,405	41,6	81	50,63	0,711	1,610	54,7	122	69,43	1,118
1,410	42,0	82	51,15	0.721	1,615	55,0	123	69,89	1,128
1,415	42,3	83	51,66	0,730	1,620	55,2	124	70,32	1,139
1,420	42,7	84	52,15	0,740	1,625	55,5	125	70,74	1,150
1,425	43,1	85	52,63	0,750	1,630	55,8	126	71,16	1,160
1,430	43,4	86	53,11	0,759	1,635	56,0	127	71,57	1,170
1,435	43,8	87	53,59	0,769	1,640	56,3	128	71,99	1,181
1,440	44,1	88	54,07	0,779	1,645	56,6	129	72,40	1,192
1,445	44,4	89	54,55	0,789	1,650	56,9	130	72,82	1,202
1,450	44,8	90	55,03	0,798	1,655	57,1	131	73,23	1,212
1,455	45,1	91	55,50	0,808	1,660	57,4	132	73,64	1,222
1,460	45,4	92	55,97	0,817	1,665	57,7	133	74,07	1,233
1,465	45,8	93	56,43	0,827	1,670	57,9	134	74,51	1,244
1,470	46,1	94	56,90	0,837	1,675	58,2	135	74,97	1,256
1,475	46,4	95	57,37	0,846	1,680	58,4	136	75,42	1,267
1,480	46,8	96	57,83	0,856	1,685	58,7	137	75,86	1,278
1,485	47,1	97	58,28	0,865	1,690	58,9	138	76,30	1,289
1,490	47,4	98	58,74	0,876	1,695	59,2	139	76,73	1,301
1,495	47,8	99	59.22	0,885	1,700	59,5	140	77,17	1,312
1,500	48,1	100	59,70	0,896	1,705	59,7	141	77,60	1,323
1,505	48,4	101	60,18	0,906	1,710	60,0	142	78,04	1,334
1,510	48,7	102	60,65	0,916	1,715	60,2	143	78,48	1,346
1,515	49,0	103	61,12	0,926	1,720	60,4	144	78,92	1,357
1,520	49,4	104	61,59	0,936	1,725	60,6	145	79,36	1,369
1,525	49,7	105	62,06	0,946	1,730	60,9	146	79,80	1,381
1,530	50,0	106	62,53	0,957	1,735	61,1	147	80,24	1,392
1,535	50,3	107	63,00	0,967	1,740	61,4	148	80,68	1,404
1,540	50,6	108	63,43	0,977	1,745	61,6	149	81,12	1,416
1,545	50,9	109	63,85	0,987	1,750	61,8	150	81,56	1,427
1,550	51,2	110	64,26	0,996	1,755	62,1	151	82,00	1,439
1,555	51,5	111	64,67	1,006	1,760	62,3	152	82,44	1,451
1,560	51,8	112	65,08	1,015	1,765	62,5	153	8 .88	1,463
1,565	52,1	113	65,49	1,025	1,770	62,8	154	83,32	1,475
1,570	52,4	114	65,90	1,035	1,775	63,0	155	83,90	1,489
1,575	52,7	115	66,30	1,044	1,780	63,2	156	84,50	1,504
1,580	53,0	116	66,71	1,054	1,785	63,5	157	85,10	1,519
1,585	53,3	117	67,13	1,064	1,790	63,7	158	85,70	1,534
1,590	53,6	118	67,59	1,075	1,795	64,0	159	86,30	1,549

Specific Gravity at $\frac{15^\circ}{4^\circ}$ C. (vacuum)	Degrees Bé	Degrees Twaddle	100 parts by weight contain in chem. pure acid	1 litre contains in chem. pure acid	Specific Gravity at $\frac{15^\circ}{4^\circ}$ C. (vacuum)	Degrees Bé	Degrees Twaddle	100 parts by weight contain in chem. pure acid	1 litre contains in chem. pure acid
			Percent H_2SO_4	Kg. H_2SO_4				Percent H_2SO_4	Kg. H_2SO_4
1,800	64,2	160	86,90	1,564	1,830		166	92,10	1,685
1,805	64,4	161	87,60	1,581	1,831	65,5		92,30	1,690
1,810	64,6	162	88,30	1,598	1,832			92,52	1,695
1,815	64,8	163	89,05	1,621	1,833	65,6		92,75	1,700
1,820	65,0	164	90,95	1,639	1,834			93,05	1,706
1,821			90,20	1,643	1,835	65,7	167	93,43	1,713
1,822	65,1		90,40	1,647	1,836			93,80	1,722
1,823			90,60	1,651	1,837			94,20	1,730
1,824	65,2		90,80	1,656	1,838	65,8		94,60	1,739
1,825		165	91,00	1,661	1,839			95,00	1,748
1,826	65,3		91,25	1,666	1,840	65,9	168	95,60	1,759
1,827			91,50	1,671	1,8405			95,95	1,765
1,828	65,4		91,70	1,676	1,8410			97,00	1,786
1,829			91,90	1,681	1,8415			97,70	1,799

11. Specific Gravity of liquid Sulphurous Acid at 15° C.

(Scott).

Spec. Gravity	Percent SO_2	Spec. Gravity	Percent SO_2
1,0028	0,5	1,0302	5,5
1,0056	1,0	1,0328	6,0
1,0085	1,5	1,0353	6,5
1,0113	2,0	1,0377	7,0
1,0141	2,5	1,0401	7,5
1,0168	3,0	1,0426	8,0
1,0194	3,5	1,0450	8,5
1,0221	4,0	1,0474	9,0
1,0248	4,5	1,0497	9,5
1,0275	5,0	1,0520	10,0

12. Specific Gravity of Acetic Acid at 15° C.

(Oudeman).

Spec. Grav.	Percent $C_2H_4O_2$	Spec. Grav.	Percent $C_2H_4O_2$	Spec. Grav.	Percent $C_2H_4O_2$	Spec. Grav.	Percent $C_2H_4O_2$
0,9992	0	1,0363	26	1,0631	52	1,0748	78
1,0007	1	1,0375	27	1,0638	53	1,0748	79
1,0022	2	1,0388	28	1,0646	54	1,0748	80
1,0037	3	1,0400	29	1,0653	55	1,0747	81
1,0052	4	1,0412	30	1,0660	56	1,0746	82
1,0067	5	1,0424	31	1,0666	57	1,0744	83
1,0083	6	1,0436	32	1,0673	58	1,0742	84
1,0098	7	1,0447	33	1,0679	59	1,0739	85
1,0113	8	1,0459	34	1,0685	60	1,0736	86
1,0127	9	1,0470	35	1,0691	61	1,0731	87
1,0142	10	1,0481	36	1,0697	62	1,0726	88
1,0157	11	1,0492	37	1,0702	63	1,0720	89
1,0171	12	1,0502	38	1,0707	64	1,0713	90
1,0185	13	1,0513	39	1,0712	65	1,0705	91
1,0200	14	1,0523	40	1,0717	66	1,0696	92
1,0214	15	1,0533	41	1,0721	67	1,0686	93
1,0228	16	1,0543	42	1,0725	68	1,0674	94
1,0242	17	1,0552	43	1,0729	69	1,0660	95
1,0256	18	1,0562	44	1,0733	70	1,0644	96
1,0270	19	1,0571	45	1,0737	71	1,0625	97
1,0284	20	1,0580	46	1,0740	72	1,0604	98
1,0298	21	1,0589	47	1,0742	73	1,0580	99
1,0311	22	1,0598	48	1,0744	74	1,0553	100
1,0324	23	1,0607	49	1,0746	75		
1,0337	24	1,0615	50	1,0747	76		
1,0350	25	1,0623	51	1,0748	77		

Note: Specific Gravity higher than 1.0553 might indicate 2 solutions of different strengths. In order to ascertain, which of the 2 solutions is meant, some water is added: an increase of specific gravity points to the solution being stronger than 78% and a decrease to the solution being weaker than 78%.

13. Specific Gravity of Tartaric Acid at 15° C.

(Gerlach).

Spec. Grav.	Percent tart. acid	Spec. Grav.	Percent tart. acid	Spec. Grav.	Percent tart. acid	Spec. Grav.	Percent tart. acid
1,0045	1	1,0761	16	1,1615	32	1,2568	48
1,0090	2	1,0865	18	1,1726	34	1,2696	50
1,0179	4	1,0969	20	1,1840	36	1,2828	52
1,0273	6	1,1072	22	1,1959	38	1,2961	54
1,0371	8	1,1175	24	1,2078	40	1,3093	56
1,0469	10	1,1282	26	1,2198	42	1,3220	57,9 saturated
1,0565	12	1,1393	28	1,2317	44		
1,0661	14	1,1505	30	1,2441	46		

14. Specific Gravity of solutions of Tannic Acid at 15° C.

(Trammer.)

Specific Gravity	Perc. tannic acid	Specific Gravity	Perc. tannic acid	Specific Gravity	Perc. tannic acid	Specific Gravity	Perc. tannic acid
1,0040	1,0	1,0092	2,3	1,0144	3,6	1,0196	4,9
1,0044	1,1	1,0096	2,4	1,0148	3,7	1,0200	5,0
1,0048	1,2	1,0100	2,5	1,0152	3,8	1,0242	6
1,0052	1,3	1,0104	2,6	1,0156	3,9	1,0324	8
1,0056	1,4	1,0108	2,7	1,0160	4,0	1,0406	10
1,0060	1,5	1,0112	2,8	1,0164	4,1	1,0489	12
1,0064	1,6	1,0116	2,9	1,0168	4,2	1,0572	14
1,0068	1,7	1,0120	3,0	1,0172	4,3	1,0656	16
1,0072	1,8	1,0124	3,1	1,0176	4,4	1,0740	18
1,0076	1,9	1,0128	3,2	1,0180	4,5	1,0824	20
1,0080	2,0	1,0132	3,3	1,0184	4,6		
1,0084	2,1	1,0136	3,4	1,0188	4,7		
1,0088	2,2	1,0140	3,5	1,0192	4,8		

15. Specific Gravity of solutions of Sodium Carbonate at 15° C.

(Lunge.)

