

FIG. 106.—EXAMPLES IN TEN-SHAFT WEAVES.

standard bases referred to, exhibits the range of fabric structures capable of being formed by twilling and matting, and in makes of a semi-perforated, sateen, diagonal, honeycomb, and checked order. But these are far from covering the varieties and types of effects obtainable. Each system of shaft mounting offers a gamut of elements for weave-planning, and for cloth

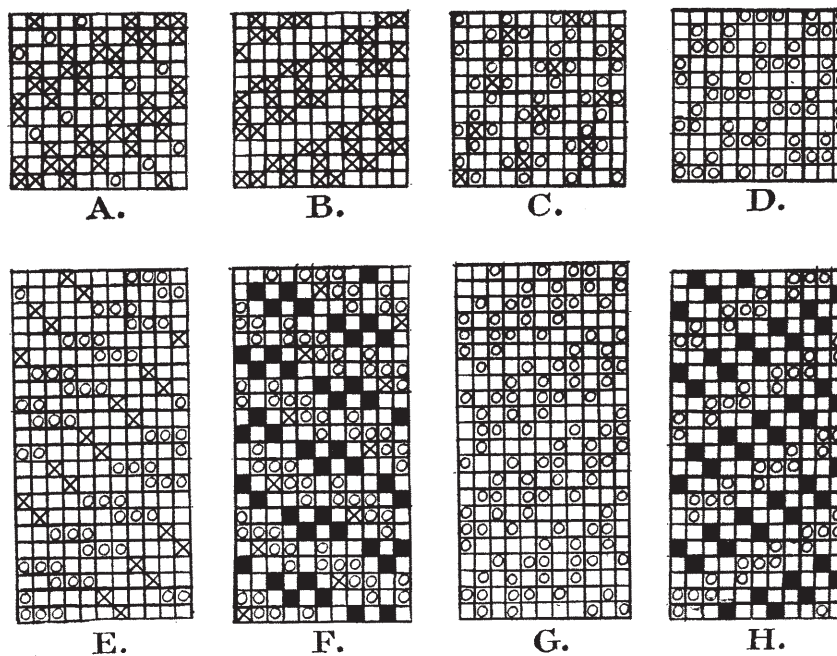


FIG. 107.—EXAMPLES IN ELEVEN-SHAFT WEAVES.

production in ordinary, as well as in specialized groups of crossings. The examples given, therefore, acquired on elementary twill bases, will be supplemented by the several series of weaves producible on multiples of threads requiring from six to sixteen-shaft mountings.

Primarily, it has been shown that on 4, 5, 6, and 7, etc., threads or heddles, twills, mats and sateens are obtainable of a similar structure in each group of shafts, but differing in the

dimensions of the floats of warp and weft yarns in the two former, and in the latter in the scale of the warp or weft intersections. Adopting increased closeness of setting as the floats increase in size, gives a finer and better grade of cloth, while adopting the same or a corresponding setting, and using thicker yarn counts, gives a coarser and heavier make of cloth, with the dimensions of the interlacings or the "effects" broader in character. In the case of crossings on sateen bases of an identical formation (*see* twilled mats on 8, 10, and 13 shafts, Fig. 101) the intersection points are less frequent with the enlargement of the weave plan.

The significance and value of these factors come out in cloth manufacture. Assuming, for example, that the effects of a selected plan are satisfactory in a fabric of a determined setting, and that (*a*) a finer cloth is required of a similar textural character, but in a weave of a larger number of threads, then in using the same yarns the setting would be proportionately increased; (*b*) that it is required to develop more pronounced textural features in the selected weave, then the basis or number of threads on which the weave is constructed would be enlarged; and (*c*) that a better definition is desirable in either the warp or weft details, then an alteration may be made in the weave, changing the shaft mounting, and also the warp and weft threads per inch, increasing or decreasing these in a fixed and relative ratio according to which class of detail, warp or weft, it is intended to emphasize.

166. *Six, Seven, and Eight-Shaft Weaves* (Figs. 102, 103 and 104).—Weaves occupying a small number of shafts have two distinctive applications: (1) in cloth building, and (2) as units in figured pattern development. The second application will be illustrated in treating of compound designs and of the principles of figuring. Cloth building, as due to the weave plan, not necessarily derived from ordinary twills, but from more original weave units, is exemplified in the groups of weaves seen in Figs. 102 to 112. A consideration of these suggests the degree to which the geometric planning of the

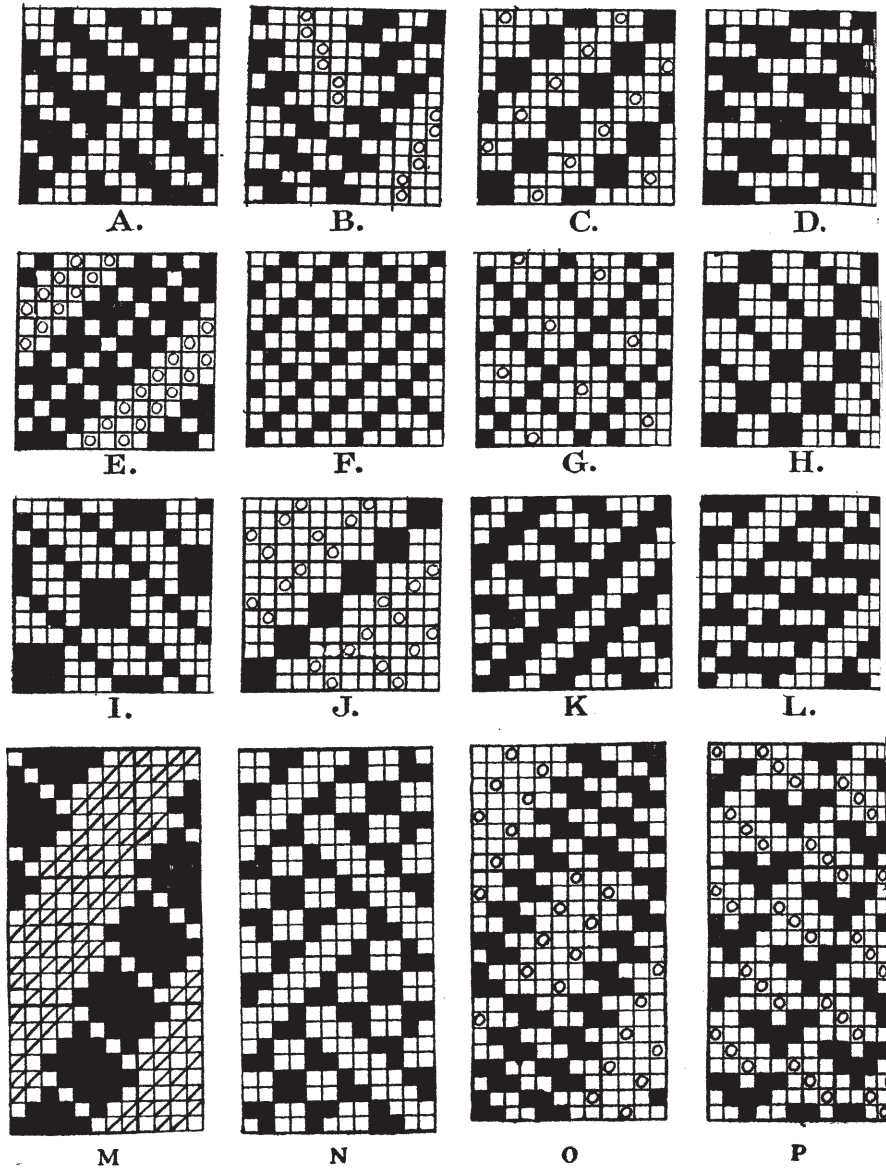


FIG. 108, PLANS A TO P.—EXAMPLES IN TWELVE-SHAFT WEAVES.

intersections may be made to give, in each group of threads, types of effect strongly differing from each other in form and arrangement, and also, in the build and style of fabric they produce. Though, for example, the 6-shaft weaves in Fig. 102 are restricted to this small number of threads, they include the detail twills A, D, and G; the angled twill F; the transposed

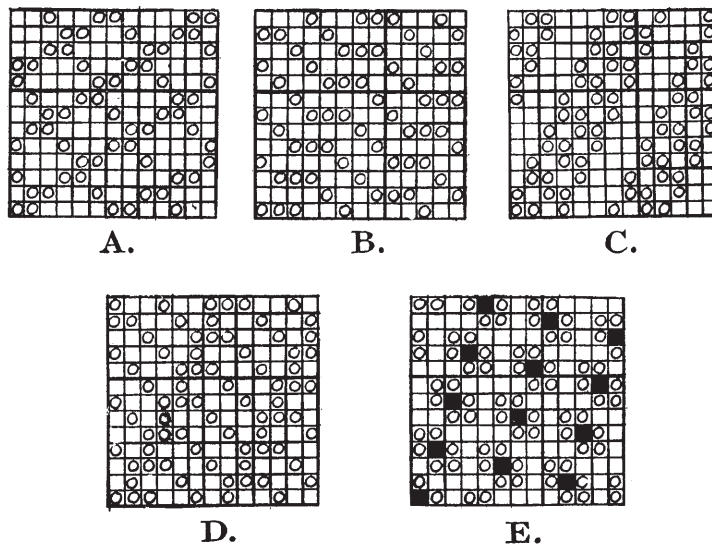


FIG. 109.—EXAMPLES IN THIRTEEN-SHAFT WEAVES.

make H; the cut check C; the broken mats E, I, L, and M; the waved  $\frac{3}{3}$  twill cutting in the picks K; and the whipcord plans N and O. Changing the shaft mounting to 7 heddles (Fig. 103) renders it possible to obtain other classes of effect, especially twills of a fine warp or weft character, and with the angle of the twill varied. Plans B, D, E, and F, each repeating on 14 picks, are seen to be distinct from each other in the warp lines, and in the detail interlacings; with plan C yielding a sort of twilled mat, and G composed of sections of  $\frac{2}{2}$  twill forming small diagonal lines. Increasing the shaft multiple to 8 (Fig. 104) enables other intersection bases to be devised of quite another description to those arranged on

6 and 7 shafts. The makes typified include reversed check effects, A and H and J and O; varied twills as in the mat and warp lines details in plan B; the warp line and diamond

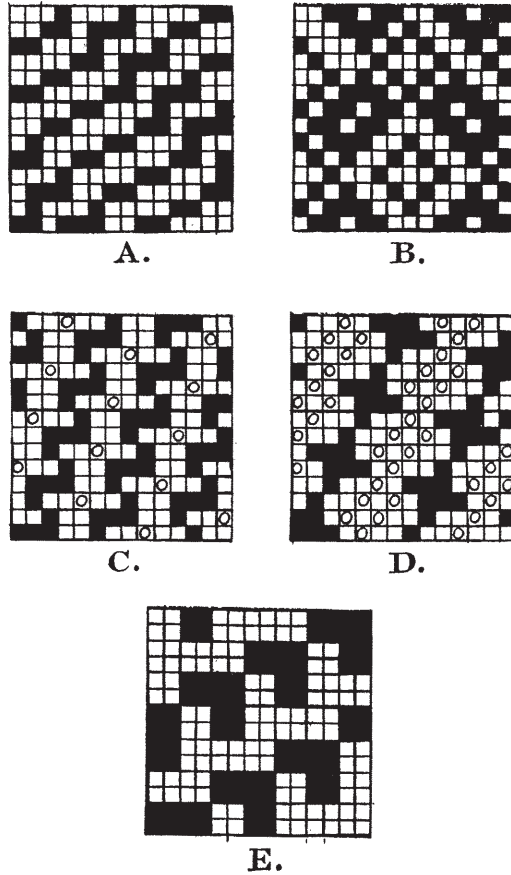


FIG. 110.—EXAMPLES IN FOURTEEN-SHAFT WEAVES.

spotted plan D; the fine warp twills L and N; Mayo effects E, F, K, and P; and the transposed and spotted types G and I. More elongated twilled patterns than those included in this series, and formed on 16, 24, and a larger number of picks, have already been dealt with in Paragraph 151.

167. *Weaves on Nine, Ten, and Eleven Shafts* (Figs. 105, 106;

107).—An analysis of these shows how the intersection types become increasingly diversified in detail in the larger systems

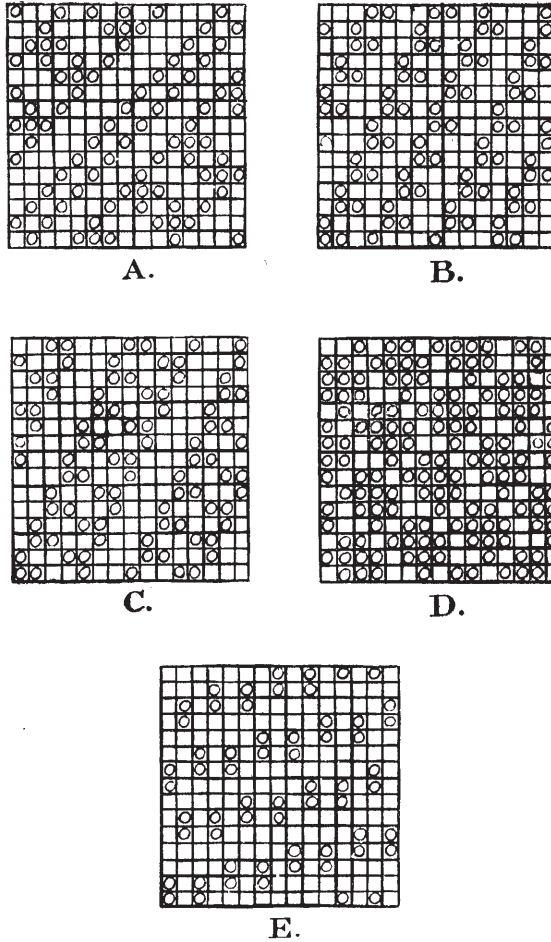


FIG. 111.—EXAMPLES IN FIFTEEN-SHAFT WEAVES.

of shaft-mounting. The examples A, B, and C in Fig. 105, resemble weaves producible on 7 shafts, but those at E, F, and G comprise quite another class of weave, E being a spotted twill, F a fancy twill with a preponderance of weft, and G a clear warp twill in a line with a weft twill in small spottings. The



10-shaft base, like the 8, enables weaves of a regular, and also of a fancy character to be constructed; thus A, B, and C, (Fig. 106) are of the twilled order, plan A being a fine warp effect, B a crêpe, and C consisting of a line of twilled mat crossed with warp details. Weaves D and E are transposed effects developed in warp and weft respectively. Plan F is arranged on a double 5-end sateen base. Adding to the number of picks in the weaves gives the type in H to N, namely, a 10-shaft spotted plan H, a weft cord twill I, and the small diagonal patterns J, K, L, M, and N. The 11-shaft makes (Fig. 107) are still more diversified in textural detail, A and B being oblique twills, C and D crêpes, E a weft cord and warp-face twill compound, and F, G, and H "effect" twills due to constructing a small "motive" and grouping the repetitions of it on an extended sateen base.

168. *Weaves on Twelve, Thirteen and Fourteen Shafts* (Figs. 108, 109 and 110).—The principal types on 12-shafts, as illustrated in Fig. 108, include—

- (1) Shaded Twill, A.
- (2) Weft-striped Effect, B.
- (3) Hopsack Twills, C and H.
- (4) Weft-effect Twills, E, D and L.
- (5) Warp-twill and Diamond Effects, F and G.
- (6) Mat-spotted Type, with warp twill ground, I.
- (7) Mat and "Swansdown" Twill, J.
- (8) Pattern composed of  $\frac{1}{2}^2$  twill to the right and  $\frac{1}{2}^2$  twill to the left, K.
- (9) Weft-face Twill, M.
- (10) Transposed Plan, with mat ground, N.
- (11) Compound Twills, O and P.

On 13-shafts (Fig. 109) similar plans are formable as on 11, and also the types shown at A to E (Fig. 108) as well as others of a definite diagonal character by extending the picks. The weaves illustrated are distinct in formation, A being of a matted structure, B a weft cord and fine warp twill, C a clear warp twill, D a modification of B, and E a hopsack twill. The examples on 14 shafts (Fig. 110) include plan A composed of



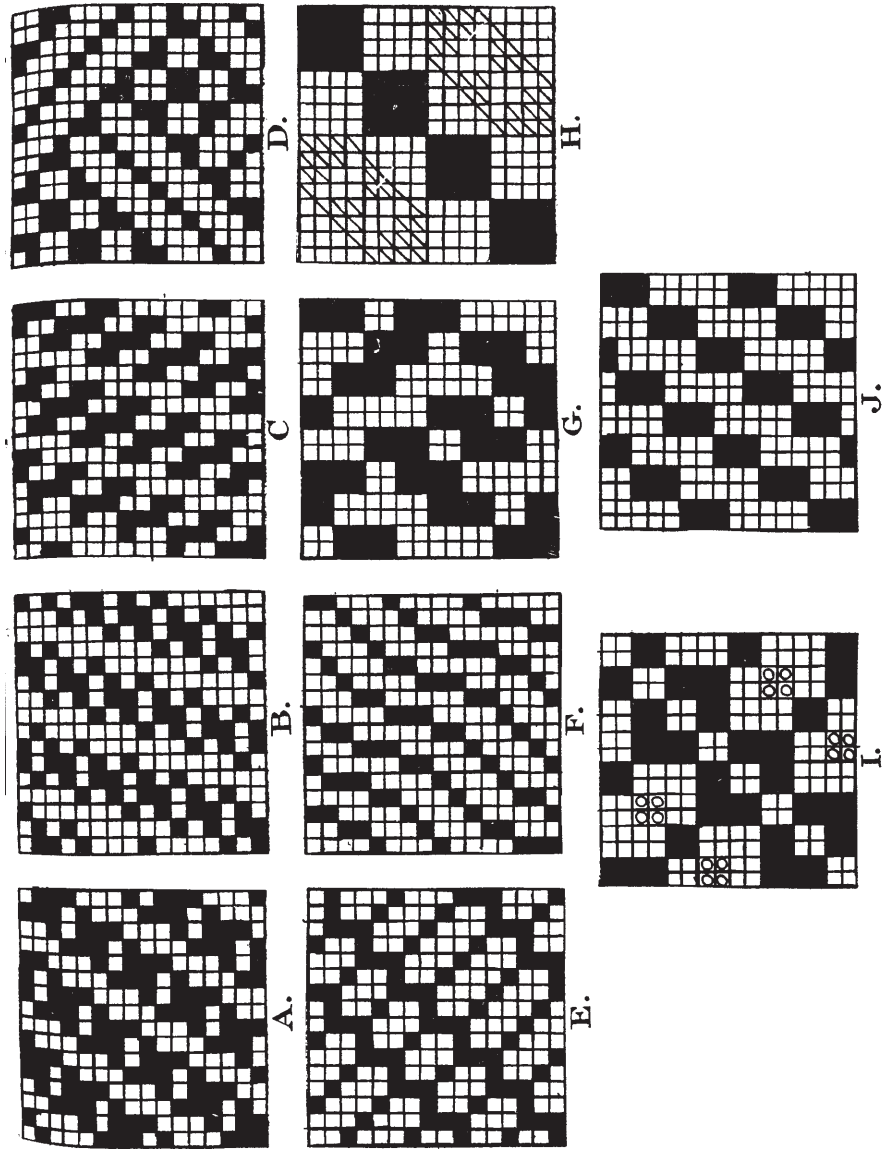


FIG. 112.—EXAMPLES IN SIXTEEN-SHAFT WEAVES.

double plain and step twill, B constructed on a diamond base, C on a sateen base, and D on a duplicated 7-shaft sateen base. Plan E is due to the extension of the threads and picks of plan A (Fig. 103).

169. *Weaves on Fifteen and Sixteen Shafts* (Figs. 111 and 112).—Several 15-shaft weave units are given in Fig. 111. They are illustrative of compound twilling, plan A; of warp-face twilling, plans B and C; of weft-face twilling, plan D; and of corkscrew twilling, plan E.

A number of the 8-shaft weaves are subject to enlargement by doubling the threads and picks, producing them on 16-shafts for giving open pattern elements as in plan I (Fig. 112), an enlargement of plan P (Fig. 104). Diagonal patterns are also obtained on 32 or more picks, and by the designing practices explained in Paragraph 134. The 16-shaft plans reproduced in Fig. 112 comprise—

- Plan A = A Step Twill.
- „ B = A Whipcord Twill.
- „ C = A Fancy Warp Twill.
- „ D = A Transposed Effect with mat features.
- „ E = A Diagonal Twill.
- „ F = A Waved Twill.
- „ G = An Open-structure of Transposed Pattern.
- „ H = A Compound Mat Check.

Plans I and J = Doubled 8-shaft Weaves.

It should be observed that the various weave structures included in these examples are not only employed as illustrated, in which the blanks represent warp interlacings, but also with the marks taken as warp and the blanks as weft effects. With either the warp or the weft features predominating in the plans, the weaves are suitable for reversing, and also for combination with each other in producing striped, checked, and other varieties of design.

## CHAPTER VI

### DRAFTED PATTERNS : STRIPES

170.—Angled-Twill Stripes. 171.—Designs on a Small Number of Shedding Units. 172.—Effects on Two Shafts. 173.—Checked Patterns on Two Heddles. 174.—Designing on Three Shafts. 175.—Repp Patterns. 176.—Twill-*Repp* and Mat Stripes. 177.—Matted Stripes. 178.—Multi-form Character of Derivative-Weave Stripes. 179.—The Combination of Weaves of Different Interlacing Principles. 180.—Fundamental Features in Forming Weave Stripes. 181.—Fine Line Pattern Types. 182.—Stripes in Twills of Different Angles. 183.—Uses of the Plain Make in Striped Designs. 184.—Mock Leno Stripings. 185.—Zephyrs and Lustres. 186.—Warp and Weft Pattern Effects. 187.—Fancy and Special Weave Stripings. 188.—Inverted Weave Structures. 189.—Striped Figured Designs. 190.—Lace Stripings.

170. *Angled-Twill Stripes*.—The term drafting is applied to the method of entering the warp threads into the healds of the shafts or heddles. It results in the transmutation, according to plan, of the grouping of the thread units of which a design is composed. The number of shafts required in the production of a design, as prepared on point paper, is that of the multiple of the distinct types of thread it contains.

