Fig. 4 was obtained by arranging two effect-figures, as shown by *cross* and *dot* type, in twill shape for the crépe weave, which repeats on 8 warp-threads and 8 picks.

Fig. 5 has the same effect-figure for its foundation as was used for weave fig. 1, the difference being that in the present instance we arranged (in place of two) four of these effect-figures, all twilling in one direction, to entwine with a set of similar four effect-figures, but twilling in the opposite direction. Repeat of weave: 10 warp-threads and 10 picks.

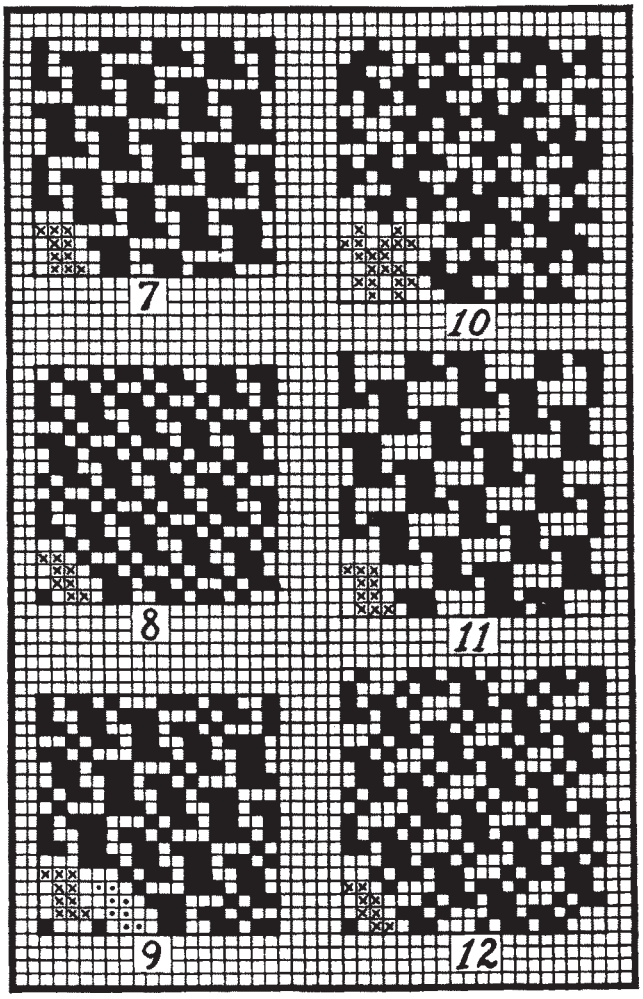


Fig. 6 has for its foundation effect-figure the same as was used in connection with weave Fig. 2, using in this instance eight (in place of two) of these effect-figures, twilling in one direction, to entwine with the same number of effect-figures, twilling in the opposite direction. This combination of effect-figures shows in four instances in the repeat of the weave a float of over four warp-threads. Since a float over three warp-threads is the largest float otherwise used in the weave, tie down each of the four floats in the repeat of the weave by one riser, using for this purpose the proper warp-thread (see *dot* type). This will omit the float of four without showing the procedure in the finished fabric. Repeat of weave: 16 warp-threads and 16 picks.

Weaves Figs. 7 and 8 have their respective foundation effect-figures (see *cross* type) distributed over the repeat of the weave (18 warp-threads and 9 picks) after the 9-harness satin motive setting, considering for the latter two warp-threads to equal one pick.

Weave Fig. 9 shows two foundation effect-figures used (one shown by *cross* type, the other by *dot* type) both being distributed by the 9-harness satin motive setting, resulting in a crépe weave repeating on 18 warp-threads and 18 picks.

Weave Fig. 10 shows the foundation effect-figure (see *cross* type) distributed after the 10-harness satin motive setting. Repeat of weave: 20 warp-threads and 20 picks.

Weaves Figs. 11 and 12 have their respective foundation effect-figures (see *cross* type) distributed over the repeat of the weave after the 5-harness satin motive setting. Repeat of both weaves: 10 warp-threads and 10 picks.

COMPARISON OF FABRIC STRUCTURE.

(*Continued from page 90.*)

Comparative Setting of Weaves.

It is a very good method in reasoning out the setting of weaves to which the intersection theory cannot be applied to find the diameters of the yarns that are considered suitable, and also the threads per inch based on the intersection theory. A comparison of the figures will then usually enable the setting to be decided upon which is suitable for the method of interlacing, and the effect that is desired in the cloth. A twill weave that is re-arranged in satin order usually requires to be set firmer than the original twill, but how much firmer varies according to the degree in which the intersections in the re-arranged weave support each other. A comparison of the designs 1, 2, 3, 4 and 5 will make this clear.