Specific Gravity	Degrees Beaumé	Degrees Twaddle	Percentage by weight		1 cbm contains Kg.	
			Na_2CO_3	$Na_2CO_3 + 10$ aq.	Na_2CO_3	$Na_2CO_3 + 10$ aq.
1,007	1	1,4	0,67	1,807	6,8	18,2
1,014	2	2,8	1,33	3,587	13,5	36,4
1,022	3	4,4	2,09	5,637	21,4	57,6
1,029	4	5,8	2,76	7,444	28,4	76,6
1,036	5	7,2	3,43	9,251	35,5	95,8
1,045	6	9,0	4,29	11,570	44,8	120,9
1,052	7	10,4	4,94	13,323	52,0	140,2
1,060	8	12,0	5,71	15,400	60,5	163,2
1,067	9	13,4	6,37	17,180	68,0	183,3
1,075	10	15,0	7,12	19,203	76,5	206,4
1,083	11	16,6	7,88	21,252	85,3	230,2
1,091	12	18,2	8,62	23,248	94,0	253,6
1,100	13	20,0	9,43	25,432	103,7	279,8
1,108	14	21,6	10,19	27,482	112,9	304,5
1,116	15	23,2	10,95	29,532	122,2	329,6
1,125	16	25,0	11,81	31,851	132,9	358,3
1,134	17	26,8	12,61	34,009	143,0	385,7
1,142	18	28,4	13,16	35,493	150,3	405,3
1,152	19	30,4	14,24	38,405	164,1	442,4

16. Specific Gravity of solutions of Common Salt at 15° C.

(Gerlach.)

Specific Gravity	Percent Na Cl	Specific Gravity	Percent Na Cl	Specific Gravity	Percent Na Cl
1,00725	1	1,07335	10	1,14315	19
1,01450	2	1,08097	11	1,15107	20
1,02174	3	1,08859	12	1,15931	21
1,02899	4	1,09622	13	1,16755	22
1,03624	5	1,10384	14	1,17580	23
1,04366	6	1,11146	15	1,18404	24
1,05108	7	1,11938	16	1,19228	25
1,05851	8	1,12730	17	1,20098	26
1,06593	9	1,13523	18	1,20433	26,395

17. Specific Gravity of solutions of Glauber's Salt at 19° C.

(Schiff.)

Specific Gravity	Percent $Na_2SO_4 + 10$ aq.	Percent Na_2SO_4	Specific Gravity	Percent $Na_2SO_4 + 10$ aq.	Percent Na_2SO_4
1,0040	1	0,441	1,0642	16	7,056
1,0079	2	0,881	1,0683	17	7,497
1,0118	3	1,323	1,0725	18	7,938
1,0158	4	1,764	1,0766	19	8,379
1,0198	5	2,205	1,0807	20	8,820
1,0238	6	2,646	1,0849	21	9,261
1,0278	7	3,087	1,0890	22	9,702
1,0318	8	3,528	1,0931	23	10,143
1,0358	9	3,969	1,0973	24	10,584
1,0398	10	4,410	1,1015	25	11,025
1,0439	11	4,851	1,1057	26	11,466
1,0479	12	5,292	1,1100	27	11,907
1,0520	13	5,373	1,1142	28	12,348
1,0560	14	6,174	1,1184	29	12,789
1,0601	15	6,615	1,1226	30	13,230

18. Specific Gravity of Sodium Bisulphite at 15° C.

Specific Gravity	Degrees Bé	Percent $NaHSO_3$	Percent SO_2
1,008	1	1,6	0,4
1,022	3	2,1	1,3
1,038	5	3,6	2,2
1,052	7	5,1	3,1
1,068	9	6,5	3,9
1,084	11	8,0	4,8
1,100	13	9,5	5,7
1,116	15	11,2	6,8
1,134	17	12,8	7,8
1,152	19	14,6	9,0
1,171	21	16,5	10,2
1,190	23	18,5	11,5
1,210	25	20,9	12,9
1,230	27	23,5	14,5
1,252	29	25,9	15,9
1,275	31	28,9	17,8
1,298	33	31,7	19,6
1,321	35	34,7	22,5
1,345	37	38	23,6

19. Specific Gravity of solutions of Acetate of Soda at 17,5° C.

(Gerlach.)

Specific Gravity	Percent $NaC_2H_3O_2$	Percent $NaC_2H_3O_2 + 3\ H_2O$
1,015	3,015	5
1,031	6,030	10
1,047	9,045	15
1,063	12,060	20
1,0795	15,075	25
1,0960	18,090	30
1,1130	21,105	35
1,1305	24,120	40
1,1485	27,135	45
1,1670	30,150	50

20. Specific Gravity of solutions of Chloride of Lime at 15° C.

Specific Gravity	Degrees Bé	grms active Chlorine per litre
1,105	13,6	64
1,097	12,6	60
1,087	11,5	55
1,078	10,4	50
1,069	9,2	45
1,060	8	40
1,053	7	35
1,045	6	30
1,037	5	25
1,030	4	20
1,023	3	15
1,015	2	10
1,008	1	5

21. Specific Gravity of solutions of Sulphocyanide of Calcium at 17° C.

Specific Gravity	Degrees Bé	grms $Ca(CNS)_2$ per litre	grms CaO per litre
1,132	16,7	220	79,4
1,126	16,1	210	75,8
1,121	15,5	201,24	72,24
1,114	14,7	190	68,6
1,108	13,9	180	65,0
1,102	13,2	170	61,4
1,096	12,5	160	57,8
1,090	11,9	150	54,2
1,084	11,1	140	50,6
1,078	10,4	130	47,0
1,072	9,6	120	43,4
1,066	8,8	110	39,7
1,060	8,0	100	36,0
1,054	7,3	90	32,4
1,048	6,5	80	28,8
1,042	5,7	70	25,2
1,036	4,9	60	21,6
1,030	4,1	50	18,0
1,024	3,3	40	14,4
1,018	2,5	30	10,8
1,012	1,7	20	7,2
1,006	0,9	10	3,6

22. Specific Gravity of solutions of Acetate of Calcium at 15° C.

Specific Gravity	Degrees Bé	Percent $Ca(C_2H_3O_2)_2$
1,0260	3,4	5
1,0530	7,1	10
1,0792	10,5	15
1,1051	13,6	20
1,1321	16,8	25
1,1594	19,8	30

23. Specific Gravity of solutions of Chloride of Alumina at 15° C.

(Gerlach.)

Specif. Grav.	Percent Al_2Cl_6	Specif. Grav.	Percent Al_2Cl_6	Specif. Grav.	Percent Al_2Cl_6	Specif. Grav.	Percent Al_2Cl_6
1,00721	1	1,08902	12	1,17953	23	1,28080	34
1,01443	2	1,09684	13	1,18815	24	1,29046	35
1,02164	3	1,10466	14	1,19676	25	1,30066	36
1,02885	4	1,11248	15	1,20584	26	1,31086	37
1,03603	5	1,12073	16	1,21493	27	1,32106	38
1,04353	6	1,12897	17	1,22406	28	1,33126	39
1,05099	7	1,13721	18	1,23310	29	1,34146	40
1,05845	8	1,14545	19	1,24219	30	1,35224	41
1,06591	9	1,15370	20	1,25184	31	1,35359	41,126
1,07337	10	1,16231	21	1,26149	32		
1,08120	11	1,17092	22	1,27115	33		

24. Specific Gravity of solutions of Chlorate of Alumina at 17° C.

(prepared from Bariumchlorate and Sulphate of Alumina).

Specific Gravity	Degrees Bé	grms Al_2O_3 per litre	Specific Gravity	Degrees Bé	grms Al_2O_3 per litre
1,302	33,5	65	1,160	19,8	35
1,277	31,3	60	1,138	17,4	30
1,252	29,0	55	1,116	15,0	25
1,235	27,4	51,8	1,095	12,4	20
1,227	26,6	50	1,073	9,8	15
1,205	24,5	45	1,050	6,7	10
1,182	22,2	40	1,026	3,5	5

25. Specific Gravity of solutions of Sulphate of Alumina at 15° C.

Specific Gravity	Percent $Al_2(SO_4)_3$	Specific Gravity	Percent $Al_2(SO_4)_3$
1,0170	1	1,1467	14
1,0270	2	1,1574	15
1,0370	3	1,1668	16
1,0470	4	1,1770	17
1,0569	5	1,1876	18
1,0670	6	1,1971	19
1,0768	7	1,2074	20
1,0870	8	1,2168	21
1,0968	9	1,2274	22
1,1071	10	1,2375	23
1,1171	11	1,2473	24
1,1270	12	1,2573	25
1,1369	13		

26. Specific gravity of solutions of Sulphocyanide of Alumina at 17° C.

(prepared from Sulphocyanide of Barium and Sulphate of Alumina).

Specific Gravity	Degrees Bé	grms Al_2O_3 per litre	Specific Gravity	Degrees Bé	grms Al_2O_3 per litre
1,209	24,9	35	1,104	13,5	17,5
1,194	23,4	32,5	1,089	11,8	15
1,179	21,9	30	1,074	9,9	12,5
1,164	20,2	27,5	1,059	7,9	10
1,149	18,7	25	1,044	5,9	7,5
1,135	17,1	22,6	1,029	4,0	5
1,119	15,3	20	1,015	2,2	2,5

27. Specific Gravity of Nitrate of Alumina at 17° C.

Specific Gravity	Degrees Bé	grms Al_2O_3 per litre	Specific Gravity	Degrees Bé	grms Al_2O_3 per litre
1,156	19,3	49,24	1,091	12	30
1,145	18,3	46	1,075	10	25
1,135	17,1	43	1,059	7,9	20
1,125	16	40	1,043	5,8	15
1,115	14,9	37	1,027	3,7	10
1,108	14	35	1,013	1,7	5

28. Specific Gravity of solutions of Nitrate-Mordant (Nitro-Acetate of Alumina) at 17° C.

Specific Gravity	Degrees Bé	grms Al_2O_3 per litre	Specific Gravity	Degrees Bé	grms Al_2O_3 per litre
1,160	19,8	56,4	1,083	11,0	30
1,156	19,4	55	1,068	9,1	25
1,141	17,8	50	1,054	7,2	20
1,126	16,1	45	1,039	5,3	15
1,112	14,4	40	1,025	3,4	10
1,097	12,7	35	1,012	1,6	5

29. Specific Gravity of solutions of Acetate of Alumina at 17° C.

Specific Gravity	Degrees Bé	grms Al_2O_3 per litre
1,100	13,0	40,8
1,098	12,8	40
1,086	11,3	35
1,074	9,9	30
1,062	8,3	25
1,050	6,7	20
1,038	5,0	15
1,025	3,4	10
1,012	1,6	5

