PATTERN
DESIGN
LEWIS
F. DAY

COMPANION VOLUME TO THIS

ORNAMENT &
ITS   APPLICATION

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OBJECTS & ORNAMENT FROM
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PATTERN DESIGN

A BOOK FOR STUDENTS
TREATING IN A PRAC
TICAL WAY OF THE AN
ATOMY, PLANNING &
EVOLUTION OF REPEAT
ED ORNAMENT   BY

LEWIS F. DAY

AUTHOR OF NATURE IN
ORNAMENT, ALPHABETS
LETTERING & ORNAMENT
&c

PREFACE.

A MAN has a right, I suppose, to pull down the building he once put up, and to raise another in its place. If he should see fit to use sometimes the very stones which belonged to it, he would only be stealing from himself. I have done something very much like that.

In the course of the last fifteen years the times have changed, and with them the standpoint of students and teachers of design; and, though my point of view has not altered, my outlook has widened with experience. When it came to the revision of "The Anatomy of Pattern" with a view to a fifth edition, it seemed to me I had done all I could do to it, that it was past mending, and that the simplest thing would be to start afresh.

The present volume, however, though it covers the ground of the former one, and answers much the same purpose, is not the same, but really a new book upon the foundations of the old one.

It contains, indeed, all that was in the other, but otherwise expressed. Here and there an explanation or description, which, by revision after revision, had been reduced to the fewest and plainest words I could find, has been allowed to stand. So with the illustrations, the greater number of them are new. Such of the old diagrams as were essential to the purpose of the book have been drawn again, not merely on the larger scale allowed by the page, but in a simpler and more self-explanatory way.

It will be seen from them and from the table of contents that " Pattern Design" covers much more ground than " The Anatomy of Pattern." But it does not go beyond its subject. The appearance, since the original publication of my little books, of a number of similar volumes each attempting to embrace more than the one before it, has firmly convinced me that the better plan is to confine oneself to a definite subject, and to treat it thoroughly. The last word, of course, is never said so long as there is life left in it.

I know very well that knowledge gained in practice can be only very partially conveyed in words ; but something of the experience of five and thirty years and more in practical pattern design is surely communicable; and, for what it is worth, I give it here.

LEWIS F. DAY.

13 MECKLENBURGH SQUARE,
          LONDON, W.C.,
     1st September 1903.

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ERRATA.

Page 108. Fig. 136. Title, *for* " in " *read* " on."

Page 177. Fig. 193. Title, *for* " diaper " *read* " diagram."

Page 220. Fig. 241. Title, *for* " 3 lines " *read* " 6 strands."

LIST OF ILLUSTRATIONS.

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I. WHAT PATTERN IS.

Pattern not understood—The meaning of the word—Comes of repetition, and is closely connected with manufacture—Has always a geometric basis—Use and necessity of system in design—Lines inevitable, and must not be left to chance.

To readers of a book upon the subject, no apology for pattern is necessary. Modest as may be its pretensions to artistic consideration, it covers ground enough to command attention. It is here and there and everywhere about us. There is too much of it by more than half—and more than half of it is of such a kind as to make the discriminating wish they could do without it altogether. Still, there it is; and there is no escape from it.

If folk knew a little more about it, realised what was and what was not within the control of the designer, understood how pattern came to be, and something of its scope and purpose, as well as of the processes through which a design must pass before ever it comes (for their momentary delight or lasting annoyance) to be produced, they would be less at its mercy. For the difficulty of designing is by no means in proportion to the importance of the field of design ; and in the case of repeated pattern, with which we have mostly to do—even those of us who are not concerned with trade or manufacture—the invention it requires is in inverse ratio to the free scope afforded. It is easier, as William Morris confessed, to design a big hand-made carpet, in which the artist is free to do very much as he likes, than to plan a small repeating pattern to the width of Wilton pile or common Kidder-

minster.   The art of pattern design consists not in spreading
yourself over a wide field, but in expressing yourself within
given bounds.

The very strictness of such bounds is a challenge to inven-
tion.   In the realm of applied design manufacture is autocrat,
and the machine is taskmaster.   Let who *can* rebel against
their authority.   For those who cannot—and they are the
great majority—revolt is futile.   We are all of us, artists no
less than the rest of the world, dependent upon manufacture ;
and those of the title who stand aloof from it give ground for
the accusation, commonly brought against artists, of being
at best unpractical and wrong-headed.   Their sense of fair-
ness is at fault, too, in blaming manufacture because it falls
short of art, while they stand by and refuse a helping hand
to the makers of things which will be made, and must be
made, and made by machinery too, whether they like it or
whether they do not.   It rests with those who have some
faculty of design (their name is not legion) to come to the
aid of manufacture, which, without help from art, is given
over to the ugliness which they deplore.

Pattern, it seems plain, and repeated pattern, conforming
to the conditions of manufacture and even to mechanical
production, is a consideration of importance, not merely to
manufacturers and others engaged in industries into which
art may possibly enter, but to all whose comfort and well-
being depends in any degree upon the beauty and fitness of
their surroundings.

The word " pattern " is here used in a somewhat technical
sense—not, as the dictionary has it, to mean " a specimen "
nor yet " a shape or model for imitation," but ornament and
especially ornament in repetition.   Pattern is, in fact, the
natural outgrowth of repetition ; and in every case the lines
of its construction may be traced ; they pronounce them-
selves, indeed, with geometric precision.   Geometric pattern
grew, of course, out of primitive methods of workmanship.

No mechanism so simple but it gives rise to it. To plait, to net, to weave, or in any way mechanically to make, is to produce pattern. The coarser the work, the more plainly is this apparent—as, for example, in the mesh of a coarse canvas ; but, though refinement of workmanship may be carried to the point at which, as in the finest satin or the most sumptuous velvet, warp and weft are not perceptible to the naked eye, the web is always there, and forms always a pattern. The pride of the mechanist is to efface such evidence of structure. To the artist it adds an interest ; and, far from desiring to obliterate it, he prefers frankly to confess it, and to make the best of the texture or pattern which a process may give. He regards it as a source of inspiration even, which to neglect would seem to him wasteful of artistic opportunity.

It is to his determination to make the best of whatever may naturally come of any way of working that we owe much of the simplest and most satisfactory, if not absolutely the most beautiful, patternwork.

So infallibly does the repetition of simple units, resulting no less from elementary processes of handwork than from mechanical production, end in pattern, that wherever there is ordered repetition there it is. Take any form you please and repeat it at regular intervals, and, as surely as recurrent sounds give rhythm or cadence, whether you want it or not, you have pattern. It is so in nature, even in the case of forms neither identical nor yet recurring at set intervals. The daisies make a pattern on the lawn, the pebbles on the path, the dead leaves in the lane ; the branches of the trees above, the naked twigs against the sky, the clouds that mottle the blue heavens by day, the stars that diaper their depths by night, all make perpetual pattern. The grain of wood, the veining of marble, the speckling of granite, fall so obviously into pattern that they have been accepted in place of intelligent design. The surface of the sea is rippled,

as the sandy shore is ribbed, with wind-woven device, the rocks are covered with shellfish clustering into pattern. Your footprints, as you walk, make a pattern on the pattern of the dewy grass; your breath upon the window-pane crystallises into pattern.

Technically speaking, however, we understand by pattern not merely the recurrence of similar forms, but their recurrence at regular intervals. The Japanese rendering of
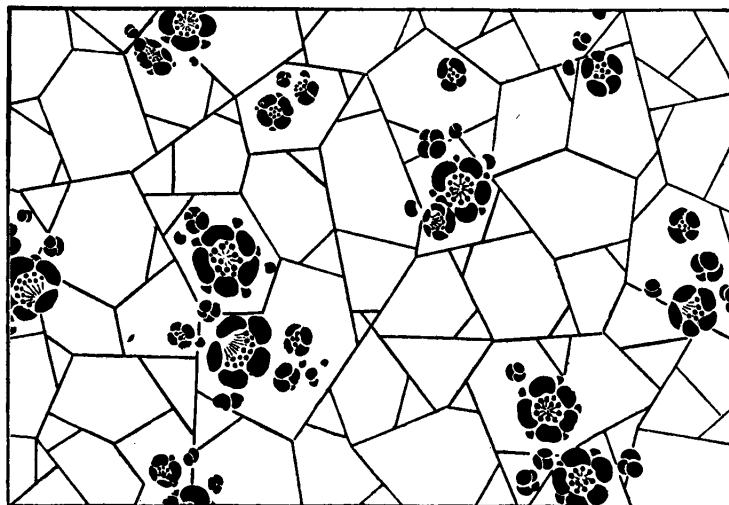
I. PEACH BLOSSOMS ON THE ICE—JAPANESE.

peach-blossoms on the surface of thin ice is undeniably ornamental. It may be regarded as part of a pattern, but, to be complete, it should repeat, which here it does not.

It must not be inferred from the casual occurrence of what is called pattern that there is anything casual about design : the very name denies that it is so.

The artist's hand does not crawl aimlessly over the paper and trail behind it flowers of the imagination. There is scope in ornament for all the fancy of a fertile brain ; but

design is no mere overflow of a brimming imagination ; it is cunningly built up on lines necessary to its consistency, laboriously, it might be said, were it not that to the artist such labour is delight. Whoever finds it irksome may be sure his bent is not in the direction of applied design.

The main lines on which repeated ornament is built are so few and simple that they can quite easily be traced. Just as the man of science divides the animal world into families and classes, so may the man of art classify pattern according to its structure. He is able, no less than the scientist, to show the affinity between groups of design to all first appearances dissimilar, and to lay bare the very skeletons upon which all possible pattern is framed.

The idea of setting out to design a pattern without regard to its logical construction is contrary to reason. It is all very well to protest that art is free of laws : they govern it none the less. And the pattern designer is bound to reckon with the dry bones of design. With regard to the unit of his design he is free ; he may, if he will, throw taste to the winds ; but when the pattern comes to be repeated, the very order of its repetition reveals the skeleton ; it was in the cupboard all the while.

This insistence upon the geometric basis of design may seem like dogmatism ; and all dogma cuts two ways, irritating the student into opposition where it does not convince him ; but experience will prove to him that the way to avoid the appearance of formality is not to set to work at haphazard. Suppose one were to begin without any thought of formal distribution and to design, let us say, a scroll, in itself as graceful as might be. A series of such scrolls, side by side, would show lines not in the least contemplated by the draughtsman, and in all probability as inelegant as they were unexpected. Who has not suffered in his time from wallpaper or other patterns in which certain ill-defined but awkward stripes would thrust themselves

upon his attention? And to the designer himself one of his strangest experiences is the trick a seemingly quite innocent pattern will play upon him in repetition. A design, for example, which appears to be quite evenly distributed will run, when hung, into lines which slant in such a way as to give the impression that the walls are not true, or that the paper has been hung askew.

In a pattern in which patches of the ground are left bare, the gaps are by no means accidental. They are most

2. PREDETERMINED GAPS IN A PATTERN.

deliberately planned—and from the very beginning—or there is no knowing what havoc they might play in repetition.

Amateurs will tell you (and a painter is an amateur when first he tries his hand at pattern) that the lines which are so distressing in incompetent pattern are the result of mathematical planning. That is not merely false, but, as every practical designer knows, the very opposite of the truth. There is no more radical mistake than to suppose that the awkward stripes which come out for the first time when a pattern is repeated are the result of the designer's having worked upon the obtrusive lines : they are the natural

3. BALANCE OF ORNAMENT ENOUGH FOR A PANEL BUT NOT FOR A
REPEATING PATTERN.

and inevitable result of not working upon any lines at all. If you work without a system the only safety is in insignificance. A pattern may be comparatively featureless; and, so long as there is in it no feature pronounced enough to distinguish itself, lack of order may perhaps pass unnoticed. But it is hardly worth while going out of the way to secure an end so insignificant.

A design of any character has usually in it features which, when it is repeated, stand prominently out from the rest. To these the eye is irresistibly drawn; and, not merely so, but the lines they take in relation one to another insist on being seen. It is barely possible that, in the event of such lines not having been taken into consideration by the designer, they should fall together in the happiest conceivable way. More likely they will look awry.

The balance which in a single composition satisfies the eye is not enough when it comes to repetition. The shoulders of the mantling, for example, on page 7, one rising above the lion's back, the other falling below it, would in repeated scrollwork almost certainly give the impression of being out of the level. The only way to be sure that scrolls in repetition will balance is to begin by disposing them, as in the wall-pattern opposite, quite symmetrically.

The designer of experience runs no unnecessary risk. Accepting some sort of geometric plan as the basis of his design, and appreciating at their worth the severity and strength resulting from it, and the sense of scale it gives, he makes sure of lines deliberately fulfilling the purposes of decoration. He will counteract a tendency to stripes in one direction by features which direct attention otherwards; he will so clothe a doubtful line that there shall be no fear of its asserting itself, as in its nakedness it might. The lines he leaves in his design were chosen for their strength and steadiness. Such lines as reveal themselves are the lines upon which it was built, by no means unforeseen.

4. WALL PATTERN IN WHICH THE LINES OF THE SCROLL ARE
QUITE EVENLY BALANCED.

If lines left to chance reveal themselves, as they are apt
to do, in sequence not to be endured, what else was to be
expected? Only by a miracle could they happen to fall
precisely as art would have them. The best of players
makes sometimes a happy fluke in design; but he does not
reckon upon such luck.

The point is this: it is, practically speaking, inevitable
that lines shall in the end assert themselves in repeated
pattern; if the artist does not arrange for them in his
design, they fall as may happen; it is therefore the merest
precaution of common-sense on his part to lay them down
from the beginning, to make them the framework upon which
his pattern is built, the skeleton of his design.

A practical designer has not, as a rule, much difficulty
in tracing the bones of a design, amply as they may be
wrapped in foliation or other disguising detail. To lay them
bare enough, however, to demonstrate the anatomy of pattern
recourse must be had to dissection.

II. THE SQUARE.

Geometry the basis of all pattern—Breaks in the simple stripe give cross-lines—Hence the lattice and the checquer, on which a vast variety of pattern is built.

IT will be as well, before proceeding to dissect design apparently far removed from the geometric, to show the lines which of themselves make pattern. They prove to be the basis of all pattern.

The simplest of all patterns is the stripe—a series of parallel lines in one direction. But the limits of the mere stripe are soon reached ; for any break in the repeated line or any deviation from the straight gives, by its regular recurrence, other lines in the cross direction. Gaps in a series of broken horizontal lines (5) give vertical lines ; and in the same way the points of the zig-zags mark the upright (6). Any recurrent feature between the lines gives, again, lines across, slanting or

5. STRIPE—BREAKS GIVE CROSS-LINES.

6. ZIG-ZAG—POINTS GIVE CROSS-LINES.

7. STRIPES—ORNAMENT GIVES
SLANTING LINES.
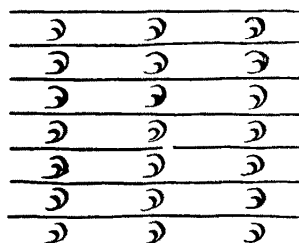
8. STRIPES—ORNAMENT GIVES
UPRIGHT LINES.

at right angles to them as the case may be (7 and 8). We
arrive in effect, as the primitive basket weaver must have
arrived in fact, at cross-lines; and upon these a vast amount
of varied pattern is built up, the simplest forms of which are
the lattice and the checquer (9). They must also have been
the earliest evolved by the basket plaiter. Grasses all of one
colour naturally showed the *lines* of interweaving, the lattice
(10). Grasses alternately light and dark in colour asserted
their checquered *masses* of colour, and gave the chess-board
pattern. Strips of different colours led also to more intricate
pattern (11); and the width of the coloured strips had only
to be varied to give all manner of plaids and tartans.

Something of the variety of pattern resulting from the
closer or looser plaiting of equal strips is indicated below—as
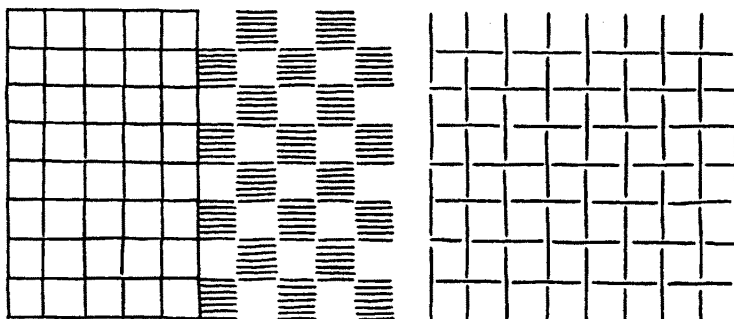
9. SQUARE LATTICE.   CHECQUER.   10. INTERLACING.
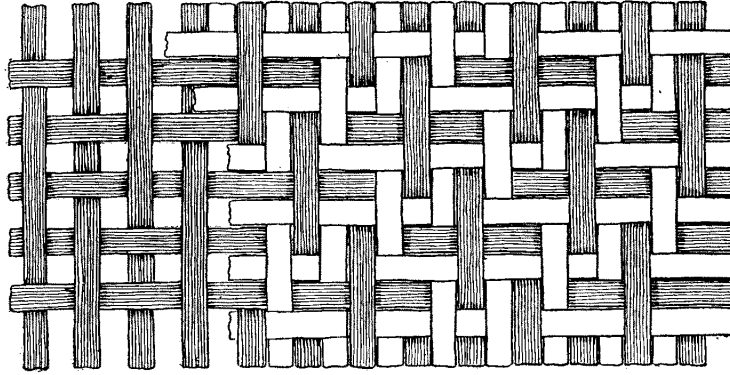
11. INTERLACING STRIPS OF DIFFERENT COLOUR.

well as the further variety which comes of strips of unequal width (12 to 15).