It has been shown that, in the examples of crossings derived from a simple intersection base, by re-arranging the threads of a given weave unit, various textural plans are producible. The varieties of design thus formed have not, however, been either of a striped or of a checked character. In one sense the waved or serpentine patterns are a species of stripe, as the dice patterns are a form of checking; but the true striped style consists of clear, parallel lines of effect, and the correct checked style, of lines of effect intersecting each other at right angles.

Waved compound styles differ from angled patterns in the order in which the twilling is reversed, that is, at the juncture in the plan where the line direction of the twill is changed; while in the herringbone or angled stripe, the warp

and weft twilled lines cut or oppose each other at the reversing point in the design. The system of drafting followed results in such differences in these two elementary forms of stripe.

What are known as the "angled," "sateen," and other healding practices, are applied to the several classes of simple weaves in the origination of striped, checked, and all-over schemes of pattern. To illustrate this branch of pattern work, reference will be made, in the first place, to the tweed costume specimens in Fig. 113, and to the worsted textures in Fig. 114. The tweed examples are woven in the  $\frac{2}{2}$  twill, and the worsted examples in the  $\frac{3}{3}$  twill, and in the healding drafts outlined in Figs. 113A' to D', and in Figs. 114E' to J'. The numerals in the drafts indicate the order of the shafts, and the marks show the method of distributing the threads in "drawing-in" the warp on to the shafts 1, 2, 3, and 4, Fig. 113, and on to the shafts 1, 2, 3, 4, 5, and 6 in Fig. 114. The striped patterns obtained by the combination of the Plans 113A<sup>2</sup> and 114D' with the healding drafts, are described below—

FIG. 113, SPECIMENS A, B, C, AND D

- Specimen A— $\frac{2}{2}$  twill, drafted "straight," as at Fig. 113 A'.  
 ,, B—Angled stripe, composed of lines of 8, 4, and 2 threads, twilled to the right and to the left alternately, and drafted as at Fig. 113, B'.  
 ,, C—Stripe composed of lines of twill cutting in two's and moving to the right and to the left, of lines of twill to the right, and of small lines of mat—Draft Fig. 113, C'.  
 ,, D—Stripe composed of angled twill, mat, and warp rib—Draft Fig. 113, D'.

FIG. 114, SPECIMENS E, F, G, H, I, J

- Specimen E— $\frac{3}{3}$  twill angled 6-and-6—Draft Fig. 114, E'.  
 ,, F— $\frac{3}{3}$  ,, ,, 96-and-96— ,, ,, 114 F'.  
 ,, G—Composed of angled effects formed of 12 and 12 lines for 96 threads, and of 6 and 6 lines for 96 threads—Draft Fig. 114, G'.  
 ,, H—Composed of stripes of twill to the right and of stripes of twill cutting in three's—Draft Fig. 114, H'.  
 ,, I—Composed of broad stripes of twill, and of twill cutting in three's, and of lines of mat—Draft Fig. 114, I'.  
 ,, J—Composed of various sizes of stripes in angled twill, and of lines of twill cutting in two's—Draft Fig. 114, J'.

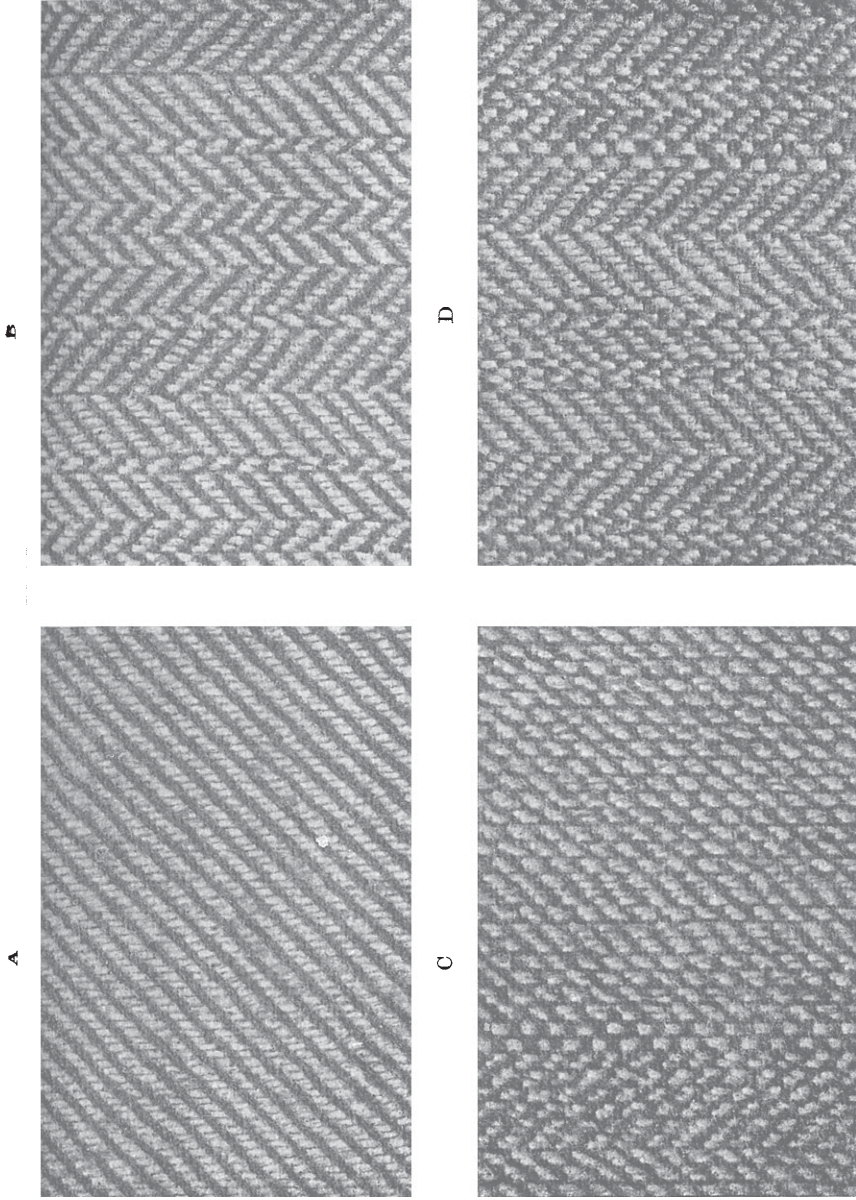


FIG. 113.—DRAFTED PATTERNS—TWEED COSTUME CLOTHS.

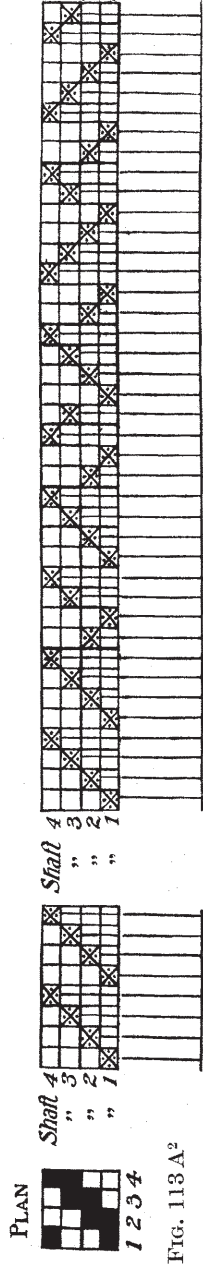


Fig. 113A'

Fig. 113B'

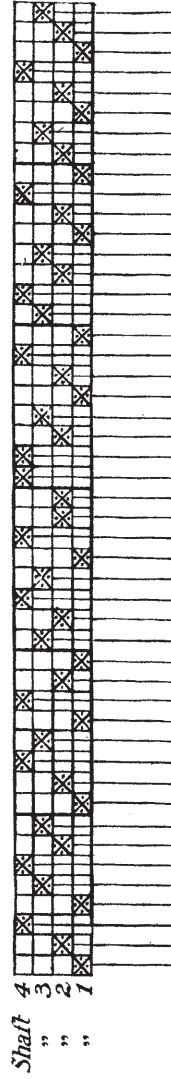


Fig. 113C'

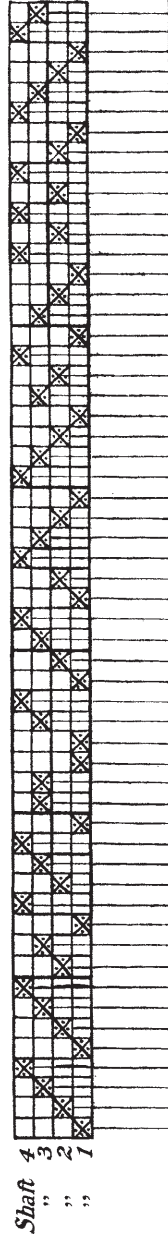


Fig. 113D'

HEALDING DRAFTS FOR SPECIMENS A TO D, FIG. 113.



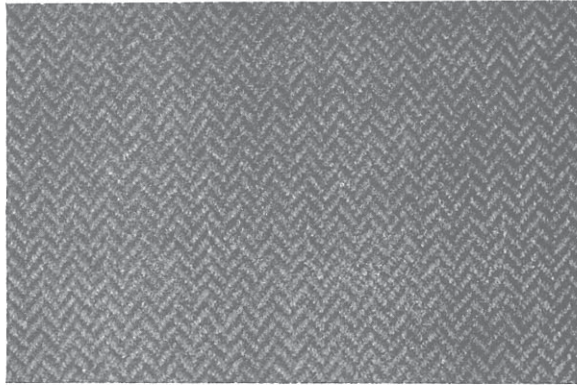
It follows that, as 4-end and 6-end weaves are here employed in the healding drafts, Fig. 113A' to D', the  $\frac{1}{3}$  twill might be used, and in the healding drafts, Fig. 114E' to J', the  $\frac{1}{2}-\frac{1}{1}-\frac{2}{1}$  twill might be applied. Similar healding drafts are formable on other multiples of shafts, such as 5, 7, 8, and 9, rendering the standard twills for such shaft mountings usable. In addition, the plans acquired by re-arranging the threads of a simple weave unit, illustrated in Figs. 74 to 78 inclusive, are suitable for combination with each other, with the basic weave as the looming plan in the weaving of the patterns. The method of combination, and the type of weave derivative applied, are, in all examples of this description, subservient to the style of design desired, and the class of fabric to be manufactured.

171. *Designs on a Small Number of Shedding Units.*—With the restricted shedding capacity in tappet and dobbie looms, systems of healding are of paramount value and importance. They enable styles of a composite textural character to be developed; first, in weave plans as exemplified in the derivatives of the common twills; second, in compound weave designs such as stripes and checks; and third, in designs arranged on a geometric base. The principles of healding are fundamental to the varieties of pattern types producible in a given plan of a limited number of threads, having different intersecting points. For example, in the 4-shaft and 6-shaft crossings (Figs. 113A<sup>2</sup> and 114D') there are in these two sorts of weave four and six distinct thread units. The transposition and re-arrangement of the threads by the healding draft, results in the distinct styles of striping observed in the woven specimens. When limited to two or three threads, many descriptions of pattern are also formable.

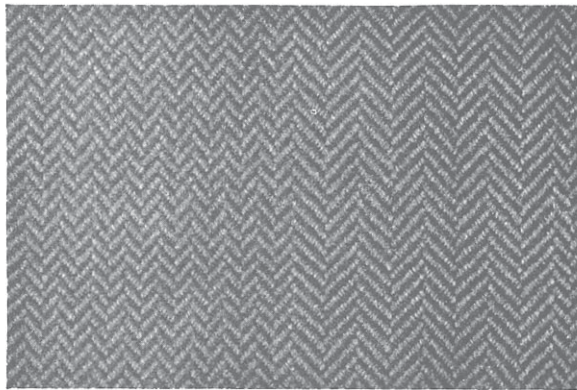
Designing, by the re-grouping of such threads, has some elements in common with the mathematical infinitude in the origination of the magic square in the use of the root of four, from which it is possible to obtain some 600 billion modifications, all included in the summation of 1891, and yet each



E



G



I

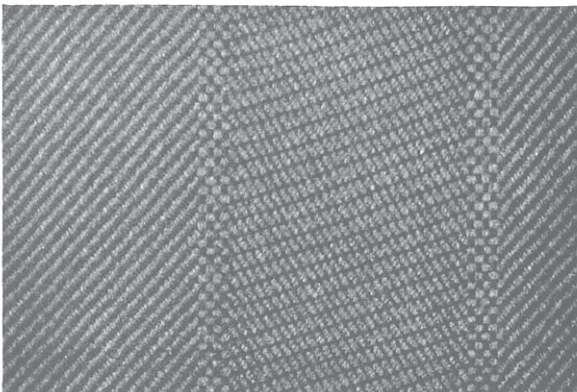
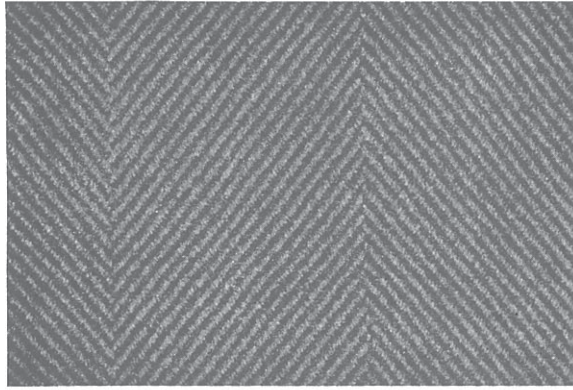
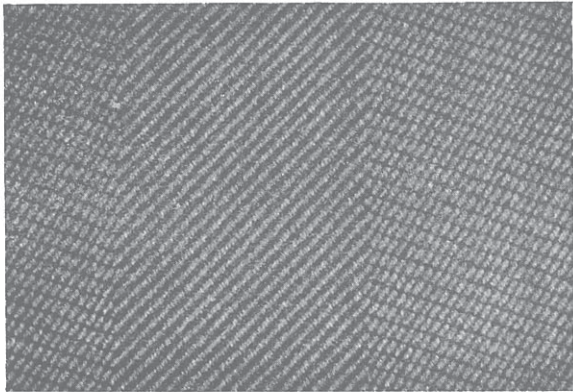


FIG. 114.—DRAFTED PATTERNS—WORSTED COSTUME CLOTHS.

F



H



J

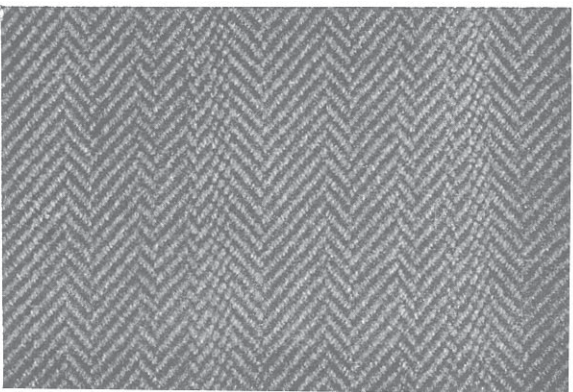


FIG. 114.—DRAFTED PATTERNS—WORSTED COSTUME CLOTHS.

PLAN  
123456



FIG. 114 D'

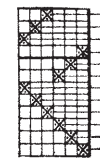


FIG. 114 E'

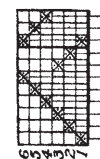


FIG. 114 F'

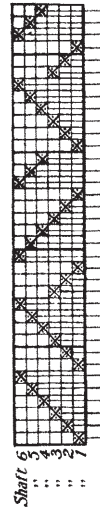


FIG. 114 G'

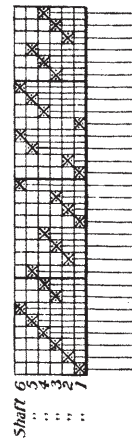


FIG. 114 H'

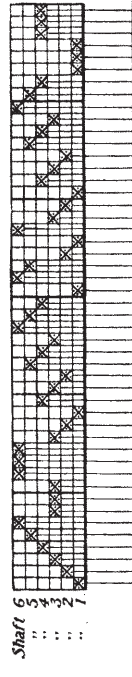


FIG. 114 I'

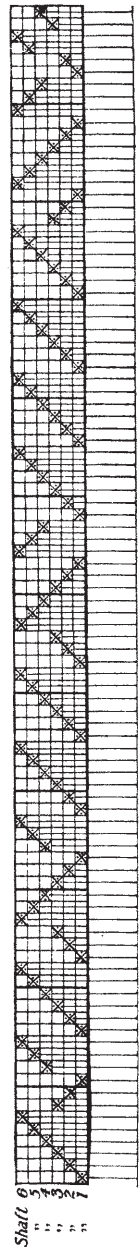


FIG. 114 J'

HEADING DRAFTS FOR SPECIMENS E TO J, FIG. 114.

square made up of sections in which the order of the numerals differ. Weave planning, by the re-arrangement of the threads or picks, in the multitude of changes of which it is productive, bears some resemblance to the process of magic square compilation ; or, it may more aptly be compared to the diversity of harmonies possible in the art of music from a given octave of notes. Thus, with ingenuity in the formation of the interlacings of the thread units, and in their methods of grouping, patternwork may be diversified to an illimitable degree.

172. *Effects on Two Shafts.*—When confined to the lowest number of shedding units, that is to two intersecting threads, there is a considerable compass provided in the formation of striped and checked patterns, as seen in the designs sketched in Figs. 115 to 120. The striped example (Fig. 115) contains three widths of line, developed in warp cord, ordinary mat, and elongated hopsack. Obviously, by varying the dimensions of these lines, and also by changing the type of the cord plan, the mats would also be modified ; and, with these alterations, other forms of striping would be producible. In addition, distinctive stripings weavable on two shafts, because composed of two threads, Nos. 1 and 2 in the examples, may be acquired by using either the transverse sections, A or B, in Figs. 117 to 120 ; for when these are separated from the designs of which they form a part, they become striped styles consisting of—

Fig. 117, Section A = A stripe of 3 threads of warp cord and of 10 threads of mat.

„ B = A stripe of 3 threads of plain and of 10 threads weft cord.

Fig. 118, „ A = A stripe consisting of lines of 5 threads of plain, 2 threads of weft cord, 2 of plain, and of 2 of weft cord.

„ B = A stripe consisting of lines of 5 threads of warp cord and plain, 2 threads of mat and weft cord, 2 threads of warp cord and plain, and of 2 threads of mat and weft cord.



- Fig. 119 Section A = A stripe consisting of lines of 4 threads of warp cord, 7 threads of mat, and of 4 threads of warp cord.  
 „ B = A stripe consisting of lines of 4 threads of plain 7 threads of weft cord, and of 4 threads of plain.
- Fig. 120 „ A = A stripe consisting of 5 threads of plain and warp cord, 2 threads of weft cord, and mat, 5 threads of plain and warp cord, and of 10 threads of weft cord and mat.  
 „ B = A stripe consisting of 5 threads of warp cord, 2 threads of elongated mat, 5 threads of warp cord, and of 10 threads of mat.

173. *Checked Patterns on Two Heddles.*—As stated, each of the examples, in Figs. 115 to 120, is composed of the 2 threads numbered 1 and 2, which are necessarily the reverse of each other in intersections. In making such plans, the formation of the thread unit is the first factor, and the grouping of the 2-thread units, in an ordered stripe or checked form, the second factor. The checkings become interesting in textural features and in style with the varied character of the unit threads combined. The use of threads, simple in order of interlacing, are seen to give (Figs. 116 and 117) two kinds of mosaic checking. Thus the effects in ■'s and in □'s (Fig. 116) correspond in size, but those in Fig. 117 consist of squares of 10 threads and picks, and of 3 threads and picks, and of oblong sections of 3 threads of warp cord and 3 picks of weft cord. In Fig. 118, another plan of arrangement has been applied, namely, lines of effect, in plain and weft cord of 5 and 2 threads, intersecting with similar lines in the weft. With a further diversification in the interlacings in the thread units, and also in the practice of their combination, the designs in Fig. 119 and 120 are obtained. In Fig. 119 the intersections in thread No. 1 consist of—

$$\begin{array}{r} 1 \ 1 \ 3 \ 1 \ 1 \ 1 \ 1 \ 2 \ 2 \ 1 \ 1 \ = \text{Warp intersections} \\ 1 \ 2 \ 2 \ 1 \ 1 \ 1 \ 1 \ 3 \ 1 \ 1 \ 1 \ = \text{Weft} \quad \text{,,} \end{array}$$

and in thread No. 2 of—

$$\begin{array}{r} 1 \ 2 \ 2 \ 1 \ 1 \ 1 \ 1 \ 3 \ 1 \ 1 \ 1 \ = \text{Warp intersections} \\ 1 \ 1 \ 3 \ 1 \ 1 \ 1 \ 1 \ 2 \ 2 \ 1 \ 1 \ = \text{Weft} \quad \text{,,} \end{array}$$

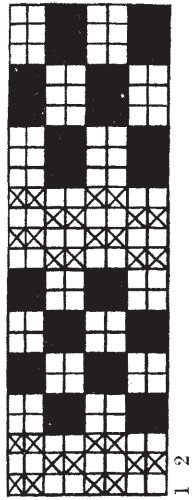


FIG. 115

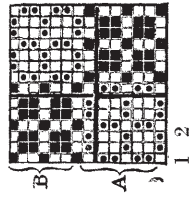


FIG. 116

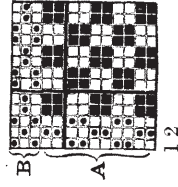


FIG. 117

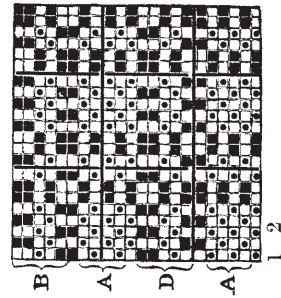


FIG. 118

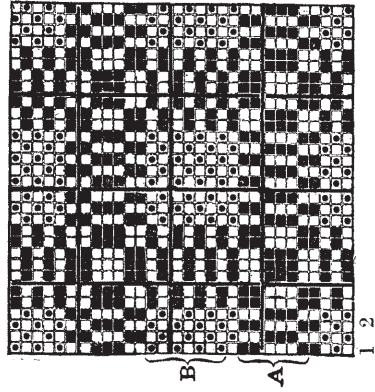


FIG. 119

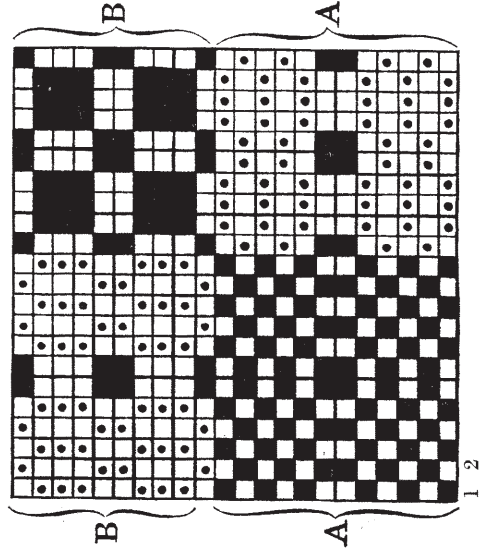


FIG. 120

STRIPED AND CHECKED PATTERNS WEAVABLE ON TWO SHAFTS.

while in Fig. 120, the intersections in thread No. 1 consist of—

$$\begin{array}{r} 1 \ 1 \ 2 \ 1 \ 1 \ 1 \ 2 \ 1 = \text{Warp intersections} \\ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 3 \ 3 = \text{Weft} \quad \text{,,} \end{array}$$

and in No. 2 of—

$$\begin{array}{r} 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 3 \ 3 = \text{Warp intersections} \\ 1 \ 1 \ 2 \ 1 \ 1 \ 1 \ 2 \ 1 = \text{Weft} \quad \text{,,} \end{array}$$

Obviously, when limited to 2 thread units, many types of pattern may be produced in piece-dyed and coloured goods. The designs are also adapted for style origination in both warp and weft colouring. For example, certain of the sections marked in ■'s, may, in the development of the plans, be woven in a thicker yarn, or in a different colour of yarn from certain of the sections in □'s. Each method of looming has the result of enforcing the details in the weave scheme. Should this be essential, the order of warping, or of both warping and wefting, may be made to coincide with the form of the design construction, in which instance Figs. 119 and 120 would be suitable for colour treatment on the following lines—

FIG. 119.—ORDER OF WARPING

1	thread of tint or shade	<i>a</i>	}	for 4 threads.
1	„	„		
2	„	„		<i>a</i>
3	„	„		<i>b</i>
2	„	„		<i>a</i>
1	„	„	}	for 8 threads.
1	„	„		
2	„	„		<i>b</i>
3	„	„		<i>a</i>
2	„	„		<i>b</i>
1	„	„	}	for 4 threads.
1	„	„		

ORDERS OF WEFTING

- I. A light tint or shade.
- II. A medium tint or shade.
- III. Same order as warping.