30. Specific Gravity of solutions of Tartrate of Alumina at 17° C.

Specific Gravity	Degrees Bé	grms Al_2O_3 per litre	Specific Gravity	Degrees Bé	grms Al_2O_3 per litre
1,390	40,5	130	1,195	23,5	65
1,375	39,4	125	1,180	22,0	60
1,360	38,2	120	1,165	20,4	55
1,345	37,0	115	1,150	18,8	50
1,330	35,8	110	1,135	17,1	45
1,315	34,6	105	1,120	15,4	40
1,300	33,3	100	1,105	13,6	35
1,285	32,0	95	1,090	11,9	30
1,270	30,6	90	1,075	10,0	25
1,255	29,3	85	1,060	8,0	20
1,240	27,9	80	1,045	6,0	15
1,225	26,4	75	1,030	4,1	10
1,210	25,0	70	1,015	2,1	5

31. Specific Gravity of solutions of Tartar emetic at 17,5° C. (Streit.)

Specific Gravity	Percent tartar emetic	Specific Gravity	Percent tartar emetic	Specific Gravity	Percent tartar emetic
1,005	0,5	1,015	2,5	1,031	4,5
1,007	1,0	1,018	3,0	1,035	5,0
1,009	1,5	1,022	3,5	1,038	5,5
1,012	2,0	1,027	4,0	1,044	6,0

32. Specific Gravity of solutions of Tin crystals at 15° C. (Gerlach).

Specific Gravity	Percent $SnCl_2 + 2H_2O$	Specific Gravity	Percent $SnCl_2 + 2H_2O$	Specific Gravity	Percent $SnCl_2 + 2H_2O$
1,013	2	1,212	28	1,497	54
1,026	4	1,230	30	1,525	56
1,040	6	1,249	32	1,554	58
1,054	8	1,268	34	1,582	60
1,068	10	1,288	36	1,613	62
1,083	12	1,309	38	1,644	64
1,097	14	1,330	40	1,677	66
1,113	16	1,352	42	1,711	68
1,128	18	1,374	44	1,745	70
1,144	20	1,397	46	1,783	72
1,161	22	1,421	48	1,821	74
1,177	24	1,445	50	1,840	75
1,194	26	1,471	52		

33. Specific Gravity of solutions of Nitro-Perchloride of tin at 15° C.

Specific Gravity	Degrees Bé	grms Sn per litre	Specific Gravity	Degrees Bé	grms Sn per litre
1,024	3,3	10	1,310	34,2	140
1,046	6,2	20	1,332	36,0	150
1,068	9,1	30	1,354	37,7	160
1,090	11,9	40	1,376	39,6	170
1,112	14,4	50	1,398	41,1	180
1,134	17,0	60	1,420	42,7	190
1,156	19,4	70	1,442	44,3	200
1,178	21,7	80	1,464	45,7	210
1,200	24,0	90	1,486	47,2	220
1,222	26,2	100	1,508	48,5	230
1,244	28,3	110	1,530	50,0	240
1,266	30,3	120	1,552	51,4	250
1,288	32,3	130	1,562	51,9	254,7

34. Specific Gravity of solutions of Acetate of Tin at 15° C.

Specific Gravity	Degrees Bé	grms Sn per litre	Specific Gravity	Degrees Bé	grms Sn per litre
1,018	2,5	5	1,115	14,9	70
1,025	3,4	10	1,123	15,8	75
1,033	4,4	15	1,130	16,5	80
1,040	5,4	20	1,137	17,4	85
1,048	6,4	25	1,145	18,3	90
1,055	7,4	30	1,153	19,1	95
1,063	8,4	35	1,160	19,8	100
1,070	9,4	40	1,167	20,6	105
1,077	10,3	45	1,175	21,4	110
1,085	11,2	50	1,183	22,3	115
1,093	12,1	55	1,190	23,0	120
1,100	13,0	60	1,192	23,2	121,5
1,107	13,9	65			

35. Specific Gravity of solutions of Tartrate of Tin at 15° C.

Specific Gravity	Degrees Bé	grms Sn per litre	Specific Gravity	Degrees Bé	grms Sn per litre
1,015	2,1	5	1,155	19,3	40
1,035	4,7	10	1,175	21,4	45
1,055	7,4	15	1,195	23,5	50
1,075	10,0	20	1,214	25,4	55
1,095	12,4	25	1,233	27,2	60
1,115	14,9	30	1,252	29,0	65
1,135	17,1	35	1,260	29,7	66,87

36. Specific Gravity of solutions of Sulphate of Zinc at 15° C. (Gerlach.)

Specific Gravity	Degrees Bé	Percent $ZnSO_4$	Percent $ZnSO_4 + 7H_2O$
1,0288	3,8	2,805	5
1,0593	8,0	5,611	10
1,0905	12,0	8,416	15
1,1236	17,2	11,220	20
1,1574	19,5	14,027	25
1,1933	23,3	16,832	30
1,2315	27,0	19,637	35
1,2709	30,7	22,443	40
1,3100	34,2	25,248	45
1,3532	37,6	28,054	50
1,3986	41,0	30,859	55
1,4451	44,4	33,664	60

37. Specific Gravity of solutions of Copper Chloride at 17,5° C. (Franz.)

Specific Gravity	Degrees Bé	Percent $CuCl_2$	Specific Gravity	Degrees Bé	Percent $CuCl_2$
1,0182	2,4	2	1,2501	28,8	22
1,0364	4,8	4	1,2779	31,4	24
1,0548	7,4	6	1,3058	33,8	26
1,0734	9,8	8	1,3338	36	28
1,0920	12,2	10	1,3618	38,1	30
1,1178	15,2	12	1,3950	40,5	32
1,1436	18	14	1,4282	43,3	34
1,1696	20,9	16	1,4615	45,5	36
1,1958	23,6	18	1,4949	47,8	38
1,2226	26,2	20	1,5284	49,9	40

38. Specific Gravity of solutions of Sulphate of Copper at 17° C.

Specific Gravity	Percent $CuSO_4 + 5H_2O$	Specific Gravity	Percent $CuSO_4 + 5H_2O$
1,0126	2	1,0933	14
1,0254	4	1,1063	16
1,0384	6	1,1208	18
1,0516	8	1,1354	20
1,0649	10	1,1501	22
1,0785	12	1,1659	24

39. Specific Gravity of solutions of Bisulphite of Nickel at 15° C.

Specific Gravity	Degrees Bé	grms Ni O per litre	Specific Gravity	Degrees Bé	grms Ni O per litre
1,169	20,7	79	1,084	11,0	40
1,158	19,6	75	1,073	9,8	35
1,147	18,5	70	1,063	8,4	30
1,136	17,3	65	1,052	7,0	25
1,126	16,1	60	1,042	5,7	20
1,115	14,9	55	1,031	4,3	15
1,105	13,6	50	1,021	2,9	10
1,094	12,3	45	1,010	1,4	5

40. Specific Gravity of solutions of Acetate of Nickel at 15° C.

Specific Gravity	Degrees Beaumé	grms NiO per litre
1,095	12,4	52
1,091	12,0	50
1,082	10,9	45
1,073	9,7	40
1,064	8,6	35
1,055	7,4	30
1,046	6,2	25
1,037	5,0	20
1,028	3,8	15
1,019	2,6	10
1,010	1,4	5

41. Specific Gravity of solutions of Chrome-Chloride at 15° C.

Specific Gravity	Degrees Bé	grms Cr_2O_3 per litre	Specific Gravity	Degrees Bé	grms Cr_2O_3 per litre
1,008	1,2	5	1,148	18,6	90
1,016	2,3	10	1,164	20,2	100
1,032	4,3	20	1,180	22,0	110
1,048	6,5	30	1,197	23,8	120
1,065	8,7	40	1,213	25,3	130
1,082	10,9	50	1,229	26,8	140
1,098	12,9	60	1,245	28,4	150
1,115	14,9	70	1,261	29,8	160
1,131	16,6	80	1,276	31,2	170

42. Specific Gravity of solutions of Chrome-Bisulphite at 17° C.

Specific Gravity	Degrees Bé	grms Cr_2O_3 per litre	Specific Gravity	Degrees Bé	grms Cr_2O_3 per litre
1,160	19,8	80	1,080	10,6	40
1,150	18,8	75	1,070	9,4	35
1,140	17,7	70	1,060	8,0	30
1,130	16,5	65	1,050	6,7	25
1,120	15,4	60	1,040	5,4	20
1,110	14,2	55	1,030	4,1	15
1,100	13,0	50	1,020	2,7	10
1,090	11,9	45	1,010	1,4	5

43. Specific Gravity of solutions of Nitro-Acetate of Chrome at 17° C.

(prepared from Chrome Alum, Nitrate and Acetate of Lead).

Specific Gravity	Degrees Beaumé	grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	grms Cr_2O_3 per litre
1,010	1,7	5	1,104	13,5	40
1,025	3,4	10	1,117	15,1	45
1,038	5,1	15	1,130	16,5	50
1,051	6,9	20	1,144	18,1	55
1,064	8,6	25	1,158	19,5	60
1,077	10,4	30	1,165	20,3	62
1,090	11,9	35			

44. Specific Gravity of solutions of sesqui — Acetate of Chrome at 17° C.

Specific Gravity	Degrees Beaumé	grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	grms Cr_2O_3 per litre
1,007	1	5	1,084	11,1	60
1,014	2	10	1,091	12,0	65
1,021	3	15	1,098	12,8	70
1,028	4	20	1,105	13,6	75
1,035	4,9	25	1,112	14,5	80
1,042	5,8	30	1,119	15,3	85
1,049	6,6	35	1,126	16,1	90
1,056	7,5	40	1,133	16,9	95
1,063	8,4	45	1,140	17,6	100
1,070	9,3	50	1,147	18,5	105
1,077	10,2	55	1,151	19	107

45. Specific Gravity of solutions of basic Acetate of Chrome at 15° C.

Specific Gravity	Degrees Beaumé	grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	grms Cr_2O_3 per litre
1,006	1,0	5	1,089	11,8	70
1,013	2,0	10	1,096	12,5	75
1,019	2,7	15	1,102	13,2	80
1,025	3,4	20	1,108	13,9	85
1,031	4,2	25	1,115	14,9	90
1,037	5,0	30	1,122	15,7	95
1,043	5,8	35	1,129	16,4	100
1,050	6,7	40	1,136	17,2	105
1,056	7,5	45	1,143	18,0	110
1,063	8,4	50	1,150	18,8	115
1,069	9,3	55	1,157	19,5	120
1,076	10,1	60	1,161	19,9	122
1,083	11,0	65			