On the regular network of cross-lines a vast number of patterns not necessarily regular may be built up, many of them suggestive of plaiting if not actually suggested by it.

Taken singly, and filled in alternately light and dark, the squares give only the chess-board pattern ; taken in groups of two, or alternately of two and one (16), they begin to show possibilities in the way of upright or diagonal patterns. Grouped in threes or fives (17) they give already independent
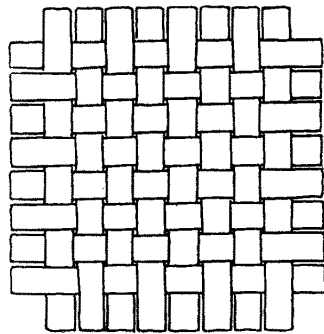
12. CLOSE PLAITING.
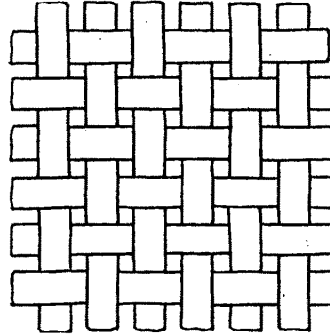
13. LOOSER PLAITING.
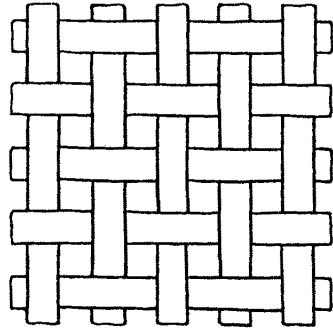
14. OPEN PLAITING.
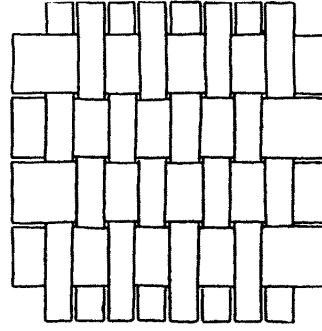
15. PLAITED STRIPS OF DIFFERENT
WIDTH.

units of design. The unit of the Arab diaper opposite (18)
is clearly a group of eight squares.

Working upon the *lines* of the lattice, we arrive, without in
any way departing from them, but simply by intermitting
some of them, at something in the nature of a key or fret
pattern (19). The elaborate Japanese fret on page 17 is built
upon that plan, upon which it will be seen (same page) all
manner of interlacing and free diapers may be schemed.

There are two ways of setting about design of this sort, both
of which amount practically to the same thing. The one is to
rule square lines and rub out parts of them, the other is to
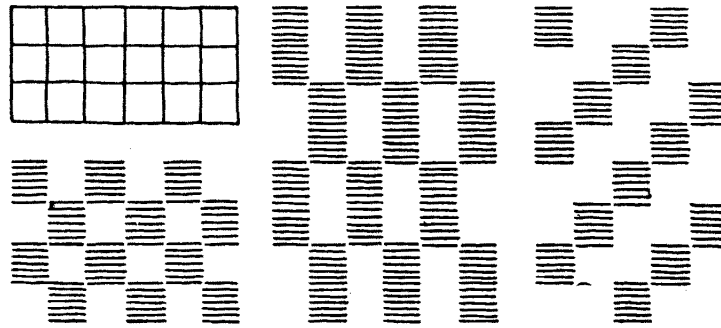
16. DIAPERS OF SQUARES AND GROUPS OF SQUARES.
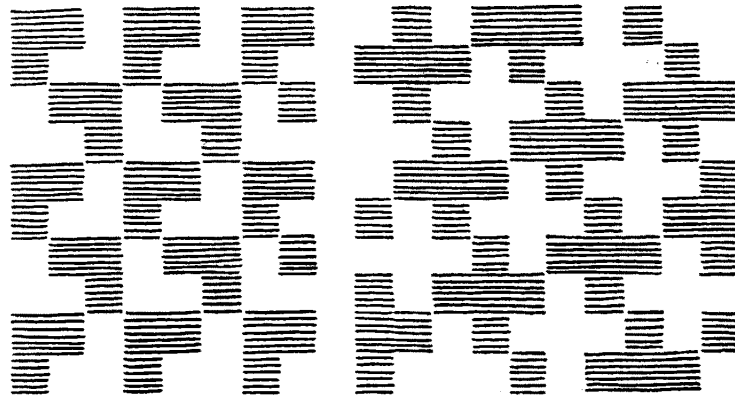
17. GROUPS OF THREE SQUARES.   GROUPS OF FIVE SQUARES.

work with a pen or brush upon faintly ruled paper—an
exercise childish enough for the kindergarten, but by no means
to be despised by the artist whose soul is not above pattern.
It is wonderful what a vast and varied range of pattern is to
be built upon the simple scaffolding of square lines.

The chess-board has only to be turned partly round to
give us diamonds—but as they are still square, and it is only
the point of view that is altered, we have as yet (as in the
case of a diagonal stripe, which is still only a stripe) no
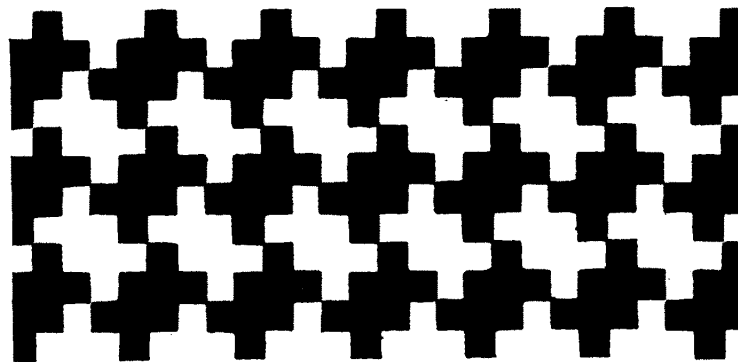
18. THE UNIT OF REPEAT A GROUP OF EIGHT SQUARES.
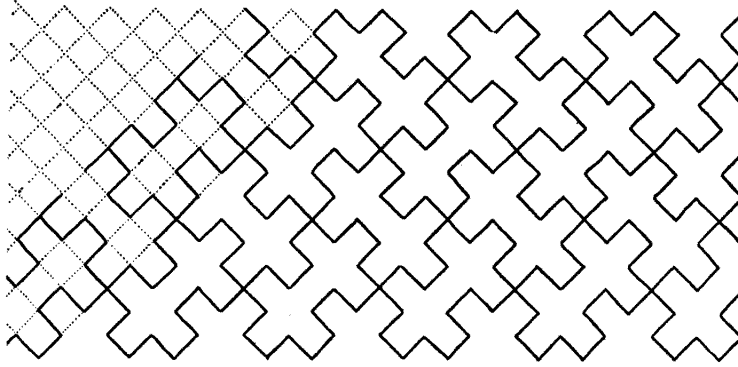
19. FRET PATTERN ON THE LINES OF SQUARE LATTICE.

different plan, but only a difference of effect—so great, however, as to be worth noting, and of quite exceptional importance when it comes to the construction of freer pattern.

By altering the *angle* at which lines cross, we get at once not only a series of new shapes (20 to 22) but a variety of the diamond which for clearness' sake it will be convenient to distinguish as *the* diamond—not in itself so satisfactory a form as the square, but invaluable in connection with cross-lines in a third direction.

The plan of the rectangular lattice is, however, as a matter of fact, the basis of the great part of our pattern design. There are obvious advantages in the use, for example, of
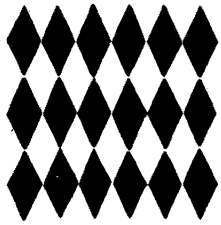
20. DIAMOND DIAPER.   21. ZIG-ZAG BUILT ON   22. DIAMOND DIAPER.
DIAMOND LINES.
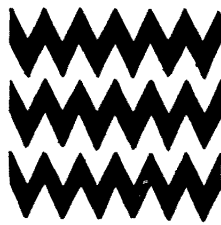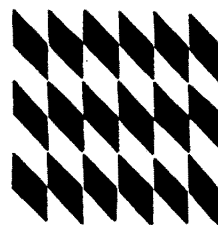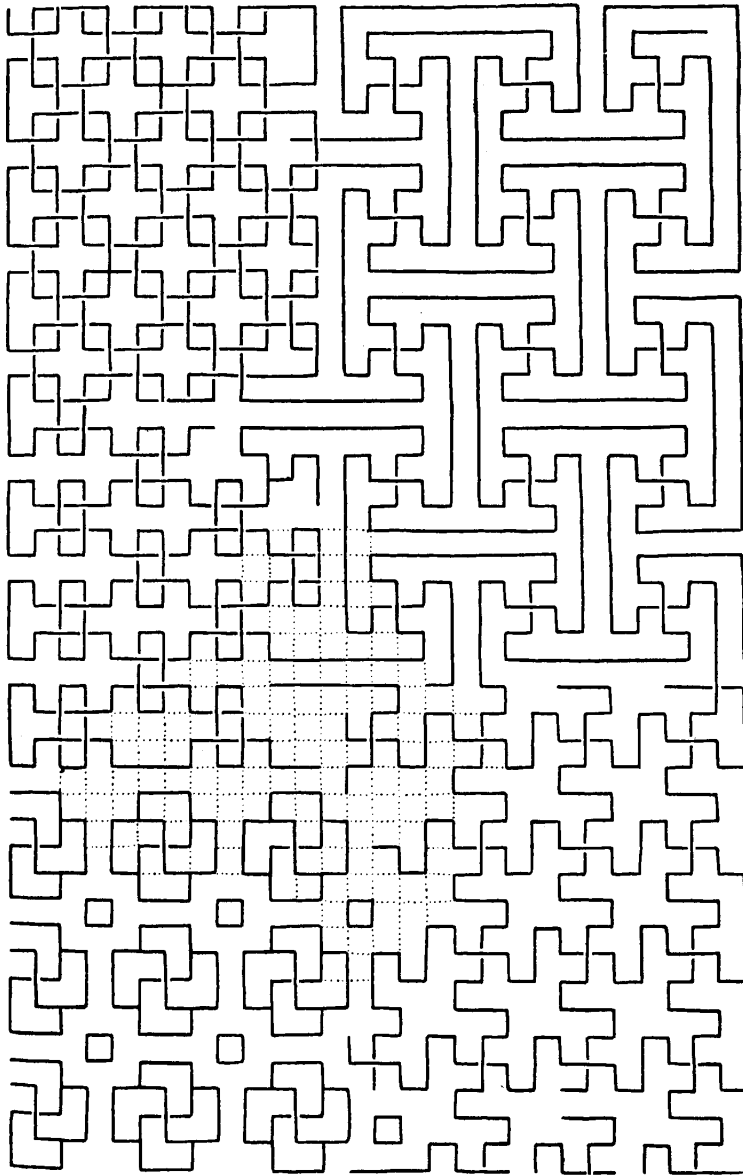
23. FRETS, ETC., ON LINES OF SQUARE LATTICE.

B

square tiles and right-sided blocks for printing and so forth ; but, over and above convenience, it seems to come more naturally to us to think out a design on square lines than on any other.

III. THE TRIANGLE.

The square lattice crossed by diagonal lines gives the triangle—Hence the diamond—And out of that the hexagon, the star, and other geometric units familiar in Arab diaper.

THE introduction of a third series of cross-lines makes quite a new and most significant departure. Cross a square lattice by a series of diagonal lines bisecting the right angles, cutting the squares in half that is to say, and the halves give us a new form to work upon—the *triangle* (24). And so it is if we cross in the same way a lattice of elongated diamond shape. But if we start with a lattice of a certain proportion ; if, that is to say, the two sharp angles of the diamonds are together equal to one of the blunter angles, then, when they are bisected by a third series, the halves of the diamond prove to be *equilateral triangles*. That being so, or, to put it another way, our
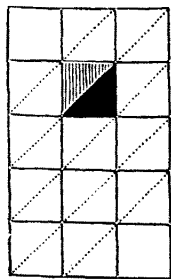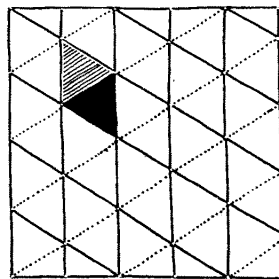
24. TRIANGLE.   EQUILATERAL TRIANGLE.   DIAMOND.
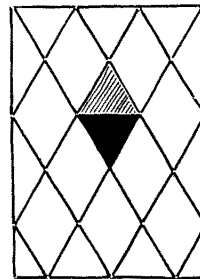
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5. STRIPE—BREAKS GIVE CROSS-LINES.

6. ZIG-ZAG—POINTS GIVE CROSS-LINES.

27. DIAPERS BUILT UP OF HEXAGONS.

The hexagon itself is a unit which makes a perfect repeat. The stars may be so arranged, point to point, as to leave only hexagonal intervals between. In the diaper on page 20 the central hexagons round which the stars are
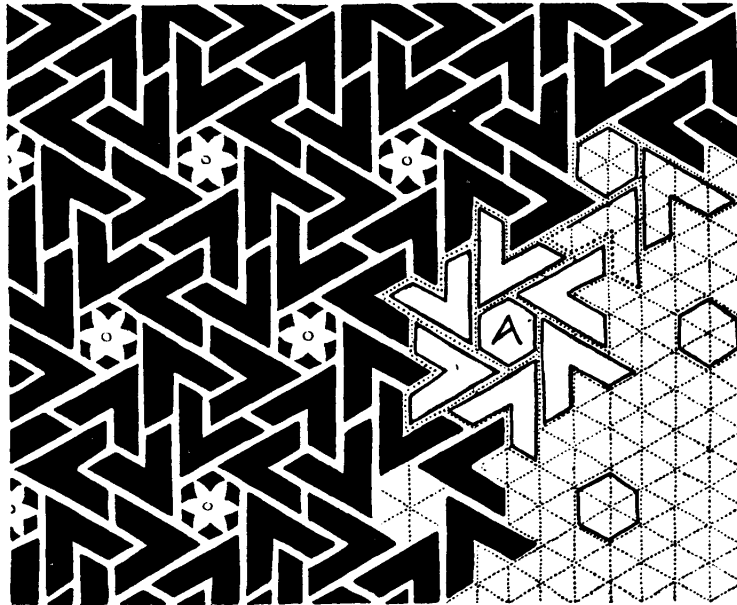
28. INDIAN LATTICE AND THE LINES ON WHICH IT IS BUILT.
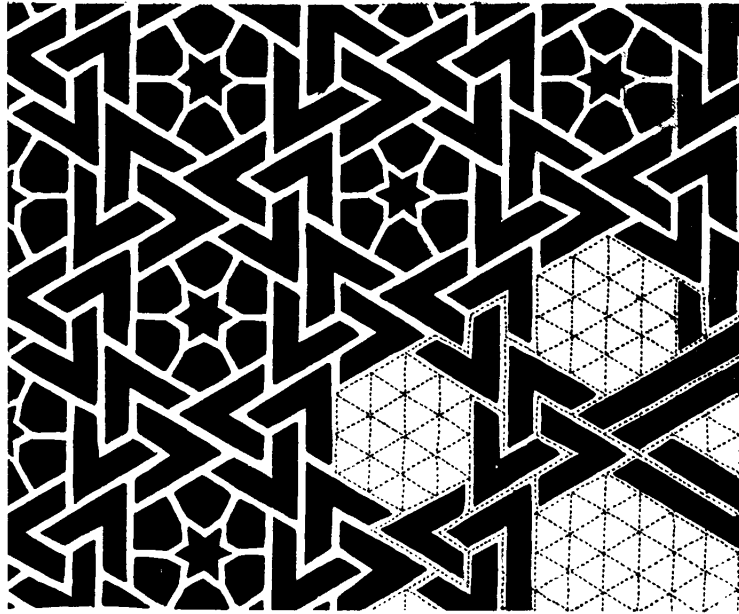
29. INDIAN LATTICE AND ITS TRIANGULAR BASIS.

built range with the hexagonal intervals. The result is a
starry pattern, composed of hexagons and triangles, in
which the cross-lines in the three directions are very plainly
marked.

Three hexagons together give a figure (27), commonly
employed in Arab ornament, which repeats (it will be seen)
either as a close-fitting diaper or with hexagonal intervals
between. The figure itself is plainly related to the triangle—
the sides of which might easily be bent into zig-zags giving
the other nine angles which go to make it.