FIG. 120.—ORDER OF WARPING

1	"	"	"	"	}	for 5 threads.
1	"	"	"	"		
2	"	"	"	"	}	for 5 threads.
1	"	"	"	"		
1	"	"	"	"	}	for 5 threads.
10	"	"	"	"		

ORDERS OF WEFTING

- I. A light tint or shade.
- II. A medium tint or shade.
- III. Same order as warping.

The order of colouring in Fig. 119 causes alternate sections in the mat to be developed in the tints *a* and *b*. Other methods of colouring weave patterns of this description consist in producing each effect in a special shade of yarn, thus—

FIG. 118.

5 threads of tint or shade <i>a</i>					
2	"	"	"	"	<i>b</i>
2	"	"	"	"	<i>a</i>
2	"	"	"	"	<i>b</i>

FIG. 119.

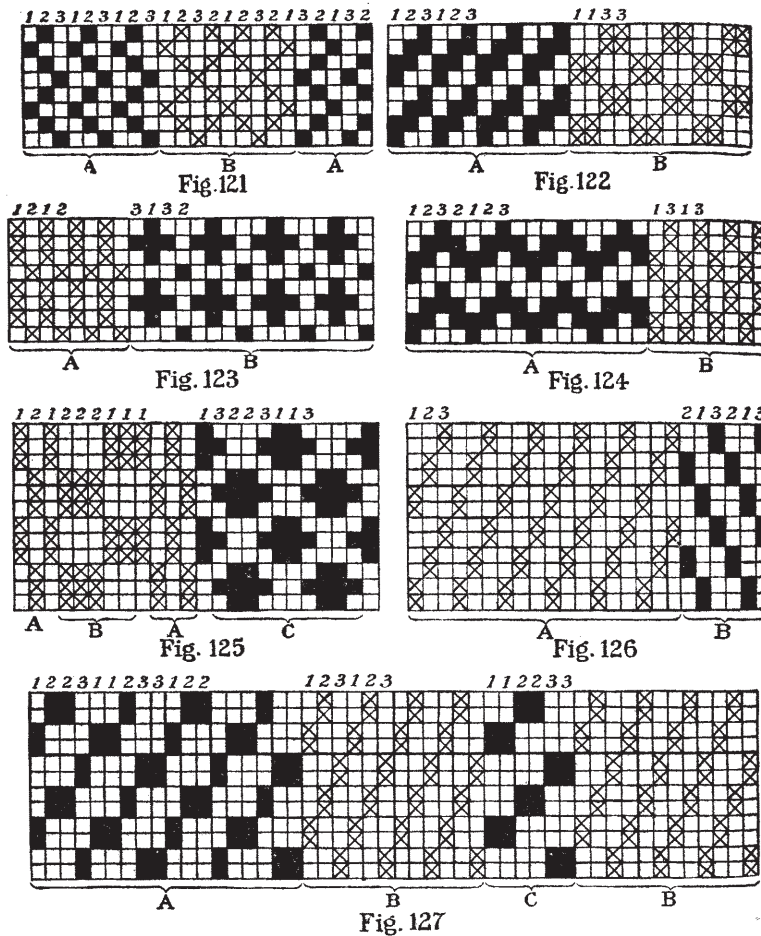
4 threads of tint or shade <i>a</i>					
7	"	"	"	"	<i>b</i>
8	"	"	"	"	<i>a</i>
7	"	"	"	"	<i>b</i>
4	"	"	"	"	<i>a</i>

FIG. 120.

12 threads of a tint or shade <i>a</i> .					
10	"	"	"	"	<i>b</i> .

174. *Designing on Three Shafts.*—The employment of three heddles or shafts has the advantage over two heddles, inasmuch as it allows of the production of twilled as well of cord and mat effects. The varieties of plan units obtainable from the prunelle, by the re-arrangement and extension of the weave base, are given under Fig. 71, but other interlacing elements are formable with three threads, which may be applied in developing designs on this number of heddles, such as the striped patterns

in Figs. 121 to 127. The first is composed of the prunelle twill waved in the weft, section A, and of the same twill reversed in section B, hence a stripe consisting of these two



STRIPED PATTERNS WEAENABLE ON THREE SHAFTS.

lines of effect. Fig. 122 is composed of three ends of the  $\frac{2}{2}$  twill cutting every third thread, and of mat; while Fig. 123 is a combination of an irregular warp cord and of a bird's-eye spot. Selecting three alternate threads of the  $\frac{2}{2}$  twill gives

an effect on three shafts, and using two of these threads (1 and 3) gives a mat ; hence the combination of the two effects, as in A and B in Fig. 124, yields a striped design. For producing more open effects on three shafts,  $\frac{3}{3}$  mat and cord are usable, with the small weave effect, seen at C in Fig. 125. By extending the prunelle in the picks, and running it to the right and to the left (section A and B, Fig. 126) fine angled-twill patterns result. Doubling the twill in both the threads and picks, and combining the resultant effect with a weave two picks in a shed, and in the form seen at A, B, and C (Fig. 127) a striped pattern is acquired composed of a line, A, of step twill ; a line, B, of upright twill ; and a line, C, of mat twill.

The numerals at the top of each of the plans show the healding order, which, it will be observed in all the examples, contains three threads workable on three shafts, and from such numerals the method of design originated may be ascertained in each instance.

Elementary forms of striping have been selected, but it will be clear that these may be elaborated either in the character of the line, or in the grouping of lines of different sizes of each of the effects comprised—principles of work which are common to all drafted designs of this category.

175. *Repp Patterns*.—These should be distinguished from the cord variety of design described in Paragraph 153. They are formed—

(1) By combining two or more warp face weaves, e.g. A' and A<sup>3</sup> and A<sup>2</sup> and A<sup>4</sup> (Fig. 70).

(2) By combining weft face weaves, e.g. Q and R (Fig. 102) and 2-and-2 and 4-and-4 ribbed weaves, etc.

(3) By combining two or more warp-face and weft-face weaves, such as A<sup>2</sup> and A<sup>7</sup>, Fig. 70 ; and by combining two types of warp ribs with similar ribbed weaves transposed.

Specimens A and B (Fig. 128) are woven respectively in the  $\frac{2}{1}\frac{4}{1}$  warp and weft repp makes, and specimens C and D in the  $\frac{2}{2}$  warp and weft cords. Combining, on the first principle, the effects in A and C, would develop lines in the

warp concealing the shots of weft, and combining, on the second principle, the effects in B and D, would develop lines in the weft concealing the threads of warp. This implies that the warp yarn would be the chief ingredient of the first style of texture, and the weft yarn the chief ingredient of the second

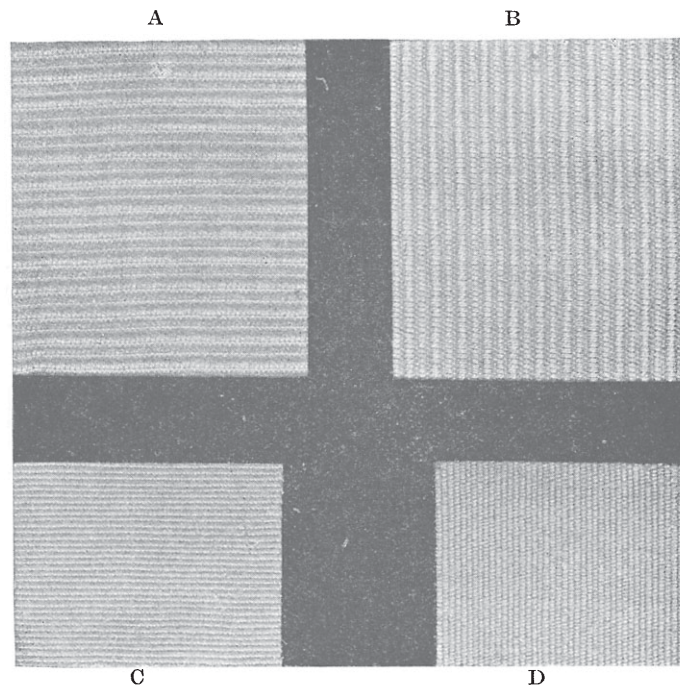


FIG. 128.—WARP AND WEFT CORD TEXTURES.

style. Varieties of striping in either the *warp* or *weft* face plans are obtainable by changing the intersecting order of the weave units selected.

When both warp and weft effects are employed, as in the third scheme of combination, rib plans may be of a like or of a different formation. Patterns may, for example, be produced in lines of A and B or C and D, or of A and D (Fig. 128); and in  $\frac{1}{4}$  warp rib with plan R (Fig. 102). The three methods of

combination are diversified in a number of ways as in the use of two kinds of warp rib (section B, Fig. 129) in arrangement with a warp-faced twill stripe A, or by using one or several ribs composed of different interlacings with common twills and other crossings. In the specimen,  $\frac{1}{2}^2$  and  $\frac{1}{2}^4$  warp ribs are combined in stripe B, giving the transverse features composed of fine and open repps. For producing such designs, the number of heddles for the cord details need not exceed two,

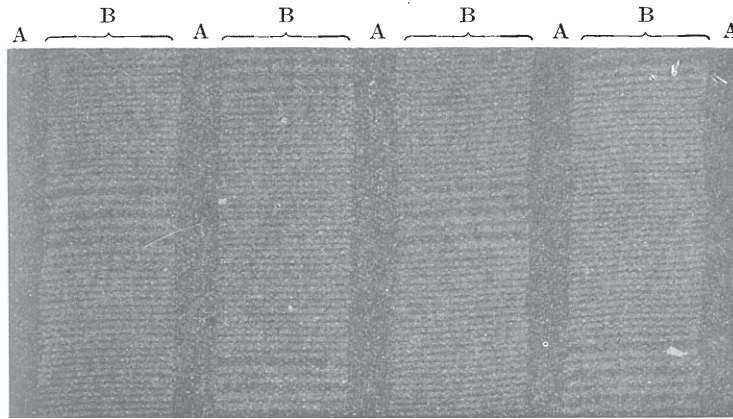


FIG. 129.—WARP CORD AND FINE-TWILL STRIPE.

but the number for the twilled sections should coincide with the number of threads in the weave applied.

176. *Twilled-Repp and Mat Stripes*.—The  $\frac{1}{2}^2$  twill is ordinarily combined with the 2-and-2 and 4-and-4 cords, and the  $\frac{1}{3}^3$  twill with the  $\frac{1}{3}^3$  and  $\frac{1}{6}^6$  cords, or with cord plans containing a corresponding number of threads or picks as the twilled weaves. In addition, simple twills are combined with mats or hopsacks, and the patterns are made in cotton, worsted, silk, and linen goods, and comprise stripings in almost any kind of line assortment and grouping as—

(a) Types of pattern in twill, mat, and cord, of equal widths, and in minute, medium, and broad lines.

(b) Types of pattern in twill, mat, and cord, of two or more lines of effect of different widths and interchanging in position.

(c) Types of pattern in three or four widths of line.

The factors, which determine the line dimensions and the weave structure applied, are the setting of the cloth and the style producible. Moreover, cord plans, twills, and angled twills, as also the derivatives of twilled makes, are formed into pattern types with rib and mat weave units, and become draftable on to the shaft mounting adapted to the twill or basic weave in the patterns.

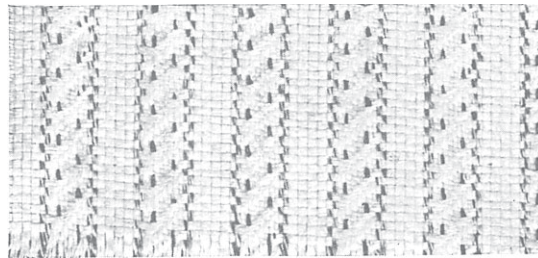


FIG. 130.—TWILL AND MAT PATTERN.

Should the cloths be required to be made firmer in construction than those obtained in the standard crossings, modified twills and mats are combined, and these increase the shafts usable. The example in Fig. 130 is composed of plans A and E (Fig. 102) and is illustrative of this, the twilled weave consisting of a 6-thread, and the mat of a 4-thread unit. Other modified weaves of this kind, made on 8 instead of 6 shafts, are B and C (Fig. 104) which might be utilized with J, O, and Q. In the lighter makes of fabric, and with the view of making a firm structure, plain interlacing intersections may be run underneath the floating threads or picks of the mat or cord, constituting the weave effects on the surface.

177. *Matted Stripes*.—Elongated mats which have been shown to be derived from warp and weft ribs, are employed



for stripes, on similar principles to the ribbed weaves alluded to. Irregular mats—i.e. mats containing an odd number of threads and picks—may be readily converted into striped and checked designs weavable on 2 or 4 heddles, and those chiefly used are formed on 5, 7, and 9 threads. The modified type of mat, E and Q (Figs. 102 and 104) and also C and J in the same series, are combinable with ordinary mats on six and eight shafts.

Another basis of work comprises the use of elongated mats, as shown in Fig. 131, where the effects in the respective stripes may be increasingly defined by extending the mat base. Here the 4-end mat has been enlarged in the picks in section A, and in the threads in section B; hence by similarly enlarging six on eight shaft mats, and combining their derivatives, the striped lines, which they are arranged to compose, strongly contrast with each other in the fabric. It is essential that the two makes should be correctly joined together by starting and finishing one of the mats with single threads, so that the weaves in the stripings fit evenly with each other, as in A and B in the example. This rule is also observed when the plans are made into checked styles.

178. *Multi-form Character of Derivative-Weave Stripes.*—The economy in shaft mounting, due to constructing striped patterns on a standard twill or crossing, is now evident. The extent to which the pattern types may be diversified has also been suggested. While, therefore, the numerous classes of striped designs, producible in each of the ordinary twill bases, need not be illustrated, it is important to show the application of this practice, in pattern design, to other and larger weave units than those treated of. For this purpose, designs consisting of three and four weave units, and devised on the 8, 9, and 13 shaft twilled bases, are typified in Figs. 132, 133, 134, and 135. Each of these patterns is formed of weave effects derived from section A, so that it is a question of using this section as the looming plan, and of healding the warp on the shafts in the order of the numerals on the upper line of the



designs. Examining these examples shows that they comprise the following lines of effect—

- Fig. 132. A striped design on 96 threads—consisting of lines A, in  $\frac{1}{4}$  twill ; B in stepped cork screw ; and C in corkscrew or warp-cord twill—draftable on to 8 shafts.
- Fig. 133. A striped design on 63 ends—consisting of lines of waved-twill A and C, and of lines of matted-twill B—draftable on to 9 shafts.
- Fig. 134. A striped design on 96 ends—consisting of five lines of effect, namely, stripe A  $\frac{1}{4}$  twill to the right ; B in the same twill to the left ; C in oblique corkscrew ; D in step twill ; and E in interrupted twill—draftable on to 9 shafts.
- Fig. 135. A striped design of 78 threads—consisting of four lines of effect, namely, a broad line A in fine twill ; lines B and D in upright twill ; and C in upright twill angled to form a pointed feature in the fabric—draftable on to 13 shafts.

The technical characteristics observed in these examples are : (1) the diversity of striped pattern acquired both as to the number of threads forming a repeat, and as to the dimensions of the lines A, B, C, D, and E ; (2) the types of weave effect of which such styles are composed ; and (3) the range of contrasts in textural detail of which designs of this class are illustrative.

Relative to the dimensions of the lines—in Fig. 132 sections A consist of 8 threads, section B of 64, and section C of 16 threads ; in Fig. 133 the lines are of two sizes, A and C representing the first, and B the second portion of the design ; in Fig. 134, striping, A and B consist of 9 and 8 threads, C of 34, D of 18, and E of 27 threads ; and in Fig. 135 the upright twilled features B, C, and D are equal in width to the section A.

Examples 132, 133, and 134 indicate the kinds of weave obtainable from a common twill and suitable for combination with each other in striped arrangement ; and Fig. 135 indicates the practice of employing one twilled unit, A, varied in composition by drafting, in the origination of an interesting compound style.

179. *The Combination of Weaves of Different Interlacing Principles.*—While, as shown, there is scope in the use of a

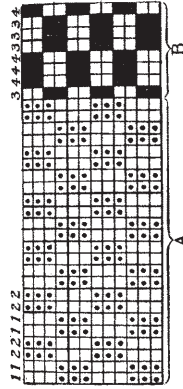


Fig. 131

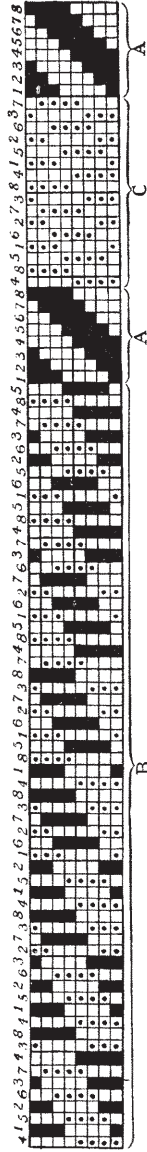


Fig. 132

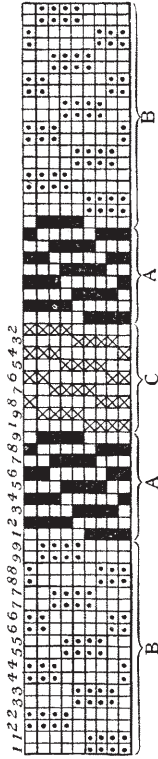


Fig. 133

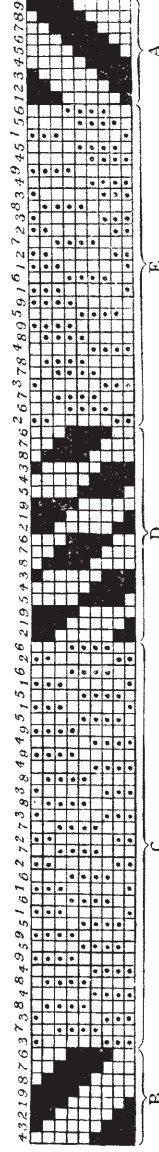


Fig. 134

EXAMPLES IN DRAFTED DESIGNS.

common weave unit by drafting for the production of several varieties of striping, yet, as may have been observed, they have necessarily one element in common, inasmuch as they result from combining threads of a corresponding intersection formula. Each stripe in Figs. 132 to 135 consists of the regrouping of the threads of the basic weave, or that in section A. In other words, the threads of which this basic weave consists, restrict the number of thread units of which the weaves derived, by changing the healding order, may be composed.

The design principles now to be explained, admit of the combination of several weaves differing in scheme of interlacing. The plain make, may, for instance, be used with the sateen, the twill, and the mock leno; and ordinary and fancy twills with mat, diamond and other crossings. Great diversity of fabric structure and of pattern style is therefore obtainable, because the weave in each line of effect of which a pattern is formed, may be the result of a special plan of intersection. The stripings included in this system of designing may be classified into—

- (1) Fine-line stripes.
- (2) Stripes in twills, moving at different angles.
- (3) Stripes in which the plain make is an ingredient.
- (4) Muslins, zephyrs, and lustres.
- (5) Fancy and special weave combinations.
- (6) Inverted weave stripes.
- (7) Small figured stripings.
- (8) Lace stripings.

It will be understood that, if the weaves combinable should be dissimilar in the thread units of which they consist, the shedding mounting will accordingly be composed of a larger number of heddles. Instead of the mounting, as in the stripings considered, being restricted to the shedding units necessary in producing one weave type, it requires to comprise the several thread units of which the two or more weaves combined are made, that is to say, if the plain weave should

be worked into a stripe with weaves on six and twelve shafts, the minimum number of distinct threads of which the design would be formed, would be a multiple of these three weave units, namely, 20.