46. Specific Gravity of Solutions of Chrome Mordant G A I at 15° C.

Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre
1,012	1,7	10	1,176	21,5	160
1,023	3,1	20	1,187	22,7	170
1,034	4,6	30	1,198	23,8	180
1,045	6,0	40	1,208	24,8	190
1,056	7,6	50	1,219	25,9	200
1,067	9,0	60	1,230	26,9	210
1,078	10,4	70	1,241	28,0	220
1,089	11,8	80	1,252	29,0	230
1,099	12,9	90	1,263	30,0	240
1,110	14,2	100	1,274	31,0	250
1,121	15,5	110	1,285	32,0	260
1,132	16,7	120	1,296	32,9	270
1,143	18,1	130	1,307	33,9	280
1,154	19,2	140	1,318	34,9	290
1,165	20,3	150	1,325	35,4	296

47. Specific Gravity of Solutions of Chrome Mordant G A II at 15° C.

Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre
1,015	2,1	10	1,175	21,4	170
1,025	3,4	20	1,185	22,5	180
1,035	4,7	30	1,195	23,5	190
1,045	6,0	40	1,205	24,5	200
1,055	7,4	50	1,215	25,5	210
1,065	8,7	60	1,225	26,5	220
1,075	10,0	70	1,235	27,4	230
1,085	11,2	80	1,245	28,4	240
1,095	12,4	90	1,250	29,4	250
1,105	13,6	100	1,266	30,3	260
1,115	14,9	110	1,276	31,3	270
1,125	16,0	120	1,287	32,2	280
1,135	17,1	130	1,298	33,2	290
1,145	18,3	140	1,309	34,1	300
1,155	19,3	150	1,320	35,1	310
1,165	20,3	160	1,328	35,7	317,4

48. Specific Gravity of Solutions of Chrome Mordant GAIII at 15° C.

Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre
1,011	1,6	10	1,170	20,9	160
1,022	3,0	20	1,181	22,1	170
1,033	4,5	30	1,191	23,1	180
1,044	5,9	40	1,202	24,2	190
1,055	7,4	50	1,219	25,3	200
1,065	8,7	60	1,224	26,3	210
1,076	10,1	70	1,235	27,4	220
1,086	11,3	80	1,246	28,5	230
1,097	12,6	90	1,256	29,4	240
1,108	13,9	100	1,267	30,4	250
1,118	15,2	110	1,278	31,4	260
1,128	16,4	120	1,289	32,2	270
1,139	17,6	130	1,300	33,3	280
1,149	18,7	140	1,311	34,3	290
1,159	19,7	150	1,316	34,7	296

49. Specific Gravity of Solutions of Tartrate of Chrome at 17° C.

Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre
1,252	29,0	110	1,124	15,9	55
1,240	27,9	105	1,113	14,7	50
1,228	26,7	100	1,102	13,3	45
1,216	25,6	95	1,091	12,0	40
1,204	24,4	90	1,079	10,5	35
1,192	23,2	85	1,067	9,0	30
1,180	22,0	80	1,056	7,5	25
1,169	20,8	75	1,045	5,0	20
1,157	19,5	70	1,034	4,6	15
1,146	18,3	65	1,023	3,1	10
1,135	17,1	60	1,012	1,6	5

50. Specific Gravity of Solutions of Lactate of Chrome at 17° C.

Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre	Specific Gravity	Degrees Beaumé	Grms Cr_2O_3 per litre
1,218	25,8	86	1,113	14,7	40
1,205	24,5	80	1,101	13,2	35
1,193	23,3	75	1,090	11,9	30
1,182	22,2	70	1,078	10,4	25
1,170	20,9	65	1,067	9,0	20
1,159	19,7	60	1,055	7,4	15
1,147	18,5	55	1,044	5,8	10
1,136	17,2	50	1,022	3,0	5
1,124	15,9	45			

51. Specific Gravity of Solutions of Pyroligneite of Iron at 18° C.

Specific Gravity	Degrees Beaumé	Grms Fe_2O_3 per litre
1,274	31,0	190
1,266	30,3	185
1,258	29,5	180
1,250	28,8	175
1,242	28,0	170
1,235	27,4	165
1,228	26,7	160
1,221	26,1	155
1,214	25,4	150
1,207	24,7	145
1,200	24,0	140
1,193	23,3	135
1,186	22,6	130
1,179	21,9	125
1,172	21,2	120
1,165	20,3	115
1,158	19,6	110
1,151	18,9	105
1,144	18,2	100
1,137	17,4	95
1,130	16,5	90
1,123	15,7	85
1,116	15,0	80
1,109	14,1	75
1,102	13,2	70
1,095	12,4	65
1,088	11,7	60
1,081	10,7	55
1,074	9,9	50
1,067	9,0	45
1,060	8,0	40
1,053	7,1	35
1,046	6,1	30
1,039	5,2	25
1,032	4,3	20
1,025	3,4	15
1,018	2,4	10
1,010	1,4	5

52. Specific Gravity of Ferrous Sulphate (Copperas) at 15° C.

Specific Gravity	Percent $FeSO_4 + 7aq.$	Specific Gravity	Percent $FeSO_4 + 7aq.$
1,011	2	1,082	15
1,021	4	1,112	20
1,032	6	1,143	25
1,043	8	1,174	30
1,054	10	1,206	35
1,065	12	1,239	40

53. Specific Gravity of Ethyl Alcohol and Percentage by weight at 60° F.

(Fownes.)

Specific Gravity	Percent by weight C_2H_6O	Specific Gravity	Percent by weight C_2H_6O	Specific Gravity	Percent by weight C_2H_6O
0,9991	0,5	0,9511	34	0,8769	68
0,9981	1	0,9490	35	0,8745	69
0,9965	2	0,9470	36	0,8721	70
0,9947	3	0,9452	37	0,8696	71
0,9930	4	0,9434	38	0,8672	72
0,9914	5	0,9416	39	0,8649	73
0,9898	6	0,9396	40	0,8625	74
0,9884	7	0,9376	41	0,8603	75
0,9869	8	0,9356	42	0,8581	76
0,9855	9	0,9335	43	0,8557	77
0,9841	10	0,9314	44	0,8535	78
0,9828	11	0,9292	45	0,8508	79
0,9815	12	0,9270	46	0,8483	80
0,9802	13	0,9249	47	0,8459	81
0,9789	14	0,9228	48	0,8434	82
0,9778	15	0,9206	49	0,8408	83
0,9766	16	0,9184	50	0,8382	84
0,9753	17	0,9160	51	0,8357	85
0,9741	18	0,9135	52	0,8331	86
0,9728	19	0,9113	53	0,8305	87
0,9716	20	0,9090	54	0,8279	88
0,9704	21	0,9069	55	0,8254	89
0,9691	22	0,9047	56	0,8228	90
0,9678	23	0,9025	57	0,8199	91
0,9665	24	0,9001	58	0,8172	92
0,9652	25	0,8979	59	0,8145	93
0,9638	26	0,8956	60	0,8118	94
0,9623	27	0,8932	61	0,8089	95
0,9609	28	0,8908	62	0,8061	96
0,9593	29	0,8886	63	0,8031	97
0,9578	30	0,8863	64	0,8001	98
0,9560	31	0,8840	65	0,7969	99
0,9544	32	0,8816	66	0,7938	100
0,9528	33	0,8793	67		

54. Specific Gravity of Solutions of Glycerine.

Percent Water	Specific Gravity Champion and Pellet	Degrees Beaumé Berthelot	Percent Water	Specific Gravity Champion and Pellet	Degrees Beaumé Berthelot
0,0	1,2640	31,2	11,0	1,2350	28,6
0,5	1,2625	31,0	11,5	1,2335	28,4
1.0	1,2612	30,9	12,0	1,2322	28,3
1,5	1,2600	30,8	12,5	1,2307	28,2
2.0	1,2585	30,7	13,0	1,2295	28,0
2,5	1,2575	30,6	13,5	1,2280	27,8
3,0	1,2560	30,4	14,0	1,2270	27,7
3,5	1,2545	30,3	14,5	1,2255	27,6
4.0	1,2532	30,2	15,0	1,2242	27,4
4.5	1,2520	30,1	15,5	1,2230	27,3
5.0	1,2505	30,0	16,0	1,2217	27,2
5.5	1,2490	29,9	16,5	1,2202	27,0
6,0	1,2480	29,8	17,0	1,2190	26,9
6,5	1,2465	29,7	17,5	1,2177	26,8
7,0	1,2455	29,6	18,0	1,2165	26,7
7,5	1,2440	29,5	18,5	1,2150	26,5
8,0	1,2427	29,3	19,0	1,2137	26,4
8,5	1,2412	29,2	19,5	1,2125	26,3
9,0	1,2400	29,0	20,0	1,2112	26,2
9.5	1,2390	28,9	20,5	1,2100	26,0
10,0	1,2375	28,8	21,0	1,2085	25,9
10.5	1,2362	28,7			

55. Testing water for its degree of hardness.

Total degree of hardness. 100 cc of the sample are filled into a glass stoppered cylinder (of 200 cc capacity) and to this some normal soap solution is gradually added until the froth which is formed in shaking, remains standing over the liquid for 5 min. If the water is harder than 12°, it is diluted: 10 cc of the sample are mixed with 90 cc of distilled water and then tested. The consumed number of cc of normal soap solution indicates the total degree of hardness.

Constant degree of hardness. 500 cc of the sample are boiled for 15 min. If any salts are precipitated in boiling, these are filtered and the solution filled up again to 500 cc with distilled water. Of this 100 cc are poured into a glass stoppered cylinder and the test then carried out as described above.

German degrees of hardness indicate milligrammes of CaO in 100 gr. Water, French degrees of hardness refer to milligrammes of $CaCO_3$ in 100 gr. Water, English degrees of hardness indicate grains of $CaCO_3$ in 1 Gall. of Water.