The friendly way in which triangles, hexagons, stars and
other shapes compounded of the triangle, unite to give com-
plex and ingenious variety of pattern, accounts for the per-
sistent use of such units in Byzantine floor patterns and
Moresque tile-work. It will be seen that the intricate Indian
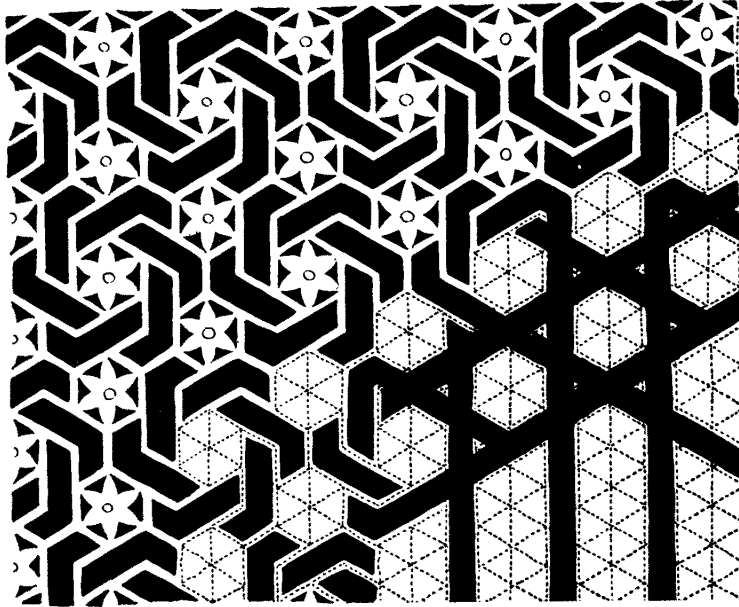
30. INDIAN LATTICE AND ITS TRIANGULAR BASIS.

window lattices illustrated (28, 29, 30), resolve themselves
(apart from the rosettes or stars inhabiting the central
hexagons) into shapes either formed by lines crossing in the
three directions or built up of equilateral triangles, in the ways
already explained.
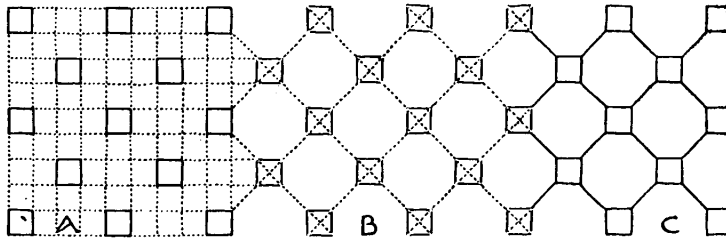
31. OCTAGON AND THE LINES ON WHICH IT IS BUILT.

IV. THE OCTAGON.

Four series of lines give the octagon—Not the unit of a complete pattern, but the basis of some radiating patterns—More complicated cross-lines, giving sixteen and eighteen sided figures, result in more elaborate pattern, but involve no new principle—Pentagon pattern really built on simple trellis lines.

A FOURTH series of cross-lines naturally gives new shapes, but no longer shapes which of themselves form a compact repeating pattern (31). The little squares at A are plainly formed on the trellis shown in dotted line. Cross that with a wider trellis, B, and you get the octagons, C. But, proportion them as you will, there remains always a series of square or oblong or diamond-shaped gaps between ; and the two forms are together necessary to make a coherent pattern. The two octagon diapers opposite (32) are of course identically the same, presented only from different points of view.

The lines of a double trellis, one crossing the other, cannot therefore be said to give a new geometric pattern unit ; but they give new lines on which a vast number of radiating patterns are built, from the comparatively plain interlacing of a cane-bottomed chair (33) to the ornamental diapering on the lower walls of the Alhambra (34). It is upon lines such as these that the bewildering patterns in which a race of mathe-
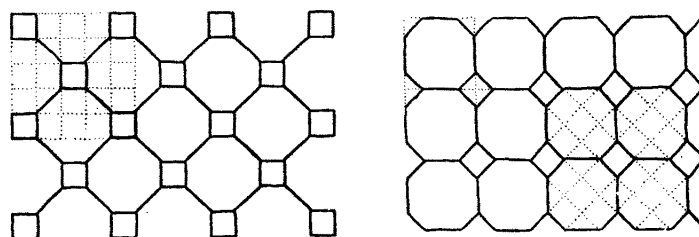
32. DIFFERENT VIEWS OF SAME PATTERN.

maticians delighted are based. We are inclined to wonder sometimes how human ingenuity comes to grasp the thread of such intricate patternwork, much less invent it. Something of the wonder ceases when the tangled lines of its construction are unravelled.

The double lattice which gives the eight pointed figures in diagram 34 might be crossed by a similar lattice giving sixteen pointed figures, and that again by itself, giving figures of twice as many points, without the introduction of any new principle of design. The lines would merely be elaborated; they would resolve themselves into cross-lines not in four or eight, but in sixteen or thirty-two, directions—that is all.
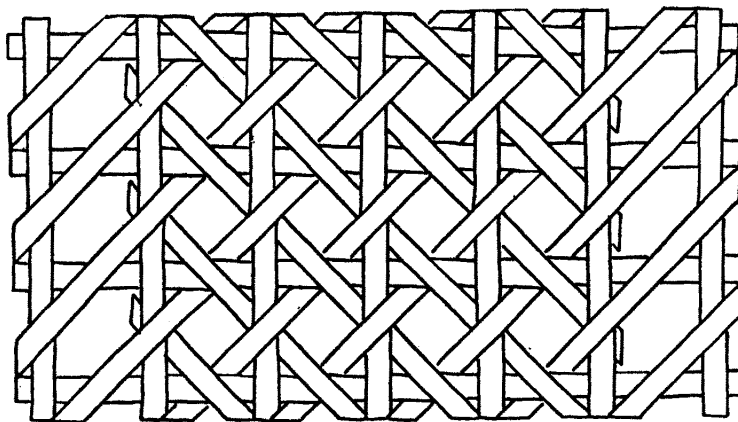
33. PATTERN FROM CANE-BOTTOMED CHAIR.
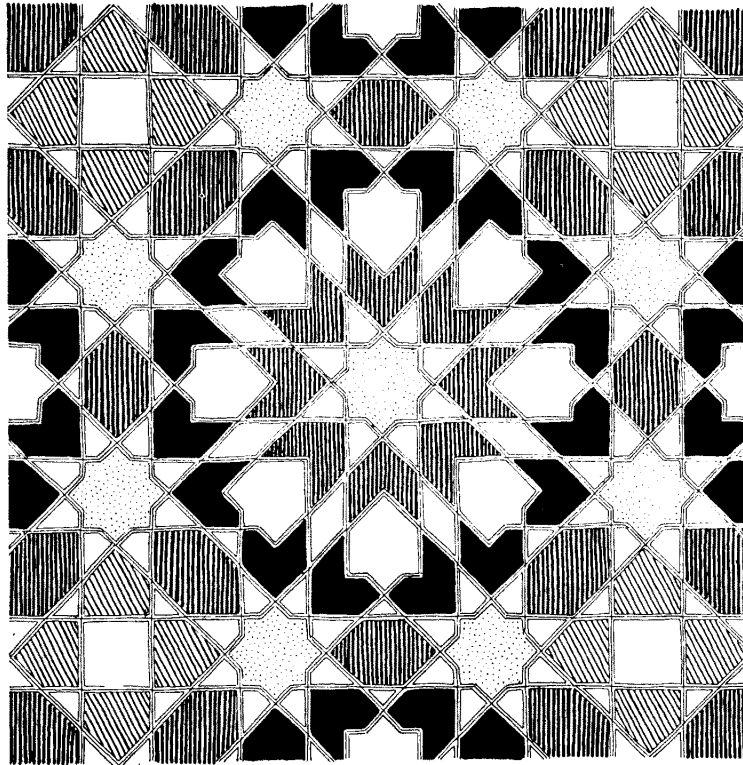
34. TILE WORK FROM THE ALHAMBRA.

Practically, we have now exhausted the plans on which straight-lined patterns can be schemed. It is within the bounds of ingenuity to put together right-lined figures, such as the pentagon, in a way to mystify even the expert and to suggest a new discovery in pattern planning. Such a pattern is the cunningly counterchanged pentagon diaper opposite (36). The star shapes within the larger pentagons and the smaller stars between, with their pentagonal centres suggesting other pentagonal shapes (in point of fact not complete), confuse the lines on which the pattern is really built. But, artfully as
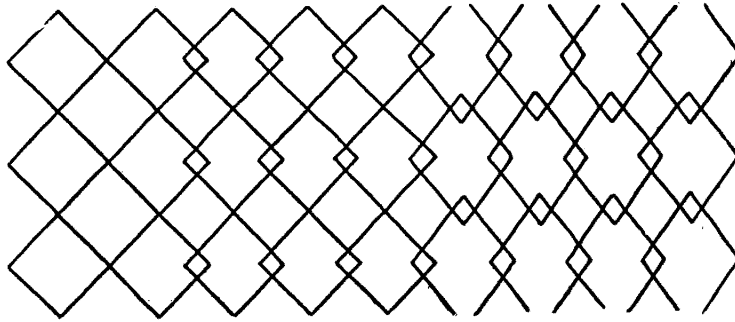
35. SIMPLE AND MORE COMPLICATED TRELLIS LINES.

they are disguised, they prove to be familiar lines involving no new plan. The pattern might be built indeed upon five series of lines in the direction of the five sides of the pentagon; but a network of such lines would be involved to a quite perplexing degree. The lines indicated on the diagram are more likely those on which the artist worked; and they are intimately related, as will be seen, to the simple trellis of cross-lines above.
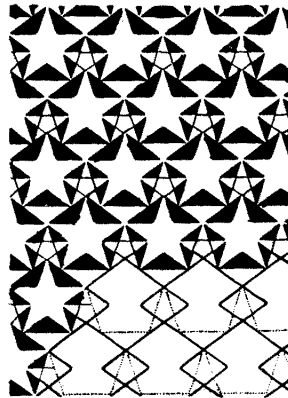
36. PENTAGON DIAPER AND ITS
SKELETON.
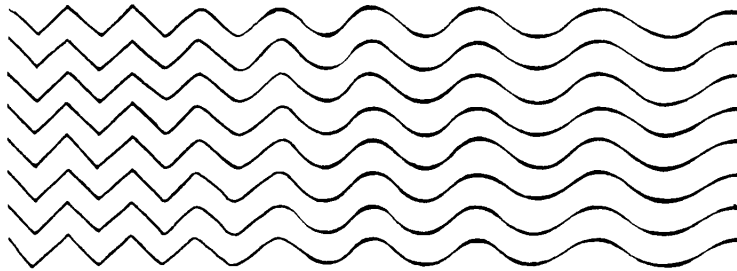
37. ZIG-ZAGS DEVELOPING INTO WAVE LINES.

V. THE CIRCLE.

The circle gives no new plan but only curvilinear versions of the foregoing
—The wave a rounded zig-zag—The honeycomb compressed circles—
Segments of circles give scale pattern, a curvilinear variation upon
diamond—The ogee—The circle itself a scaffolding for design.

A MOST important element in geometric pattern is the circle :
with it curvilinear design begins at once to flow more freely.

But (as in the case of the pentagon) the circle gives us no
new plan to work on ; it must itself be planned upon one or
other of the systems already described ; it must be struck, that
is to say, from centres corresponding to the points of inter-
section given by a lattice of straight lines.

Curvilinear pattern is in its simplest form plainly only a
suaver variety of rectilinear design. Flowing patterns can
often be deduced from angular, and *vice versâ*. The priority
of either is open to dispute, but hardly worth disputing.

Long before geometric principles were formulated in the
mind of man he practised them intuitively. As to the use of
the circle in ornament, we need not ascribe it to geometry,
nor trace it back to the sun's disc and symbolism, nor yet to
conscious imitation. The primeval artist had but to pick up
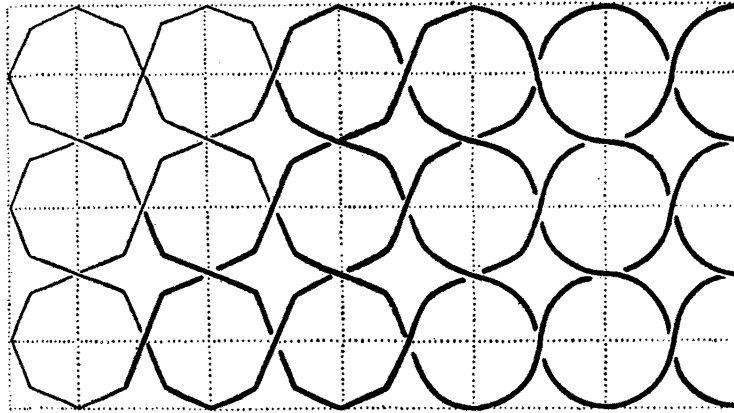
38. RELATION OF OCTAGON TO CIRCLE DIAPER.

the nearest dry twig and indent the damp earth with it, and, lo! a diaper of circular forms. Or, again, he might begin to scratch zig-zags, and, as his hand flowed on, they might develop into waved lines (37). Wave or zig-zag lines fall naturally into stripes: it is not the plan of the pattern, but only the detail, that differs. The wave is in fact a zig-zag blunted at the points, the zig-zag an angular form of wave. A network of straight staves gives, as seen in slight perspective (look at any common hurdle), distinctly waving lines.
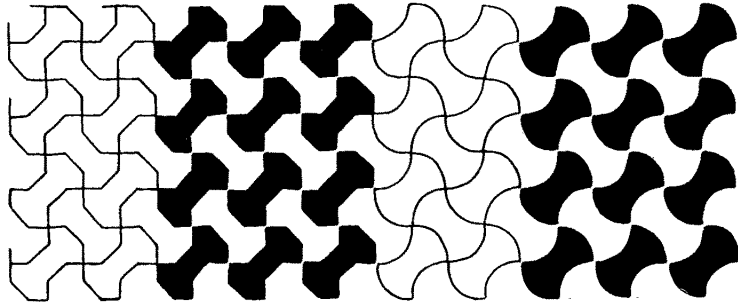
39. STRAIGHT-LINED AND CURVILINEAR VARIETIES OF THE SAME PATTERN.
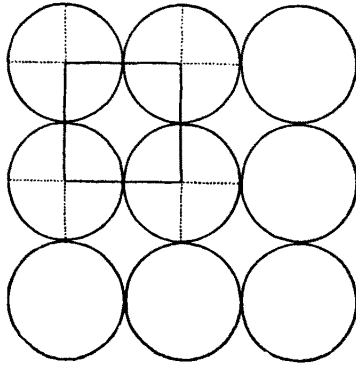
40. DIAPER OF CIRCLES PLANNED
ON SQUARE LINES.
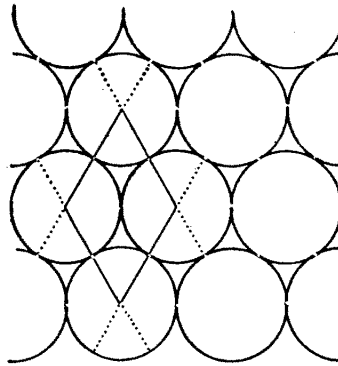
41. DIAPER OF CIRCLES PLANNED
ON DIAMOND LINES.

Again, round off the corners of the hexagon or octagon, and you have straightway a circle (38). Indeed, at a little distance, the lines of a sixteen-sided figure round themselves, to all appearance, and give the effect of a circle. The reduction of the circle to hexagonal shape is practically effected in the honeycomb. The busy bee, if one may so far throw doubt upon his proverbial forethought, works blindly in a circle, and the shape of his cells is simply the result of gravitation.
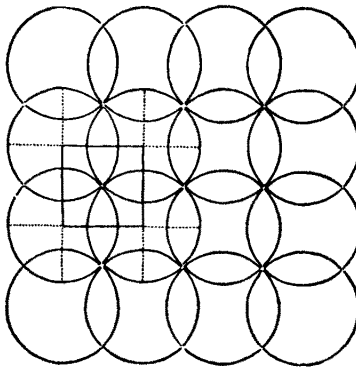
42. PLANNED ON LINES OF 40, BUT
RADIUS RELATIVELY WIDER.
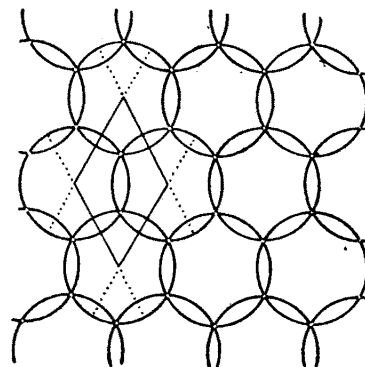
43. PLANNED ON LINES OF 41, BUT
RADIUS RELATIVELY WIDER.
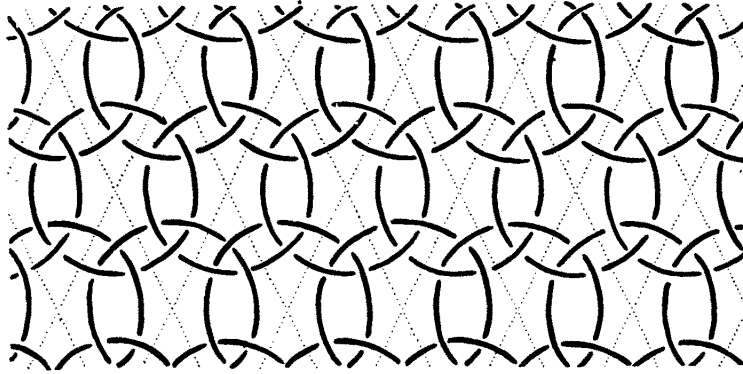
44. PLANNED ON LINES OF 41, BUT RADIUS RELATIVELY WIDER.

Cylinders crowded together crush themselves into hexagonal prisms. There is not a question of design : it is a matter of plasticity and weight.

