This black may be either hung to develop, which is the safer course, or, if printed in fine shirting patterns, it may be “ aged ” through steam for 2 to 3 minutes. Whichever method is adopted the printed cloth must afterwards be passed through hot bichromate —“ chroming - and then well washed.

The following ferrocyanide black works well in practice :—

10 lb starch.

2 lb British gum.

6 lb yellow prussiate (ferrocyanide) of potash.

7 gals. water.

Boil, turn off the steam, and add:

2¾ lb chlorate of soda in powder.

Cool and add :

8J lb aniline salt.

Print, age 4 minutes through the rapid ager, chrome, wash and soap. If printed with alizarine steam colours it must be passed through ammonia vapour after “ ageing,” and then be steamed for one hour before chroming and washing. Sometimes the chroming is omitted, but the colour is then apt to become green after a short time owing to the action of sulphur dioxide present in the air.

Aniline black is now used almost exclusively for printing along with mordants for the madder style, and for black ground goods that were formerly dyed with logwood on an iron mordant. Shirt­ings and all single-colour black dress goods are also executed in aniline black, which is faster to light, washing, and perspiration than any other black except some of the sulphur blacks.

(2) *Printing of Mordants.—*This, the second of the great styles of textile printing, was, at one time, the most extensively practised of all, and is still the most important for all classes of work where

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| --- | --- | --- | --- | --- | --- | --- |
|  | **Red.** | Pink. | Chocolate. | Dark Purples. | Violet. | Black. |
| Aluminium acetate, 6° Tw. Black liquor, 24° Tw. . | 12 gals. | 3 gals. | 10½ gals. ιi ., | 1 gal. | à gal. | 8 gals. |
| Water |  | 8 gals. | II » | IlJ ,, | 4 » |
| British gum |  | 36 lb |  |  | 36 lb |  |
| Acetic acid |  | I gal- |  |  |  |
| Tin crystals | ιj tb |  |  |  |  |  |
| Cotton-seed oil | i gal. |  | i gal. | ï gal. |  | i gal- |
| Starch | 16 lb |  | 16 lb | 16 lb |  | 16 lb |

the fastest colours are required. It may be conveniently divided into two branches: (a) the madder style, and (*b*) the printing of other mordants such as chrome, tannic acid, ß-naphthol, &c.

(a) *The Madder Style.—*In this style the only mordants used are those of aluminium and iron.

Aluminium alone yields various shades of red and pink when dyed **up** in madder, or its artificial competitor alizarine. Iron alone yields with the same dye-stuffs shades varying from black to the palest lavender. Iron and aluminium mordants in combination yield colours ranging in shade from claret through all gradations of bordeaux and maroon to the deepest chocolates, according to which of the two mordants predominates in the mixture. Browns and allied colours may be dyed on the same mordants with either nitroalizarine alone, or with alizarine itself mixed with dyewood extracts—logwood, Persian berry or quercitron bark, &c.

Both aluminium and iron mordants consist of the acetates of their respective metals. The iron mordant which gives the best results is known as “ black liquor.” It is a crude acetate contain­ing a good deal of organic matter which appears to regulate the speed of its oxidation and so produce much more level colours than have ever been obtained from any other iron mordant.

Aluminium acetate in the pure state is also rarely employed, the crude commercial “ red liquor ” being found in practice to yield the best results, both as. regards colour and ease of working. The “ red liquors ” vary considerably in composition, some being normal acetates, others basic acetates, some normal sulphate-acetatcs, others basic sulphate-acetatcs, but their mode of application is always the same, that is, they are thickened, printed, aged and dyed in alizarine. If they are too basic they decompose on boiling, or on dilution, and become utterly useless; but this rarely happens nowadays and. need not be further gone into. Many difficulties occur in the printing of mordants and their subsequent dyeing, but if the following points are observed most of them may be sur­mounted; (1) after printing the cloth must be gently dried, other­wise the mordants become dehydrated or “ burnt,” and instead of dyeing up evenly they appear patchy and very light in the over- dried parts; (2) the dye-stuff must not be used in excess; and (3) the temperature of the dye-bath must be kept as low as is con­sistent with the fixation of the colour. If these last two points are neglected the unprinted parts of the cloth, which should remain a pure white when it is finished, will be soiled beyond repair unless indeed the “ whites ” are cleared at the expense of weakening the colour.. Iron mordants especially are liable to unevenness due to the oxidation being too rapid ; and as this defect is most noticeable in purples and lavenders, the pyrolignite of iron or “ black-liquor ” is frequently boiled for half an hour or more with 1 per cent. of

