"stentering ” machines. On these machines the damped cloth is carried forward, over steam-heated drying plates, by two travelling endless chains, each link of which is constructed to clip the selvedge of the cloth. The distance apart of these chains can be regulated to suit various widths of cloth and in travelling forward they diverge, so that as the cloth advances it gradually becomes stretched out to the required width and is dried at the same time to prevent it contracting when it is released from the pull of the chains, as it leaves the machine.

Finally the goods are cut into certain lengths, wound round flat boards, tied up, ticketed and packed.

*Wool-Printing.*

The printing of wool differs little from the printing of cotton in general. Most of the colours employed in the one industry are used in the other, and the operations of steaming, washing and soaping are almost identical.

Unlike cotton, however, wool requires to be specially prepared, after bleaching, if the full tinctorial value of the colours is to be obtained.

Two quite different methods of preparation are resorted to, namely (1) the chlorination of the wool; and (2) the precipitation of stannic acid on the fibre. In the first method the woollen fabric is first passed through a solution of bleaching powder, then well squeezed and passed, without washing, into dilute sulphuric or hydrochloric acid, squeezed again and well washed in water, after which it is dried. Great care and experience are demanded in this operation to prevent the wool from becoming hard and yellow.

In the second method the cloth is padded in stannate of soda, well squeezed, passed into dilute sulphuric acid, well washed and dried. For certain styles of work it is necessary to combine both preparations.

Although alizarine, mordant colours and dyewood extracts can be used on wool, the vast majority of patterns printed on wool are executed by means of acid dye-stuffs and basic colours, for both of which this fibre possesses a natural affinity. In most cases therefore these colours are simply dissolved in a little acetic and citric acids, thickened with gum and printed without any further addition. The addition of tannic acid, however, can be made to, and considerably increases the fastness of, the basic dyes. Mordant colours like logwood black are applied in the usual way.

The printing of wool is carried out exactly as for cotton, but if the best results are to be obtained, the engraving of the rollers must be deep, the blanket on the machine as soit as possible, and the drying of the printed cloth very gentle. After printing, the goods are steamed in moist steam or wrapped between moistened “ greys ” and steamed in a “ cottage ” steamer. If too little moisture is given, the colours lack both strength and brilliancy; if too much they run. The correct degree of dampness can only be determined by experience of the work, combined with a special knowledge of the particular apparatus employed.

After steaming, the printed goods are washed in plenty of water, then dried up and finished with a little glycerin or some waxy preparation.

Discharges may be very easily obtained on wool dyed in acid dye-stuffs, by means of stannous chloride and basic colours for the coloured effect, and hydrosulphite for the white.

*Silk-Printing.*

Silk-printing calls for no special mention. The colours and methods employed are the same as for wool, except that in the case of silk no preparation of the material is required before print­ing and the ordinary dry “ steaming ” is preferable to damp “ steaming.”

Both acid and basic dyes play an important rôle in silk-printing, which for the most part is confined to the production of articles for wearing apparel—dress goods, handkerchiefs, scarves, &c. &c. —articles for which bright colours arc in demand. Alizarine and other mordant colours are mainly used, or ought to be, for any goods that have to resist repeated washings and prolonged exposure to light. In this case the silk frequently requires to be prepared in alizarine oil, after which it is treated in all respects like cotton —steamed, washed and soaped—the colours used being the same.

Silk is especially adapted to discharge and reserve effects. Most of the acid dyes can be discharged in the same way as when they are dyed on wool; and reserved effects arc produced by printing mechanical resists, such as waxes and fats, on the cloth and then dyeing it up in *cold* dye-liquor. The great affinity of the silk fibre for basic and acid dye-stuffs enables it to extract colouring matter from cold solutions, and permanently combine with it to form an insoluble lake. After dyeing, the reserve prints are washed, first in cold water to get rid of any colour not fixed on the fibre, and then in hot water or benzene, &c., to dissolve out the resisting bodies.

As a rule, after steaming, silk goods arc only washed in hot water, but, of course, those printed entirely in mordant dyes will stand soaping, and indeed require it to brighten the colours and soften the material. (E. K.)

II. Art and Archaeology

Printing patterns on textiles whether of flax, cotton or silk, by means of incised wooden blocks, is so closely related in its ornamental effects to other different methods of similar inten­tion, such as by painting and by processes of dyeing and weaving, that it is almost impossible to determine from the pic­turesque indications afforded by ancient records and writings of pre-Christian, classical or even medieval times, how far, if at all, allusion is being made in them to this particular process. Hence its original invention must probably remain a matter of inference only. As a process, the employment of which has been immensely developed and modified in Europe during the last hundred years by machinery and the adoption of stereotypes and engraved metal plates, it is doubtless traceable to a primeval use of blocks of stone, wood, &c., so cut or carved as to make impressions on surfaces of any material; and where the existence of these can be traced in ancient civilizations, *e.g.* of the Chinese, Egyptians and Assyrians, there is a probability that printing ornament upon textiles may have been practised at a very early period.@@1 Nevertheless, highly skilled as the Chinese are, and for ages have been, in ornamental weaving and other branches of textile art, there seem to be no direct evidences of their having resorted so extensively to printing for the decoration of textiles as peoples in the East Indies, those, for instance, of the Punjab and Bombay, from whose posterity 16th- century European and especially Dutch merchants bought goods for Occidental trade in “ Indiennes ” or printed and painted calicoes.

Whilst the earlier history of stamping patterns by hand on to textiles in the East has still to be written, a serious attempt has recently been made to account for the existence of this decorative process in Europe during several centuries prior to the introduction of the “ Indiennes ” above mentioned. As in the case of weaving and embroideries, specimens of printed stuffs have of recent years been obtained from disused cemeteries in Upper Egypt (Akhmîm and elsewhere) and tell us of Egypto- Roman use of such things. Some few of them are now lodged in European museums. For indications that earlier Egyptians, Greeks and Romans were likely to have been acquainted with the process, one has to rely upon less certain evidence. Of textiles painted by Egyptians there are many actual examples. Apart from these there are wall paintings, *e.g.,* those of Beni Hassan—about 2100 b.c.—in which are represented certain Asiatic people wearing costumes irregularly patterned with spots, stripes and zig-zags, which may have been more readily stamped than embroidered or woven. A rather more com­plicated and orderly pattern well suited to stamping occurs in a painting about 1320 b.c., of Hathor and King Meneptha I. Herodotus, referring to the garments of inhabitants of the Caucasus, says that representations of various animals were dyed into them so as to be irremovable by washing. Pliny describes “ a very remarkable process employed in Egypt for the colouring of tissues. After pressing the material, which is white at first, they saturate it, not with colours, but with mordants that are calculated to absorb colour.” He does not explain how this saturation is done. But as it is clearly for the purpose of obtaining a decorative effect, stamping or brush­ing the mordants into the material may be inferred. When this was finished the cloth was “plunged into a cauldron of boiling dye” and “removed the next moment fully coloured.” “It is a singular fact, too, that although the dye in the pan is of one uniform colour, the material when taken out of it is of various colours according to the nature of the mordants that have been respectively applied to it.” Egypto-Roman bits of printed stuffs from Akhmîm exhibit the use, some three hundred years later than the time of Pliny, of boldly cut blocks for stamping figure-subjects and patterns on to textiles. Almost concurrent

@@@1 When Cortes conquered Mexico he sent to Charles V. cotton garments with black, red, yellow, green and blue figures. The North American Indians have a mode of applying patterns in different colours to cloth (see Parnell’s *Dyeing ana Calico Printing,* p. 12).