In dissecting this class of loomwork, it will be shown that particular weave plans, though adapted for the same or distinct shaft mountings, have certain threads in common ; and that the designs, in which such weaves occur, are reducible to a number of heddles tallying with the aggregate of the individual threads comprised, or to a lower number than that represented by the multiple of threads in the two or more weaves combined. For instance, a compound pattern, arranged 24 threads of plain, 8 threads of plan C (Fig. 104), 16 threads of plain, and 12 threads of plan E (Fig. 108) would be producible on 16 and not 22 shafts, on account of six of the threads in plan E being similar to the threads in the plain make.

180. *Fundamental Features in Forming Weave Stripes.*—The fundamental features to be observed in the origination of this class of design are (1) the limitation, as far as feasible, of the series of shafts employed, with the acquirement, in the drafting, of a regular or practical system of healding ; and (2) the selection of weave structures of a suitable character for making an effective style, and a satisfactory build of texture.

An explanation of these technicalities may be rendered by alluding to Figs 136, 137, and 138, the first a compound of 6-shaft and 12-shaft weave units, the second of two 4-, one 14-, and one 8-shaft, and the third of 8- and 16-shaft units. If all the threads in the weaves in Fig. 136 were distinct in interlacing plan, it would necessitate the use of 18 shafts ; and, with each weave differing in thread formation in Figs 137 and 138, 30 and 24 shafts would require to be utilized ; but in consequence of the 12-shaft make A, in Fig. 136, being partly composed of the threads in the twilled section, the shaft complement of this weave is reducible to 6, rendering the whole design weavable on 12 shafts. Then, by reversing the  $\frac{3}{3}^3$  twill sections, and

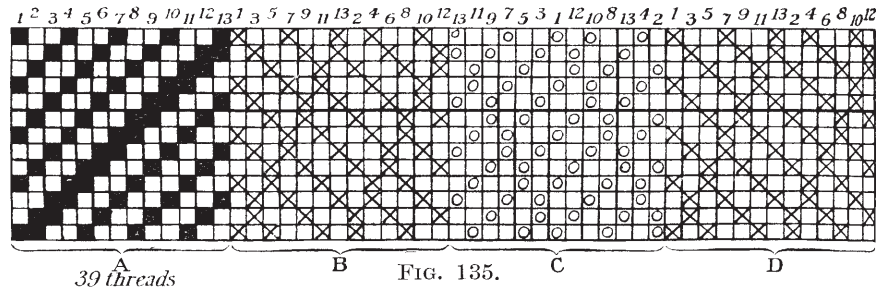


FIG. 135.

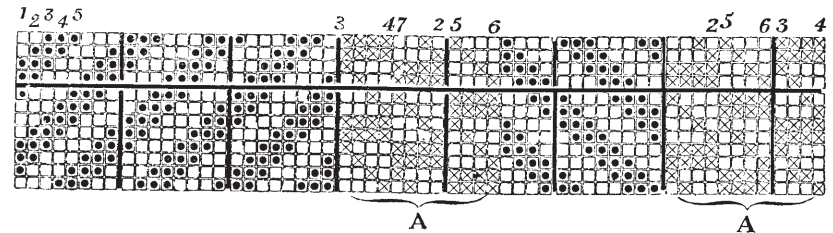


FIG. 136.

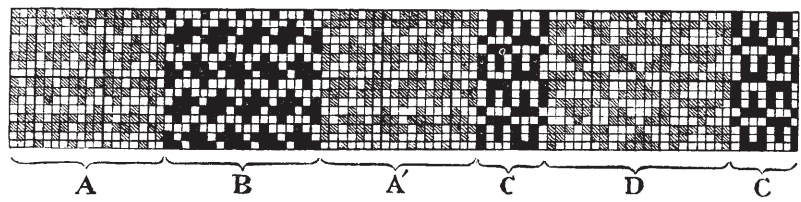


FIG. 137.

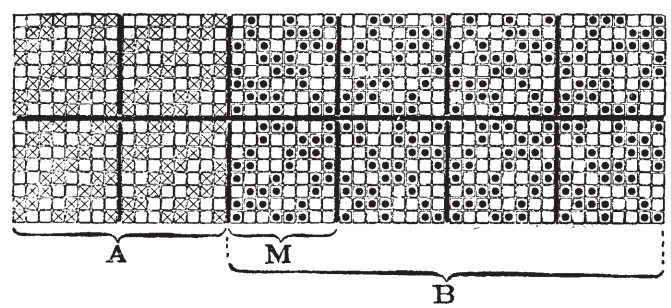


FIG. 138.

STRIPED DESIGNS DRAFTED.

also those of A, variety of weave type and style is acquired without adding to the range of the shaft mounting.

Similar technicalities obtain in the construction of Fig. 137, a pattern on 91 threads, and complete on 24 picks, and in which each line of effect is extensible or otherwise. For economic healding, threads A would be drawn on to shafts 1, 2, 3 and 4, B on to shafts 5, 6, 7, and 8, C on to shafts 9 to 16, and threads D on to shafts 17 to 23, but if a further reduction should be desirable, section C should be woven on shafts 9 to 12, reducing the whole design to 20 heddles. Providing the weave units selected, as in this illustration, do not tally with one another in the number of picks they occupy, the joining of the weaves together may involve the edging threads in the several stripings being slightly re-arranged. To do this on the threads in the repeated weave elements in the pattern (A, B, and D) would add to the shedding units applicable. It is therefore usual to modify the outside ends of the unrepeatable weave in the style, or that in section C in Fig. 137. If here, for example, the irregular or four floats of weft on the 3rd, 12th, and 15th picks, should be found unsatisfactory in the fabric, the first and last threads of weave C would be so changed in the intersecting order as to eliminate the defect.

In Fig. 137, as a result of the intersections in weaves A and B being the reverse of each other, the two crossings require eight shafts, whereas the method of interchanging the orders of the threads and picks in section B of Fig. 138, gives a 16-shaft plan, weavable on half this number of shafts. The mayo crossing (the 8 threads lettered M), and also other regular interlacing weaves on 8, 10, 12, and a fuller number of shafts, are converted into designs of double the threads and picks of which they consist by the re-arrangement practice here adopted. For acquiring the 16-shaft plan from detail M, first the 9th to the 16th picks are compiled by commencing on the 4th pick, and reversing their sequence; then, for the 9th to the 16th threads of the plan, the threads of the extended section M are

re-arranged, commencing on the 4th and reversing serially through the weave.

Practising this system of designing gives a varied pattern style on a reduced number of shafts, for it follows that this 4-shaft and 16-shaft compound is producible on 12 instead of 20 heddles, which the two weave units theoretically represent. What is apparent in these three forms of stripings is, that the weave types combined may effectively differ in structure, whether considered as separate bases of cloth building, or as distinctive textural elements in broad striped patterns weavable in a convenient shaft-mounting.

The technical points named concern style quality as due to the plan of weave assortment. The several stripings in the designs are understood to be variable in order of grouping, and also in dimensions. The lines of effect seen in Fig. 136 may be doubled, trebled, etc., in size, and this also applies to Figs. 137 and 138. As the different effects are grouped, they form, however, interesting striped styles. Briefly examining Fig. 136, the broader twilled line consists of 24 threads of twill to the right, lines of modified mat, and lines of  $\frac{3}{3}$  twill reversed. The matted details in crosses are equally adapted for the larger as the smaller sections of the design. Fig. 137 consists of three lines of equal width, A, B, and A', of two small lines C, and of a medium-sized line D. The fine intersecting plan C is used in the smaller stripings, and the more open crossing D in the broader line. Should the twill, part A in Fig. 138, be striped with colour, it might be enlarged, which would change the character of the whole style, or a broader striping might be made in the interchanging mayo effect, B.

The relative widths of the stripes, and the order of grouping them, fix the style formation. Weave structures are selected which contrast with each other, and which are adapted in type to the textural qualities required. Thus, where the weave units, as in A and B, Fig. 137, are the reverse of each other, the stripes in each may be of a similar size, but in the case of weave C, a comparatively fast principle of



interlacing, it is adapted for the smaller stripe. In Fig. 136, both weaves being regular in structure, they are suitable for lines of equal or different sizes, and in Fig. 138, either the cassimere or the mayo may be used in making the broader or the smaller pattern lines.

181. *Fine Line Pattern Types.*—By combining plain with single or double threads of twill and cord weaves; or warp-face weaves—prunelle and  $\frac{1}{1}^3$  twills and sateens—with single or double threads of reversed weaves, line stripings are produced. To obtain a correctly-balanced pattern and an evenly-made fabric, the threads of the reversed weaves, forming the line details, should follow in natural sequence as in Fig. 139, consisting of a stripe of prunelle twill C, and of a stripe of line effects D. In the latter, threads  $a'$ ,  $a^2$ , and  $a^3$  are arranged in a regular weft twill order, and the warp twill is made to cut the single threads. Using two threads for the line elements (Fig. 140) and the  $\frac{2}{2}$  twill for the ground of the pattern, the striping is varied by turning the direction of the  $\frac{1}{1}^3$  twill as at  $aa$  and  $bb$ .

With a twill or plain weave in the ground stripings, the lines may be successively formed in warp and weft twill on the practice shown at  $a$ ,  $b$ ,  $c$ , and  $d$  (Fig. 141). The sections T may be enlarged as desired, with angled or matted features introduced, or they may be produced in plain, mat, and other standard weaves. With the use of the plain, the effects  $a$ ,  $b$ ,  $c$ , and  $d$  are frequently woven in a special quality of yarn such as silk with worsted or cotton for the ground; while, with twill as the basic weave, the lines may be distinct in colour or in yarn composition, from the yarns used in the rest of the warp. Such, however, is the difference in the weave construction of the ground features, and of the line details in these patterns, that the effects become sufficiently distinctive in quality and structure when produced in one counts of yarn.

182. *Stripes in Twills of Different Angles.*—In this variety of striping, there is considerable scope for the development of pattern style both in the use of different weaves, and in the lines

of effect combinable. Primarily, twills are used of a warp-face structure in which the twilled details are of a similar size, and

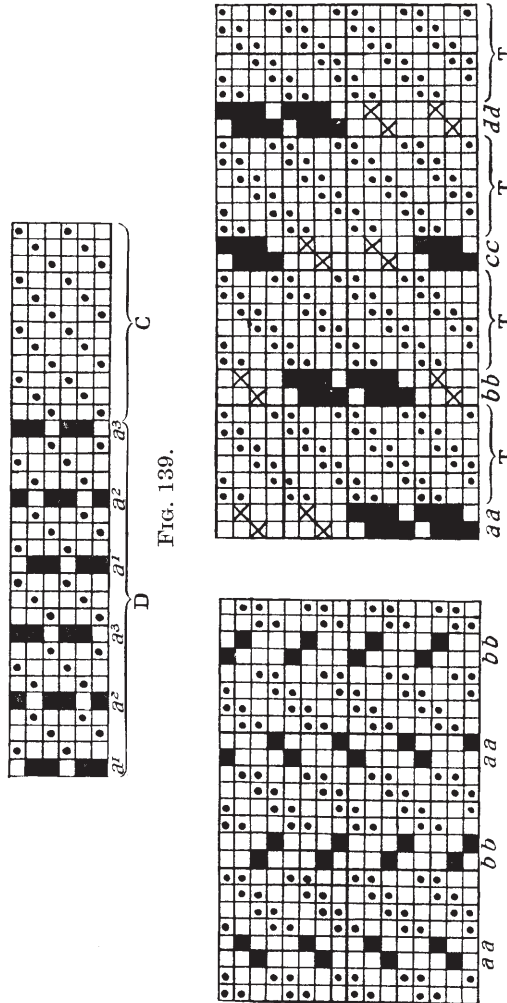


FIG. 139.

FIG. 141.

FIG. 140.

EXAMPLES IN LINE STRIPING.

run in a like direction, but at different angles. Secondly, the twills may consist of warp and weft effects with the details of each differing in size; and thirdly, warp-face twills may be

combined with ordinary twills, and also with fancy twills. Such designs comprise three groups of Weave Compounds, namely—

## GROUP I.

Compounds of such weaves as the prunelle and  $\frac{1}{1}^2$  twills with the same weaves 2 picks in a shed.  
 „ „ 4-shaft twills with the 8-shaft buckskin and other weaves.  
 „ „ 5-end Venetian or garbadine with the 10-shaft buckskin, etc.  
 „ „ 7-shaft corkscrew with the 7-shaft Venetian.  
 „ „ 7-shaft warp twills with 9-shaft upright twills.  
 „ „ 6-shaft whipcords with 12-shaft upright twills.

## GROUP II.

Compounds of 5-shaft Venetian and 10-shaft small diagonals.  
 „ „ 7-shaft warp twills and 9-shaft small diagonals.  
 „ „ 8-shaft „ „ „ 8-shaft „ „  
 „ „ 9-shaft „ „ „ 9-shaft „ „  
 „ „ 11-shaft „ „ „ 11-shaft „ „

## GROUP III.

Compounds of  $\frac{2}{2}^2$  twill with  $\frac{3}{3}^4$  twill, 2 picks in a shed.  
 „ „  $\frac{2}{2}^2$  „ 8-shaft buckskin, warp twills and fancy crossings.  
 „ „  $\frac{2}{2}^2$  „ 5-shaft and 10-shaft warp twills and diagonals.  
 „ „ 8-shaft buckskin with weaves on a sateen base, and with special makes.  
 „ „  $\frac{3}{3}^2$  twill with whip cords, 12-shaft upright twills, etc.  
 Modified corkscrews, with ordinary and upright warp twills.  
 Diagonal corkscrews, with twills and derivative-twill crossings.

The first group of these stripings are specially adapted for neat, fine twilled patterns, in worsted yarns for costumes, and, in silk, cotton, and linen, for the closer-set varieties of dress goods. The two examples, weavable on six and nine heddles, given in Figs. 142 and 143, are formed respectively of two and three weave units. The lines of each weave may be modified to agree in width with the style of manufacture intended. With differentiations in the interlacing order on which the plans are constructed, it is the practice to vary the setting, making this correspond with the structure of the several weaves applied.

The reeding is fixed for each type weave in the style, that is to say, in Fig. 144, with 72 threads per inch in A, there should be 84 to 90 threads per inch in B.

The variations in the angles of the twills, and the contrasts in fineness of the lines in each weave, form the distinctive pattern qualities. In Group I, the design features result purely from these sources ; but, in Group II, the weave units develop other textural details than those due to the angle of the twills ; and in Group III certain of the stripings are woven

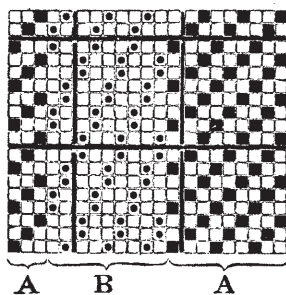


FIG. 142.

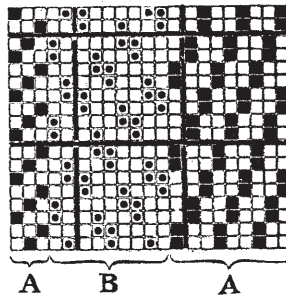
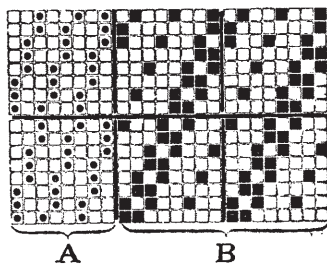


FIG. 143.



For 16 threads. For 32 threads.

FIG. 144.

COMBINATIONS OF TWILLS RUNNING AT DIFFERENT ANGLES.

in twills which give weft as well as warp effects, while other stripings in the designs consist of warp-face twills. Each class of combination is illustrated—first in Figs. 142 and 143, second in Figs. 144, 145, and 146, and third in Figs. 147 to 150.

The lines of effect A in Fig. 142 traverse the cloth at 45°, and those in B at 60°, and in Fig. 143 the same two weaves

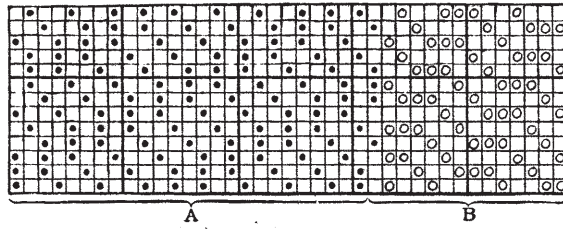


FIG. 145.

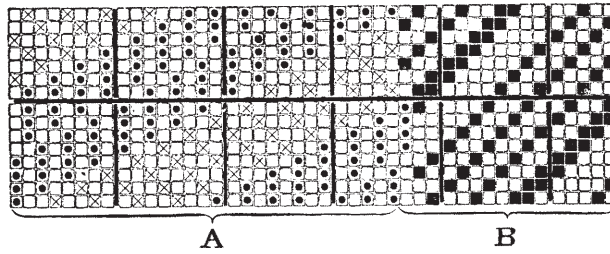
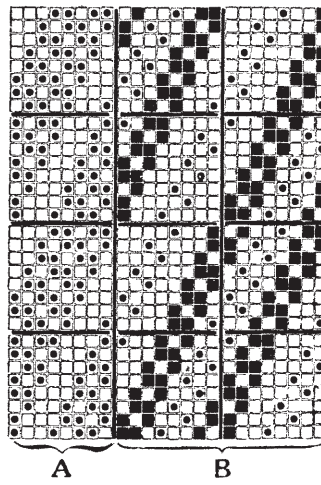


FIG. 145A.



For 16 threads. For 32 threads.

FIG. 146.

COMBINATIONS OF TWILLS RUNNING AT DIFFERENT ANGLES.

are used, with a third weave C, forming an intermediate type of twill. The finest contrasts, in such warp-face twilled stripes, are obtainable when the weaves are constructed on a similar base, as, for example, in D and E, Fig. 103 ; in A and B, Fig. 105 ; and in A and B, Fig. 106 ; or in two weaves of a like structure, but occupying different numbers of threads, as in the instances of compounds of the Venetian and the 10-shaft buckskin, and of the 6-shaft and 12-shaft whipcords. The second description of pattern affords considerable facility

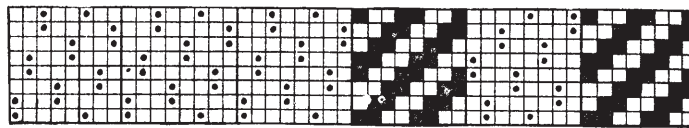


FIG. 147.

STRIPES COMPOSED OF VARIOUS WEAVES.

(See Figs. 142 to 150.)

in the choice of plans weavable in corresponding shaft mountings, such as two 6-shaft, two 8, two 9, and two 10-shaft units ; or larger makes according to the shedding capacity available. Figs. 144, 145, 145A, and 146 typify this principle of design. The first of these examples is composed of a fine twill effect in section A, of and a small diagonal effect in section B. The grouping adopted is 16 threads of the former and 32 threads of the latter, but this technicality is changeable with the kind of striping desired.

In Fig. 145, 13-shaft weaves are used. The weave in section B is the inverted form of that in section A, which is a principle applicable to twilled weaves constructed on the sateen base, giving, in this illustration, a warp-cord twill in the first, and a weft-cord twill in the second striping, and forming respectively oblique and upright twilled effects in the fabric. A modification of this class of striping is shown in the undraftable compound (Fig. 145A) where the diagonal, in part A, runs at an angle of  $27^\circ$ , and is combined with a 15-shaft twill.

In applying plans occupying different multiples of threads,



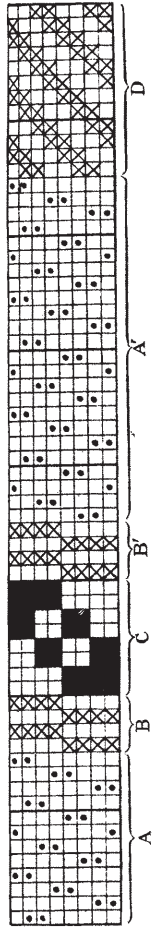


FIG. 148.

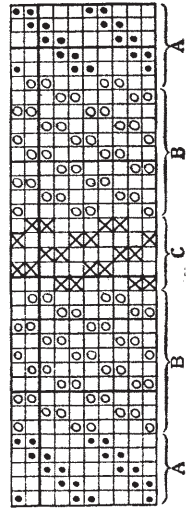


FIG. 149.

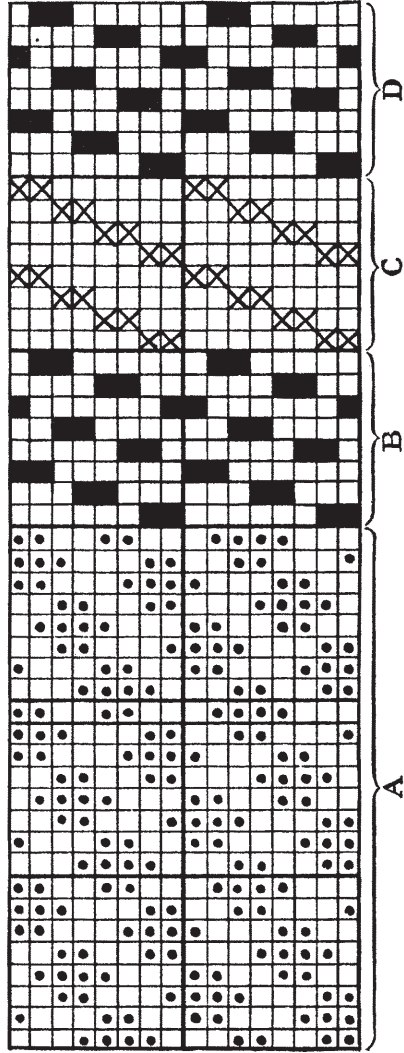


FIG. 150.

STRIPES COMPOSED OF VARIOUS WEAVES.

certain twilled features may run at a like angle as in the warp-floated twills in Fig. 146. The linking of the details of one plan with those of another plan on this principle, causes certain twills to move regularly through each striped line in the pattern, with, however, the formation of the complete series of twills, in each effect, as in A and B of this design, differing in detail and in structure. In originating the stripings, the constructive lines and features in the several weaves are the chief essential, in association with the plans being of a structure to weft satisfactorily together.