56. Table for determining the hardnes of water.

Soap ccm	German Degrees of hardness	Soap ccm	German Degrees of hardness	Soap ccm	German Degrees of hardness
3,4	0,5	18,9	4,5	34,7	8,9
4,2	0,7	19,7	4,7	35,0	9,0
5,0	0,9	20,4	4,9	35,3	9,1
5,4	1,0	20,8	5,0	36,0	9,3
5,8	1,1	21,2	5,1	36,7	9,5
6,6	1,3	21,9	5,3	37,4	9,7
7,4	1,5	22,6	5,5	38,1	9,9
8,2	1,7	23,3	5,7	38,4	10,0
9,0	1,9	24,0	5,9	38,7	10,1
9,4	2,0	24,4	6,0	39,4	10,3
9,8	2,1	24,8	6,1	40,1	10,5
10,5	2,3	25,5	6,3	40,8	10,7
11,3	2,5	26,2	6,5	41,5	10,9
12,1	2,7	26,9	6,7	41,8	11,0
12,8	2,9	27,6	6,9	41,9	11,1
13,2	3,0	28,0	7,0	42,4	11,2
13,6	3,1	28,4	7,1	42,8	11,3
14,3	3,3	29,1	7,3	43,1	11,4
15,1	3,5	29,8	7,5	43,4	11,5
15,9	3,7	30,5	7,7	43,7	11,6
16,6	3,9	31,2	7,9	44,0	11,7
17,0	4,0	31,6	8,0	44,4	11,8
17,4	4,1	31,9	8,1	44,7	11,9
17,8	4,2	32,6	8,3	45,0	12,0
18,1	4,3	33,3	8,5		
18,5	4,4	34,0	8,7		

57. Comparative table of German, English and French degrees of hardness.

German	English	French	German	English	French	German	English	French
0,5	0,62	0,9	3,92	4,9	7,0	8,5	10,63	15,18
0,56	0,7	1,0	4,0	5,0	7,17	8,8	11,0	15,75
0,7	0,87	1,26	4,48	5,60	8,00	8,96	11,20	16,00
0,8	1,0	1,43	4,5	5,63	8,06	9,0	11,25	16,08
1,0	1,25	1,79	4,8	6,00	8,60	9,5	11,88	17.0
1,12	1,41	2,0	5,0	6,25	8,95	10,0	12,50	17,9
1,5	1,88	2,69	5,04	6,30	9,00	10,08	12,6	18,0
1,68	2,10	3,0	5,5	6,88	9,85	10,4	13,0	18,6
2,0	2,5	3,58	5,6	7,00	10.00	10,5	13,13	18,78
2,24	2,8	4,0	6,0	7,5	10,74	10,64	13,3	19,0
2,4	3,0	4,3	6,5	8,13	11,64	11,0	13,75	19,68
2,5	3,13	4,48	6,7	8.38	12.00	11,2	14.00	20,0
2,8	3,5	5,0	7,0	8,75	12,55	11,5	14.38	20,59
3,0	3,75	5,37	7,28	9,10	13,43	11,76	14,07	21,0
3,2	4,0	5,73	7,84	9,8	14,00	12,0	15,0	21,5
3,36	4,2	6,0	8,0	10,0	14,30			
3,5	4,38	6,27	8,4	10,5	15,0			

58. Table for determining the quantity of Acetic Acid required to correct the water.

To 1 litre of water a trace of Methyl Orange is added and normal Hydrochloric Acid 1 : 10 (10 ccm Hydrochloric Acid 34,2 ° Tw per litre) poured into it until a change of colour is noticeable. The table shows what quantity of Acetic Acid of different strength is required for the correction of 100 litres of water; (the first column referring to normal Acid 1 : 10).

Normal Hydrochloric Acid 1 : 10 ccm per litre water	Grammes of Acetic Acid necessary to correct 100 litres water						
	8° Bé	7° Bé	6° Bé	5° Bé	4° Bé	3° Bé	2° Bé
1	1,3	1,5	2	2,4	3	3,5	6
2	2,6	3	4	4,8	6	7	12
3	3,9	4,5	6	7,2	9	10,5	18
4	5,2	6	8	9,6	12	14	24
5	6,5	7,5	10	12	15	17,5	30
6	7,8	9	12	14,4	18	21	36
7	9,1	10,5	14	16,8	21	24,5	42
8	10,4	12	16	19,2	24	28	48
9	11,7	13,5	18	21,6	27	31,5	54
10	13	15	20	24	30	35	60
11	14,3	16,5	22	26,4	33	38,5	66
12	15,6	18	24	28,8	36	42	72
13	16,9	19,5	26	31,2	39	45,5	78
14	18,2	21	28	33,6	42	49	84
15	19,5	22,5	30	36	45	52,5	90
16	20,8	24	32	38,4	48	56	96
17	22,1	25,5	34	40,8	51	59,5	102
18	23,4	27	36	43,2	54	63	108
19	24,7	28,5	38	45,6	57	66,5	114
20	26	30	40	48	60	70	120
21	27,3	31,5	42	50,4	63	73,5	126
22	28,6	33	44	52,8	66	77	132
23	29,9	34,5	46	55,2	69	80,5	138
24	31,2	36	48	57,6	72	84	144
25	32,5	37,5	50	60	75	87,5	150
26	33,8	39	52	62,4	78	91	156
27	35,1	40,5	54	64,8	81	94,5	162
28	36,4	42	56	67,2	84	98	168
29	37,7	43,5	58	69,6	87	101,5	174
30	39	45	60	72	90	105	180
31	40,3	46,5	62	74,4	93	108,5	186
32	41,6	48	64	76,8	96	112	192
33	42,9	49,5	66	79,2	99	115,5	198
34	44,2	51	68	81,6	102	119	204

Normal Hydrochloric Acid 1:10 ccm per litre water	Grammes of Acetic Acid necessary to correct 100 litres water						
	8° Bé	7° Bé	6° Bé	5° Bé	4° Bé	3° Bé	2° Bé
35	45,5	52,5	70	84	105	122,5	210
36	46,8	54	72	86,4	108	126	216
37	48,1	55,5	74	88,8	111	129,5	222
38	49,4	57	76	91,2	114	133	228
39	50,7	58,5	78	93,6	117	136,5	234
40	52	60	80	96	120	140	240
41	53,3	61,5	82	98,4	123	143,5	246
42	54,6	63	84	100,8	126	147	252
43	55,9	64,5	86	103,2	129	150,5	258
44	57,2	66	88	105,6	132	154	264
45	58,5	67,5	90	108	135	157,5	270
46	59,8	69	92	110,4	138	161	276
47	61,1	70,5	94	112,8	141	164,5	282
48	62,4	72	96	115,2	144	168	288
49	63,7	73,5	98	117,6	147	171,5	294
50	65	75	100	120	150	175	300
51	66,3	76,5	102	122,4	153	178,5	306
52	67,6	78	104	124,8	156	182	312
53	68,9	79,5	106	127,2	159	185,5	318
54	70,2	81	108	129,6	162	189	324
55	71,5	82,5	110	132	165	192,5	330
56	72,8	84	112	134,4	168	196	336
57	74,1	85,5	114	136,8	171	199,5	342
58	75,4	87	116	139,2	174	203	348
59	76,7	88,5	118	141,6	177	206,5	354
60	78	90	120	144	180	210	360
61	79,3	91,5	122	146,4	183	213,5	366
62	80,6	93	124	148,8	186	217	372
63	81,6	94,5	126	151,2	189	220,5	378
64	83,2	96	128	153,6	192	224	384
65	84,5	97,5	130	156	195	227,5	390
66	85,8	99	132	158,4	198	231	396
67	87,1	100,5	134	160,8	201	234,5	402
68	88,4	102	136	163,2	204	238	408
69	89,7	103,5	138	165,6	207	241,5	414
70	91	105	140	168	210	245	420
71	92,3	106,5	142	170,4	213	248,5	426
72	93,6	108	144	172,8	216	252	432
73	94,9	109,5	146	175,2	219	255,5	438
74	96,2	111	148	177,6	222	259	444
75	97,5	112,5	150	180	225	262,5	450
76	98,8	114	152	182,4	228	266	456
77	100,1	115,5	154	184,8	231	269,5	462
78	101,4	117	156	187,2	234	273	468
79	102,7	118,5	158	189,6	237	276,5	474
80	104	120	160	192	240	280	480

Normal Hydrochloric Acid 1:10 ccm per litre water	Grammes of Acetic Acid necessary to correct 100 litres water						
	8° Bé	7° Bé	6° Bé	5° Bé	4° Bé	3° Bé	2° Bé
81	105,3	121,5	162	194,4	243	283,4	486
82	106,6	123	164	196,8	246	287	492
83	107,9	124,5	166	199,2	249	290,5	498
84	109,2	126	168	201,6	252	294	504
85	110,5	127,5	170	204	255	297,5	510
86	111,8	129	172	206,4	258	301	516
87	113,1	130,5	174	208,8	261	304,5	522
88	114,4	132	176	211,2	264	308	528
89	115,7	133,5	178	213,6	267	311,5	534
90	117	135	180	216	270	315	540
91	118,3	136,5	182	218,4	273	318,5	546
92	119,6	138	184	220,8	276	322	552
93	120,9	139,5	186	223,2	279	325,5	558
94	122,2	141	188	225,6	282	329	564
95	123,5	142,5	190	228	285	332,5	570
96	124,8	144	192	230,4	288	336	576
97	126,1	145,5	194	232,8	291	339,5	582
98	127,4	147	196	235,2	294	343	588
99	128,7	148,5	198	237,6	297	346,5	594
100	130	150	200	240	300	350	600

59. Soap Analysis.

a) **Water.** A certain quantity (about 3 g) of soap is mixed with perfectly dry sand (about 10 g) in a small porcelain dish and the whole weighed exactly.

After adding a few drops of alcohol to accelerate the evaporation, the sample is gradually dried until a constant weight is obtained. The loss indicated by the difference in weight represents water.

b) **Fatty Acid.** The following method will be found satisfactory for all practical purposes: A certain quantity of soap (3 g) is dissolved in a porcelain dish with water, the fatty Acid then precipitated with normal sulphuric Acid and melted with 10 g dry and pure wax. The wax cake which is easily separated on cooling, is rinsed in cold water and then dried first with Filter paper and then in the Exsiccator until a constant weight is obtained.

c) **Alkali.** The solution of b is neutralized with normal Soda lye (Phenolphtaleine reaction). The number of cc Soda lye, deducted from the number of cc Sulphuric Acid shows the total amount of alkali: 1 cc normal Sulphuric Acid equalling 0.031 g Na_2O.