It is clear on the face of it that we have in illustration (39) not so much two patterns as straight-lined and curved varieties of the same thing.
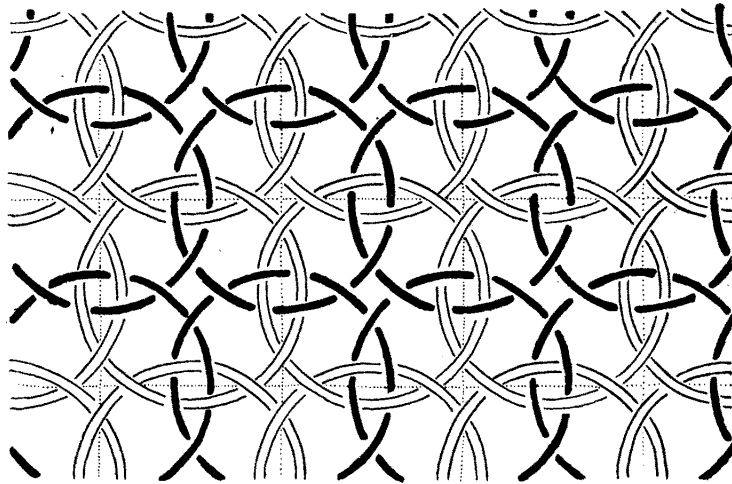
45. DOUBLE DIAPER OF CIRCLES PLANNED ON LINES OF 40, BUT
RADIUS RELATIVELY WIDER STILL.
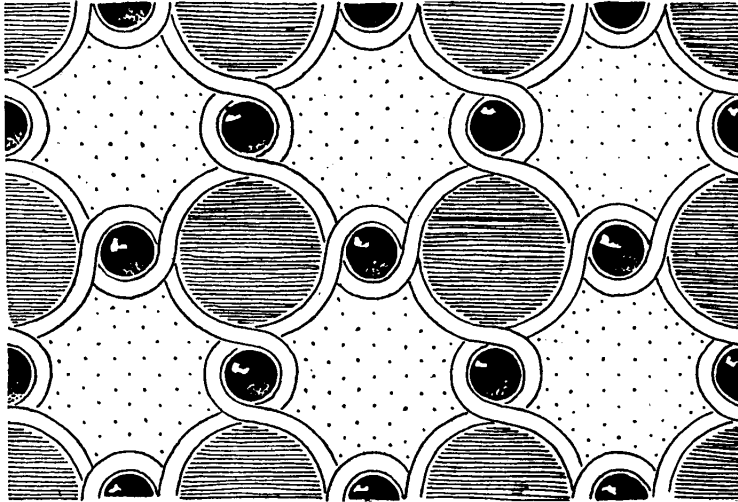
46. DIAPER OF INTERLACING CIRCLES.

Circles closely packed to form a diaper show by the shape
of the interspaces the plan on which they are put together.
Arranged on the square (40) they show between them a four-
sided space, on a diamond (41) a three-sided.

Larger circles struck from the same points, or circles of the
same size struck from similarly arranged but closer points,
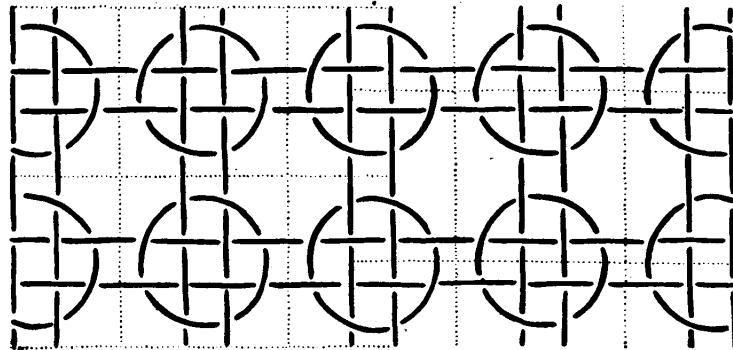
47. DIAPER OF CIRCLES INTERLACING WITH SQUARE TRELLIS.
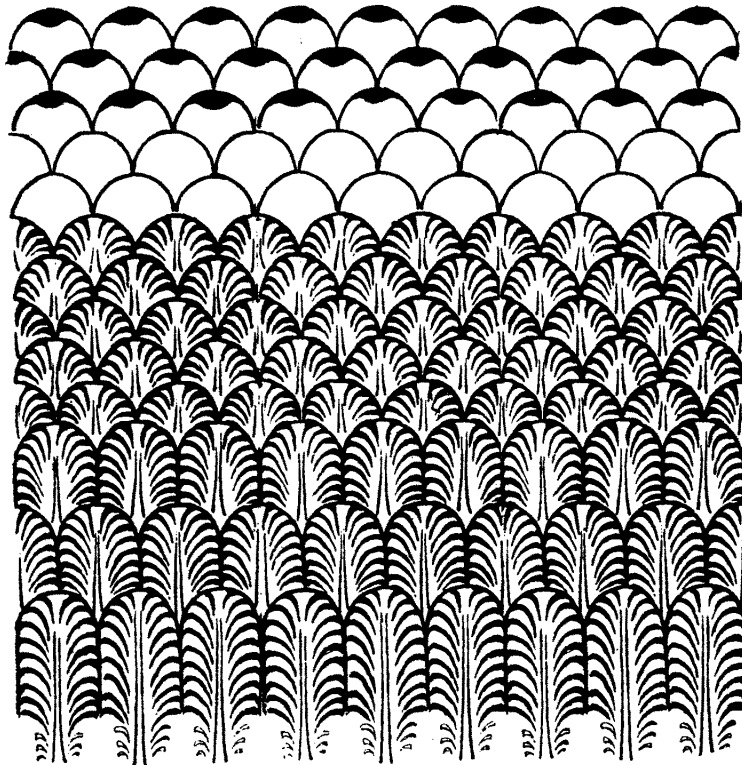
48. DIAPER OF SCALES AND DERIVATIVES FROM IT.

give, it will be seen (42, 43, 44, 45), more intricate-looking diapers. And infinite variations may be played upon the same tunes. The dotted lines in the diagrams fully explain the construction of the patterns, and show that no new principle is involved in the planning of them.

In the pattern (46) on page 32, the larger circles are struck from the points given by equi-distant lines crossing at right angles, and the smaller circles from points midway on the lines between these. The combination of straight with curved lines (47) helps only to show more plainly than ever the scaffolding on which the pattern was built. Other lines (square

C
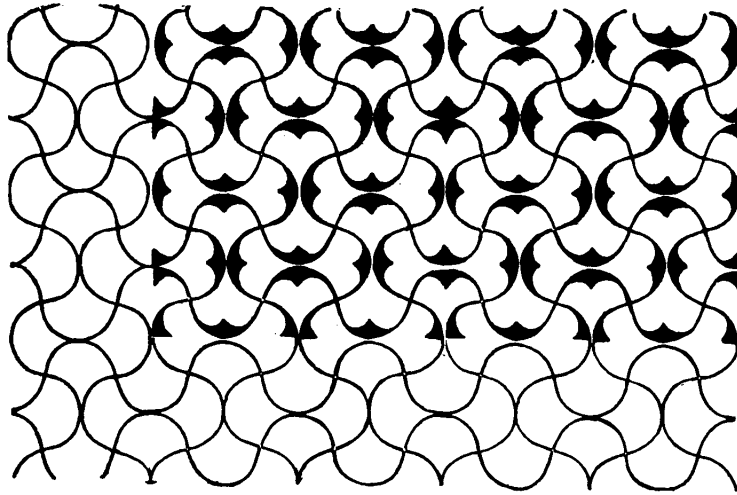
49. SCALES TURNED ABOUT TO MAKE FLOWING DIAPER.

always) on which it might have been constructed are indicated by dotted lines.

As with the circle so with its segments and its compounds (the trefoil, quatrefoil, and so forth); they give new forms, to be arranged always on the old plans—the quatrefoil naturally upon square lines, the trefoil or sexfoil upon the lines of the triangle. The segments of the circle give us the scale pattern (48), derived it might be from the scales of a fish or from the plumage of a bird's neck, but, practically speaking, only a translation of the diamond into curved lines.

Regarding the scales only as curvilinear diamonds, we are free to turn them about, as neither scales nor feathers would naturally grow, and to produce a flowing diaper (49) in which occurs a form, compounded of four scales, which itself may be regarded as a version either of the diamond or of the hexagon. All this is more plainly shown in diagram 50. The flowing shape occurs again in yet another diagram (51) together with the waved lines out of which it is composed. The inter-
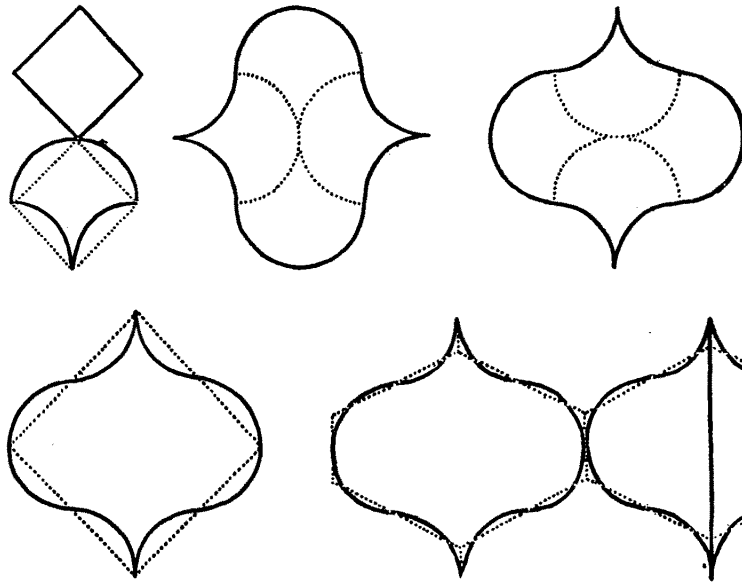
50. SHOWING RELATION OF SCALE TO DIAMOND AND OGEE, AND
OF OGEE TO DIAMOND AND HEXAGON.
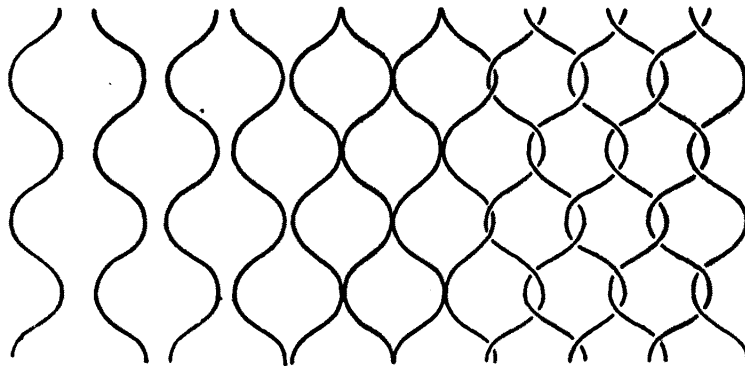
51. WAVE LINES, OGEE DIAPER, AND INTERLACING OGEES,
GIVING HEXAGONAL SHAPES.
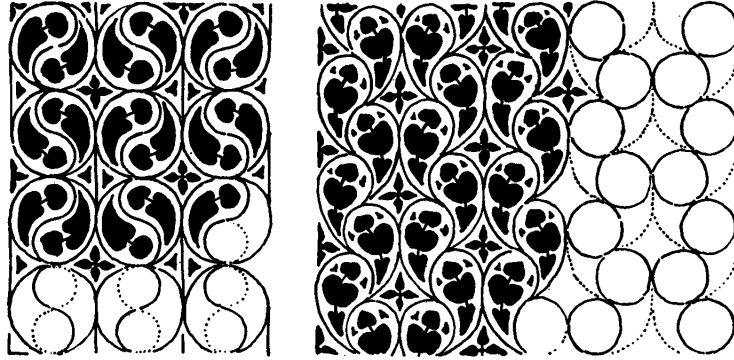
52. GOTHIC TRACERY DIAPERS CONSTRUCTED ON CIRCULAR LINES.

lacing of these waved lines gives a six-sided figure, the lines of which only want straightening to be recognised at once as the familiar hexagon. It is not surprising that in the fifteenth and sixteenth centuries pattern commonly took the graceful lines of the ogee. The designer fell into them as naturally as Mr Wegg dropped into poetry.
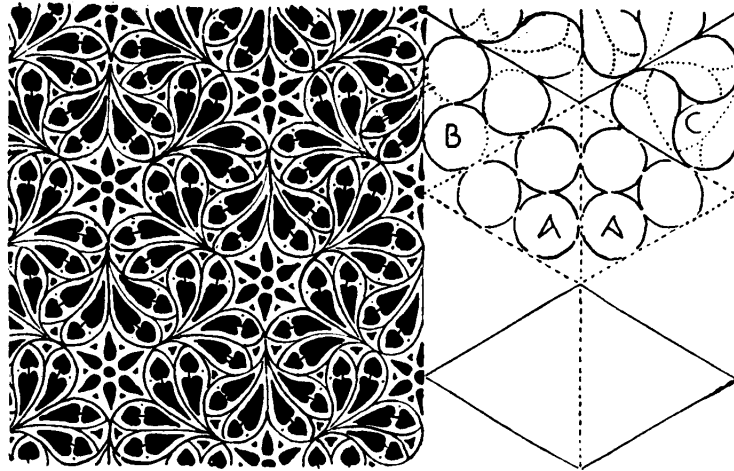
53. GOTHIC TRACERY DIAPER AND ITS CONSTRUCTIONAL LINES.

The circle deserves further to be considered because it is itself the scaffolding, or at all events forms part of the scaffolding, upon which a great number of more or less geometric patterns have been devised.

The simple Gothic diaper (52) to the left on page 36
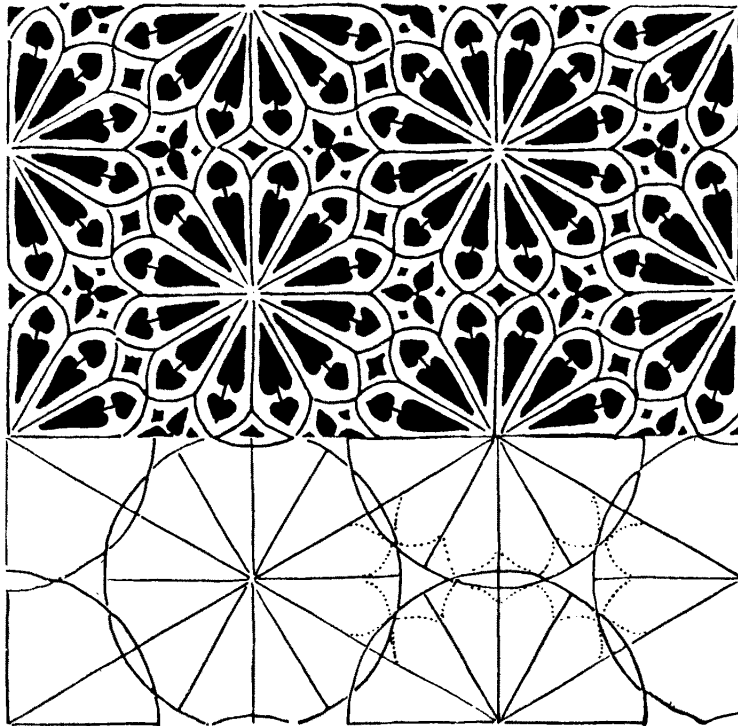
54. GOTHIC TRACERY AND ITS CONSTRUCTIONAL LINES.

shows not only circles but forms into which the segments of smaller circles enter. One circle, it seems, begets others.

The tracery pattern next to it (52) is constructed by the help of small circles, themselves arranged on a circular (or hexagonal) plan, though what they give in the result is a sort of vertical wave pattern.
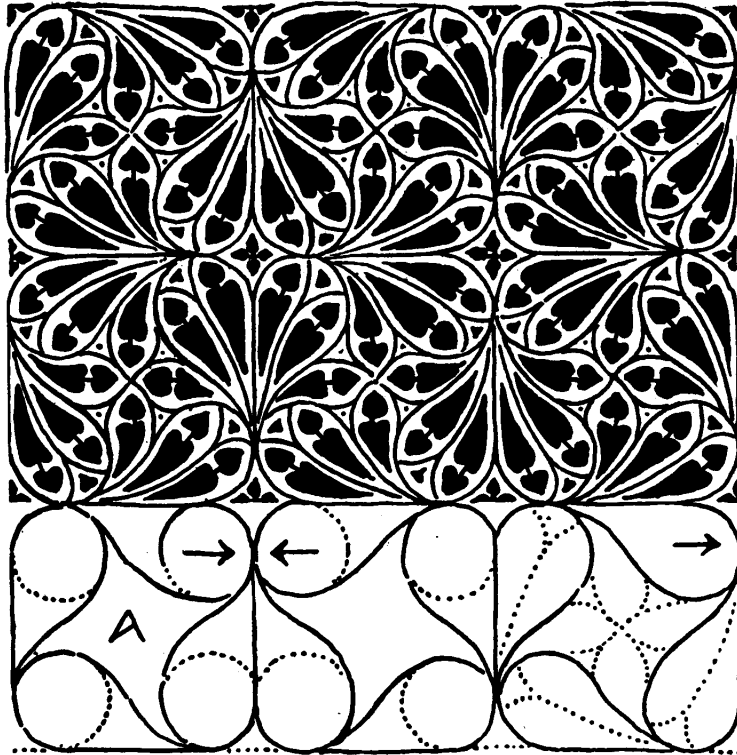
55. GOTHIC TRACERY DIAPER AND ITS CONSTRUCTIONAL LINES.

The rather more elaborate design at the bottom of the same page (53) repeats upon the lines of a hexagon, the points of which correspond with the centres of star-shapes. But the six of these enclose another star and the hexagon is seen to be a compound unit—of which the component diamond repeats as a drop. The small circles drawn within these diamonds at A, give by the mere effacement of a portion of them the twisting shapes at B, which only remain to be subdivided as at C, and the skeleton is complete. It is once more on intersecting circles that the pattern (54) on page 37 is set out;

and the points of intersection give, as there shown, the points of the starry rosettes.

