Calico-Printing. (*Manuf.*) The art of impressing cotton fabrics with various figures in one or more colors. In describing this art, the term will be taken in its widest sense, as signifying printing on any fabric, whether cotton, woollen, or silk. There are few dyes which of themselves will impart to cotton a brilliant color, able to resist the actions of light and washing. The dye must be combined with a substance called a *mordant*, which has an affinity both for the dye and the cotton fibre. These substances, although generally colorless, have the property of changing the color of the dye. Thus, if a piece of cotton cloth be impressed with acetate of alumina in lines, with acetate of iron in dots, and with a mixture of the two in circles, it will become permanently impressed with red lines, black dots, and chocolate circles. The process of printing in different colors by means of mordants is very ancient, being described by Pliny as having been practised in his day in Egypt. In his *Natural History*, he says: "Robes and veils are painted in Egypt in a wonderful way, being first imbued, not with dyes, but with dye-absorbing drugs, by which they appear to be unaltered, but when plunged into a caldron of boiling dyestuff, it is curious to see many colors imparted to the robe, in consequence of the modifying agency of the excipient drug." In India, the modern method of printing by resist-pastes has been known from time immemorial, the process employed being that of painting the design upon the fabric by hand with melted wax. Many of the specimens of Indian calico-printing by this method are most intricate in their design, and must have taken a lifetime to execute. The processes employed in calico-printing are: — *Singeing*, by which the cloth is denuded of its fibrous down, which would prevent the perfect application of the dyestuff. It is effected in two ways: either by rapidly passing the cotton cloth over a red-hot iron, or by passing it over a series of gas-flames, which are sucked through the fabric by suction-tubes placed over them. The fabric is next bleached by being boiled in an alkaline lye of soda or lime, rinsed, steeped in a weak solution of chloride of lime, rinsed again, steeped in dilute sulphuric acid, once more rinsed, dried, and smoothed. The cloth is now ready for printing, being brilliantly white, and capable of receiving dyes of the brightest and purest colors. Calicoes are printed in four ways: — by small wooden blocks worked by hand, by large wooden blocks worked by a machine, by copper plates, and by copper cylinders. The first and third methods are almost obsolete; the second is practised principally in France; and the fourth is the English method. In the large blocks mentioned in the second method, the patterns are generally made of sycamore laid upon deal, and either engraved in relief, or formed by copper slips, of different shapes, being driven into the surface. The machine used in this style is termed a *Perroline*, from the name of its inventor, M. Perrot, of Rouen. The cloth is wound round a prismatic iron roller, and the different colored blocks are brought down on it successively. By this process, one man and three children can print thirty pieces of cloth in a day. In the English process, the pattern is impressed upon copper cylinders by hard steel rollers called *dies*. These cylinders are mounted upon strong iron shafts, upon the end of which is a toothed wheel, by means of which motion is communicated to them. Several of these engraved cylinders, one for each color, are united in one machine, forming two-, three-, five-, and even ten-color machines. The cotton cloth is made into a continuous web of forty or fifty pieces, and is drawn over the rollers, each one receiving its color from a cylinder covered with woollen cloth, and revolving in an oblong trough of coloring matter, mordant, or resist-paste, and transferring it to the cloth. Calico-printings have reached such a state of perfection that they will print nearly *ten miles* of cloth per day, with a pattern containing four or five colors. Dyestuffs are of two kinds, those which impart their color alone, and those which require the application of a mordant. The former are

called *substantive*, the latter *adjective*. There are, principally, five styles of calico-printing. — 1. The *Fast-color*, or chintz style, in which the pattern is applied in the form of a mordant, the cloth being afterwards passed through a dye-bath. The color, of course, clings only to the mordanted portion, the rest being washed out in an after-process. 2. The *Rongeant* style, in which the pattern is worked upon the cloth by the agency of some chemical substance which discharges portions of the uniform color in which the cloth was first printed. 3. The *Resist-paste* style, when the pattern is printed in some substance which resists the general dye afterwards applied to it, such as indigo or some other substantive color. 4. *Steam colors*, in which a mixture of the mordant and dye is printed on the cloth, the union of the two being effected by subjecting it to the action of steam. 5. *Spirit colors*, in which a mixture of dye and *tin spirits*, or chloride of tin, is used. Patterns printed in this style are very brilliant, but extremely fugitive. In the first style the mordant used may be either acetate of alumina, or red liquor; acetate of iron, or iron liquor; or chloride of tin, or tin spirits. The mordant is mixed with starch or British gum, and different shades of the same color may be obtained by diluting it more or less. The principal dyes used in this style are logwood, Brazil-wood, peach-wood, Persian berries, archil, madder, cochineal, fustic, catechu, quercitron, and galls. (The different colors obtained by the combinations of various mordants with dye-stuffs will be found fully described under DYEING, in the body of this work.) In the *rongeant*, or discharge style, the discharge generally consists of some strong acid, such as nitric, oxalic, or tartaric acid, made into a paste with pipe-clay gum, and applied either to the dyes or mordanted cloth. In the latter method a new mordant may be applied along with the discharge, in which case a colored pattern will be the result. For instance, a violet ground with red lines and white dots may be produced by passing the cloth through weak iron-liquor, and printing the lines with red-liquor mordant. The dots are then printed with a discharge-paste of tartaric oxalic acid, and the whole is passed through a madder dye-vat. In the *resist*, or reserve style, various substances capable of resisting the action of substantive dyes are used; such as oils, metallic oxides, and their salts; and reserves containing mordants are used when a colored impression is desired. The latter method of printing with mordant resists is called the *lapis-lazuli* style — why, it is hard to say. Steam colors are mostly produced by the aid of peroxide of tin, or stannic acid, or perchloride of tin is used as a mordant. A full-bodied red, for instance, is produced in the following manner: A decoction of peach-wood is thickened with chloride of tin. The impression is printed on the cloth with this mixture, and, when dry, the goods are submitted to the action of dry steam, which causes the union of the substances contained in the dyestuff. *Spirit colors* are brilliant but very fugitive. They are mostly vegetable dyes, mixed with perchloride of tin, or tin spirits, as it is termed. A sixth style, *pigment-printing*, is when a heavy insoluble color, such as ultramarine or magenta, is mixed with gutta-percha solution, albumen, or casein, and printed on the cloth. Since the introduction of the aniline dyes, this method of printing has somewhat revived. By the combination of super-excellence in machinery and chemistry, England is now at the head of the calico-printing trade; but it will be long before she will succeed in rivalling the exquisite printed muslins of the French manufacturer. Though taking the lead in machinery and chemistry, the English are very far behind in the artistic portion of the trade; the staring combinations of twenty colors of Manchester contrasting very unfavorably with the artistically blended hues of the commonest productions of Mulhouse and Paris.