In the third series of these examples, each line of effect may be made distinctive in character, which partially arises from the employment of twills in which the warp and weft interlacings are equal in size, with twills producing an excess warp effect on the surface of the fabric. Four typical patterns will be examined, Figs. 147, 148, 149, and 150. Fig. 147 is made up of two sorts of line, namely, buckskin and  $\frac{1}{2}$  twill; Fig. 148 of lines A.A', buckskin; lines B, warp cord; line C, fancy 8-shaft mat; and line D, cassimere twill.

The standard 5-end twill is suitable for combining with the Venetian as in Fig. 149, where the latter is twilled in two directions. For obtaining an even emphasis of the right and left-hand twills, B and C the warp yarns in B should be left-hand twine, and in C right-hand twine. This practice of thread grouping is observed in the manufacture of fine twilled fabrics for giving equal accentuation of the twills when moving in reverse directions.

Another system of warp-yarn arrangement, as to the direction of the twine in the thread in relation to the twills, is to use two varieties of twist for developing the twilled features, alternately, in clear and indefinite tones.\*

Assuming this method of work should be applied to Fig. 148, stripe A<sup>1</sup> might be arranged—8 threads with the twist in the yarn to the left, 8 to the right, and 8 with the yarn twine to the left. If this were done the twill, in the two outside

\* See Chapter V: *Woollen and Worsted*.

groups of warp threads, would be distinct, and in the central section subdued. The method of producing diversity of weave detail, and yet of retaining the twilled features as distinctive of the pattern form, is suggested more particularly in Fig. 148, the warp cord, B, and broken mat, C, yielding a striped element in contrast with the details in buckskin and  $\frac{1}{2}$ - $\frac{1}{2}$  twill. Fig. 150 is interesting, first, in the use of the fine warp-twilled lines due to B; and, second, in the more open warp twill due to C—two upright twills, in one of which the twilled lines make an angle of  $63^\circ$  in the woven texture, and in the other an angle of  $70^\circ$ , with both types of effect in pronounced contrast with the hopsack twill applied in section A.

183. *Uses of Plain Make in Striped Designs.*—The plain make is largely used in striped designing, as it is one of the commonest weaves employed in the ground of many varieties of figured dress goods. The alternate grouping of its intersections causes it to fit correctly with every class of crossing. For this reason it is frequently introduced into compound weave patterns for joining one weave element with another in a symmetrical and even order. Its insertion in this way prevents irregular flushes in the use of either warp or weft plans differing in interlacing formation. Thus, in the combination of diamond, waved, mock leno, sateen and special types of weave, and also of warp and weft twills and sateens, its employment enables pronounced textural contrasts to be acquired, and yet a level and satisfactory fabric produced. The manufacture, therefore, of the lighter makes of striped and figured dress and blouse cloths is facilitated by its selection, either as the principal or lesser ingredient of the style.

The subject will be illustrated and explained by examining the principles of pattern origination as they relate to muslin and zephyr stripes, artificial silk weft goods, and lustres of various qualities and schemes of figuring. Gauze, cellular, lappet, and other typical builds of cloth, in which the plain weave is selected for the ground, will be dealt with later.

Suggestive examples of the former are given in Figs. 151 to 160. The woven specimen (Fig. 151) is produced in cotton warp, and wefted 6 picks of cotton and 4 picks of artificial silk. The warp threads are sleyed two in a dent in stripes A and B, with several empty dents intervening at C, edged by two ends of grey cotton. It will be noted that the difference in the lustrous nature of the silk and cotton shuttling yarns, adds tone and textural detail to each of the stripings. The style

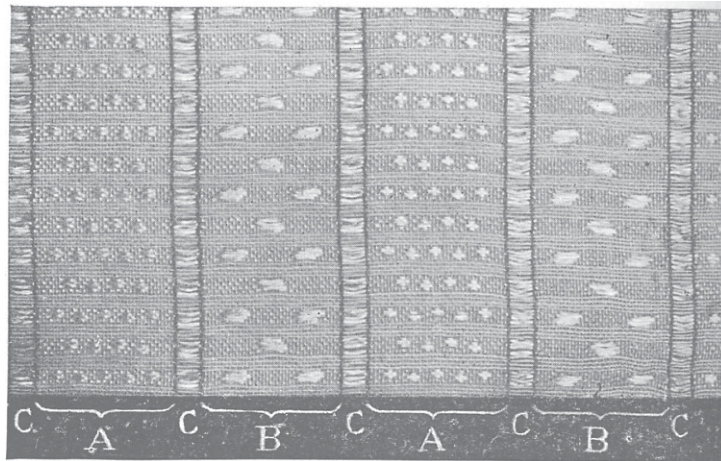


FIG. 151.—SPOTTED AND DENTED STRIPE.

thus obtained is due to a simple weaving practice, that of forming a distinction in the weft effects, and to the degree in which the silk picks are floated on the face, for developing the spottings in the lines A and B. In A these picks form small weft features similar to the star details in section A of Fig. 171; while in B the floating weft runs in twilled order for three picks in succession. Any weave but the plain would be less adapted for producing the fabric fineness and structure, which in this specimen give distinctiveness of character to elementary pattern types.

184. *Mock Leno Stripings*.—The mock leno is combined with plain, sateen, and mat weaves in the construction of muslin

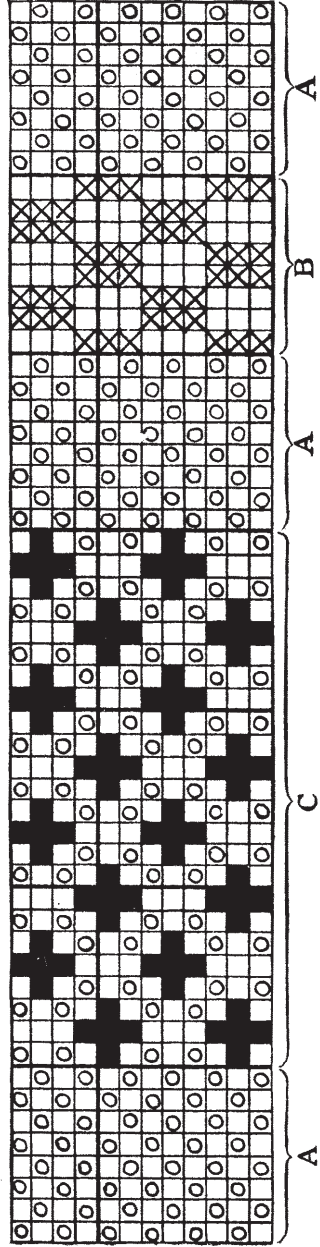


FIG. 152.—MOCK LENO, PLAIN AND ELONGATED MAT STRIPE.

stripes. As in Fig. 151, the reeding practice followed is an important technicality for imparting quality to the effects in this class of weave-stripping. The leno sections in C, Fig. 152, require to be sleyed 3 ends in a dent, and the mat should be woven with 2 threads in a heald, and sleyed 4 threads in a dent, but splitting identical thread units in the weave. By this grouping of the threads in the healds and in the sley, the cellular structure of stripings C, the fast structure of stripings A, and the hopsack elements in B, contrast strongly with each other in the fabric. Assuming a combination of 40 threads of plain, 30 threads of imitation gauze, 40 threads of plain and 24 threads of 6-end sateen, the two former might be appropriately reeded as indicated, and the sateen reeded 3 threads in a split. In this way the fineness of setting, necessary to the development of a smooth, full, sateen stripe, is acquired with the special setting for the leno weave, and the regular setting for the plain intertexture.

185. *Zephyrs and Lustres*.\*—Cotton zephyr patterns are the result of combining weave plans in which either weft (Fig. 153) or warp and weft effects are utilized with the plain make. Both these designs are arranged on a striped base, but in section B (Fig. 153) the design elements are formed in three and five floats of weft, while in section B (Fig. 154) they are alternately woven in floats of weft and warp. With the weft as the figuring or pattern yarn, this principle of loomwork is applicable to lustre dress stuffs, with a cotton warp and alpaca or mohair weft; and also to light blouse textures, with cotton yarn in the warp and silk or artificial silk as the shuttling yarn. On either system the designs may be suitably elaborated, and yet restricted, as in the examples, to heddle weaving.

Figs. 153 and 154 are draftable on to 14 shafts, and are susceptible to further modification in design features by the method of drafting followed; or other effects are formable on 10, 14 or 16 shafts for the decorative details, with the

\* See *Union Textile Fabrication*.



addition of two shafts for the plain section A, should striped styles be produced.

186. *Warp and Weft Pattern Effects*.—Designs illustrative of

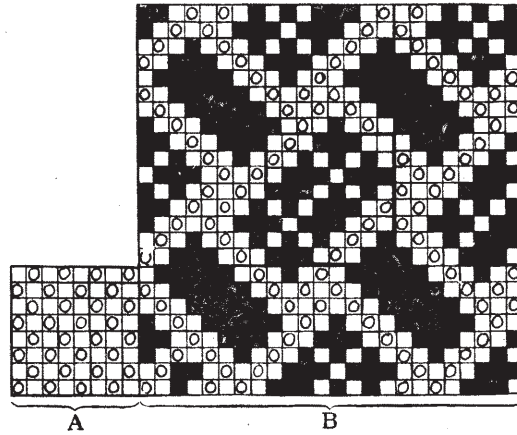


FIG. 153.

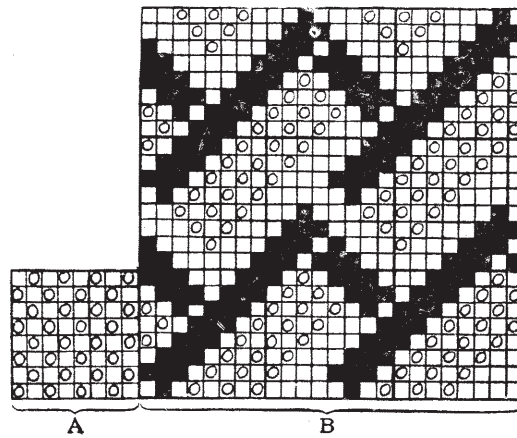


FIG. 154.

FANCY WEAVES AND PLAIN WEAVE COMPOUNDS.

the styles of effect obtainable when both the warp and weft threads are employed in producing textural ornament are sketched in Figs. 155 to 160. The examples (Figs. 155 and 156) are respectively composed of waved and diamond features,

the first consisting, in the space between the waved lines, of warp diamond details; and the second, in the intermediate spaces between the larger effects, of structural plans developed in floating threads and picks.

The width of the plain band, and also of the decorative stripings, is changed according to the style of pattern desired. Without extending the heddle capacity in the loom, more diversified weave elements may be combined, as seen in Fig. 157, a compound pattern on 68 threads, and producible

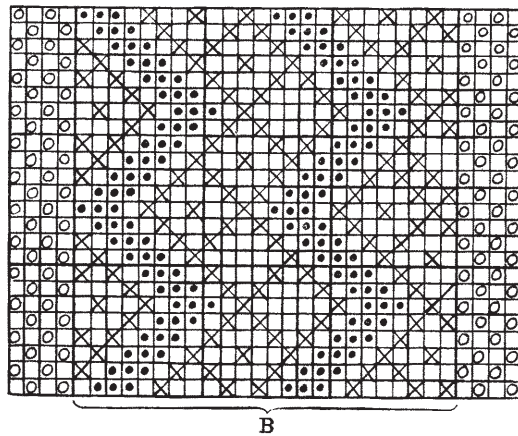


FIG. 155.

## FANCY WEAVES AND PLAIN WEAVE COMPOUNDS.

on 13 shafts, stripes B on 7, C on 4, and the plain features A on 2. Here the warp and weft details, differing in structural formation, constitute types B and C, the former being a species of heart-shaped figuring woven in warp and weft floats, and the latter a simple diamond effect woven in weft yarn.

The enlargement of the heddle mounting enables this principle of design composition to be increasingly elaborated, and varied in the weave units, as illustrated in Fig. 158, where, by drafting in the picks as in the threads, the figured forms in section B might be developed successively in diamond types, and on the pointed base shown. As the style is constructed,

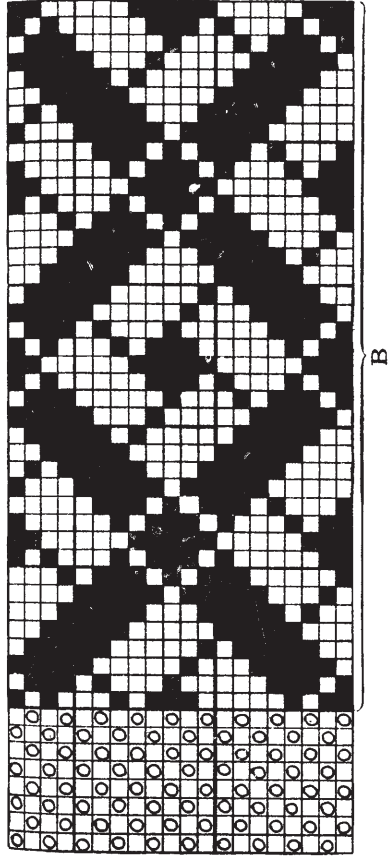


FIG. 156.

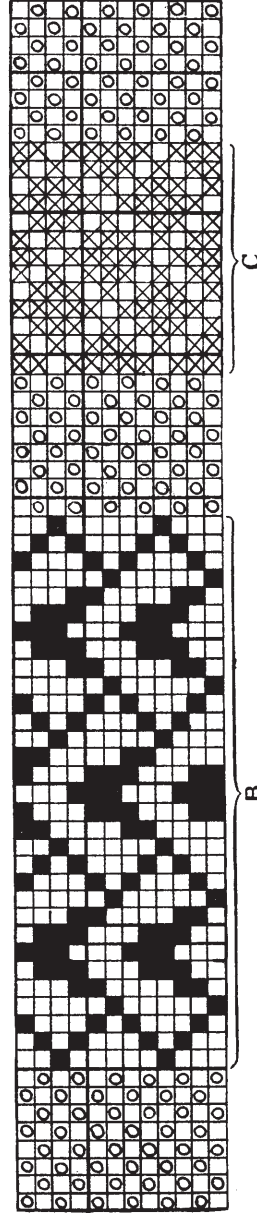


FIG. 157.

FANCY WEAVES AND PLAIN WEAVE COMPOUNDS.

it is weavable on 18 shafts. Another species of detailed striping, more particularly applicable to silk warp and weft fabrics, is that produced in Fig. 159. While section B, in this instance, is not draftable, it might be used sectionally in the formation of a larger description of striping than that in which it appears. Combining for example—

30	threads of plain,
8	„ shaded twill B to the right,
10	„ plain,
8	„ shaded twill B to the left,
10	„ plain,
8	„ shaded twill A to the right,
30	„ plain,
24	„ section B,

would result in a broad striped pattern varied in line width and in textural effect, and yet draftable, like Fig. 159, on to 18 shafts.

The type of spotted stripe in Fig. 160 is suitable for textures in which the warp and weft are of equal value in developing the design structure. It might, however, be used for cloths in which the spots are formed solely in the weft yarn, by running a 2-and-2 weft cord over the warp surface sections in the plan. Using it as illustrated in silk or cotton cloths—piece dyes, or loom-coloured manufactures—produces the richer variety of pattern. The spottings are grouped on the 8-end irregular sateen plan of distribution, and their structure makes it feasible for the complete striped design to be woven on 18 shafts. Enlarging the spots and changing them to diamond or lozenge shape does not add to the number of heddles required.

187. *Fancy and Special Weave Stripings*.—From the examples given in the different forms of weave compound, it will be clear that the range of plans, constructed on the series of shafts illustrated under Figs. 102 to 112, in addition to the derivatives of the common twills, are suitable for combination purposes. Some of the examples, considered as sectional but decorative parts of striped fabrics, are, moreover, suggestive of the latitude provided for “weave” design in this class

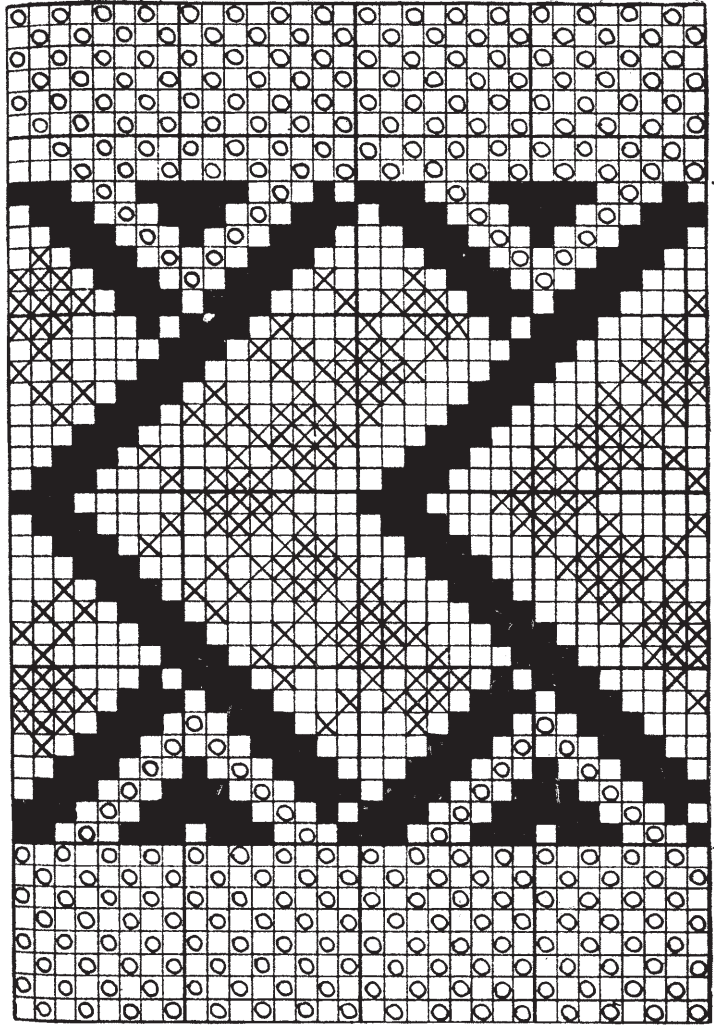


FIG. 158.  
 FANCY WEAVES AND PLAIN WEAVE COMPOUNDS.

of loomwork. Further, there is the variety of special weave structures available for application, with elementary types of crossings, to patterns of a striped description.

Three illustrations (Figs. 161, 162, and 163) may be referred

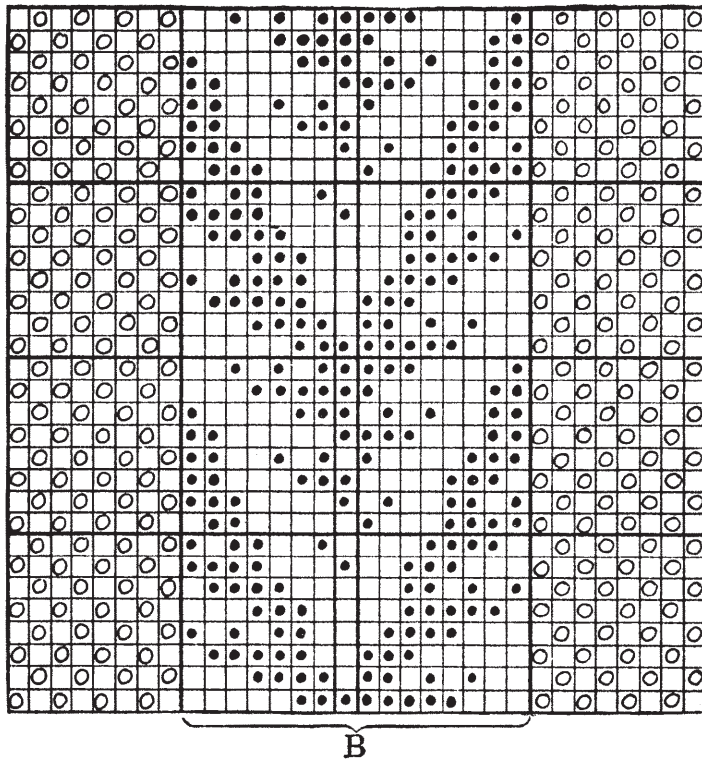


FIG. 159.

FANCY WEAVES AND PLAIN WEAVE COMPOUNDS.

to, as they show, first, that these are, in reality, textural designs ; second, that the weave units with which they are combined should accentuate and bring out their characteristics ; and, third, that, in the case of the special makes being of a regular type, the weave details, inserted into the composition of the complete pattern, vary in a large degree in principle of intersection.



To examine the three schemes of design, the special weave plan in Fig. 161 is based on the key pattern, the divisional lines of which are woven in plain, and the rest of the effects in even floats of warp yarn on the face of the fabric. Designs thus constructed, produce the features developed in the warp, on the right side of the cloth, and in weft on the under side, so that they are reversible in appearance as to warp and weft

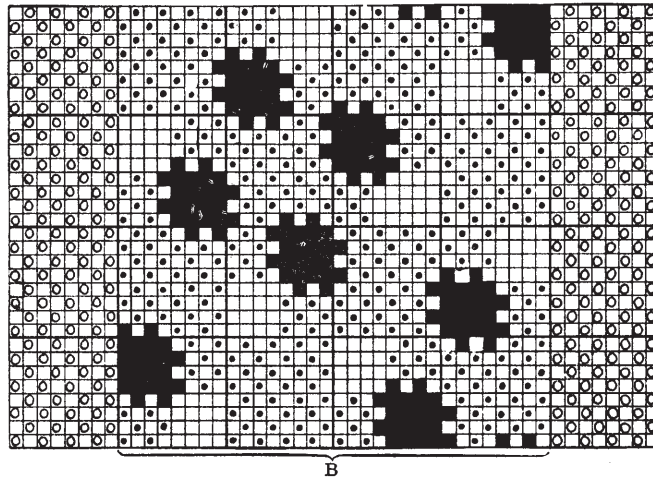


FIG. 160.—SPOTTED AND PLAIN WEAVE STRIPE.

qualities, but have a like form of decorative structure on both surfaces. The warp cord, in sections A and B, is, consequently, the correct weave to employ in this kind of striping, for it contrasts with the scheme of weave interlacing in sections D and E, and yet gives a species of clear, smart effect that adds precision to the decorative elements of the key pattern. A twilled weave would also be applicable, but it would increase the shaft mounting, and be more likely than the cord to impinge on the particular order of design details of which the larger stripings are composed.