Yet another Gothic tracery pattern is given (55), planned this time on the lines of the double square. One half of this is a turnover of the other. It works as a drop repeat, and shows plainly that at an early stage the circle entered into its construction. Here again the stages by which it might possibly have been reached are indicated; but that is not to say with any certainty the designer may not have approached it from another direction.

The limited variety of skeleton upon which pattern is built, is nowhere more plainly shown than in the way in which, in the maze of design, we find ourselves, no matter on what path we set out, arriving over and over again at precisely the same point.
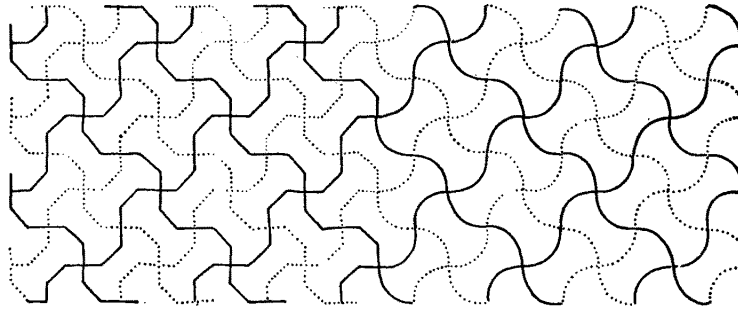
56. STRAIGHT-LINED AND CURVILINEAR VERSIONS OF DIAPER.

VI. THE EVOLUTION OF PATTERN.

Various starting points for the same pattern — Six ways in which it might have been evolved—The construction of sundry geometric diapers —Influence of material upon design—Some complex lattices.

IT is not safe to pretend to say with authority, the way in which a given pattern was evolved; there are usually several ways in which it might have come about. Close up the waved lines in diagram 51 and they give you an ogee diaper. Open out the ogee diaper and it gives you waved lines. The starting point of the interlacing pattern might equally well have been waved lines, the ogee, or the idea of a net.

In diagram 56 (straight and curved lined versions of the same thing) the dotted lines may be taken to indicate the way the larger unit was built up of four smaller units forming in themselves a repeat; but the smaller unit would result equally from, as it were, crossing the larger pattern by itself. The dotted diaper is the same as that in solid lines. Together they give a smaller diaper which may or may not have been its origin.

There are at least half-a-dozen ways in which a simple
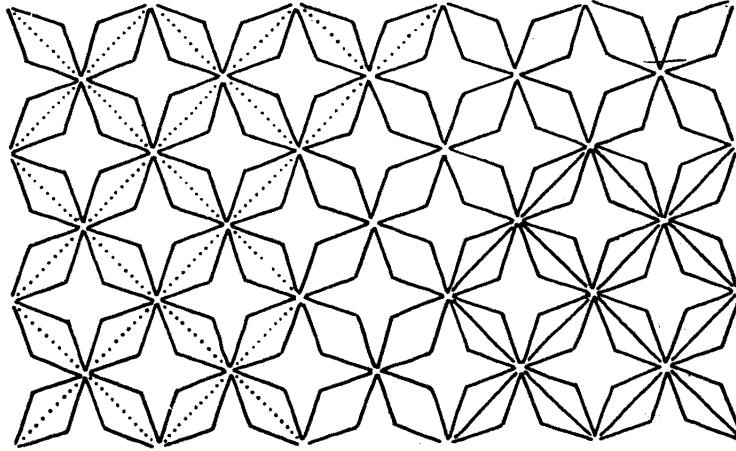
57. BEGINNING WITH RECTANGULAR TRELLIS.

star pattern such as that above might possibly have been arrived at :—

1. By beginning with a diamond lattice and occupying the spaces with four-pointed stars (57).

2. By arranging either star-shapes or diamonds point to
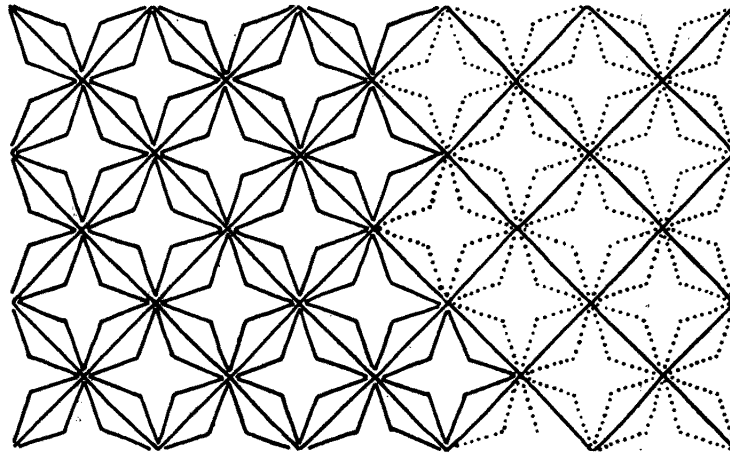
58. BEGINNING WITH FOUR-POINTED STARS.
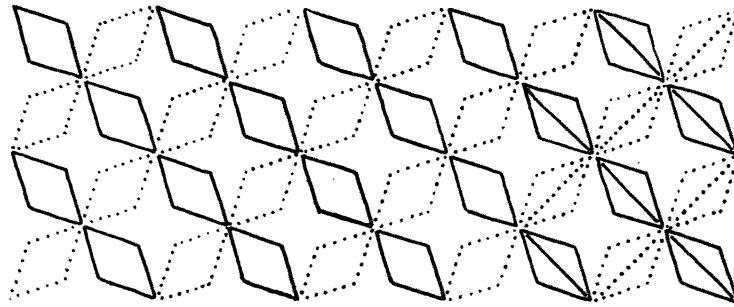
59. BEGINNING WITH CROSS BANDS OF DIAMONDS.
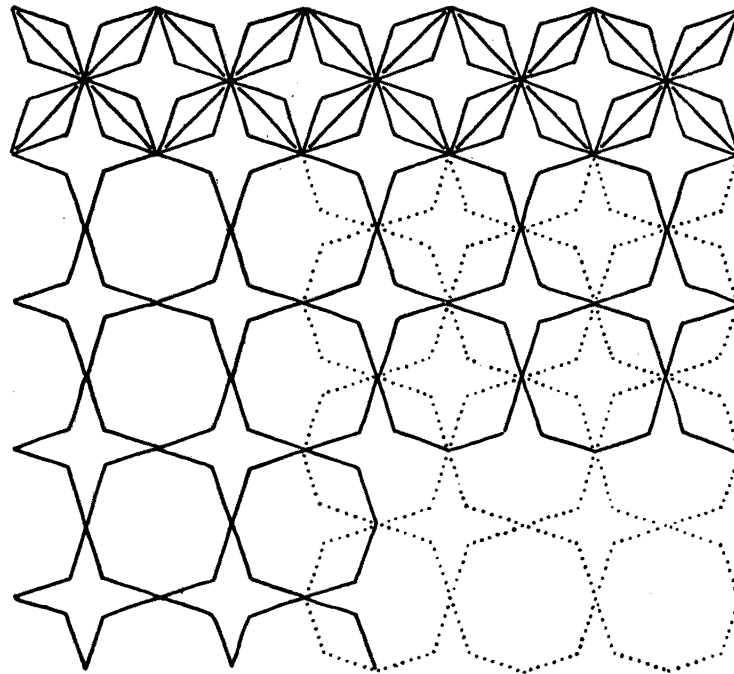
60. BEGINNING WITH OCTAGONS AND STARS.

point, and drawing diagonal lines across, between the stars, or through the diamonds (58).

3. By starting on diagonal lines, crossing a row of diamonds by a similar row in the cross direction, and steadying the diamonds by giving them a backbone (59).

4. By beginning with a diaper of octagons and four-pointed
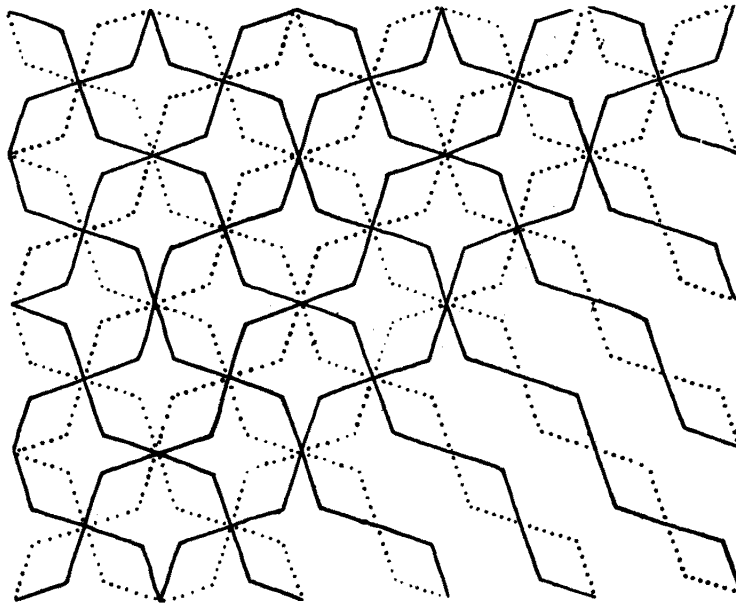
61. BEGINNING WITH ZIG-ZAG LINES.

stars, crossing that by itself, and adding lines to steady the effect (60).

5. By beginning with zig-zag lines, crossing them by similar zig-zag lines, and crossing the pattern thus produced by itself (61).

6. By starting with the eight-sided unit—by no means necessarily arrived at on the lines of diagonal zig-zags—and crossing it by itself (62).

In the two last mentioned diagrams the long diagonal

backbone lines are for the sake of clearness omitted, and the
unit of a repeat common in Oriental diaper-work is emphati-
cally expressed. A very similar unit occurs in the diaper
opposite (63), which may be built up, as will be seen, in the
simplest possible way, on the basis of the square. The squares
have only to be crossed by X lines alternately in transverse
direction, and the framework of the design is there. Another
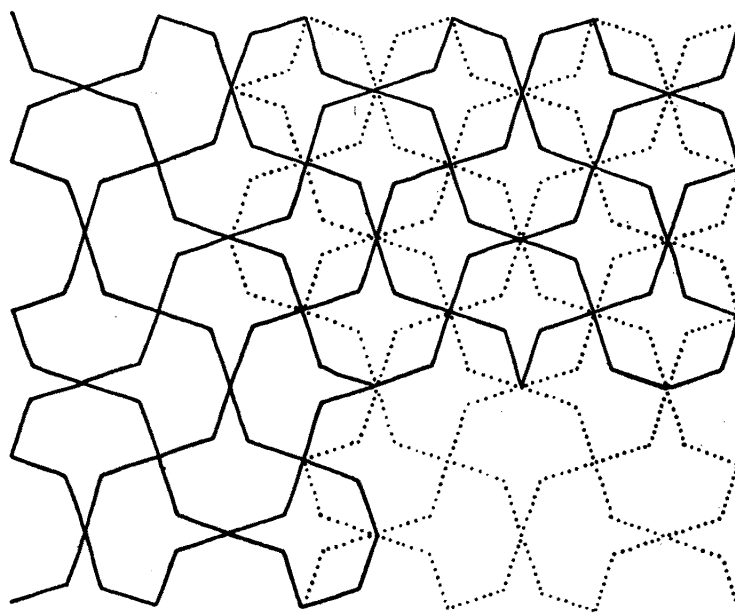
62. BEGINNING WITH EIGHT-SIDED UNIT.

simple way of producing a very complex result (64) is shown
on page 46 (65), where the design is resolved into a compara-
tively simple square pattern crossed by itself. The construc-
tion of the Arab lattice pattern (64), shown in single line to
the left of diagram 65, is better explained by diagram 66,
from which it will be seen that the unit is merely a square
enclosing a small diamond, the sides of which diamond are
successively continued to the corners of the square.
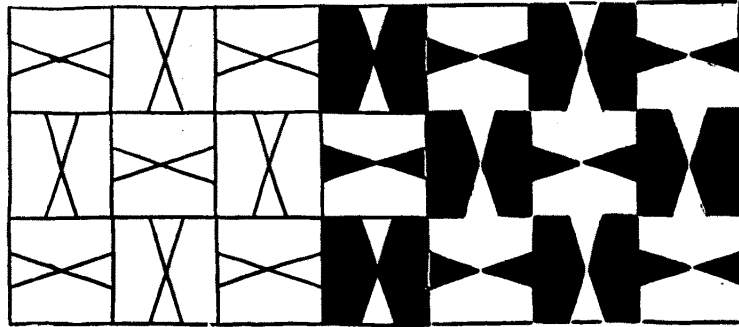
63. COUNTERCHANGE DIAPER AND ITS CONSTRUCTION.

The same diagram will help to explain the construction of the patterns shown at 67 and 70.

Given the base lines to the left of diagram 66 and the desire to counterchange the colour, what is the designer to do ? It is easy to make the figures in one direction dark and in the other light; but there remain the small intermediate diamonds which can obviously be neither one nor the other. By effacing the diamond, however, and joining the loose ends of the lines to the left of the diagram in the way shown to the right of it, the difficulty is at once overcome and we get the diapers (67) on page 47.
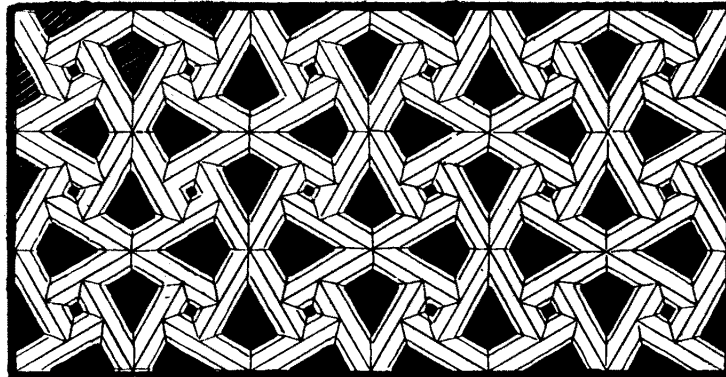
64. ARAB LATTICE PATTERN.
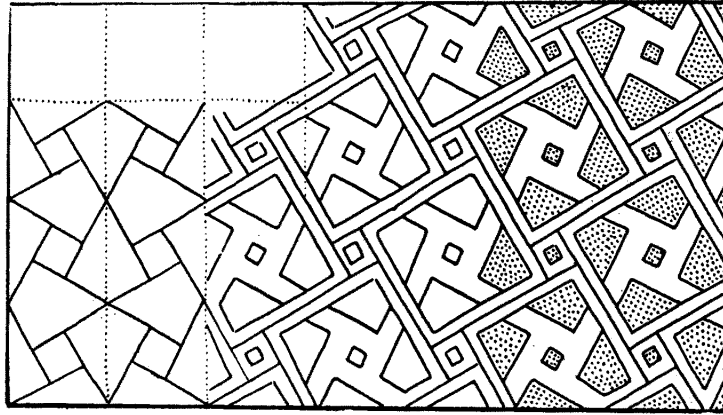
65. CONSTRUCTION OF ARAB LATTICE 64.

A similar difficulty is got over much in the same way in another Alhambresque tile pattern (70). The pointed projections at the sides of the oblong shapes corresponding absolutely to indentations at the ends of them, the parts fit together perfectly, except for the small square spaces between. By dividing these into four triangular parts, alternately light and dark, the patterns are made to counterchange. And the expedient is just what would occur to an artist building up his pattern, as the Moors did, out of shaped pieces of tile.