Another method is to titrate 100 cc soap solution (containing 2—3 g. soap) whith normal Acid and Methyl Orange direct, until a red tinge is visible: 1 cc. normal Acid equalling 0.031 g Na_2O.

d) **Free Alkali.** (Qualitative test) Upon a fresh cross cut of the soap in question a few drops of Mercury chloride solution will produce a brownish yellow to reddish brown colour, according to the amount of free alkali.

e) **Glycerine.** 20—25 g soap are dissolved in 100 cc Water, then the fatty Acid precipitated with sulphuric Acid (Acid reaction) and removed with wax. The filtrate is neutralised with Potash, evaporated to dryness, powdered and extracted with pure alcohol. The extracted solution is filtered into a glass, of known tare and heated, on a water bath or direct, to 50—60° C. until constant weight is obtained. The remnant is glycerine.

f) **Unsaponified fat.** Very finely powdered and dried soap (20—25 g) are extracted with Ligroine in the Soxhlet's extraction apparatus for 3—4 h, the ligroine evaporated and the fat weighed. Traces of soap are soluble in Ligroine, therefore a correction is necessary: 100 cc Ligroine dissolve 0.01 Olive Oil soap.

60. Turkey Red Oil Analysis.

Primary test. The Oil must react slightly alkaline or neutral mixed with water a perfect emulsion must be obtained from which Oil drops are separated after a few hours. These drops must be perfectly soluble in Ammonia, otherwise unsaponified fat is present.

Water. According to Stein 10 g Oil are melted with 25 g dry wax in about 75 cc. saturated salt solution. The cake is dried and weighed. The increased weight of wax represents Oil free from water; the difference between 10 or the exact amount of Oil used is Water.

Fat (total). 100 cc. Oil are mixed in a graduated cylinder with 20 cc. Hydrochloric Acid (conc.) and then made up with saturated salt solution to 500 cc. The whole is shaken frequently and sligthly heated.

On cooling the fat swims on the salt solution. The number of cc shows direct the total amount of fat (this is sufficiently accurate for practical purposes).

61. Indigo Analysis.

One gramme of the well dried Indigo sample is weighed into a short wide tube; then 7 ccm Sulphuric Acid 66° Bé are added and the whole heated for $^1/_2$ h in steam of about 95° C. The solution is then poured into 100 cc. cold water and then filtered into a 1 litre wash bottle. After washing the filter with hot water until the latter is perfectly colourless, the solution and washwater are filled up to exactly 1 litre.

20 cc of this solution are diluted with 300 cc distilled water in a white porcelain dish of $^1/_2$ litre capacity and titrated with a Permanganate solution containing $^1/_2$ gramme $KMnO_4$ per litre. The Permanganate solution is added in drops while constantly stirring the Indigo solution. The titration is finished, when the blue has changed to gold yellow without any green reflexion.

For comparison a very pure Indigo of known percentage is always analysed simultaneously with the new sample. This enables one to find the percentage of the latter by a simple equation:

A=Indigo of known percentage requires 17.2 cc Permanganate
B= ,, ,, unknown ,, ,, 16.6 cc ,,
A=contains 99% Indigo
B= ,, therefore: B: 99 = 16.6:17.2
B = 95.5%

The result of the titration is generally controlled by a dye test. The same solutions that served for the titration, are used for dyeing. The Indigo of known percentage (the "type") is dyed in 3 different strenghts viz 10 gr. of wool yarn or cloth are dyed with 100, 98 and 96 cc.

The number of cc of the Indigo solution of unknown strength is found by multiplying by 100 the quotient of the titration

$$100 \cdot \frac{17.2}{16.6} = 100 \cdot 1{,}036 = 103{,}6 \text{ cc.}$$

Since the dye baths must not contain more than 4% free sulphuric Acid the superfluous Acid of the Indigo solutions must be neutralized with 0.1 cc Soda solution (1:10) for every 1 cc Indigo solution. The varying additions of Soda naturally produce varying amounts of Glauber's salt in the dyebaths. This difference is equalized by adding 2.7 cc Glauber's salt solution (1:10) for every deficient cc of Soda viz: The bath containing the highest percentage of Soda, will require **no** addition of Glauber's salt at all:

A: Type of Indigo (known percentage)
B: sample of Indigo (unknown percentage) } sol 1:1000.

1) for 100 cc. of A are required 10 cc Soda sol and 0,8 cc Glauber's salt sol
2) ,, 98 ,, ,, A ,, ,, 9.8 ,, ,, ,, ,, 1.3 ,, ,, ,, ,,
3) ,, 96 ,, ,, A ,, ,, 9.6 ,, ,, ,, ,, 1.9 ,, ,, ,, ,,
4) ,, 103,6 ,, ,, B ,, ,, 10.3 ,, ,, ,, no Glauber's salt.

For a second dyeing test the baths are prepared as stated above, but 50 cc of Flavazine S are added to each bath. Thus green shades are produced which are easier compared as regards depth and purity of shade than blues.

The dye tests are to be carried out simultaneously under exactly equal conditions as to temperature, time etc. The result will corroborate or correct the figures arrived at by titration.

Table

showing **Percentage** of colour and corresponding quantity in **grammes** per 100 **kilo** goods, and **lbs oz** and **grains** per 100 **lbs** goods.
1 lb = 16 oz = 7000 grains = 454 grammes
1 oz. = 437 1/2 grains; 1 gramme = 15.43 grains.
0·001 = 1/1000 %, 0·01 = 1/100 %; 0·10 = 1/10 %.

	per 100 kilo	per 100 lbs		per 100 kilo	per 100 lbs
%	grammes	lb oz grains	%	grammes	lb oz grains
0·001	1	7	0·34	340	5 193
0·002	2	14	0·35	350	5 263
0·003	3	21	0·36	360	5 333
0·004	4	28	0·37	370	5 403
0·005	5	35	0·38	380	6 35
0·006	6	42	0·39	390	6 105
0·007	7	49	0·40	400	6 175
0·008	8	56	0·41	410	6 245
0·009	9	63	0·42	420	6 315
0·01	10	70	0·43	430	6 385
0·02	20	140	0·44	440	7 18
0·03	30	210	0·45	450	7 88
0·04	40	280	0·46	460	7 158
0·05	50	350	0·47	470	7 228
0·06	60	420	0·48	480	7 298
0·07	70	1 53	0·49	490	7 368
0·08	80	1 123	0·50	500	8 —
0·09	90	1 193	0·51	510	8 70
0·10	100	1 263	0·52	520	8 140
0·11	110	1 333	0·53	530	8 210
0·12	120	1 403	0·54	540	8 280
0·13	130	2 35	0·55	550	8 350
0·14	140	2 106	0·56	560	8 420
0·15	150	2 176	0·57	570	9 53
0·16	160	2 246	0·58	580	9 123
0·17	170	2 316	0·59	590	9 193
0·18	180	2 386	0·60	600	9 263
0·19	190	3 18	0·61	610	9 333
0·20	200	3 88	0·62	620	9 403
0·21	210	3 158	0·63	630	10 35
0·22	220	3 229	0·64	640	10 105
0·23	230	3 299	0·65	650	10 175
0·24	240	3 369	0·66	660	10 245
0·25	250	4 —	0·67	670	10 315
0·26	260	4 70	0·68	680	10 385
0·27	270	4 140	0·69	690	11 18
0·28	280	4 210	0·70	700	11 88
0·29	290	4 280	0·71	710	11 158
0·30	300	4 350	0·72	720	11 228
0·31	310	4 420	0·73	730	11 298
0·32	320	5 53	0·74	740	11 368
0·33	330	5 123	0·75	750	12 —

	per 100 kilo	per 100 lbs		per 100 kilo	per 100 lbs
%	grammes	lb oz grains	%	grammes	lb oz grains
0·76	760	12 70	0·89	890	14 105
0·77	770	12 140	0·90	900	14 175
0·78	780	12 210	0·91	910	14 245
0·79	790	12 280	0·92	920	14 315
0·80	800	12 350	0·93	930	14 385
0·81	810	12 420	0·94	940	15 18
0·82	820	13 53	0·95	950	15 88
0·83	830	13 123	0·96	960	15 158
0·84	840	13 193	0·97	970	15 228
0·85	850	13 263	0·98	980	15 298
0·86	860	13 333	0·99	990	15 368
0·87	870	13 403	1	1 kilo	1
0·88	880	14 35			

Conversion of Kilogrammes into lbs english.

Kilogrammes into	cwts	qrs	lbs	oz	Approximate conversion into lbs
1	0	0	2	3 1/4	2 1/5
2	0	0	4	6 1/2	4 2/5
3	0	0	6	9 3/4	6 3/5
4	0	0	8	13	8 7/8
5	0	0	11	0 1/4	11
6	0	0	13	3 1/2	13 1/5
7	0	0	15	7	15 1/8
8	0	0	17	10 1/4	17 3/8
9	0	0	19	13 1/2	19 7/8
10	0	0	22	0 3/4	22 1/8
20	0	1	16	1 1/2	44 1/4
30	0	2	10	2 1/2	66 3/8
40	0	3	4	3	88
50	0	3	26	3 3/4	110 1/4
60	1	0	20	4 1/2	132
70	1	1	14	5 1/4	154
80	1	2	8	6	176
90	1	3	2	6 1/2	198
100	1	3	24	7	220 1/2
200	3	3	20	15	441
300	5	3	17	6	661 1/2
400	7	3	13	14	882
500	9	3	10	5	1102 1/2

Conversion of grammes into oz and grains.