An inverted zig-zag plan is the special weave type used in example Fig. 162, and in combination with elongated mat and irregular cord crossings. As the pattern, in band A, consists

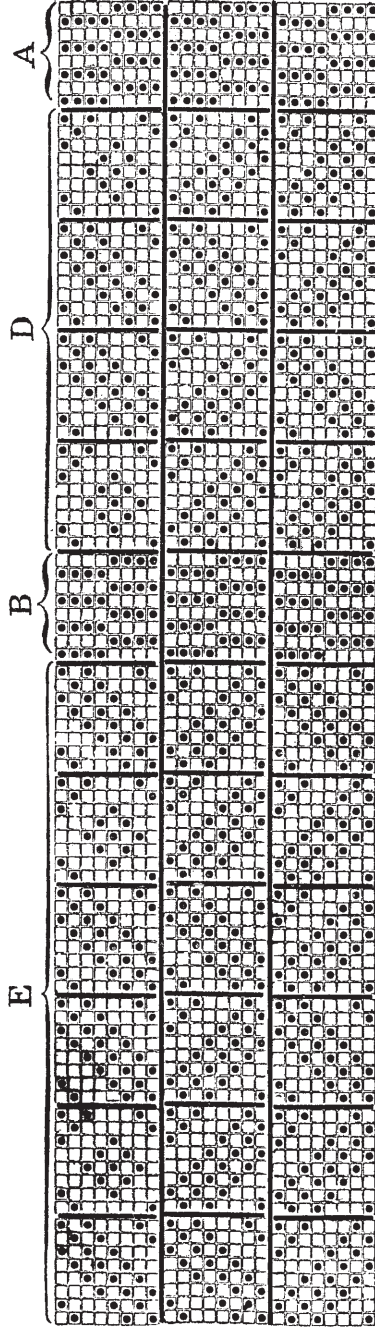


FIG. 161.—KEY PATTERN WITH WARP-CORD STRIPING.

of diagonal lines developed in  $\frac{1}{3}$  and  $\frac{3}{1}$  twills, it comprises a variety of twilling which should form the true decorative feature of the pattern. This being so, mat and repp are the types of crossing suitable for the smaller lines of effect in B and C. Either the repp or the mat might have been used in contact with the waved diagonal, but the mat, as arranged in this composition, gives a neat and effective edging which, in conjunction with the minute lines C, develops the design elements in the broad and principle stripe.

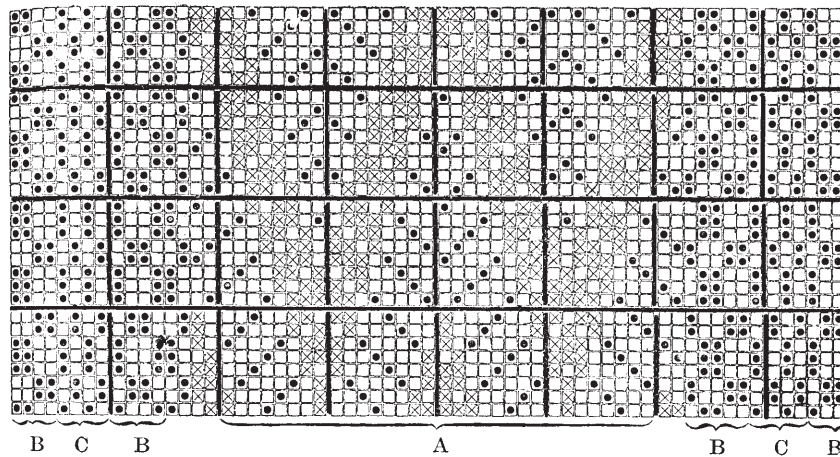


FIG. 162.—ZIG-ZAG DIAGONAL AND MAT AND CORD STRIPE.

Fig. 163 is still more varied in weave character, stripes E being formed in  $\frac{4}{4}$  twill cutting, B in weft rib, C in serpentine weft cord, and D in 4-and-4 warp repp. Plans C and E may both be defined as the special types of weave in this style, for each produces a particular class of effect in the compound pattern. The idea, however, in originating the style, has been to form a smart line of effect in an interesting but regular weave, with smaller lines of contrasting detail, and this is seen to be the result of the divisional line D in warp cord and of the intermediate line C in weft detail, balanced by the pronounced weft rib, line B.

It is by thus considering the character of the pattern as a

whole, and the distinctive elements it comprises in the weave structures combined, that the design originated, gives, in the first place, the quality of striping and of detail features required, and, in the second place, an evenly built fabric.

188. *Inverted Weave Structures*.—Only two types of these patterns need be examined, those illustrated in Figs. 164 and 165. The first exemplifies the principle of constructing an effect in weft on a warp ground, namely, striping A, and of

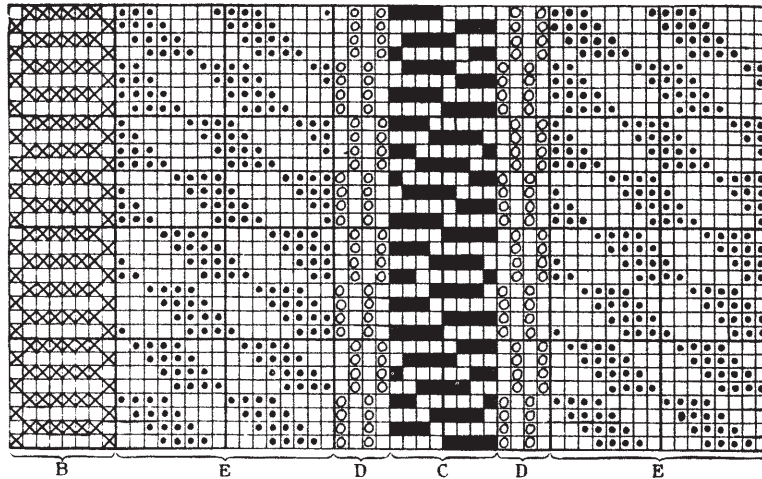


FIG. 163.—STRIPE COMPOSED OF FOUR WEAVE UNITS.

inverting this in the construction of the style. Hence, in such types of pattern, the alternate stripings have warp and weft flushed grounds.

On the weft surface, in Fig. 164, warp spottings are formed, and on the warp surface weft spottings. A degree of contrast in the textural and pattern effects is thus secured. The arrangement is simple, but capable of various modifications. Sections A and B might for example be repeated for three or four times, and formed into lines of different widths, or the whole design might be enlarged without adding to the shafts required in the weaving. Provided it is employed as printed, and woven in a light shade of warp and in a medium shade of weft, then

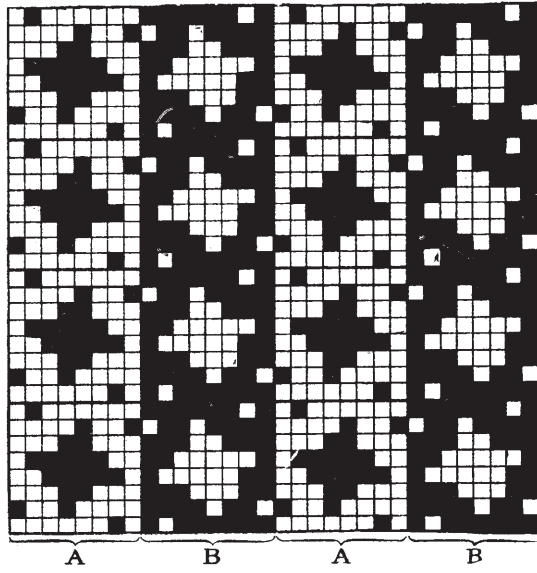


FIG. 164.—INVERTED STRIPED DESIGN.

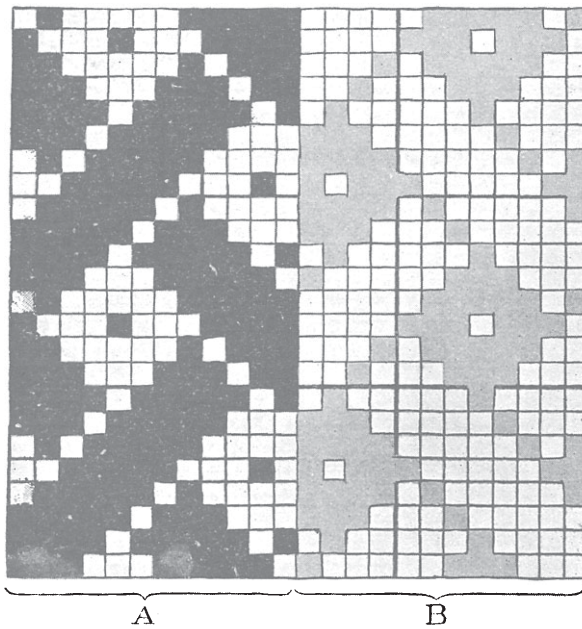


FIG. 165.—INVERTED STRIPED DESIGN.

stripes A would, in the fabric, consist of a light coloured ground, ornamented with spots in the medium colour, with stripes B produced in a medium colour in the ground, and spotted in the light colour.

Fig. 165 is typical of a second practice, that of selecting a warp or weft face plan, and of inverting it to make a striped pattern. Section B in Fig. 156 also lends itself to this method of treatment, which may also be carried out in all weave designs in which the warp threads develop a group of textural details, distinct in formation from those woven in the shots of weft. Another method of varying this description of style is that of inserting between the two effects of which the patterns are composed, or between the repetitions of each effect, lines of plain, twill, or fancy weave, which may be separately tinted in the warp for the purpose of imparting clearness of definition to the different features, due to the reversed plans, as well as of importing diversity of toning to the striping as a whole.

189. *Striped Figured Designs*.—When limited in the design range to 24 or 32 threads, as in the employment of heddle mountings, the styles of figuring obtainable are necessarily of a simple character, and free from detail forms. The patterns in the loom—not draftable, as a rule, to a smaller number of shafts than the number of thread units of which they consist—rarely exceed a small fraction of an inch in width. Considering this factor, and that of the decorative types being the product of the interlacing of the warp and weft threads in a prescribed order, or an order which gives a correct build of fabric, such geometric and conventional forms as may be utilized require to be of a miniature kind; yet it is possible, by exercising skill in the shaping of the figures, and in the planning of these on point paper, to produce a fair range of styles, differing in decorative quality and composition, and also distinct from the styles characteristic of pure “weave” design and arrangement.

Referring to the three examples in Figs. 166, 167, and 168, the figured sections A are weavable on 24 healding shafts. In



the first, a plain stripe is combined with the pattern details ; in the second, a cassimere stripe with the decorative features ; and in the third, stripes of warp and weft sateen are combined with a stripe in warp sateen spotted with floats of weft.

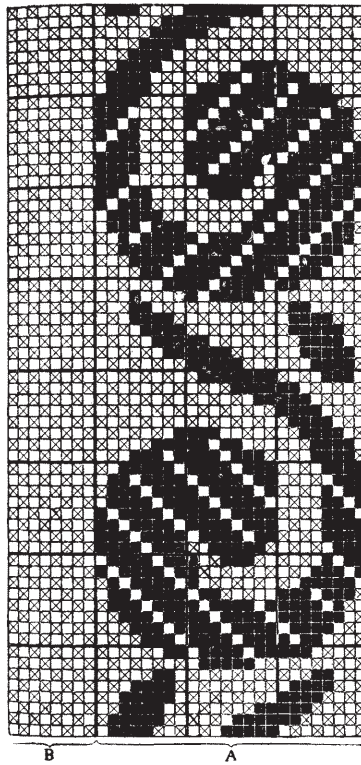


FIG. 166.

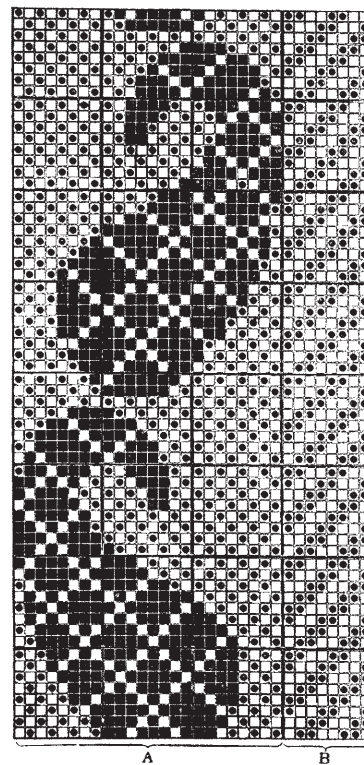


FIG. 167.

SMALL FIGURED STRIPES APPLICABLE TO SHAFT MOUNTINGS.

Each pattern makes a particular type of elementary figuring. That in Fig. 166 is composed of curvilinear forms expressed in 5-end weft twill with the ground in plain make ; that in Fig. 167 of small pine figures, and that in Fig. 168 of conventionalized floral features developed in two kinds of twilling

on a 5-end sateen ground. The decorative parts of these examples are weavable in dobbie mountings. Figs. 167 and 168 might be slightly reduced and worked out on 20 threads,

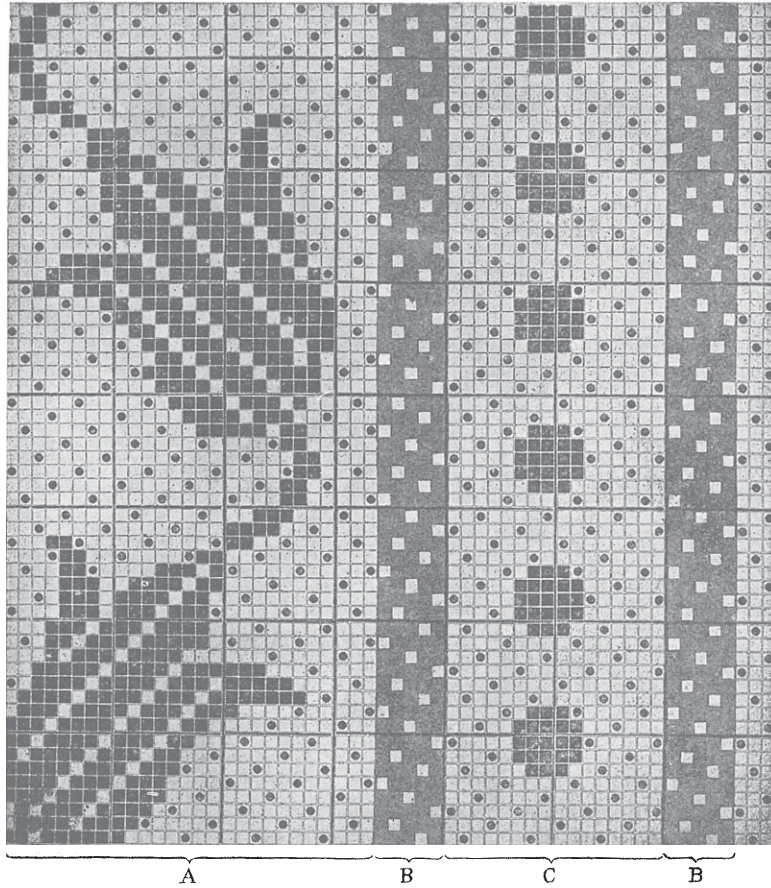


FIG. 168.—SMALL FIGURED STRIPE.

allowing 2 or 4 shafts for the plain or twilled stripe, so that they would be producible on 24 heddles. The supplementary stripings in Fig. 168 have made this pattern suitable for the harness loom, but should the weft sateen lines be eliminated, and the figured forms brought within 20 threads—which is feasible—the lines in warp sateen, and also the one in which

circular spots occur, may be retained, and the pattern constructed be woven in a 30-shaft gear.

Striped designs of this elementary figured description are used in the manufacture of light fabrics in silk and in cotton

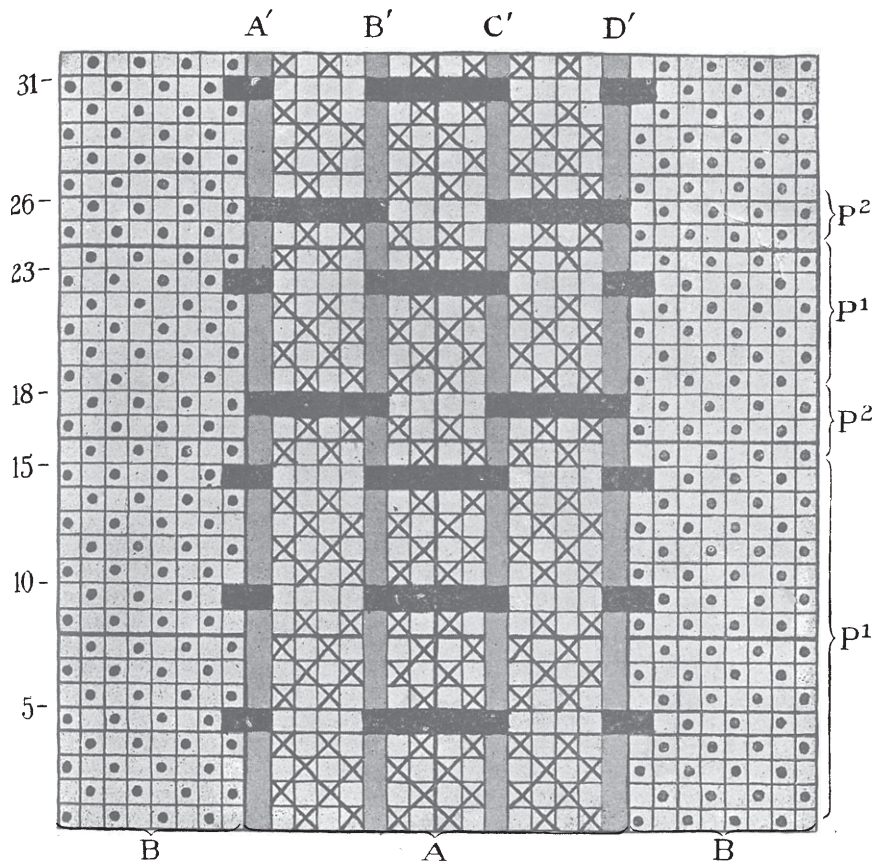


FIG. 169.—LACE STRIPING.

yarns, and in cotton warp crossed with an alpaca or artificial silk weft. If the designs should be constructed to be weavable in a centre-point healding draft, they would be doubled in size, or if weavable in a duplicated-point draft, they would be correspondingly increased in dimensions.

190. *Lace Stripings*.—In what are termed woven lace



patterns, certain threads of warp—usually delivered off a separate chain beam from the warp of the ground of the fabric—are formed into circular, oval, and other cellular shapes on the face of the cloth. Fig. 169A demonstrates the principle of inter texture comprised, and also the style of effects produced. The white yarns  $A^1$  and  $B^1$ ,  $C^1$  and  $D^1$  are here seen to give a species of network.

The design plan is that reproduced in Fig. 169, where section A represents the structural scheme, combined with the plain stripings B. From this it will be observed that the

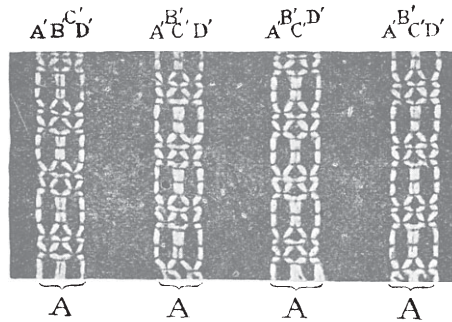
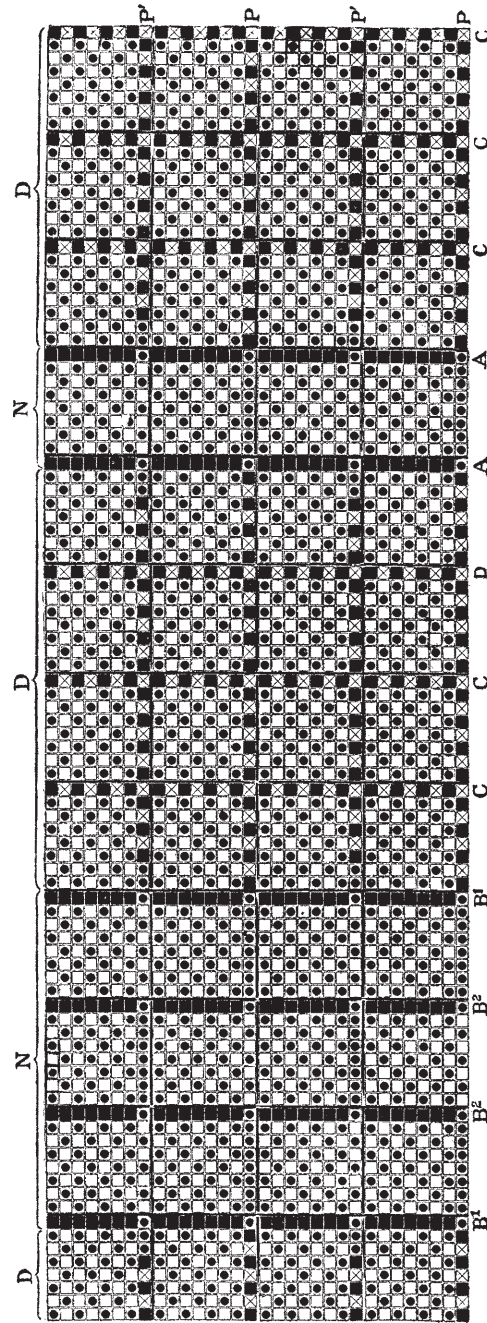


FIG. 169A.

lacing threads float loosely over a number of picks of weft in succession—the length of their floats determining the openness or closeness of the net, and also its diversified character. In section  $P^1$ , these threads flush on the face of the cloth over four picks, but in section  $P^2$  over two picks—a method of shuttling which binds the lacing threads in two serial groups, of a greater and of a lesser formation, into the ground of the texture. The lacing picks are floated in such a manner as to link alternate pairs of threads to each other, that is to say, picks 5, 10, 15, 23, and 31 link the central lacing ends with each other, and picks 18 and 26 link central with edging threads. This practice in thread-linking originates the quality of the net woven.