The kind of key or swastika seen in diagram 66 occurs
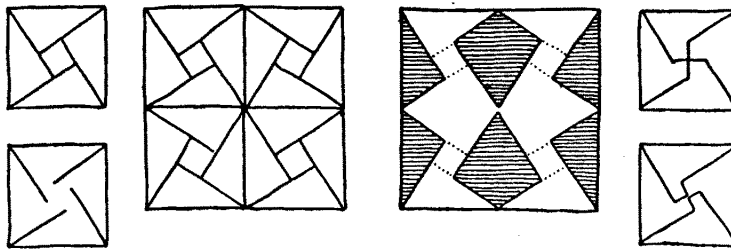
66. DIAGRAM EXPLAINING THE COMPOSITION OF THE UNIT IN PATTERNS 64 AND 65.
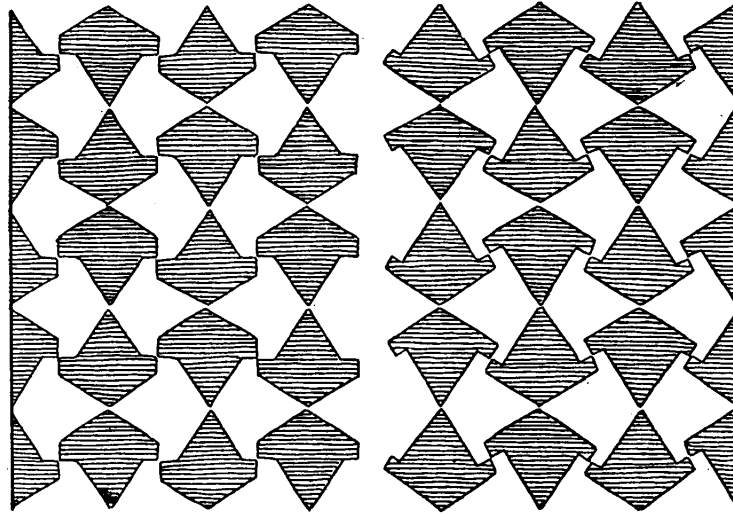
67. ARAB COUNTERCHANGE PATTERNS CONSTRUCTED AS 66.

also in diagram 68 which is in some sort a key to the construction of the Roman pavement pattern 69. The most likely way of setting about such a design would be to divide up a small square with swastika lines (as shown to the right of diagram 68) and to reverse the unit in either direction as shown by the arrows to the left—where the dotted lines of the diamond are given. The two together (nearer the centre)
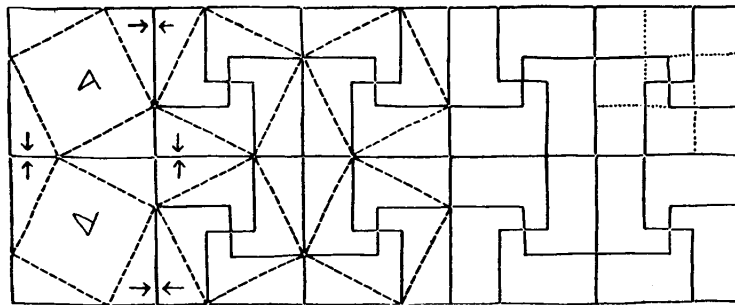
68. KEY TO CONSTRUCTION OF ROMAN PAVEMENT PATTERN 69.
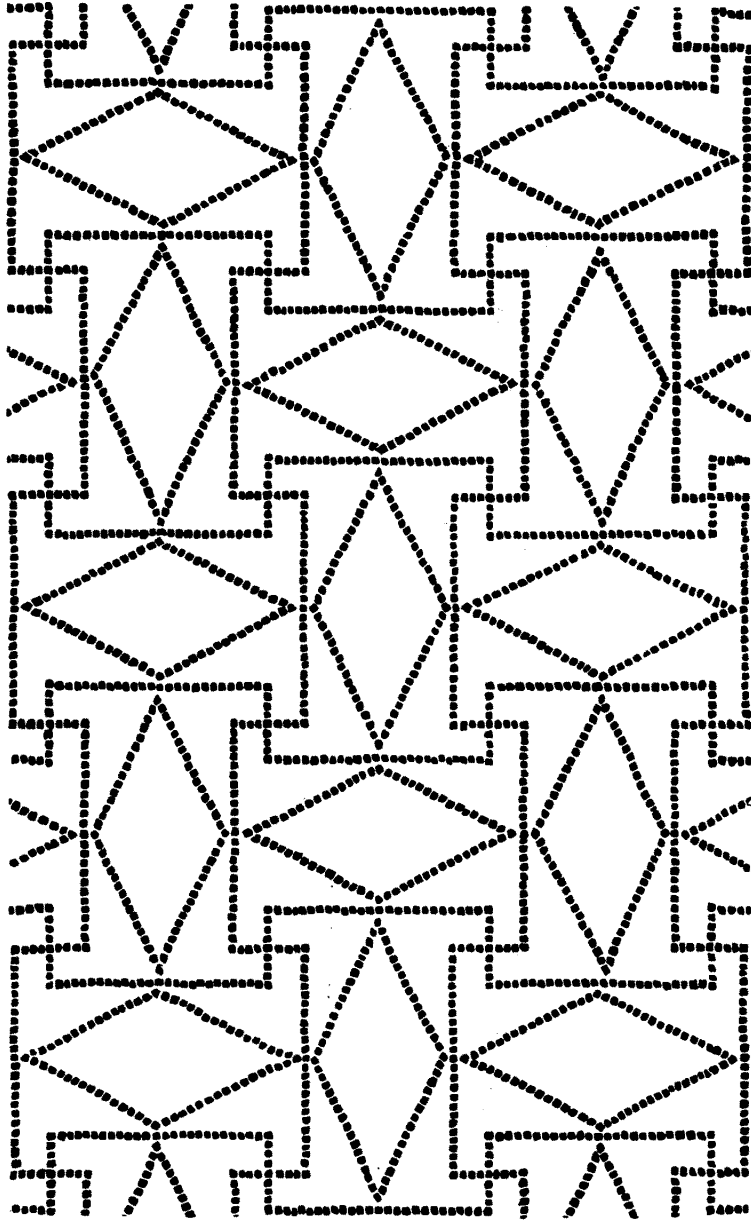
69. ROMAN MOSAIC PAVEMENT PATTERN.
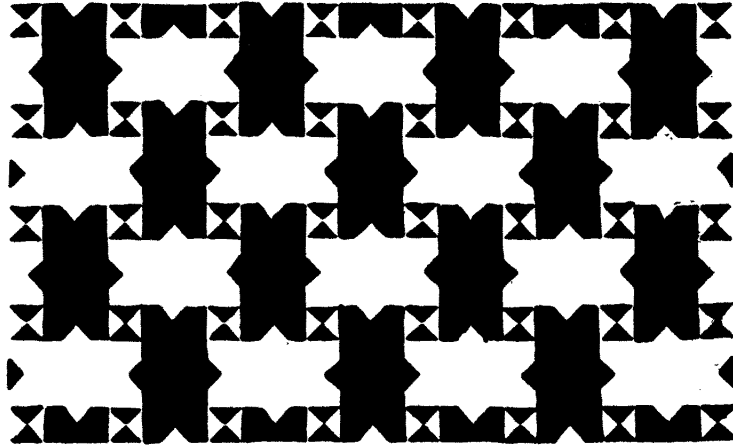
70. ALHAMBRESQUE COUNTERCHANGE PATTERN.

give, in the space of four squares, the complete compound unit, which repeats on the lines of the larger square.

A very broad hint as to the lines on which a designer actually went to work is sometimes given by the nature of the work on which he was engaged. Working in tesseræ, a mosaicist would naturally start with lines—which, somehow, thin as they may be, never look mean in a pavement. Working with triangular-shaped blocks he would as naturally fit together the parts of his pattern puzzle-wise.

Speaking as a practical pattern designer, and one who finds it most amusing to devise merely geometric pattern, I am strongly disposed to believe that the elaboration of Oriental patternwork (which resolves itself at last into a network of lines not easily to be disentangled) comes of the practice of building up designs out of little triangular-faced pieces of marble, glass, or tile.

The intricate lines develop themselves as the artist proceeds; and, having got them, he goes on to emphasise them. Carvers and others translate the tile pattern into line, as in the natural course of their craft they must, and in that way

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we get the cunningly intersecting line work of pierced lattices and so forth (71). Designing upon the lines themselves he would get caught in the meshes of his own pattern, and lose the sequence of line so difficult to keep in view.

It dazzles one to think of the plan of no more elaborate a lattice than that below. The simplified unit of the design is shown in dotted lines. It might equally have been built up upon the lines of either of the diagrams opposite (72-73), octagons point to point, with four-pointed star-shapes between.
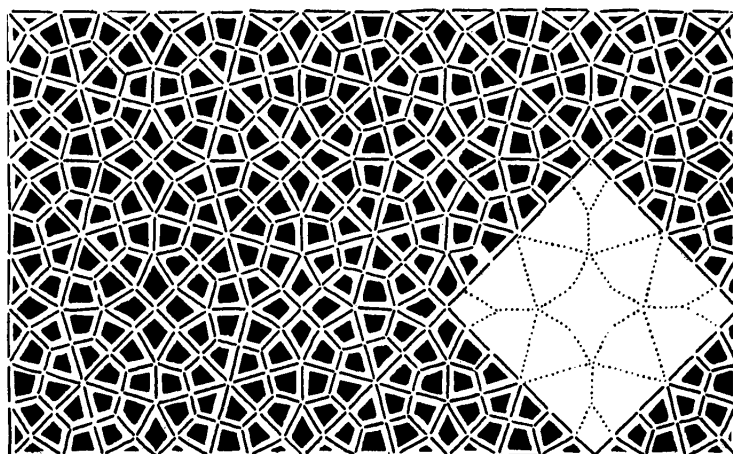
71. LATTICE PATTERN, POSSIBLY DERIVED FROM TESSELATED WORK.

And in this particular case it is not clear that any great advantage would have been gained by building up the pattern; but where the component shapes are triangles or compounds of triangles, it is not only easier to play with them than with the involved lines of a complicated lattice, but much more fun to do so.

The complexity of the lattice (74) on page 52 is less puzzling when one realises the plan of it, a squat diamond, which may be divided into two equilateral triangles A and B (one a
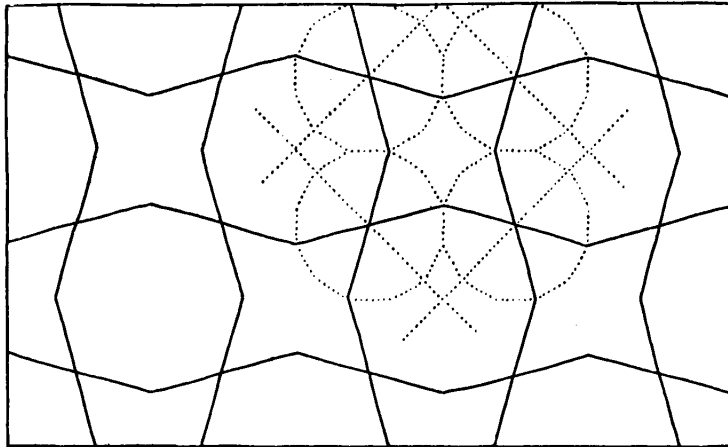
72. LINES ON WHICH LATTICE 71 MIGHT HAVE BEEN BUILT.

turnover of the other) either of which may be subdivided, as the dotted lines show, into equal equilateral triangles and the corresponding diamonds. Given those lines it is a comparatively simple thing to build up the lattice.
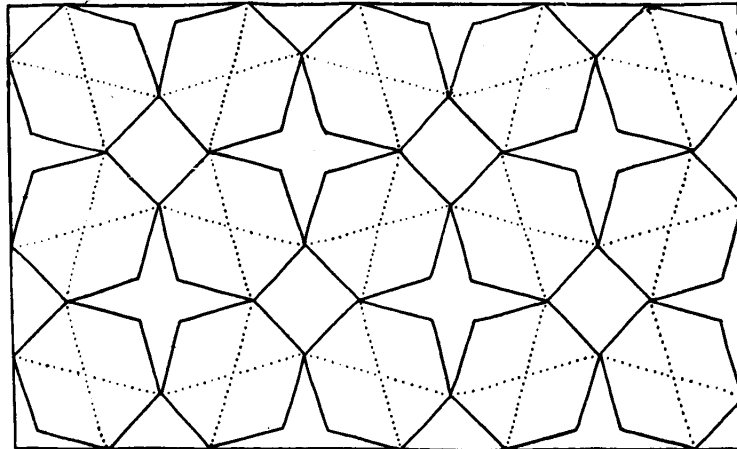
73. LINES ON WHICH LATTICE 71 MIGHT HAVE BEEN BUILT.
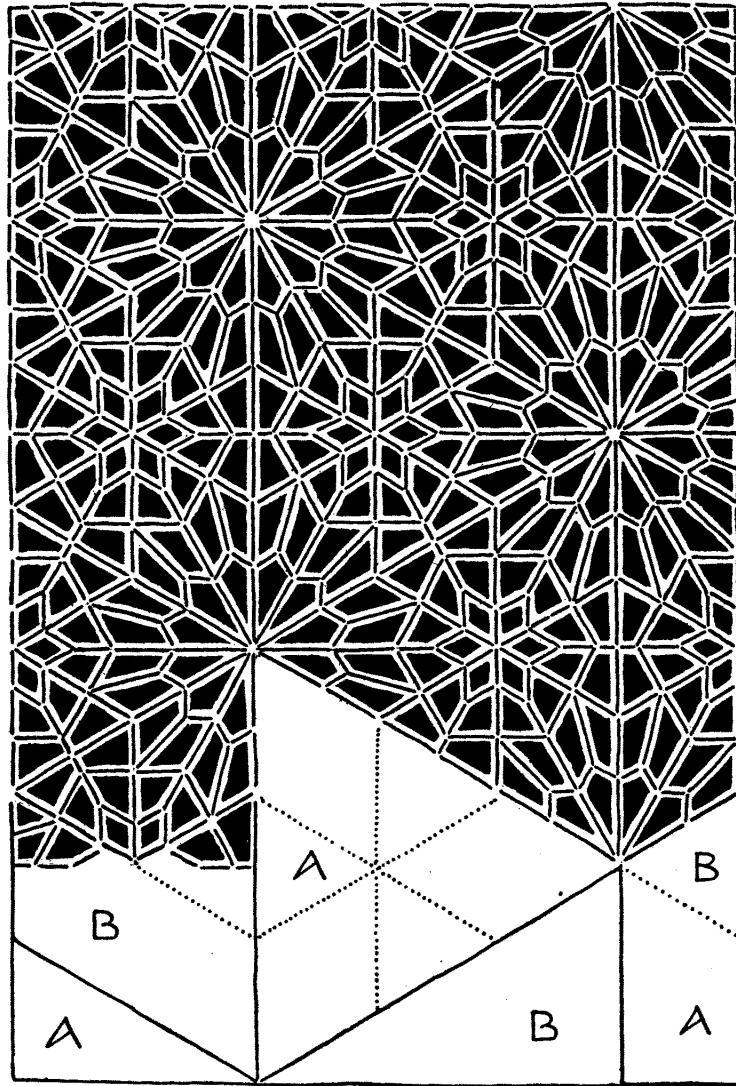
74. ARAB LATTICE AND THE LINES OF ITS CONSTRUCTION.
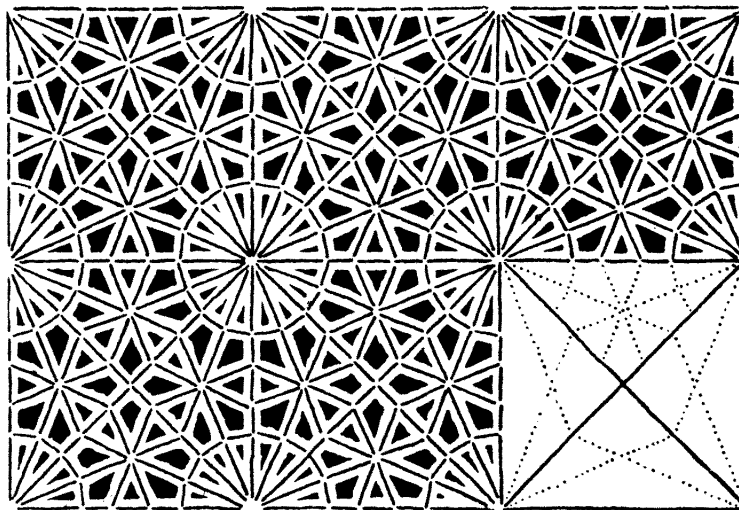
75. ARAB LATTICE AND ITS CONSTRUCTION.

One more instance. The repeat of the pattern above (75) (equivalent to the tile which would go to make it, or the block from which it could be printed) is indicated in the skeleton to the right, a square; but the component unit is all there in the triangle which forms only a fourth part of it. And of the twelve parts of which (as the dotted lines show) that is made up, all but one are repeated three or four times over, so that it takes figures of only four different shapes to make it—presumptive evidence at least that that is the way in which the design came about, not perhaps in this particular instance of the lattice, but in the case of some pattern which was its prototype.

VII. PRACTICAL PATTERN PLANNING.

Possible and practicable lines of pattern construction—Lines often fixed
for the designer—Conditions of production affect plan—Triangular plan,
oriental—Rectangular plan, western—Relation of one plan to the other
—of triangular and octagonal repeat to rectangular—Possibilities of the
diamond—Design regulated by proportions of repeat.

THE lines of the square or of the parallelogram, of the diamond
or of the triangle, are naturally, as a glance at our illustrations
will show, conspicuous in geometric design ; and, even where
they do not make up the pattern altogether, they constantly
make part of it. The design opposite (76) is, for example,
in its main lines only a translation into waving lines of the
simple hexagon and star pattern on page 20. But these same
square, diamond, and triangular lines underlie also repeated
pattern of the freest kind. And it is because they are the
basis of all repeated pattern, that it behoves the designer to
acquaint himself with certain simple geometric principles, as
indispensable to him as a knowledge of superficial anatomy to
the figure-draughtsman.

The fact is that to many arts, or to proficiency in them,
and certainly to proficiency in pattern design, there goes a
modicum of science—without which the merely practical con-
ditions imposed by the necessity of repetition, and especially
of repetition within a given area, are hardly to be overcome.

The art of the pattern designer is, not merely in devising
pretty combinations of form, but in scheming them upon lines
not of his choice at all, mapped out for him, on the contrary,
by the conditions of his work, by no means always those
which he would have chosen for himself as the most promising.
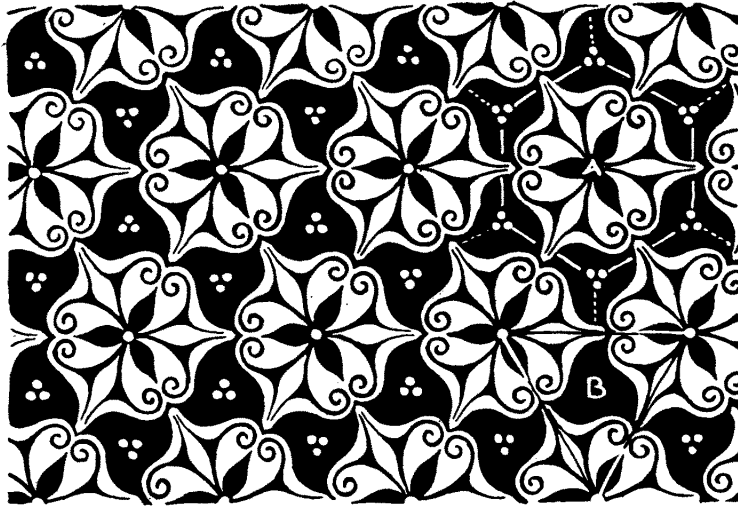
76. CURVILINEAR DEVELOPMENT OF DIAGRAM 26.