1	grms	=	15·43235	grs				51	grms	=	787·04	grs	= 1 oz	350	grs
2	,,	=	30·86470	,,				52	,,	=	802·48	,,	= 1 ,,	365	,,
3	,,	=	46·29705	,,				53	,,	=	817·91	,,	= 1 ,,	380	,,
4	,,	=	61·72940	,,				54	,,	=	833·34	,,	= 1 ,,	395	,,
5	,,	=	77.16175	,,				55	,,	=	848·77	,,	= 1 ,,	411	,,
6	,,	=	92.59410	,,				56	,,	=	864·21	,,	= 1 ,,	427	,,
7	,,	=	108·02645	,,				57	,,	=	879·64	,,	= 2 ,,	005	,,
8	,,	=	123·45880	,,				58	,,	=	895·07	,,	= 2 ,,	020	,,
9	,,	=	138·89115	,,				59	,,	=	910·50	,,	= 2 ,,	036	,,
10	,,	=	154·32350	,,				60	,,	=	925·94	,,	= 2 ,,	051	,,
11	,,	=	169·75585	,,				61	,,	=	941·37	,,	= 2 ,,	066	,,
12	,,	=	185·18820	,,				62	,,	=	956·80	,,	= 2 ,,	082	,,
13	,,	=	200·62055	,,				63	,,	=	972·23	,,	= 2 ,,	097	,,
14	,,	=	216·05290	,,				64	,,	=	987·67	,,	= 2 ,,	113	,,
15	,,	=	231·48525	,,				65	,,	=	1003·10	,,	= 2 ,,	128	,,
16	,,	=	246·91760	,,				66	,,	=	1018·53	,,	= 2 ,,	144	,,
17	,,	=	262·34995	,,				67	,,	=	1033·96	,,	= 2 ,,	159	,,
18	,,	=	277·78230	,,				68	,,	=	1049·39	,,	= 2 ,,	174	,,
19	,,	=	293·21465	,,				69	,,	=	1064·83	,,	= 2 ,,	190	,,
20	,,	=	308·64700	,,				70	,,	=	1080·26	,,	= 2 ,,	205	,,
21	,,	=	324·07935	,,				71	,,	=	1095·69	,,	= 2 ,,	220	,,
22	,,	=	339·51170	,,				72	,,	=	1111·12	,,	= 2 ,,	236	,,
23	,,	=	354·94405	,,				73	,,	=	1126·56	,,	= 2 ,,	252	,,
24	,,	=	370·37640	,,				74	,,	=	1141·99	,,	= 2 ,,	267	,,
25	,,	=	385·80875	,,				75	,,	=	1157·42	,,	= 2 ,,	282	,,
26	,,	=	401·24110	,,				76	,,	=	1172·85	,,	= 2 ,,	298	,,
27	,,	=	416·67345	,,				77	,,	=	1188·29	,,	= 2 ,,	313	,,
28	,,	=	432·10580	,,				78	,,	=	1203·72	,,	= 2 ,,	329	,,
28$^{35}/_{100}$	grms	=	437$^{1}/_{2}$	,,	= 1	oz		79	,,	=	1219·15	,,	= 2 ,,	344	,,
29	grms	=	447·53	grs	= 1 oz	10	grs	80	,,	=	1234·58	,,	= 2 ,,	360	,,
30	,,	=	462·97	,,	= 1 ,,	25	,,	81	,,	=	1250·02	,,	= 2 ,,	375	,,
31	,,	=	478·40	,,	= 1 ,,	41	,,	82	,,	=	1265·45	,,	= 2 ,,	390	,,
32	,,	=	493·83	,,	= 1 ,,	56	,,	83	,,	=	1280·88	,,	= 2 ,,	406	,,
33	,,	=	509·26	,,	= 1 ,,	72	,,	84	,,	=	1296·31	,,	= 2 ,,	421	,,
34	,,	=	524·69	,,	= 1 ,,	87	,,	85	,,	=	1311·74	,,	= 2 ,,	437	,,
35	,,	=	540·13	,,	= 1 ,,	102	,,	86	,,	=	1327·18	,,	= 3 ,,	015	,,
36	,,	=	555·56	,,	= 1 ,,	118	,,	87	,,	=	1342·61	,,	= 3 ,,	030	,,
37	,,	=	570·99	,,	= 1 ,,	133	,,	88	,,	=	1358·04	,,	= 3 ,,	045	,,
38	,,	=	586·42	,,	= 1 ,,	149	,,	89	,,	=	1373·47	,,	= 3 ,,	061	,,
39	,,	=	601·86	,,	= 1 ,,	164	,,	90	,,	=	1388·91	,,	= 3 ,,	076	,,
40	,,	=	617·29	,,	= 1 ,,	180	,,	91	,,	=	1404·34	,,	= 3 ,,	092	,,
41	,,	=	632·72	,,	= 1 ,,	195	,,	92	,,	=	1419·77	,,	= 3 ,,	107	,,
42	,,	=	648·15	,,	= 1 ,,	210	,,	93	,,	=	1435·20	,,	= 3 ,,	123	,,
43	,,	=	663·59	,,	= 1 ,,	226	,,	94	,,	=	1450·64	,,	= 3 ,,	138	,,
44	,,	=	679·02	,,	= 1 ,,	241	,,	95	,,	=	1466·07	,,	= 3 ,,	154	,,
45	,,	=	694·45	,,	= 1 ,,	257	,,	96	,,	=	1481·50	,,	= 3 ,,	169	,,
46	,,	=	709·88	,,	= 1 ,,	272	,,	97	,,	=	1496·93	,,	= 3 ,,	184	,,
47	,,	=	725·32	,,	= 1 ,,	288	,,	98	,,	=	1512·37	,,	= 3 ,,	200	,,
48	,,	=	740·75	,,	= 1 ,,	303	,,	99	,,	=	1527·80	,,	= 3 ,,	215	,,
49	,,	=	756·18	,,	= 1 ,,	319	,,	100	,,	=	1543·23	,,	= 3 ,,	230	,,
50	,,	=	771·61	,,	= 1 ,,	334	,,								

Conversion of lbs into Kilogrammes.

1	lbs Engl.	=	0·454 Ko.	30	lbs Engl.	=	13·608 Ko.
2	,, ,,	=	0·907 ,,	31	,, ,,	=	14·062 ,,
3	,, ,,	=	1·361 ,,	32	,, ,,	=	14·515 ,,
4	,, ,,	=	1·814 ,,	33	,, ,,	=	14·969 ,,
5	,, ,,	=	2·268 ,,	34	,, ,,	=	15·422 ,,
6	,, ,,	=	2·722 ,,	35	,, ,,	=	15·876 ,,
7	,, ,,	=	3·175 ,,	36	,, ,,	=	16·330 ,,
8	,, ,,	=	3·629 ,,	37	,, ,,	=	16·783 ,,
9	,, ,,	=	4·082 ,,	38	,, ,,	=	17·237 ,,
10	,, ,,	=	4·536 ,,	39	,, ,,	=	17·690 ,,
11	,, ,,	=	4·990 ,,	40	,, ,,	=	18·144 ,,
12	,, ,,	=	5·443 ,,	41	,, ,,	=	18·598 ,,
13	,, ,,	=	5·897 ,,	42	,, ,,	=	19·051 ,,
14	,, ,,	=	6.350 ,,	43	,, ,,	=	19 505 ,,
15	,, ,,	=	6·801 ,,	44	,, ,,	=	19·958 ,,
16	,, ,,	=	7·258 ,,	45	,, ,,	=	20·412 ,,
17	,, ,,	=	7·711 ,,	46	,, ,,	=	20·866 ,,
18	,, ,,	=	8·165 ,,	47	,, ,,	=	21·319 ,,
19	,, ,,	=	8 618 ,,	48	,, ,,	=	21·773 ,,
20	,, ,,	=	9·072 ,,	49	,, ,,	=	22·226 ,,
21	,, ,,	=	9·526 ,,	50	,, ,,	=	22·680 ,,
22	,, ,,	=	9·979 ,,	60	,, ,,	=	27·216 ,,
23	,, ,,	=	10·433 ,,	70	,, ,,	=	31.752 ,,
24	,, ,,	=	10·886 ,,	80	,, ,,	=	36·288 ,,
25	,, ,,	=	11·340 ,,	90	,, ,,	=	40·824 ,,
26	,, ,,	=	11·794 ,,	100	,, ,,	=	45·360 ,,
27	,, ,,	=	12·247 ,,	200	,, ,,	=	90·720 ,,
28	,, ,,	=	12·701 ,,	300	,, ,,	=	136·080 ,,
29	,, ,,	=	13·154 ,,	400	,, ,,	=	181·440 ,,
				500	,, ,,	=	226·800 ,,

Conversion of grains, oz, lbs, qrs, cwts, into Kilogrammes.

7·716175 grains = 0·5 grammes
15·432350 ,, = 1·0 ,,
154·323500 ,, = 10·0 ,,
437½ grains = 1 oz = 28⁸/₁₀ grammes
16 oz = 1 lbs = 453·59 ,,
28 lbs = 1 qrs = 12 kilos 712 grammes
4 qrs = 1 cwt = 112 lbs = 50 kilos 803 grammes
20 cwts = 1 ton = 1016·06 kilos.

1	oz =	437½	grs =	28·3502	grammes		
2	,, =	875	,, =	56·6991	,,		
3	,, =	1312½	,, =	85·0486	,,		
4	,, =	1750	,, =	113·3981	,,		
5	,, =	2187½	,, =	141·7482	,,		
6	,, =	2625	,, =	170·0972	,,		
7	,, =	3062½	,, =	198·4466	,,		
8	,, =	3500	,, =	226·7962	,,		

.9 oz	=	3937½ grs	=	255·1457 grammes
10 ,,	=	4375 ,,	=	283·4952 ,,
11 ,,	=	4812½ ,,	=	311·8448 ,,
12 ,,	=	5250 ,,	=	340·1942 ,,
13 ,,	=	5687½ ,,	=	368·5438 ,,
14 ,,	=	6125 ,,	=	396·8933 ,,
15 ,,	=	6562½ ,,	=	425·2428 ,,
16 ,,	=	7000 ,,	=	453·5923 ,,

1 milligramme	=	0·001	grammes
1 centigramme	=	0·01	,,
1 decigramme	=	0·1	,,
1 decagramme	=	10·000	,,
1 hectogramme	=	100·000	,,
1 kilogramme	=	1000·000	,,

Conversion of grammes per litre into ounces per gallon.

