The goods are simply dried after printing and the tannic acid immediately fixed by passing through a solution of—

<-2 oz. tartar emetic.

J I oz. chalk. ♦

11 gal. water at 60° C.

After washing they may be dyed up in any of the basic aniline colours.

Various chrome mordants are employed in printing, amongst which may be mentioned chromium chromate, and chromium acetate. The former is thickened with starch or gum, printed, and fixed by being passed through boiling sodium carbonate. The latter is applied in the same way but, after printing, is steamed before the carbonate treatment. Both these mordants are suitable for dyeing with any of the dyes mentioned under the direct printing of mordant colours, such as alizarine, alizarine bordeaux, coeruleine and the natural dye-wood extracts. They are dyed similarly to the madder colours, with an addition of glue size to preserve the white of the unprinted parts of the cloth. - \_

(3) *The Discharge Style.—*This style is now one of the most important produced. Its range is so extensive, and its modifica­tions so numerous, that it is impossible to mention more than a few of its chief applications. It may be used for locally destroying either the colours dyed on cloth, or the mordants with which they have been previously prepared. In both cases the resulting pattern appears in white, or colours, on a full rich ground the beauty of which cannot be equalled by direct printing.

The discharging agents consist of organic acids, caustic alkalis, oxidizing agents and reducing agents, each used according to the kind of colour or mordant to be discharged.

(a) *Discharge of Iron and Aluminium Mordants.—*The cloth is padded with a solution of these mordants, dried in hot air, and then printed with thickened citric acid or acid citrate of soda mixed with china clay to prevent the pattern running. It is then passed through the rapid ager once or twice, " dunged," washed, and dyed in the usual way for madder colours. Wherever the discharge has been printed the mordant is dissolved out, leaving a white pattern on a dyed ground.

(δ) Tannate of antimony mordant is similarly discharged by print­ing on caustic soda. The goods are passed in like manner through the ager, well washed in water, and dyed-up in any basic aniline dye.

(c) The chrome discharge is produced by padding the goods in chromium bisulphite; then drying them, and printing-on citric acid, or chlorate of soda and yellow prussiate of potash. They are then steamed, passed through chalk and water, well washed and dyed up in any mordant dye.

(d) Turkey red may be discharged in both white and coloured patterns by either oxidizing agents or caustic alkalis. (1) The dyed cloth is printed with strong citric acid, or arsenic acid, at 180o Tw., and then run through bleaching powder solution, whereby the printed parts are completely decolorized. If colours are re­quired, the citric acid is mixed with lead salts and Prussian blue, and the fabric after passing through the bleaching powder solution, is further treated in a bath of bichromate of potash which forms with the lead salts the insoluble chrome yellow. Green is obtained by the combination of Prussian blue with the chrome yellow.

Examples :—

*White.* 6 lb citric acid or tartaric acid.

I gal. water.

4 lb British gum or dextrine. Boil together.

*Yellow.* 15 lb British gum.

1½ gals. dark British gum paste, 30 per cent.

2½ „ water.

20 lb tartaric acid.

12 lb nitrate of lead.

Print, dry, discharge through bleaching powder solution, 18° Tw., and chrome.

(e) The dyed cloth is printed with strongly alkaline discharge pastes, passed through the "ager" two or three times, and then washed off in silicate of soda. If blue, yellow and green discharges are desired the dyed cloth must first be passed through glucose solution, well dried, printed with the colours, “ aged," passed through silicate of soda, chromed in bichromate, well washed and dried. Examples:—

*White.* 10 lb stannous chloride dissolved cold in

8 gals, alkaline thickening.

2 „ silicate of soda, 70° Tw.

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| *Blue.* 15 lb indigo pure 20 per cent. paste.  1/32 gal. turpentine.  ⅛ „ glycerin.  ιj ,, British gum paste.  7 ,, alkaline thicken­  ing.  *Green.* 8 parts of the yellow without silicate.  I part of blue. | *Yellow.* 30 lb lead hydrated 50 per cent.  2 gals, water. J „ silicate soda.  5Ì „ alk. thickening. |
| *Alkaline Thickening.* 15 lb yellow dextrine.  8 gals, caustic soda, ιooβ Tw. |

(f) *Paranitraniline red* is discharged by means of the new hydro- sulphite-formaldehyde compounds. The dyed cloth is printed with the following:—

25 lb hydrosulphite N.F. conc., or hydraldite cone.