His task is to get beautiful results out of no matter what unpromising conditions. Then indeed he may claim to be an artist.

I have been at some pains to lay down the lines on which pattern may *possibly* be constructed, but the possible lines are not in all cases practicable. Conditions of production have to be taken into account, and they affect not merely the character of design (that is a subject discussed at length in another volume) but its plan also.

A necessary preliminary to design is the determining of the lines on which it shall be distributed—to plan it, that is to say. The possible lines are few, and the more clearly the artist realises what they are, the easier it will be for him to determine which of them are available, and the one it is expedient to adopt. Mechanical conditions or practical considerations may so limit his choice that he has no alternative, and it is mere waste of time to do anything but proceed at once upon the inevitable course.

PATTERN DESIGN.

The system upon which of old the mathematically-minded Oriental craftsman built up, out of the simplest units, elaborate schemes of ornament, encouraged the use of triangular lines as the basis of his design. The more practical and expeditious habit of the Western manufacturer leads him to work more often upon rectangular lines, and compels the designer to abandon the triangular basis, except in so far as triangular units can be made to conform to rectangular repetition (see below). The designer for manufacture, therefore, is restricted as the handworker is not. He works, however, on the old lines still—manufacture following constantly in the footsteps of handicraft.

We put down early methods of design to tradition. But traditions grew out of ways of working ; and we find ourselves to-day using expedients of design which, if they had not resulted from the simple contrivances of elementary handicraft, would most certainly have been evolved out of the more complex conditions of modern manufacture. The square lines, for example, given us by the most rudimentary form of tapestry are equally imposed by the power loom.
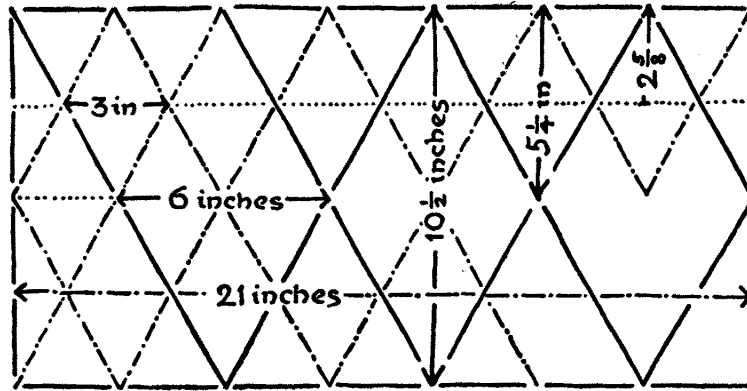
77. DIAGRAM SHOWING RELATION OF EQUILATERAL TRIANGLES AND HEXAGONS TO SQUARE REPEAT.

It is on square lines that we have mainly to work, and our design has to be considered in relation to the rectangular repeat which the conditions of to-day determine.

The possibilities of working upon other plans are limited. To adapt, for example, the equilateral triangle or octagon to a square repeat measuring let us say 21 inches either way, is possible only on a scale which makes it not often worth doing.

Take 21 inches as the base of an equilateral triangle. It will be found to measure from base to apex 18 inches. The difference between 21 and 18 is 3, the greatest common measure of both. This gives us an equilateral triangle of 3 inches from point to point as the largest which will repeat precisely within an area of 21 inches by 21.

The accompanying diagram (77), though it represents only half that area (21 inches by 10½), explains the situation and proves the point. It shows also the possibilities of adapting a diamond equal to two equilateral triangles to the rectangular space. A diamond measuring 10½ inches by 6 inches repeats in the width 3½ times (which would work out only as a "drop" pattern—presently to be discussed, page 60). To repeat on the square, or as a straight-running pattern, these diamonds must needs be quartered and reduced to 5¼ by 3 inches.
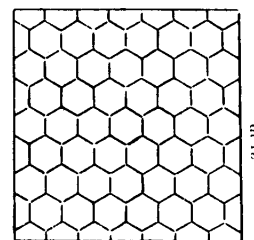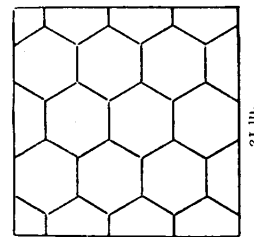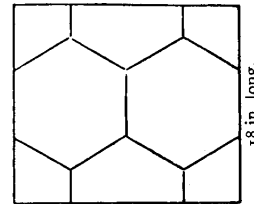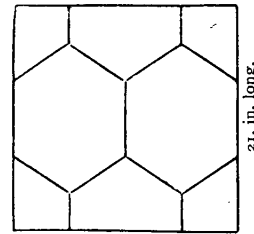
78. DIAGRAM SHOW-ING HOW OCTAGONAL DIAPERS WILL REPEAT ON RECTANGULAR LINES.
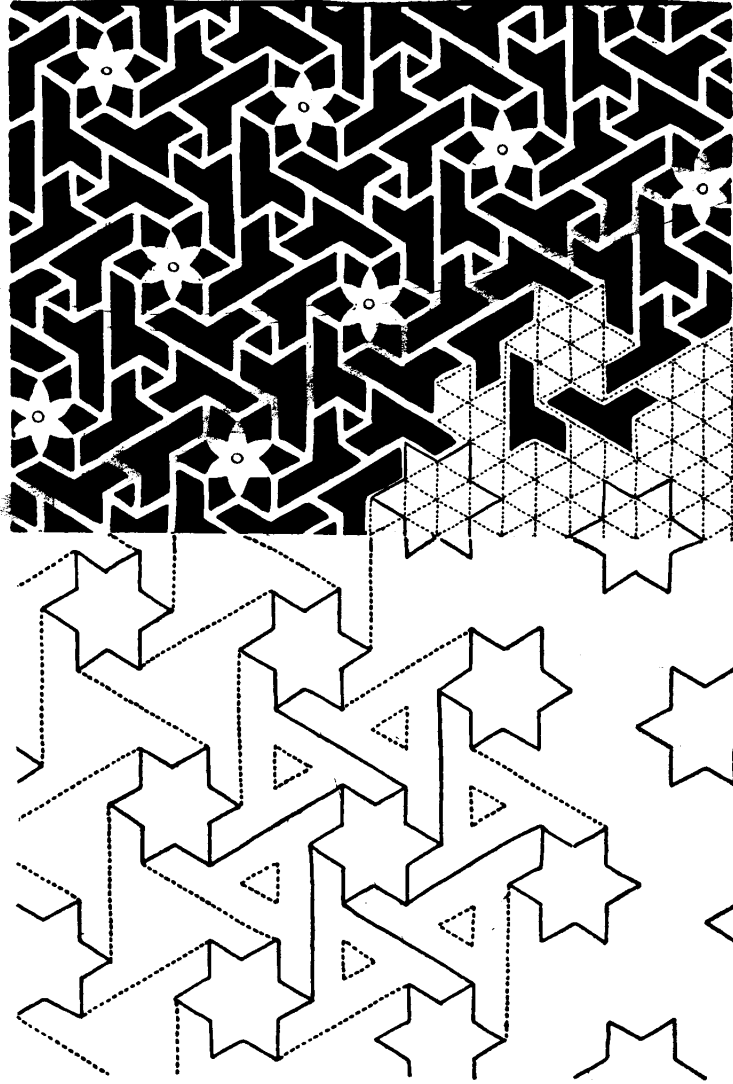
79. INDIAN LATTICE PATTERN BUILT ON TRIANGULAR LINES.

The hexagon, which is a multiple of the equilateral triangle, adapts itself no more readily to the square (78). Hexagons half the width of the square, though they would repeat lengthwise in it, would not be equal-sided, but of the elongated form shown at the top of the diagram. True hexagons would not fill the square, but only a space of 21 by 18 inches.

Equilateral hexagons of 6 inches from side to side would repeat 3½ times in the width (and work therefore only as a "drop"). Like the triangles, they would need to be reduced to 3 inches wide before they would repeat in horizontal order.

The designer is frequently asked by inexperienced people to adapt designs to proportions which put them quite out of the question. If he is not well aware of the possibilities, and especially the impossibilities, of so doing, he is likely to waste valuable time over a task which was from the first hopeless. Few persons would realise, until failure had taught them, how proportionately small a triangle or hexagon it is which lends itself to a square repeat.

Let any one try and make the lattice pattern on page 58 repeat on rectangular lines of given dimensions, and he will realise, as no verbal explanation can possibly prove to him, how difficult it is to think of it, even, as built up on anything but the triangular lines which are in great measure responsible for it.

VIII. THE "DROP" REPEAT.

Scope given by drop repeat—Designed on diamond lines—And on the square—Geometrically same result—Practically different patterns—Opportunity of carrying pattern beyond width of stuff—Brick or masonry plan—Octagonal plan—Step pattern—False drop.

THE mystery of the drop repeat is more easily explained than how it came to be a mystery at all. The root of the trouble in designing it is perhaps in the fact that the inexperienced will not take the trouble to set out repeats enough of their pattern to show how the lines of it will come. Designers of experience do that as a matter of course—because of their experience.

The pattern of a woven or printed stuff must naturally follow on throughout the length and across the breadth of the piece—the top edge of the design must, that is to say, join on to the bottom edge, and the one side on to the other. But, whilst it is obvious that the pattern must follow in a continuous line throughout the length of the stuff, it is not a matter of necessity that it should be designed to take the same level when the strips come to be sewn together or hung upon the wall. They have to tally—that is all. The pattern may just as well be schemed to "drop" in the making up or hanging.

It is quite possible to design a pattern which shall repeat both on level lines and as a drop. The diagram opposite (80) shows that very plainly. It was drawn by Professor Beresford Pite to explain how some wall-papers of his design could be hung either way.

The planning of a drop repeat is in reality a very simple

matter, how simple may be seen in the diagram overleaf (81), in which the upright lines mark the width of the stuff, and the squares the limits of the repeat. It will be seen that the central feature in stripe A does not in stripe B range with it, but falls midway between two repeats : it " drops," in fact, one-half the depth of the repeat. In the third stripe, which drops again in the same way, the feature finds once more its level ; in the fourth it drops again, rights itself once more in the
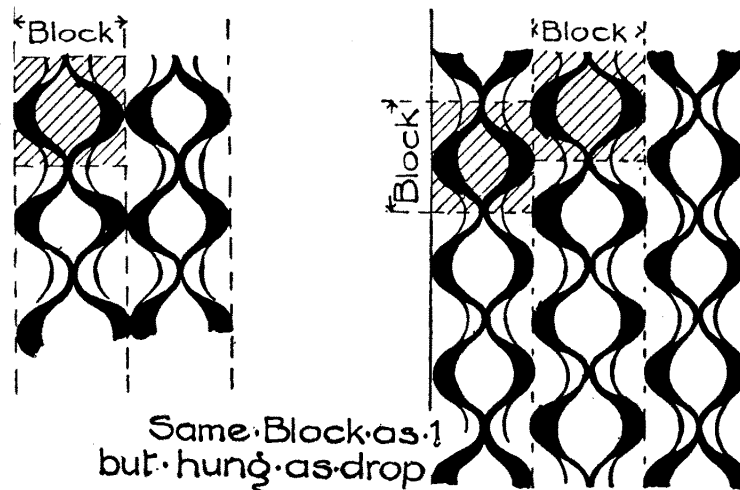
80. DIAGRAMS SHOWING HOW A PATTERN MAY BE DESIGNED TO HANG IN TWO WAYS.

fifth, and so on to the end. A further effect of the drop is seen in the direction of the stem ; the wave, instead of repeating itself, seems to take the opposite line, and not to follow but to be turned over or reversed.

It will be clear from this what new scope is given by the " drop " pattern.

And what applies to the strip of material applies no less to the units of a repeat within the width of the stuff. A pattern, for example, half the width of the material may drop

Stripe A Stripe B
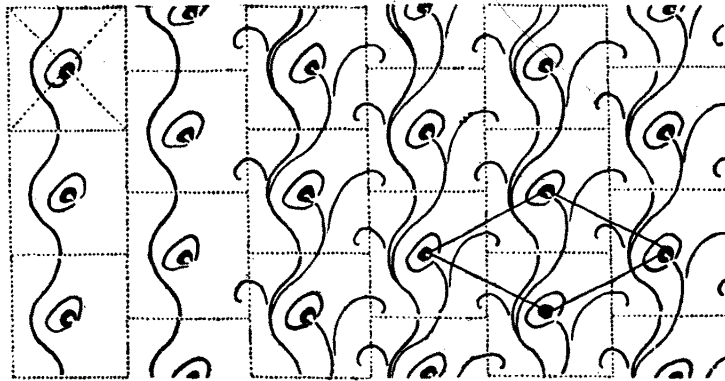
81. DIAGRAM TO ILLUSTRATE THE "DROP REPEAT."

within its area so that, in the stuff as it hangs, the double pattern does not drop. A drop pattern one-third the width of the stuff, would hang as a drop again.

Referring once more to diagram 81, it will be seen that, though the pattern is built upon the square, lines drawn from centre to centre of a given feature in it form a diamond ; and this diamond, equally with the square, contains all the parts of the pattern, and may, just as well as the square, be regarded as the unit of repeat.

The difficulty which the inexperienced have in scheming a drop pattern, would be considerably diminished if they would only accustom themselves to think of it as a question
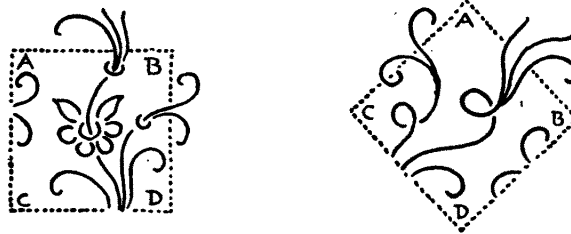
82. DIAGRAM TO ILLUSTRATE THE WAY REPEATS MUST FIT.

of filling a diamond instead of a square. That is all it is—designing, in fact, within a .trellis of diagonal, instead of vertical and horizontal, lines.

The diamond is merely a square or parallelogram turned part way round. In designing upon the one plan an artist would probably proceed to do differently from what he would have done upon the other; but the problem is the same. The opposite sides of either pattern have to tally. The lines ending at A B (in diagram 82) must be taken up at C D, or *vice versâ*. In the same way whatever portion of the design extends *beyond* the margin B D or A C must recur again *within* the margin on

A.   B.   C.
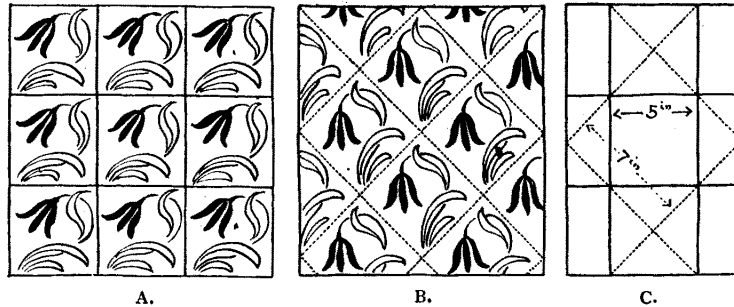
83. DIAGRAM TO ILLUSTRATE DIFFERENCE OF MEASURE WHEN A SQUARE REPEAT IS TURNED ROUND TO WORK AS A DROP.

the opposite side, no matter whether of square or diamond. The pattern has only to join on and fit.

It should be observed, however, that if a pattern designed upon square lines is turned part way round, though it repeats as a drop upon the lines of the diamond, the *measure* of the repeat (as manufacturers reckon it, from top to bottom and from side to side) is no longer the same. If, that is to say, the squares in A of diagram 83 measure 5 in. each way, the diamonds in B (though it is the same pattern drawn to the same scale) measure 7 in. from point to point; and that is the trade way of reckoning, with which it is advisable to fall in.
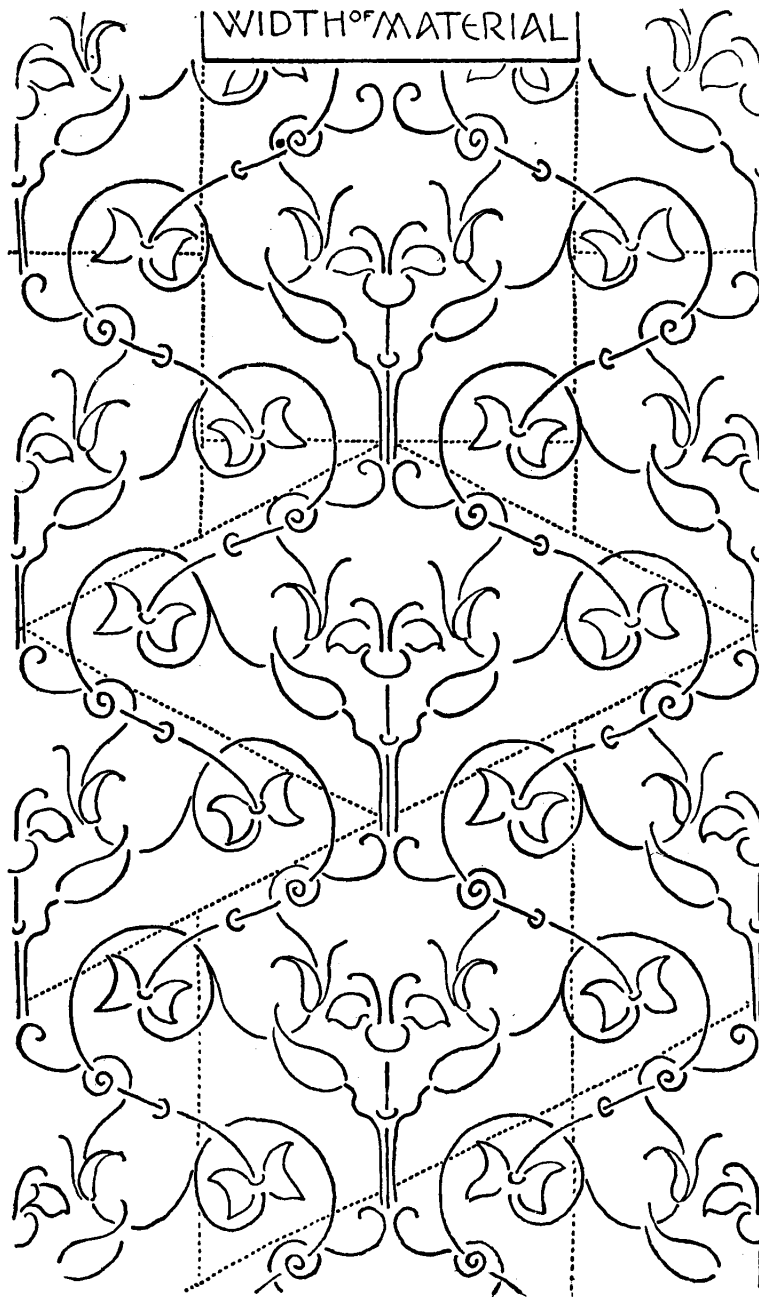
84. DIAGRAM TO SHOW A PATTERN MAY BE CONTAINED EQUALLY
WITHIN SQUARE AND VARIOUS DIAMOND LINES.