Striped combinations, with plain interlacing as a chief factor, are worked into various styles on the system shown in Fig. 170. This design results in the type of effect sketched



*In preparing for the loom lift* □ *s and* ■ *s.*  
 FIG. 170.—LACE AND CHECKED STRIPING.

in Fig. 170A. Analysing the loom plan, and considering the threads A, B, and C, and the picks P and P<sup>1</sup> as distinct units from the remainder of the threads and picks composing the pattern, its structure will be more clearly presented. First, it should be observed that the cloth proper is plain woven, so that the netted striping N, and the checking details D in the sketch, are due to the supplementary threads and picks. Such yarns, by interlacing plain in section D, developed the checked features.

The lacework is caused by floating these yarns on the surface of the cloth, on the principle described in Fig. 169, and also by linking B<sup>1</sup> alternately with B<sup>2</sup>, and an edging yarn, B<sup>3</sup>,

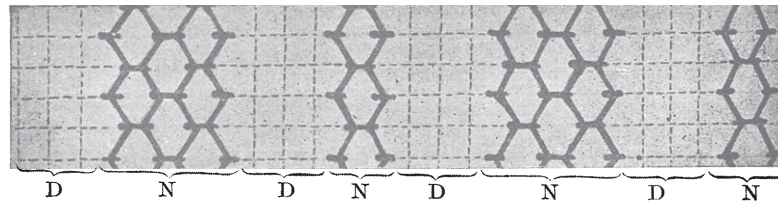


FIG. 170A.

alternately with B<sup>2</sup> and B<sup>4</sup>, and B<sup>4</sup> alternately with a second edging yarn, and with B<sup>3</sup>. Either the lacing, plain, or checking details may be repeated in any prescribed order, or the lacing effects may be combined with other design principles, one of which is illustrated in Fig. 171. This compound of crescent, star, and net stripings is reducible to a limited shaft mounting. It may be examined in relation to the following practice in manufacture—

*Warp.*

	4	threads of 60's cotton twist or 60's 2-fold silk, light fawn.
21	„	60's „ „ „ 60's „ „ „ light blue.
12	„	60's „ „ „ 60's „ „ „ light fawn.
1	„	60's „ „ „ 60's „ „ „ 2 ends in a mail, fancy colour.
5	„	60's „ „ „ 60's „ „ „ light blue.
1	„	60's „ „ „ 60's „ „ „ 2 ends in a mail, fancy colour.
8	„	60's „ „ „ 60's „ „ „ light fawn.



*Steying*—Stripes B, C, and D, 2 threads in a dent, with the threads in  $\boxtimes$ 's one end in a dent.

Stripes A, 4 ,, ,, and one dent empty on either side.

*Reed*—40 dents per inch.

*Weft.*

40's cotton or silk, white, or in a contrasting colour.

Considered in regard to weave elements, the design comprises several distinct types of crossings ; firstly, there is the

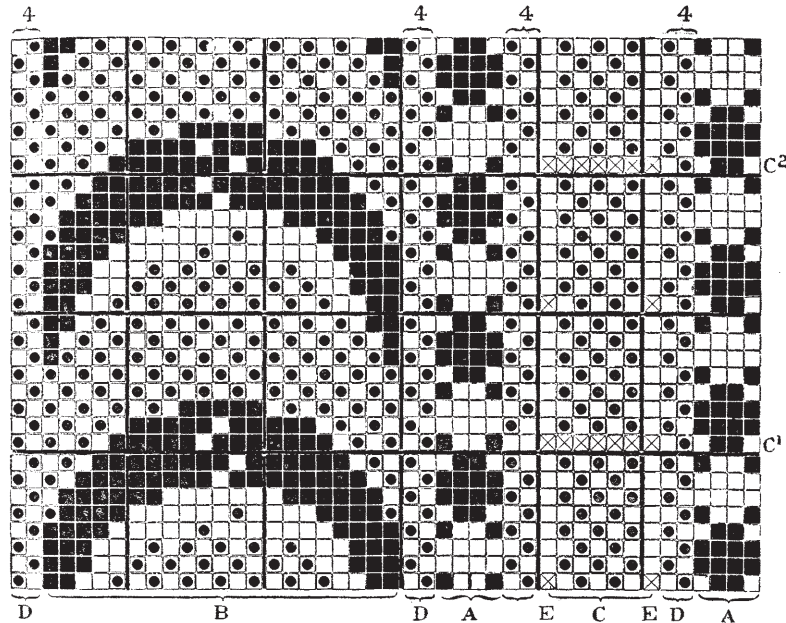


FIG. 171.—STRIPING IN WARP AND WEFT EFFECTS COMBINED WITH NET OR LACE DETAILS.

plain ground ensuring the construction of a level fabric ; next there are the star stripings or leno effects A in warp and weft floats ; and, in the third place, the lace and figured structures.

According to the colour scheme, the warp features in A would be in fawn, and the weft features in white. The larger band of effects B consists of crescent forms alternately woven in warp and weft effect. Light blue warp threads being applied

to this section, the elements marked in □'s would be in this tint, and those marked in ■'s in white. In addition, there are the lacing threads used in part C, which are, in the weaving, drawn into diamond or cross-over net. Such lacing threads require to be entered into separate dents in the reed. This arrangement provides for threads E being successively linked with each other by picks C<sup>1</sup> and C<sup>2</sup>, and with the edging threads by the 1st and 17th picks in the design.

## CHAPTER VII

### GEOMETRIC DESIGN BASES—WEAVE COMPOUNDS

191.—Weave Units as Design Formulae. 192.—Design Bases. 193.—Rectangular or Checked Base. 194.—Elaborating Minute Checked Intersection Units. 195.—Damask and Diaper Checking. 196.—Converting Twilled Weaves into Diamond and Waved Checked Types. 197.—Waved and Diamond Checks with a Plain Ground. 198.—Various Checked Forms with a Plain Ground. 199.—Developing a Constant Checked Type. 200.—Cord and Repp Weave Checking. 201.—Star Checks. 202.—Checked Patterns in Multi-weave Compounds. 203.—Development of Diamond Outlines in Checking. 204.—Weaves Applicable in Modifying Diamond Outlines. 205.—Special Weave Structures and Checked Styles. 206.—Open Weave Structures and Checked Compounds. 207.—Rhomboidal Base. 208.—Rhomboidal and Transposition Bases. 209.—Transposed Base in a Single and Compound Build of Fabric. 210.—Interlacing Figuring. 211.—Diamond Structure of Pattern. 212.—Lozenge-shaped Types. 213.—Compound Geometric Types. 214.—Combination of Transposed and Checked Pattern Bases. 215.—Circular and Geometric Forms. 216.—Design Construction on Weave Bases.

191. *Weave Units as Design Formulae.*—Many of the standard weaves, as has been shown, have a geometric structure. The basic plan of the plain and of its derivatives is rectangular; that of the twilled crossings, in all their varied forms, consists of parallel lines of intersection details traversing a given width and length of cloth at a pre-determined angle; that of the check, and also of intermixed checkings, is a quadrilateral figure; and that of the different types of transposition weaves is rhomboidal. The “sateen” base is of another order. It consists of a mathematical division of the weave (threads and picks of which the sateen is composed) into a number of equal parallelograms—5, 6, 7, 8, etc., in sateen makes occupying these numbers of shafts. But, in each of these bases, the design plan is purely a weave unit—a simple but complete

scheme of intertexture adapted for producing a distinctive structure of cloth with a specific surface effect. Such weave elements have been considered, firstly, as systems of warp and weft interlacing in fabric building ; and, secondly, in regard to the minute, and in a number of examples, the mosaic forms of pattern they produce.

There is strictly no technique or craft comparable with that of Weaving in the means which it provides for the origination of design details. In the manifold orders in which the threads of warp may be intersected with the shots of weft, there is unlimited scope for acquiring diversity of fabric construction, and diversity of decorative minutiae ; and, in the use of coloured yarns, variously assorted in the warp and weft, each scheme of intersection is capable of giving a special description of textural style. Viewed from this standpoint, the subject of Woven Design—to whatever class of manufacture it relates—affords the widest range for experiment in the elements of loomwork resulting from Weave Principles, and also in their Colour Arrangement and Combination as effected by the crossing of the threads of warp with the shots of weft. When these principles are understood, the more complex phase of textural design, as it exists in weave compounds, is presented for study and analysis. For a fuller exposition of Colour Technique, the reader should consult *Colour in Woven Design* and Chapters XI and XII in *Woollen and Worsted*.

192. *Design Bases*.—In “Design,” as a resultant of combining Weave Units, the striped, geometric, and other bases on which the patterns are originated, will be treated of, and the principles of work comprised will be examined relative to each weave unit applied. This method of analysis treats, in the first place, of the basic type ; secondly, of the weave units suitable for combination in a particular form of design ; and, in the third place, of the practices in loom setting, and in the warp and weft orders of colouring adapted to certain weave compounds in making definite styles of pattern.

The following Design Bases will be illustrated and described—

- I. Rectangular or Checked Type.
- II. Rhomboidal Type.
- III. Interlacing Type.
- IV. Diamond and Lozenge Types.
- V. Compound and Geometric Types.

193. *Rectangular or Checked Base.*—Here the common variety of pattern is that of checking. As the several kinds of weave units are combinable in striped arrangement, they may also be worked on similar principles of combination into designs of a checked character. It follows that should the twilled weaves, of which the specimens A to D (Fig. 113) and E to J (Fig. 114) are the result, be re-arranged and re-ordered in the picks in corresponding sections as the threads have been shown to be regrouped by the healding drafts A' to D' (Fig. 113) and E' to J', (Fig. 114), they would give checked styles formed of equal rectangular areas as the stripings represent. Such duplicated drafting would cause the striped units to be changed into square and parallelogram units of effect. From this, it is to be understood that line, waved, angled, pointed, and other striped patterns, due to the combination of weave elements, have their complementary forms of pattern in checkings. It will therefore be useful, in treating of this textile design scheme, to explain briefly the technicalities underlying its formation, as a derivative or modification of striped weave compounds, taking lined and other checks as typical of the plan of construction.

The small rectangular effects in Figs. 172, 173, 174, and 175A are apparently acquired by reversing the picks as well as the threads in the weave unit marked in  $\square$ 's; whereas, in Fig. 113, the order of the intersections in the warp threads are simply inverted for giving the striped characteristics. In checks, as in stripes, different descriptions of crossing may be used, but particularly those of a regular twill and sateen

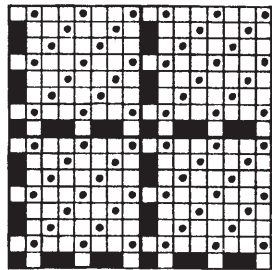


FIG. 172.

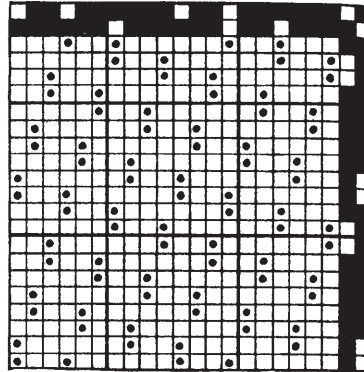


FIG. 173.

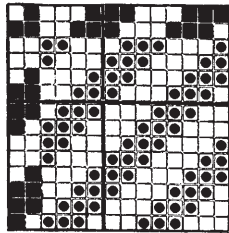


FIG. 174.

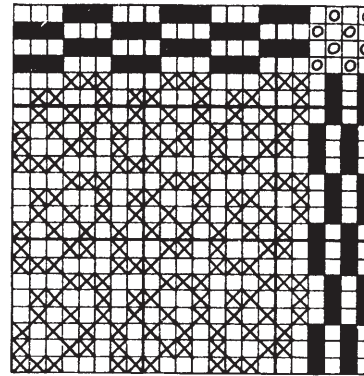


FIG. 175.

LINE CHECKINGS IN VARIOUS WEAVES.

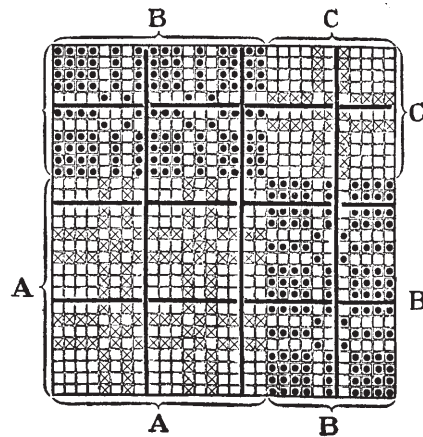


FIG. 175A.—IRREGULAR MAT CHECK.



variety, which allow of the line details cutting smartly with the details of which the rectangular figures in the pattern are formed.

The line arrangements are modified by reversing two or more threads as in Fig. 173; or, for rendering the cutting

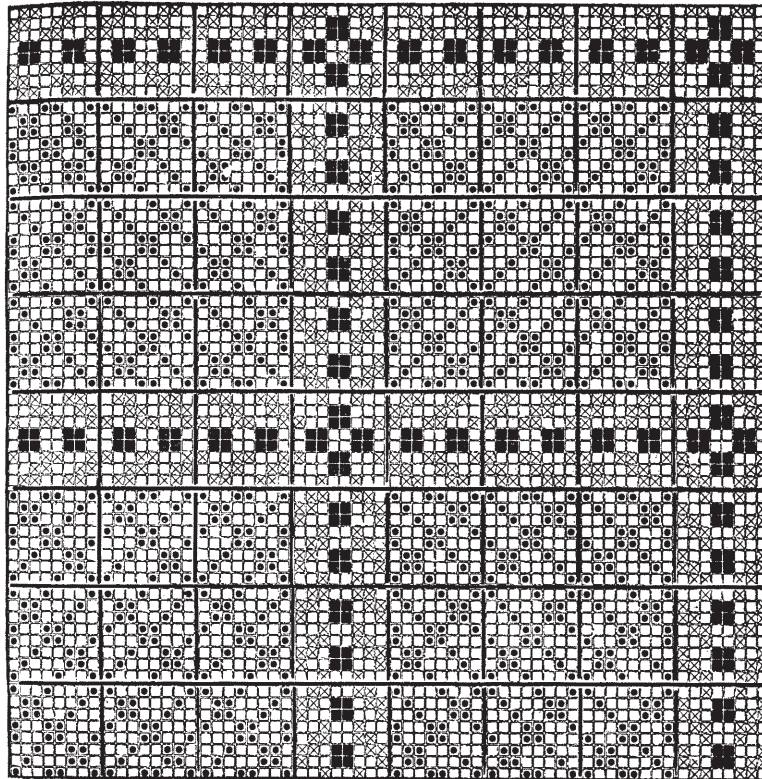


FIG. 176.—DUPLICATED LINE CHECK.

lines the more distinctive feature of the style, they may be developed in a special type of weave as in Figs. 176 and 177, where matted plans are substituted for transposed ends and picks. This latter practice is also suggested in the use of cord and mat weaves for making the intersecting lines in the checkings in Figs. 175 and 175A.

194. *Elaborating Minute Checked Intersection Units.*—By combining two threads, the opposite of each other in interlacing order, on a pre-arranged plan, it was demonstrated in reference to Figs. 116 to 120 how the most elementary type of woven checking is producible. Plans A, B, and C (Fig. 178) are of this structure, but will now be applied in the origination of checked designs containing several weave elements. Each series of intersections in these plans will be assumed as representing a determined number of threads and picks in a compound weave pattern, or the plans will be regarded as fundamental forms of checking. Taking each intersection in Plan

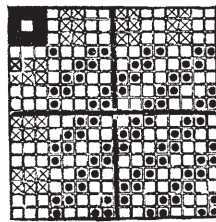


FIG. 177.—CUT-WEAVE CHECK.

178A, as corresponding to 5 ends of warp and 5 shots of weft, it would result in an enlarged type of checking,  $30 \times 30$  on the point paper, that is, as mapped out in Fig. 178D, which, it will be observed, is an extended counterpart of the sectional base in Fig. 178A. Applying the warp sateen to the portion of the design equivalent to the details printed in  $\square$ 's, and the weft sateen to the portions equivalent to the details printed in  $\blacksquare$ 's, gives a checked pattern (Fig. 178D) consisting of rectangular spaces in sateen makes.

Sketches thus prepared may obviously be made typical of the manner in which specified groups of threads and picks should be combined in producing a repeating checked pattern. Clearly, each of the details in  $\blacksquare$ 's,  $\square$ 's,  $\otimes$ 's,  $\odot$ 's, and  $\square$ 's may also be considered as suggestive of different weave structures. Assuming, for example, that they severally correspond to 8 threads and picks in Plans 178B and C, the result

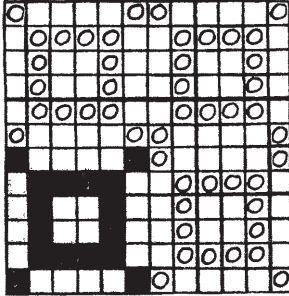


FIG. 178A.

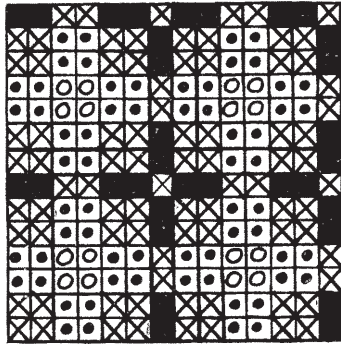


FIG. 178B.

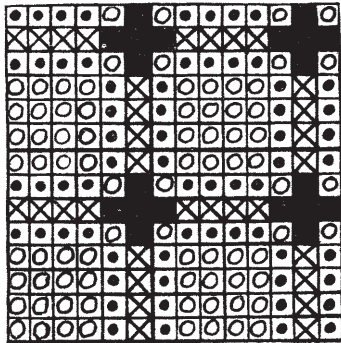


FIG. 178C.

EXAMPLES IN CHECK MOTIVES.

would be an enlarged check on point paper of 56 threads and picks. On the sectional parts of the design thus devised,

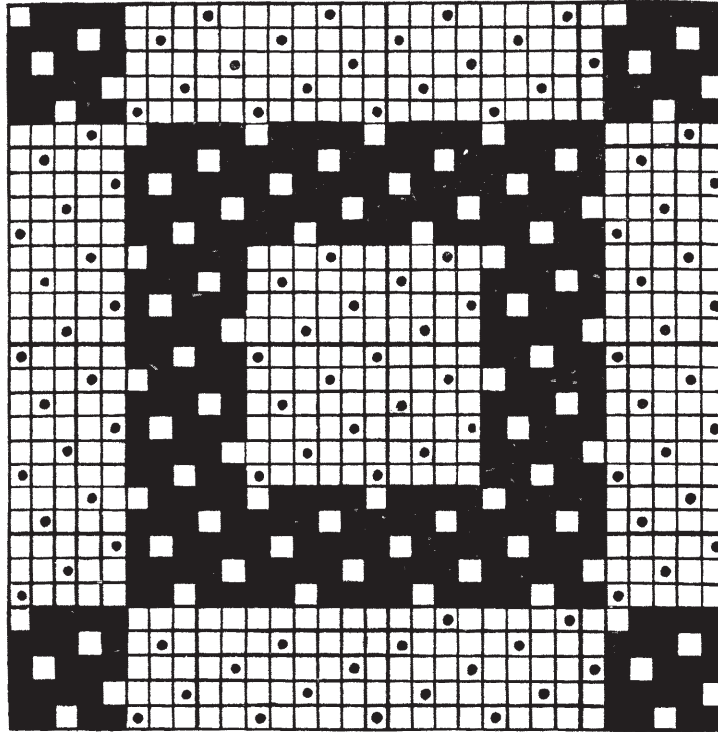


FIG. 178D.—DIAPER CHECK—SATEEN WEAVES.

selected weaves would be run ; for instance, in the case of Plan 178B, the outlined check might be treated thus—

- Details in  $\square$ 's = 4-end mat.
- „  $\square$ 's = plain make.
- „  $\otimes$ 's =  $\frac{2}{2}$  twill to the right.
- „  $\blacksquare$ 's = weft cord.

Or treating Plan 178c, on a similar basis, it would give a

checked combination of the same size ( $56 \times 56$ ), developable in such weaves as the following—

Details in  $\square$ 's = mat.  
 „  $\otimes$ 's = warp cord.  
 „  $\blacksquare$ 's = weft cord.  
 „  $\square$ 's =  $\frac{1}{2}$  twill.

195. *Damask and Diaper Checking.*—While this class of checking finds its specific application to linen and worsted fabrics for decorative use, it is a fundamental basis of design which, in other weaves than the 5-shaft and 8-shaft warp and weft sateens, such as the common twills, plain and leno makes, may be effectively employed in dress fabrics. It is illustrative of the principle of duplicating a definite but strictly limited assortment and plan of intersection details in the production of compound check designs.

The method of combination differs from that dealt with in regard to Figs. 116 to 120, in that the fundamental plan is not a complete scheme of intertexture. Fig. 179 is, as in the checkings weavable on two shafts, the result of the re-arrangement of a given number of intersecting threads—the first three in the example—but it will be seen that the design would not make a fabric structure. If, however, as in the examples described in the previous paragraph, each intersection were taken as a 4-thread and 4-pick unit, and the plain weave were applied to the blank sections, and a mat weave to the sections in  $\blacksquare$ 's, the design would repeat on 276 ends and picks, and the ground would be in plain and the checking features in mat.