Per litre		Per gall.			
grm. 1	=	4½ grms.	=	⅛ oz.	
grms. 2	=	9 ,,	=	¼ ,,	
,, 3	=	13½ ,,	=	⅜ ,,	
,, 4	=	18 ,,	=	½ ,,	
,, 5	=	22½ ,,	=	⅝ ,,	
,, 6	=	27 ,,	=	1 ,,	
,, 7	=	31½ ,,	=	1⅛ ,,	
,, 8	=	36 ,,	=	1¼ ,,	
,, 9	=	40½ ,,	=	1⅜ ,,	
,, 10	=	45 ,,	=	1½ ,,	
,, 11	=	49½ ,,	=	1⅝ ,,	
,, 12	=	54 ,,	=	2 ,,	
,, 13	=	58½ ,,	=	2⅛ ,,	
,, 14	=	63 ,,	=	2¼ ,,	
,, 15	=	67½ ,,	=	2⅜ ,,	
,, 16	=	72 ,,	=	2⅝ ,,	
,, 17	=	76½ ,,	=	2⅝ ,,	
,, 18	=	81 ,,	=	3 ,,	
,, 19	=	85½ ,,	=	3⅛ ,,	
,, 20	=	90 ,,	=	3⅓ ,,	
,, 30	=	135 ,,	=	5 ,,	
,, 40	=	180 ,,	=	6⅔ ,,	
,, 50	=	225 ,,	=	8⅓ ,,	
,, 60	=	270 ,,	=	10 ,,	
,, 70	=	315 ,,	=	11⅔ ,,	
,, 80	=	360 ,,	=	13⅓ ,,	
,, 90	=	405 ,,	=	15 ,,	
,, 100	=	450 ,,	=	16⅔ ,,	
,, 200	=	900 ,,	=	33⅓ ,,	= 2 lbs 1⅓ oz.
,, 300	=	1350 ,,	=	50 ,,	= 3 ,, 2 ,,
,, 400	=	1800 ,,	=	66⅔ ,,	= 4 ,, 2⅔ ,,
,, 500	=	2250 ,,	=	83⅓ ,,	= 5 ,, 3⅓ ,,

Fluid Measures.

pints	quarts	gallons	litres
2	= 1		
8	= 4	= 1	= 4·543

1 Imp. gallon = 8 pints = 32 gills = 160 oz = 4 kil. 540 grms.
1 ,, = 4 ,, = 20 ,, = 0 ,, 567 ,,

In English works 2 noggins = 1 gill (10 fl. oz.)
2 gills = 1 pint.
In Scotch works 4 gills = 1 pint
(of 5 fl. oz. each) (20 fl. oz.)

1 U. S. gallon = 3·785 litres
1 Imp. ,, = 4·5436 litres = 4543 cubic centimetres
1 ,, water = 10 lbs Engl.
1000 Imp. gallons = 10015 lbs Engl. = 4543 kilo
210 ,, water = 1 ton = 35·943 cubic feet
1 ,, ,, = 277¼ cubic inch. = 0·16 cubic feet = 10 lbs

1 Imp. pipe = 572·48 litres
1 U. S. pipe = 476·94 ,,

1 litre = 100 centilitres = 1 cubic decimetre = 1·76 Imp. pint
[= 2·114 U. S. pints.
1 hectolitre = 10 decalitres = 100 litres.

Conversion of gallons, pints and gills into lbs and oz.

1 gallon	=	10 lbs
100 gallons	=	1000 ,,
1 pint	=	1¼ lbs
2 pints	=	2½ ,,
3 ,,	=	3¾ ,,
4 ,,	=	5 ,,
5 ,,	=	6¼ ,,
6 ,,	=	7½ ,,
7 ,,	=	8¾ ,,
8 ,,	=	10 ,,

1 pint = = 2 gills = 1¼ lbs
1 quart = 2 pints = 4 ,, = 2½ ,,
1 gallon = 4 quarts = 8 pints = 32 ,, = 10 ,,

Conversion of litres into gallons and pints.

Litres		Gallons	Pints	Gills
1	=		1	3·0430
2	=		3	2·0864
3	=		5	1·1296
4	=		7	0·1728
5	=		8	3·2160
6	=	1	2	2·2592
7	=	1	4	1·3024
8	=	1	6	0·3456
9	=	1	7	3·3888
10	=	2	1	2·4320
11	=	2	3	1·4752
12	=	2	5	0·5184
13	=	2	6	3·5616
14	=	3	0	2·6048
15	=	3	2	1·6480
16	=	3	4	0·6912
17	=	3	5	3·7344
18	=	3	7	2·7776
19	=	4	1	1·8208
20	=	4	3	0·8640
21	=	4	4	3·9072
22	=	4	6	2·9504
23	=	5	0	1·9936
24	=	5	2	1·0368
25	=	5	4	0·0800
50	=	11	0	0·1600
75	=	16	4	0·2400
100	=	22	0	0·3200

Conversion of Cubic Centimetres into English Measures.

1	cubic centimetres	=	17	minims.						
2	,,	=	34	,,						
3	,,	=	51	,,						
4	,,	=	68	,,	or 1	drachm	8	minims		
5	,,	=	85	,,	,, 1	,,	25	,,		
6	,,	=	102	,,	,, 1	,,	42	,,		
7	,,	=	119	,,	,, 1	,,	59	,,		
8	,,	=	136	,,	,, 2	drachms	16	,,		
9	,,	=	153	,,	,, 2	,,	33	,,		
10	,,	=	170	,,	,, 2	,,	50	,,		
20	,,	=	340	,,	,, 5	,,	40	,,		
30	,,	=	510	,,	,, 1	ounce	0	drachm	30	minims.
40	,,	=	680	,,	,, 1	,,	3	,,	20	,,
50	,,	=	850	,,	,, 1	,,	6	,,	10	,,
60	,,	=	1020	,,	,, 2	,,	1	,,	0	,,
70	,,	=	1190	,,	,, 2	,,	3	,,	50	,,
80	,,	=	1360	,,	,, 2	,,	6	,,	40	,,
90	,,	=	1530	,,	,, 3	,,	1	,,	30	,,
100	,,	=	1700	,,	,, 3	,,	4	,,	20	,,
1000	,,	=	1 litre	=	34 fluid ounces nearly, or $1^{3}/_{4}$ pints.					

Conversion of gallons into litres.

1	Imp. gallons	=	4·5436 litres	40	Imp. gallons	=	181·744 litres
2	,,	=	9·0872 ,,	50	,,	=	227·180 ,,
3	,,	=	13·6308 ,,	60	,,	=	272·616 ,,
4	,,	=	18·1748 ,,	70	,,	=	318·052 ,,
5	,,	=	22·718 ,,	80	,,	=	363·488 ,,
6	,,	=	27·2616 ,,	90	,,	=	408·924 ,,
7	,,	=	31·8052 ,,	100	,,	=	454·360 ,,
8	,,	=	36·3488 ,,	200	,,	=	908·720 ,,
9	,,	=	40·8924 ,,	300	,,	=	1363·080 ,,
10	,,	=	45·436 ,,	400	,,	=	1817·440 ,,
20	,,	=	90·872 ,,	500	,,	=	2271·800 ,,
30	,,	=	136·308 ,,	1000	,,	=	4543·600 ,,

Water quantities.

1	pint	=	34·65 cubic inches	=	$1^1/_4$ lbs
1	quart	=	69·31 ,,	=	$2^1/_2$,,
1	gallon	=	$277^1/_4$,,	=	10 ,,
1	bushel	=	$2218^1/_5$,,	=	80 ,,
1	cubic inch	=	—	=	·0361 ,,
1	,, foot	=	1·728 ,,	=	62·5 ,,
1	,, ,,	=	6·25 gallons		
1	cylindrical foot	=	4·893 ,,		
1	cubic yard	=	168·264 ,,		
1	ton of water	=	35·76 cubic feet	=	224 Gallons
1	bushel of water would fill a box				12" × 12" × $15^2/_5$"
1	peck	,,	,, ,,		8" × 8" × $8^2/_5$"
1	gallon	,,	,, ,,		6" × 6" × $7^3/_4$"
1	quart	,,	,, ,,		4" × 4" × $4^1/_2$"

Water occupies the least space when at 4° C. or 39° F.

Conversion of Metres into Yards

1	metre	=	1·0936	Yards
2	,,	=	2·187	,,
3	,,	=	3·281	,,
4	,,	=	4·374	,,
5	,,	=	5·468	,,
6	,,	=	6·562	,,
7	,,	=	7·655	,,
8	,,	=	8·749	,,
9	,,	=	9·843	,,
10	,,	=	10·936	,,
20	,,	=	21·873	,,

Conversion of Yards into Metres

1	yard	=	0·91438	Metres
2	,,	=	1·8288	,,
3	,,	=	2·7432	,,
4	,,	=	3·6576	,,
5	,,	=	4·5720	,,
6	,,	=	5·4864	,,
7	,,	=	6·4008	,,
8	,,	=	7·3152	,,
9	,,	=	8·2296	,,
10	,,	=	9·1440	,,
20	,,	=	18.2880	,,

30	metre	= 32·809	Yards	30	yard	= 27·4320	Metres
40	,,	= 43·745	,,	40	,,	= 36·5760	,,
50	,,	= 54·682	,,	50	,,	= 45·7200	,,
60	,,	= 65·618	,,	60	,,	= 54·8640	,,
70	,,	= 76·554	,,	70	,,	= 64·0080	,,
80	,,	= 87·491	,,	80	,,	= 73·1520	,,
90	,,	= 98·427	,,	90	,,	= 82·2960	,,
100	,,	= 109·363	,,	100	,,	= 91·4400	,,
200	,,	= 218 727	,,	200	,,	= 182·8800	,,
300	,,	= 328·090	,,	300	,,	= 274·3200	,,
400	,,	= 437·453	,,	400	,,	= 365·7600	,,
500	,,	= 546·816	,,	500	,,	= 457·2000	,,

Metre Denominations.			Equivalents in the standard of Canada.
	cubic-metres	litres	Imp. gallons and decimal parts of same.
kilolitre	1	1000	220.244
hectolitre	$^1/_{10}$	100	22.0244
decalitre	$^1/_{100}$	10	2.2024
litre	$^1/_{1000}$	1	0.2202
decilitre	$^1/_{10\,000}$	$^1/_{10}$	0.0220
centilitre	$^1/_{100\,000}$	$^1/_{100}$	0.0022

How to determine the capacity of a square dye-vessel.

What is the **capacity** of a **square dye-vessel** if it is for instance 8 × 3 × 3 feet?

Determine the cubic content and then multiply by 6·25 as a cubic foot of water contains 6·25 gallons.

1 gallon of water equals 10 lbs
therefore 1 cubic foot of water equals 62 $^1/_2$ lbs or 1000 oz
and 446·4 gallons equal 4464 lbs.

Dimensions of the dye vessel.
8 feet long
3 ,, wide
3 ,, high

or 8 × 3 × 3 = 72 cubic feet × 6·25 gallons = 446·4 **gallons.**

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