its weight of arsenious acid, or “ white arsenic,” a substance which retards its oxidation. For this purpose the goods are printed with either aluminium or iron acetates, and hung or “ aged ” for 2 to 3 days in a brick chamber containing moist air at about 30° C. dry bulb, and 27° C. wet bulb thermometer. In this operation the “ ageing ” (which is really the volatilization of the acetic acid, leaving the hydrated oxide on the fibre) goes on slowly and evenly. After hanging, the last traces of acid are removed and the hydroxide thoroughly fixed by. “ dunging," a process in which the goods are passed through a mixture of cow-dung and chalk at a temperature of about 50° C. In this “ dunging" bath they are worked alto­gether about 1½ hours, at the end of which the mordants are thoroughly fixed, and all the thickening agents perfectly eliminated, thus leaving the cloth in the best condition to absorb the dye-stuff. The dyeing is carried out by working the goods at 60° C. in a mixture of alizarine, a little chalk, and glue size for 1 to 1½ hours. They are then well washed, soaped, and the whites cleaned by a passage through weak bleaching powder solution, followed by a passage through steam. Further soaping and washing is then resorted to until the goods are quite clear and bright.

In the case of cloth dyed in red and pink alone the goods after dyeing are well washed, passed through a bath of alizarine oil containing oxalate of ammonia, and then steamed for one hour at 15 lb pressure. This brightens the colours by removing the brown appearance they possess after dyeing. When reds are associated with chocolates and purples, however, the oiling process must be carefully conducted, otherwise the two latter suffer; frequently it is omitted altogether, the brightening being effected by vigorous soaping.

By printing the following mordants a six-colour design may be produced with a single dye-stuff and in one dyeing:—

The above mordants are printed on white bleached cloth, dried, hung 2 to 3 days, “ dunged, dyed, washed, well soaped and washed again; then.” chemicked" through weak bleaching powder solu­tion, and finished.

The “ dunging ” is performed in vats through which the cloth circulates continually during the operation. As a rule dunging is done twice, the second bath being weaker than the first. The vats or “ becks ” contain a mixture of :—

100 gals. water )

10 lb chalk 1st dunging.

50 lb cow-dung )

at 60° C.

100 gals. water )

5 lb chalk 2nd dunging.

25 lb cow-dung )

Wash well after “ dunging ” and dye in alizarine, &c.

The dyeing is carried out in large becks over which a roller or bowl revolves, equal in length to the beck. Over this roller the cloth is wound spirally in large loose loops so that one end of the loop is on the roller and the other dips into the dye liquor. When about 700 yds. of cloth have been entered in this way the two ends of it arc knotted together, thus forming an endless rope which circulates continuously in and out of the dye-liquor. The vat or beck is then charged with alizarine, chalk and glue, the propor­tions varying according to the amount of space covered by the mordants on the cloth. If, for instance, half the surface is printed then the dye-liquor might be made up as follows, the quantities being calculated on the weight of the cloth :—

*4½* per cent. alizarine (blue shade), 20 per cent. ) in a sufficiency „ acetate of lime, 28° Tw. of water

10 ,, glue solution, or size, 15 per cent. )

The goods are entered into this solution cold. The temperature is gradually raised to 60o C., and the dyeing continued at this for one hour or more. The goods are then washed in a similar machine, soaped well and finished off by drying.

Aniline black may be printed along with “ red liquor ” and iron liquor, and many other modifications also employed, but the prin­ciple of dyeing is always the same.

*(b) The Printing of other Mordants.—*Of these the most important are tannic acid, chrome mordants and ß-naphthol.

For printing tannic acid the following is used :—

( 5 lb tannic acid dissolved in

I gal. acetic acid and added to

(9 ,, starch and tragacanth paste.