196. *Converting Twilled Weaves into Diamond and Waved Checked Types.*—It was indicated in reference to Fig. 158, that by drafting the picks of weft as the threads of warp, diamond figures would be formable in Stripe B. The application of this practice in drafting is shown in Figs. 180 and 181, where, by using, in the first pattern, a  $\frac{1}{1}$  twill, and, in the second, an 8-shaft plan, the rectangular sections in twill, waved lines, and in diamond-shaped details, have been constructed. Selecting twilled units, varied in the intersection lines, and retaining the

basis of construction as a standard factor, patterns, more or less decorative in style and structure, are obtainable in different classes of dress fabrics. Weaves suitable for this purpose

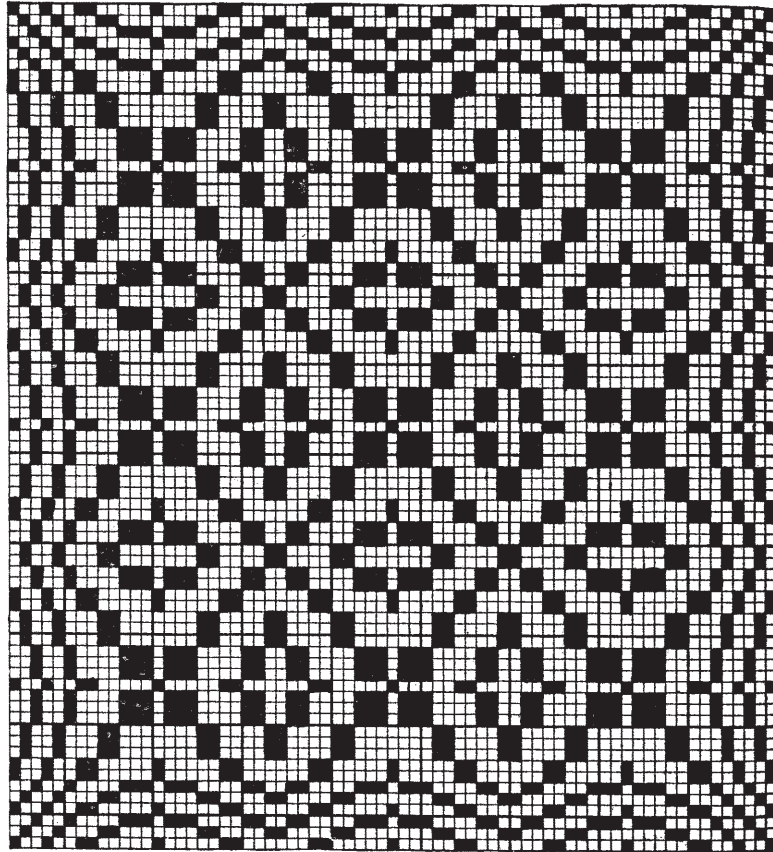


FIG. 179.—DRAFTED DIAPER CHECK.

include those seen at A, Fig. 102 ; B, Fig. 103 ; C, Fig. 104 ; and twills on 9, 10, or 12 shafts arranged—

$$\frac{3 \ 1 \ 1}{2 \ 1 \ 1}, \frac{3 \ 1 \ 1}{3 \ 1 \ 1}, \frac{3 \ 1 \ 3}{2 \ 2 \ 1}, \text{ and } \frac{3 \ 1 \ 1}{3 \ 2 \ 1} \left. \begin{array}{l} = \text{Warp} \\ = \text{Weft} \end{array} \right\} \text{intersections}$$

It will be seen that the idea is that of using the twilled crossing



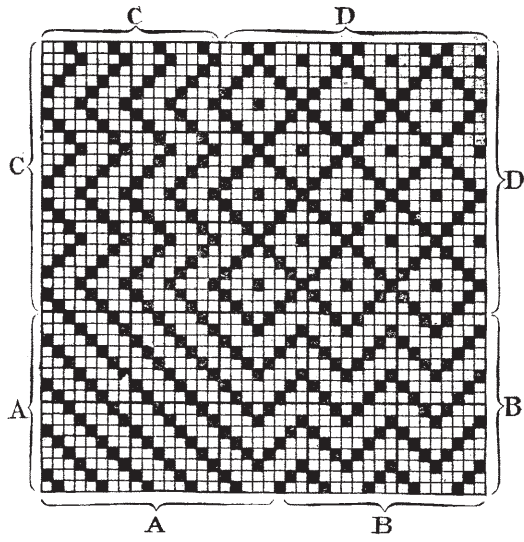


FIG. 180.

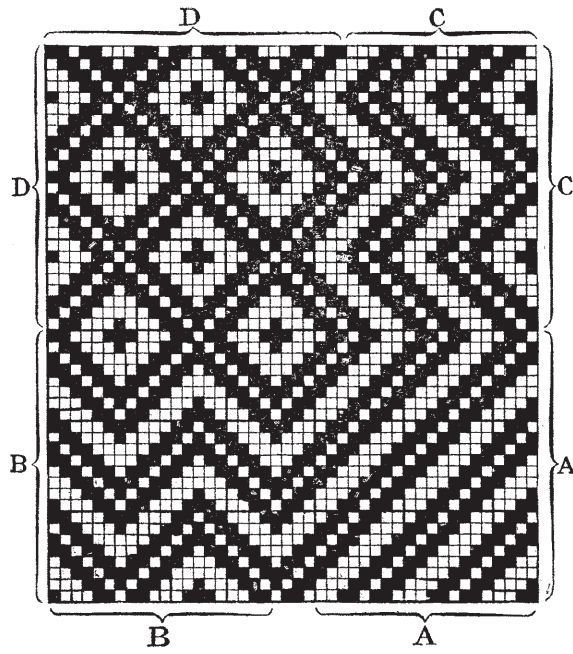


FIG. 181.

DRAFTED TWILL CHECKS.

for section A (Figs. 180 and 181), and of running it alternately to the right and to the left in the *threads* for section B, and in the *picks* for section C, and of reversing the twill in both the *threads* and *picks* for section D.

197. *Waved and Diamond Checks with a Plain Ground.*—Diamond, waved and spotted checkings, with the ground of the texture woven in plain, are a modified description of this principle of design. The blouse specimen in Fig. 182 is illustrative of this form of combination. Considering the design as a weave compound, that is detached from the colour scheme by which it is neatly enhanced, it comprises—

(1) The simple form of checking in sections A and A', centrally ornamented with a series of spottings.

(2) The weave units produced, where the texture is woven 6 picks of cotton and 4 picks of silk, or the detailed features in section B.

(3) The corner diamond figures which, in 2-and-2 colouring produce, in the drafting plan, the details seen at D and D<sup>1</sup>.

(4) The waved features along section C due to the design for the diamond spottings in A, and to the healding draft for section B.

In designing checked styles of this character, the detail units are primarily selected and planned on a suitable base. This done, the system of drafting is formulated, and ranges of designs are originated workable in the selected healding draft.

198. *Various Checked Forms with a Plain Ground.*—Several of the designs examined have been made from one weave by transposing its thread and pick units ; but, in the intersecting lines for specimen Fig. 182, a waved element is combined with the plain crossing, and the resultant effects converted by drafting, into a diamond check. Other typical examples, with plain as an ingredient, are given in Figs. 183 to 187, in which the plain make lends stability and evenness to the texture, while the mat, cord, and fancy weaves impart the design effects. To bring out the structure of each plan in this form of check, certain groupings of tinted yarn are essential. These

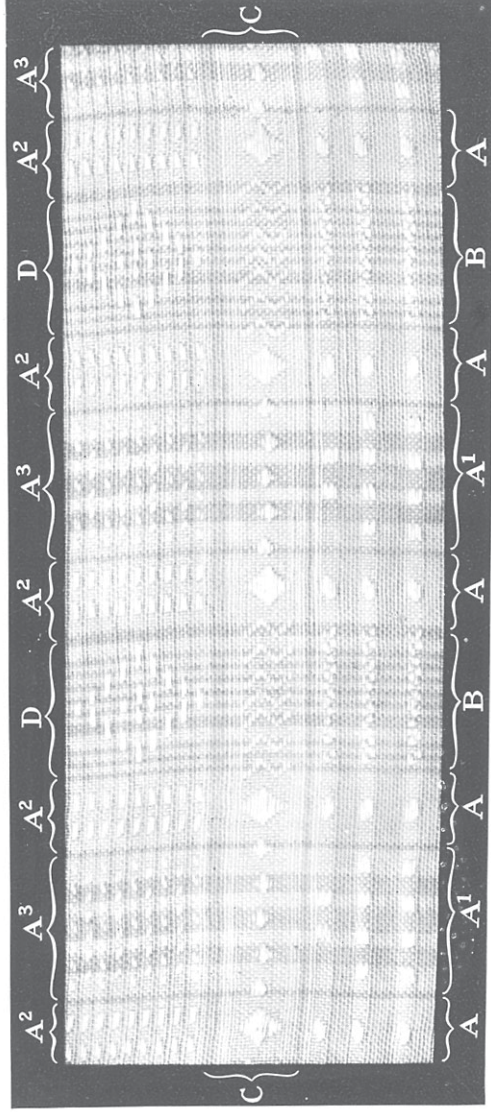


FIG. 182. FANCY BLOUSE CHECKING-DRAFTED STYLE.

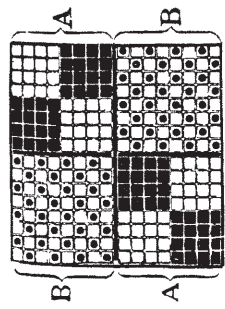


FIG. 183.

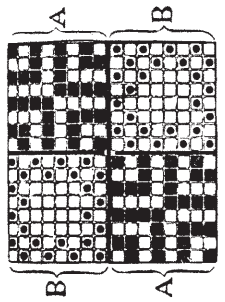


FIG. 184.

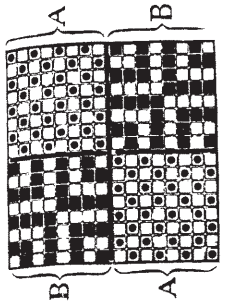


FIG. 185.

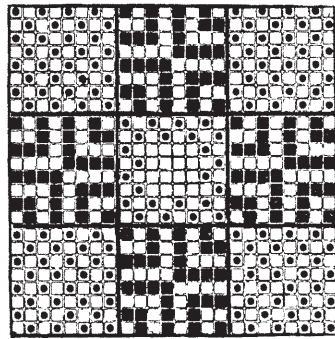


FIG. 186.

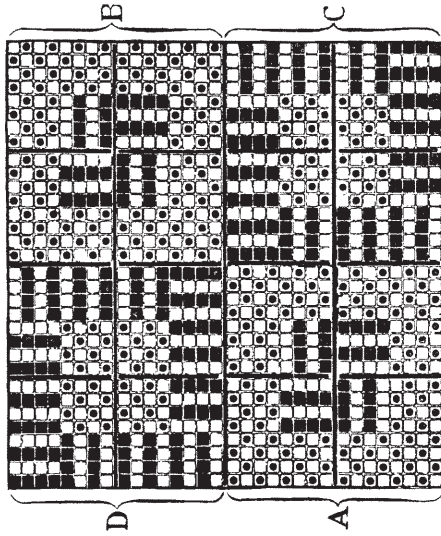


FIG. 187.

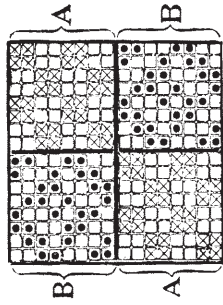


FIG. 188.

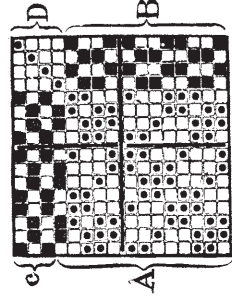


FIG. 189.

EXAMPLES IN CHECKING.

groupings may suitably tally with the method of weave combination, as, for example, in—

Figs. 183 and 184,	Coloured	8-and-8	in both	Warp	and	Weft.
Fig. 185,	„	1-and 1	„	„	„	„
Fig. 186,	„	8-8-and-8	„	„	„	„
Fig. 187,	„	1-and-1 or	„	„	„	„
		4-8-and-4	„	„	„	„

applying two sets of coloured threads in each warping and wefting arrangement. Designs of this class are also woven in one colour of yarn in cotton, linen, silk, and worsted textures.

It should be pointed out that a change in one of the weave units in the pattern, alters the textural effects, though the checking features remain constant. Figs. 183, 184, and 185 are of the simplest form of pattern, the sectional checkings being composed of equal numbers of threads and picks. In the first of these examples plain is combined with mat, in the second plain with warp effects and checked repp; and, in the third, squares of plain with squares of checked repp. Fig. 186 is a compound of Plans 184 and 185, resulting in larger and lesser squares of detail, in plain repp and warp effects respectively. The basis of the counter-change check is illustrated in Fig. 187, in which section A is transposed at B, and C at D, with the plain elements in A and B produced in warp and weft repp in C and D.

199. *Developing a Constant Checked Type.*—Each of the basic forms of checking is adapted for development in a variety of weave units, and in different sizes of pattern. The common checks, with the two types of effect transposed, are applied to the several classes of dress manufactures, and are formed in many types of crossings. For example, in the 8-and-8 check in Fig. 188, parts A consist of 2-and-2 mat and parts B of  $\frac{2}{2}$  twill reversed, with parts A and B transposed on the dice principle. Regular, as well as modified mats on 6 and 8 threads, or weaves composed of mat and plain, are treated on this system of plan-making, and combined with 6-shaft and 8-shaft twills.

Another elementary order of checking, developed in quite a number of the standard weaves, is that in which larger and

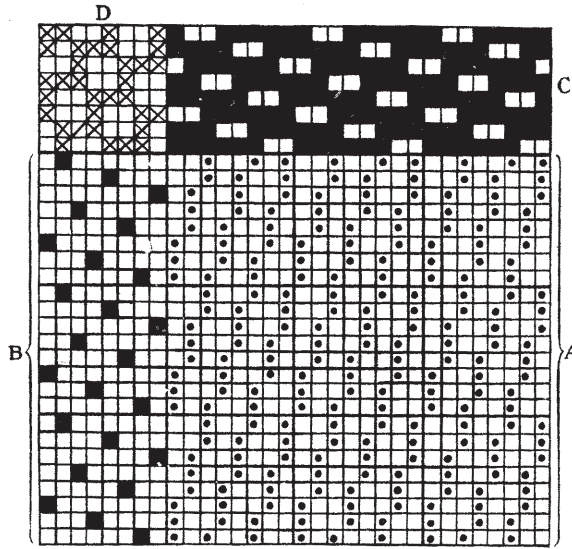


FIG. 190.

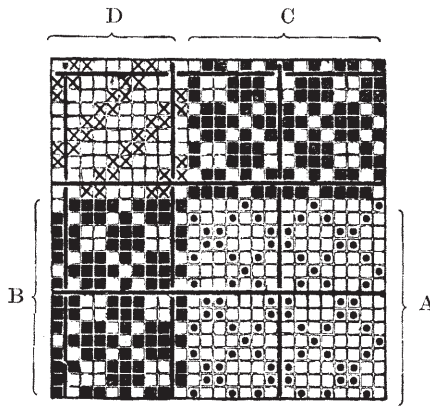


FIG. 191.

CHECKING IN THREE-WEAVE UNITS.

smaller squares interchange with each other, and with intermediate parallelograms in a third variety of textural detail. Figs. 189, 190, and 191 are given in illustration of this basis,



and also of the weaves usable, and of the methods of combining them. The first design consists of four crossings, namely, a 12-shaft small diagonal, warp and weft cords, and the  $\frac{3}{1}$  twill; the second of 8-shaft fine warp twill, sateen, weft-face twill, and twilled mat; and the third, of irregular hopsack,  $\frac{3}{3}$  twill, and of the hopsack reversed. While, on the preceding base, two or three weaves were selected with different plans for sections A or B respectively, in Figs. 189 to 191 the larger sections A are usually formed in one weave, sections B and C in one or two weaves, and section D in distinct type of weave. The object, in constructing the designs, is to combine weaves which accentuate each other and define the sectional parts of the style, and which also yield a sound description of fabric.

200. *Cord and Repp Weave Checking*.—Cords and repp plans are employed in the origination of simple and intermingled checked designs. Their use in the former was noted in describing this class of plain-weave derivatives. Irregular cords, such as those observed in Fig. 192, admit of either two *warp* or two *weft* crossings being transposed as in parts A and B of this example, and marked in  $\square$ 's,  $\blacksquare$ 's,  $\boxtimes$ 's, and  $\boxplus$ 's. Colour practice is important in the weaving of these patterns. Though constructed on a check base, they may, by adopting certain systems of looming, be changed in character. Warping and wefting (Fig. 192) as below—

One thread or pick of grey	}	for 6
“ “ “ white		
“ “ “ white	}	”
“ “ “ grey		
“ “ “ grey	}	”
“ “ “ white		

would give an ordinary checked formation, but should the order of the colouring be changed throughout the warping and wefting to 1 grey and 1 white, similar effects to those seen on point paper would be also observed in the woven production. This arises from the fact that the grouping of the shades would tally with the weave structures, bringing out

their distinctive details. It would, therefore, cause the dotted intersections in part A to form transverse lines of white alternating with *transverse* lines of grey, and exactly set across correspondingly coloured lines in the sections marked in ■'s; whereas, in section B, equivalent but *vertical* lines in grey and

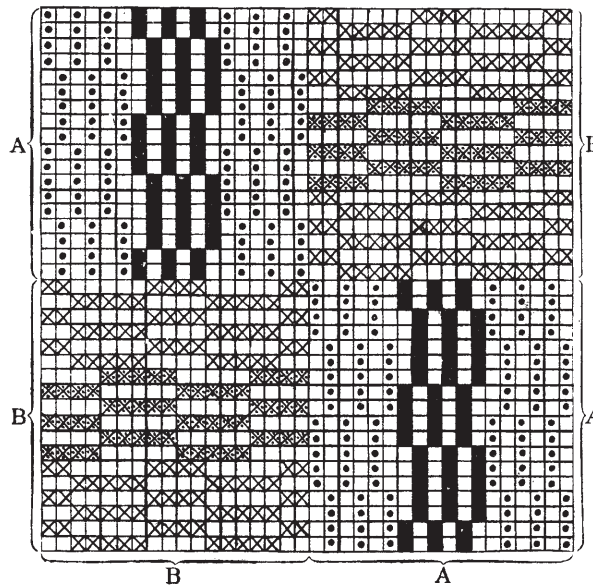


FIG. 192.—REPP OR CORD CHECK.

white would be relatively arranged in the details in ⊠'s and in ⊞'s, as in parts A of the pattern.

This method of colouring is also applied to checks in which twilled and ribbed waved plans are employed, as it adds to the diversity of the textural contrasts in a given design. Thus Fig. 193 would, in piece-dyed goods, result in a well pronounced type of checked style; but, if arranged in the warp one thread of tone 1 and one thread of tone 2, and wefted in tone 3, the waved lines would be expressed successively in tones 1 and 2; the weft cords, in parts B and C, in tone 3; and the small squares of effect, in D, in the three tones intermingled. To further show the utility of the colour

scheme in cord and weave combinations, Fig. 194 may be assumed to be tinted as follows—

Warp—1 thread of light red, and 1 thread of toned red.

Weft—1 pick of light greenish-blue, and 1 pick of toned greenish-blue.

The design is made up of warp cord, in  $\square$ 's; weft cord, in

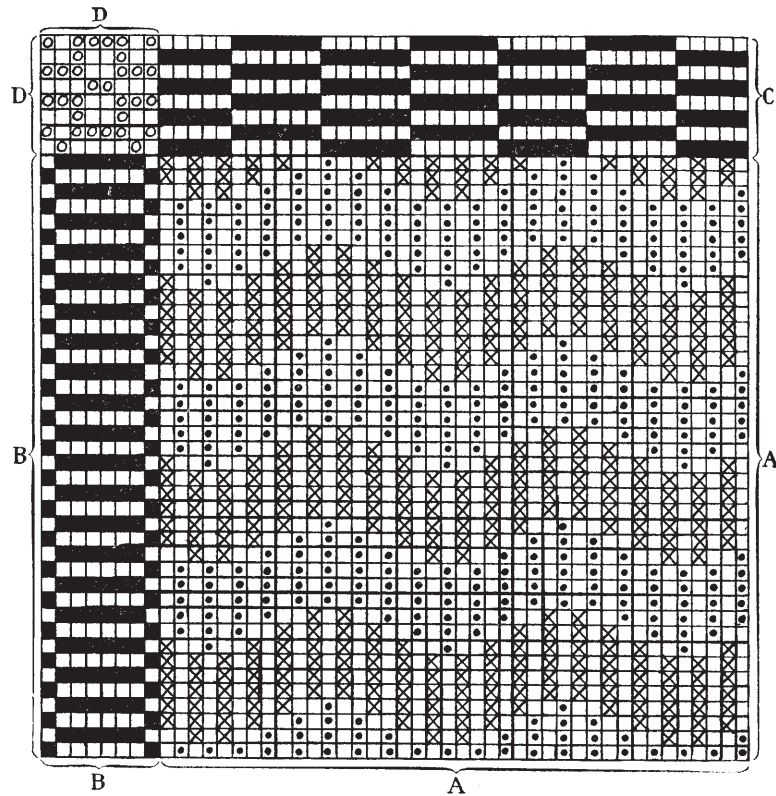


FIG. 193.—WAVED CORD CHECK.

$\square$ 's; and of a checked warp and weft cord, in  $\blacksquare$ 's. The first would, in this order of colouring, develop warp lines in tinted and toned red, the second weft lines in tinted and toned greenish-blue, and the third, a melange spotting in the two tints and two tones of colouring. Seeing that in weaves of a repp structure, the warp plans conceal the weft interlacings,

and the weft plans the warp interlacings, they enable the repp details, either warp or weft, to be developed clearly in two shades, and yet the pattern scheme—checked or figured—to be distinctly brought out in the cloth.

201. *Star Checks*.—Ordinary star checkings are producible by colour arrangement in the elementary weaves, such as in the 2-and-2 order of warping and wefting in the plain weave; in the 4-and-4 colouring in the 2-and-2 mat; and 6-and-6 colouring in the angled 6-end twill. Another species of star checking, and that now comprised, is derived from types of woven colour effect, but the base is extended and two or more weave units are combined.

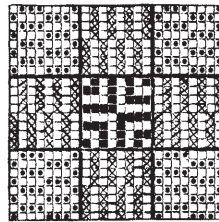


FIG. 194.—CHECK IN WARP AND WEFT  
CORD WEAVES.

This description of checking will be treated of by showing that the different types of geometric form may be arranged on a rectangular plan. Such form types may be in juxtaposition in the pattern, or they may be detached from each other, and with the intermediate ground spaces filled in with the selected weave units. Fig. 195 is designed on the latter basis, having a 16-shaft weft twilled cord in the star features, and a 12-shaft warp twill in the sections marked in □'s. Increasing the area of the ground between the figures tends to subdue the checked quality of the pattern, but this may be obviated by altering the base utilised on some such principle as shown in Fig. 196, section A of which shows the star grouping in Fig. 195. Considering each intersection in this modified