1} gals. British gum paste.

Heat till dissolved and add—

⅛ gal. glycerin.

4∣ „ starch-tragacanth thickening.

After printing, age twice for 4 minutes through dry steam

at 2200 F., then wash well and soap.

Coloured discharges are obtained by mixing hydrosulphite, tannic acid, aniline or phenol, and basic colouring matters together. Mor­dant dyes fixed with chromium acetate may also be used.

On α-naphthylamine maroon the above discharge white requires the addition of induline scarlet, patent blue or anthraquinone, before it becomes effective, otherwise the procedure is the same as for paranitraniline red.

(g) Indigo is usually discharged by oxidation. For this purpose the dyed cloth is printed in two different ways. Firstly, with chlorate of soda, and red or yellow prussiate of potash together with a little citric acid or citrate of soda; secondly, with chromate of potash. In the first instance, the cloth is "aged ” through the rapid ager after printing, and, in the second, is passed through a vat containing hot sulphuric acid and oxalic acid. Coloured dis­charges may be obtained in both methods by adding albumen and pigment colours to the discharging agents.

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| (1) Discharge by steaming:— |
| Γ12 lb citric acid, dissolve in: |
| "1 7 lb caustic soda, 70 o Tw., and add: |
| l12 lb sodium chlorate. |
| 5 gals. British gum paste. |
| Heat rill dissolved, cool and add ;— |
| < l} gals. British gum paste. |
| <2 lb yellow prussiate of potash. |
| Print, steam and wash. |
| Chlorate of aluminium is also used for this process, but it a |
| ery energetically and is apt to tender the cloth. |
| (2) Chromate discharge :— |
| *White.* 8⅛ gals. British gum paste. |
| 12 lb bichromate of soda. |
| i gal. turpentine. |
| *Yellow.* 32 lb chrome yellow pigment. |
| 3 gals. 50 per cent, albumen solution. |
| ⅛ „ thick tragacanth mucilage. |
| î „ oil (vegetable). |
| ri2 lb bichromate of soda neutralized with |
| -J 1 gal. caustic soda, 700 Tw. |
| L ï „ water. |
| Print, dry, pass through a " beck *” (i.e.* a bath) containing:— |
| 100 gals, water. |
| 50 lb sulphuric acid (1680 Tw.). |
| 50 lb oxalic acid. |
| Then well wash and dry. |

With these oxidation discharges it is impossible to prevent the fibre being attacked in the discharged portions, with the result that it is partially converted into oxycellulose. Recently a method has been brought out for the production of a white discharge on indigo which is said to do away with the formation of oxy­cellulose and which consists in printing on a thickened solution of sodium nitrate and, after drying, running through sulphuric acid of 500 Tw.

Another method of producing white discharges on indigo consists in printing the dyed cloth with hydrosulphite N.F., then steaming and running through a boiling solution of caustic soda. Good whites are thus obtained without the formation of oxycellulose, but the process is expensive.

(*h*) *Direct dyeing* or *substantive colours* can be easily discharged with the hydrosulphite discharge used for paranitraniline red (see above). It must be reduced in strength to about one-fourth for dark shades, and much weaker for lighter colours. Direct colours were formerly discharged by stannous chloride or acetate, but the hydrosulphite has almost entirely displaced these salts for white discharges.

(*i*) Discharges on manganese bronze are of little importance at the present time. They are effected by means of stannous chloride, colours being obtained by the addition of basic dyes and dyewood extracts.

(*j*) Sulphur-colours, dyed basic colours, and some alizarine colours, are discharged with chlorate and prussiate like indigo.

(4) *The Resist or Reserve Style.—*Reserves are substances which, when printed, prevent the fixation or development of mordants and colours subsequently applied, and are used to produce effects similar to those obtained by discharge printing.

The principal reserves are those used for madder dyed goods, steam alizarine reds and pinks, steam basic colours, vat indigo blue, insoluble azo colours, sulphur-colours and aniline black.