(11) Assuming that the designs 1, 2, 3, 4 and 5 are required to be woven in 20's cotton yarns (116 diameters):

For design 1 the number of ends per inch by the intersection theory =

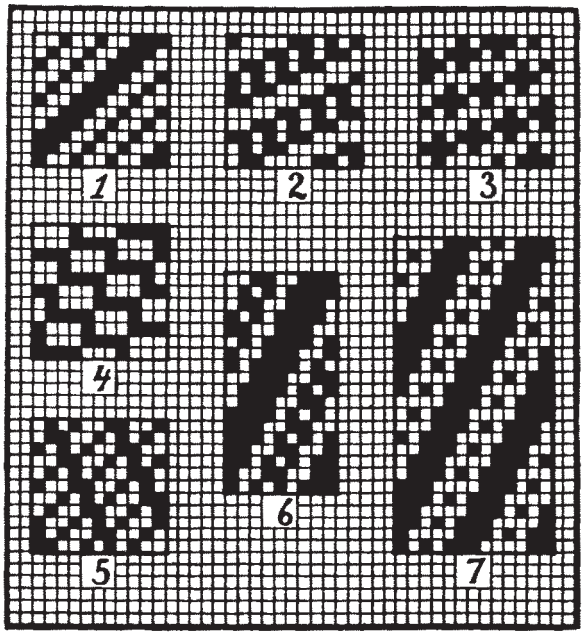
$$\frac{118 \text{ diameters} \times 11 \text{ threads}}{11 \text{ threads} + 6 \text{ intersections}} = 77.$$

The number of ends and picks per inch may, if desired, be reduced from 77 to the neighborhood of 70.

The designs 2, 3, 4 and 5 are looser in structure than the design 1; 5 being firmer than the others, while 2 is firmer than 3 and 4. It is necessary, however, to consider the effects that the weaves will produce in the cloths. The design 2 produces a flat twill and the filling should therefore predominate over the warp. The warp may be set with 77 ends per inch, as found in the eleventh calculation, while the picks may be increased to about half way between 77 and 118 diameters per inch, *viz.*, about 98 picks.

The designs 3 and 4 are very loose and may be set almost up to the diameters per inch, but half way between 77 and the 118 diameters, *viz.*, 98 ends and 98 picks, may be taken as reasonable setting.

The design 5 produces a steep twill, and it is therefore advisable to allow the warp to predominate over the filling. The weave is nearly as firm as the design 1, and taking 77 ends and picks as the maximum setting of the latter design, an increase in the number of ends to about 88, and a decrease in the number of picks to about 68 may be taken as suitable for the design 5. A looser woven steep twill would require to be set finer, and very loose weaves, such as those shown at 6 and 7 might be set in the warp about up to the diameters per inch. Thicker filling than warp also should be employed.



A consideration of honeycomb weaves will show that the warp and filling should be similar, and in reasoning out the setting of the cloths a comparison may be made between the threads per inch of a plain ordinary cloth, and the diameters per inch of the yarns.

(12) Assuming that 20's cotton yarns (118 diameters) is employed for a honeycomb weave: The intersection theory gives 59 ends and picks per inch as maximum setting for plain cloth. About half way between 59 and 118 (diameters), *viz.*, 88 ends and picks per inch will be suitable for an ordinary honeycomb. A large loosely woven honeycomb weave may be set finer.

A Bedford cord weave has a warp surface and the warp should therefore be finely set. The surface is really plain weave, but only half of the picks are on the face in the cord stripes. The setting therefore requires to be finer than plain weave in both warp and filling. In 30's cotton warp and filling (146 diameters) a number half way between the threads per inch for plain cloth (73) and 146 diameters, *viz.*, 110. will give a reasonable basis of the setting. The warp may be set finer or coarser, according to price, while the picks may be reduced, if desired, to about 84.

The face of a piquè structure is an ordinary plain fabric, and plain weave may therefore form the basis of the setting. If 40's cotton (168 diameters) is used for the face warp and filling, 84 face ends and picks is the maximum setting for plain weave. In the piquè cloth, however, stitching ends are woven into the face fabric and impart firmness to it, and it is therefore quite appropriate to reduce the setting from 84 to an average of about 72 face threads per inch. The stitching ends require to be thicker than the face ends, while thick filling is generally used for the wadding picks.

An open, imitation gauze weave is quite different from an ordinary cloth, but the warp and filling should be similar. By basing the setting upon plain weave, and placing each group of ends in one split with a split missed between the groups, a reasonably good result will be obtained. Thus if the 4 by 4 imitation gauze weave is required in 30's cotton yarns (146 diameters) a reed with 37 splits per inch may be employed, dented 4 ends per split and 1 split missed.

The foregoing methods of arriving at the weaving particulars of cloths can be compared with the particulars of structures that have been previously given. No hard and fast rules are laid down, as the correct setting of cloths is very largely a matter of good judgment, but theory can be made a very useful adjunct to practice. It will be found serviceable to compare the known particulars of good cloths with the results ascertained by the diameter and intersection theory.

JACQUARD HARNESS MOUNTING.

By F. Bradbury.

Principle and Routine of Harness Mounting.

Harness mounting, which is very frequently designated the tie-up of the harness, is the generic term used to express the arrangement, order and number of harness twines which are connected to each neck band, tug cord or hook, and their distribution in the comberboard. It is not necessarily a part of the Jacquard machine; on the contrary, the Jacquard apparatus is an invention designed to select and operate the harness twines which in earlier days were acted upon by the draw loom.

Sequence of Processes in Harness Building.

Harness building embraces a series of operations, involving the preparing and making of the mail couplings, cutting and tying the tug cords to hooks, warping the harness twines, tying the harness twines to the tugs, threading the harness twines through the perforation in the comberboard after the latter has been marked off according to pattern, hanging the couplings on to the harness twines and then levelling the harness. Varnishing is an auxiliary operation.

Variety of Knots in Harness Tying.

A complete connection from the uprights to the lingos with all the different kinds of *nautical* knots which have to be used in the processes of harness building is shown at Figs. 1 to 4 inclusive.

Fig. 1 shows one complete series of knots in the cords for tying *below* the comberboard.

Fig. 2 shows the same details and their relative positions when tying *above* the comberboard.