It is sometimes quite worth while, bearing this danger always in mind, to *start* a design (83, C), not the full width of the stuff, but on a diamond seven-fifths of its width. This would work out as a drop pattern of the right width twice as long as it is wide; but the start would suggest a pattern which could never have occurred to any one working within the narrower strip. The expedient is useful especially in designing floor or ceiling patterns in which the *direction* of the design is not meant to be obvious.

It would be difficult to overestimate the value of the drop repeat, or of the diamond plan upon which it is commonly but not invariably devised.

Mechanically speaking, there is no reason why the design should drop just half its depth. It might drop any distance; and there are occasions when a pattern which drops a third is extremely useful. But if the drop were very slight, say only one-sixth of its depth, it would take six repeats before the design righted itself; and, moreover, the recurrence of any pronounced feature in it would be apt to mark a diagonal line. A stepped pattern has naturally a tendency that way. One great use, indeed, of the diamond plan is, that it minimises the danger of *horizontal* stripes, likely always to occur in a pattern repeating on the same level. In the case of a drop of one-half, the stripes go, as it were, alternately up and down, and give zig-zag lines, if any, or perhaps the lines of a trellis, to which there is little or no objection.

Another condition materially affecting design is the area of the repeat, the proportions of which are determined often by conditions quite beyond the control of the artist.

It was shown in diagram 81 that a drop pattern designed upon square lines was contained also within the lines of a diamond. In the same way a pattern designed within the lines of a diamond is contained within the lines of a rectangular figure working as a drop. Many drop patterns are designed upon the lines of the diamond. They may be

E

85. TWO PLANS UPON WHICH THE SAME DESIGN MIGHT HAVE BEEN
BUILT.

designed equally within the lines of a diamond two sides of which run parallel with the width of the fabric. It will be seen in diagram 84 how the pattern there given in skeleton is contained equally within the square, the squat diamond, and the diamond formed by upright and slanting lines. It will repeat, that is to say, as a square pattern occupying the width of the material, as a diamond, and as a pattern of the width of the material cut as it were upon the slant.

In theory the design might have been started upon any one of these plans. In practice such a pattern would have been more likely to have resulted from working upon the lines of the diamond : as a point of fact it did result from it.

The design opposite (85), actually planned upon the diamond, might possibly have come about upon rectangular lines ; it would certainly not have resulted from working upon the diagonal lines shown in diagram 84.

Such a pattern, on the other hand, as Mr Crane's (86) was clearly built upon the upright lines given by the width of the repeat (shown in dots) and lines across (from left to right) meeting them at the points emphasised by the puff balls of the dandelion. The sweep of marguerites, plainly the leading feature of the design and perhaps the start of it, falls very comfortably within the slanting shape, which seems almost to have suggested the composition of the flowers, evidently planned to take their graceful line, and afterwards provided with stalks.*

Mechanically it all amounts to precisely the same thing. You have but to snip off the two opposite corners of the square to the left of diagram 87, and shift them to a position beyond the lines of the square, and they give you the oblique shape. You have but to snip off the four corners and arrange the pieces on either side of the remaining hexagon, as shown to the right of the diagram, and they give you the squat

* Having made this assertion, I thought it as well to ask Mr Crane's authority for making it, and he tells me I am quite right.

86. WALLPAPER DESIGN BY MR WALTER CRANE.

diamond. Artistically it makes all the difference in the world
to the designer upon which plan he sets to work. Either one
of them would encourage him to do something which the
others would not. His design is materially influenced by the
shape he sets himself to fill. It would never occur to him, for
instance, to stretch a wreath of flowers across a width of space
which he did not see before him. And the idea of extending
a design far beyond the width of the material in which it is to

87. DIAGRAM SHOWING MECHANICAL RELATION OF VARIOUS PLANS.

be executed, may be set down as directly due to working on the lines of the diamond. A designer does not, except in certain deliberately formal patterns, keep his design within the lines upon which it repeats. But he has them always in view; and he does not stray from them so far that it ceases to make a difference what lines he works on. The advantage of setting out a drop design upon the plan of the diamond is, that the simplicity of the four straight lines enables him to keep more clearly in view than the other lines upon which the drop is worked, the ultimate relation of the parts of his design, and the order in which they will recur. Perhaps the most conspicuous advantage of the drop repeat is that it enables one to perform the apparently impossible feat of designing a pattern twice the width of given material, which yet works out perfectly as a repeat within its limits.

Working on the lines of the diamond, it is easy to do this. You have only to subdivide the area of your square repeat as here shown (88), (it might just as well have been a parallelogram as a square) so that two smaller divisions A and y together equal the larger $\frac{A}{V}$. Then if you transpose the smaller parts A and v so that together with $\frac{A}{V}$ they form a squat diamond twice the width of the original square, you have
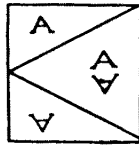
88. DIAGRAM SHOWING DIVISION OF SQUARE REPEAT INTO THREE PARTS.
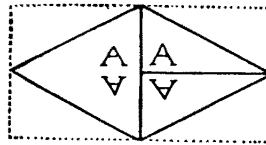
89. DIAGRAM SHOWING TRANSPOSITION OF PARTS OF SQUARE TO FORM WIDE DIAMOND.

the repeat of a design which amounts to, mechanically, the same thing as a square repeat of half that width.   In the case of materials which can be dropped one-half their depth in hanging or in making up this is clearly a great gain.

The advantage, it may be argued, is only apparent: what is put into one strip is, as it were, taken out of the other ; but in the case of pattern appearance must be allowed to count for a great deal.   It is for want of knowing things like this, the common property of trade designers, that, genius not-
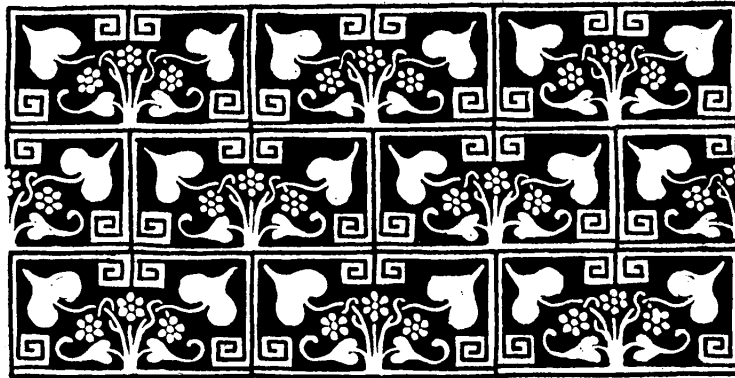
90. BRICK OR MASONRY PATTERN.

withstanding, artists inexperienced in practical work fall short even of the trade standard of efficiency.

The skeleton given by the upright marginal lines of the fabric and parallel lines in a diagonal direction across it, is plainly helpful in the design of a diagonal stripe.   The angle of inclination determines the depth of the drop.

An all-over pattern may also be designed within those lines ; and they encourage greater freedom than rectangular or diamond lines ; but it is not easy on such a scaffolding to balance the parts of a design ; and if there are emphatic features in it they are liable to come out awkwardly in repetition.
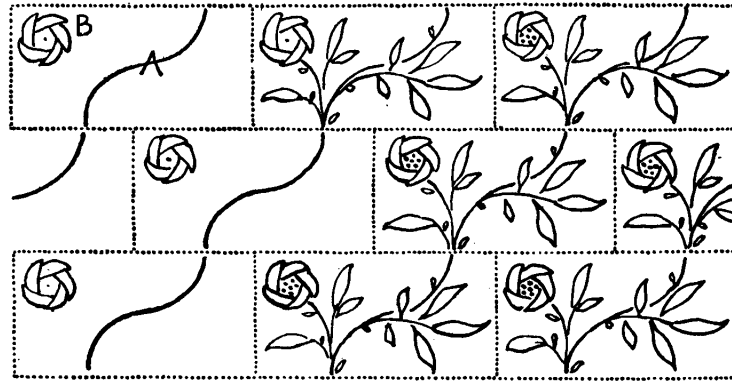
91. DIAGRAMS OF BRICK PLAN
AND ITS RELATION TO
DROP REPEAT.

Another very useful stepped plan on which to scheme especially patterns which take diagonal lines is the brick or masonry basis—which also works out as a drop.

In the tile pattern 90 the masonry lines form part of the design, and materially influence the lines of its growth.

It will be seen from the diagrams on this page (91) that a pattern designed upon brick lines and one upon the lines of the ordinary drop may amount to precisely the same thing,
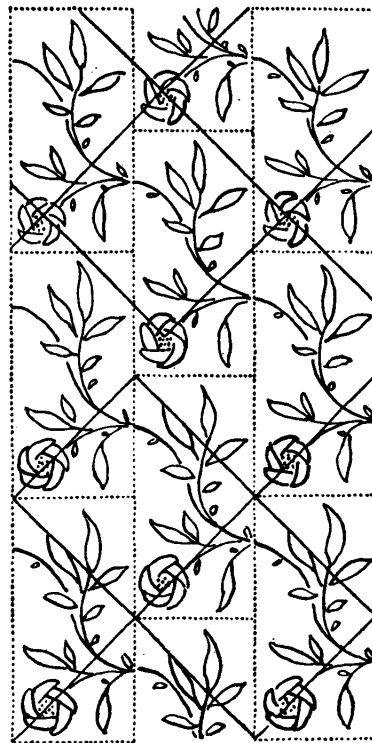
though either plan would naturally affect to some extent the growth of the pattern. (The diamond lines in the lower of the two diagrams show plans upon which theoretically it might have been, but practically would not have been, constructed.) The diagonal lines may wave as freely as you please within the four sides of the brick, at the same time that the rigid skeleton of brickwork enables you to distribute your flowers or other free-growing features in strict order.

The adoption of the brick plan leads sometimes to confusion as to the *dimensions* of the repeat. The brick pattern above would not answer to the description of " a drop-repeat twice as wide as it is deep." As a unit of those dimensions, it does not drop in the technical sense. It drops in fact as a repeat twice as deep as it is wide, or as a right-angled diamond. If, therefore, a drop-repeat *of given dimensions* were specified, and the artist were to send in a design planned on a brick of those proportions, he might have it thrown back upon his hands, as not being to size.
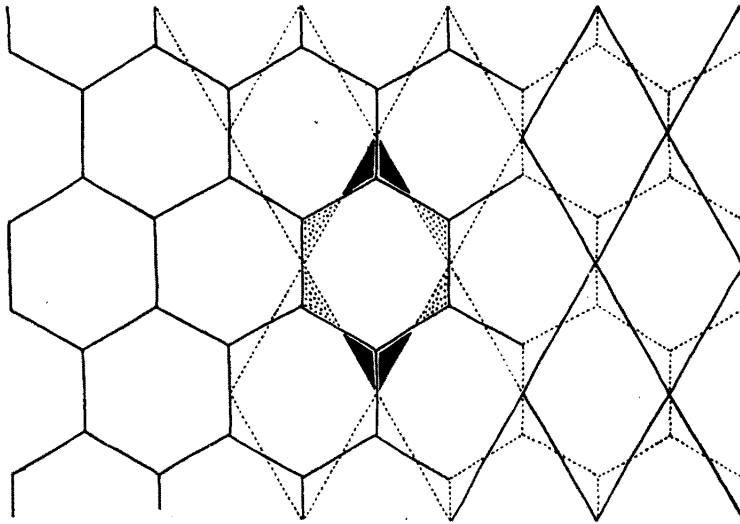
92. HEXAGON PLAN—ITS RELATION TO DIAMOND.
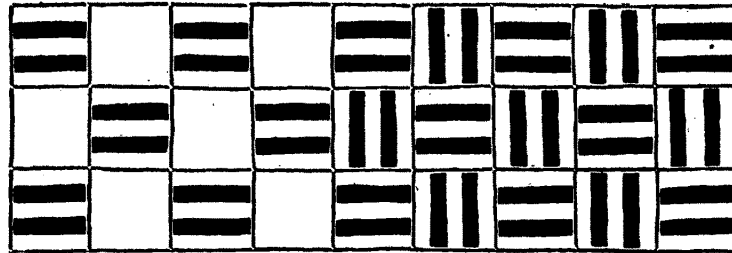
93. COUNTERACTING LINES OF DESIGN—REPEAT A DOUBLE SQUARE.

The hexagon, again, does not drop in the orthodox manner, though it amounts to the same thing as a diamond which does drop. Diagram 92 will show how, if the dotted portions of the hexagon were cut off, and attached again in the position of the solid black triangles, the result would be a diamond.

But it is not convenient to design upon the hexagon. It gives you no scope which the diamond does not ; and it does not help you to avoid a too horizontal arrangement of features, as the diamond does. It may be at times convenient to *prove* a design planned upon the diamond on the lines of the hexagon.

A drop design upon vertical and horizontal lines, say upon the square or other rectangular *step*, does not afford the opportunities given by the diamond plan ; but it has compensating advantages of its own, especially where it is desirable to give
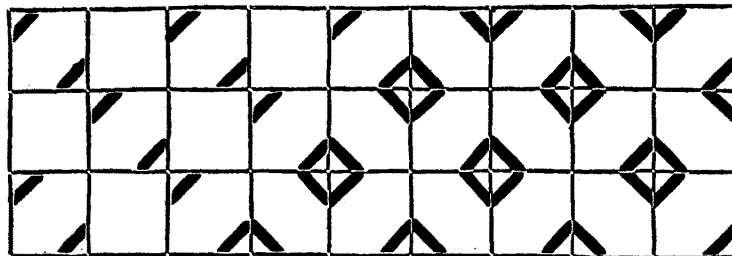
94. DIAMOND FORMS RESULTING FROM COUNTERACTING LINES—
REPEAT A DOUBLE SQUARE.

an upright tendency to the pattern, and more especially still when the depth of the repeat happens to measure (as in some manufactures—tiles for example—it is convenient it should) precisely twice its width. The unit of repeat being in this case a double square, gives us the trellis on which the chessboard pattern is built. A checquer pattern (illustration 93) works as a drop-repeat one square wide and two squares deep.

The unit of a double square planned to step half-way, is most convenient in the case where it is desired to preserve square lines of construction in the design and yet to avoid any tendency it might have in one direction or the other.
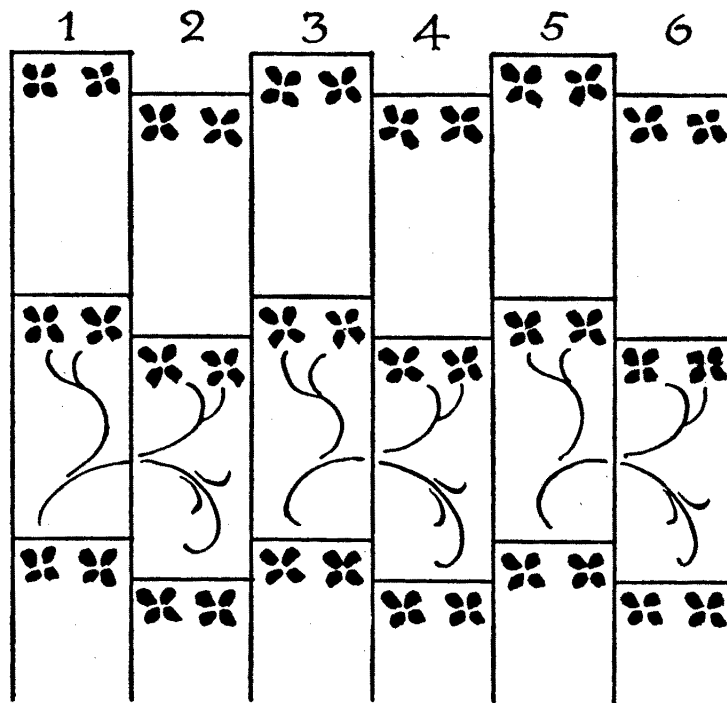
95. DIAGRAM OF STEP PLAN WHICH DOES NOT GIVE A "DROP REPEAT."
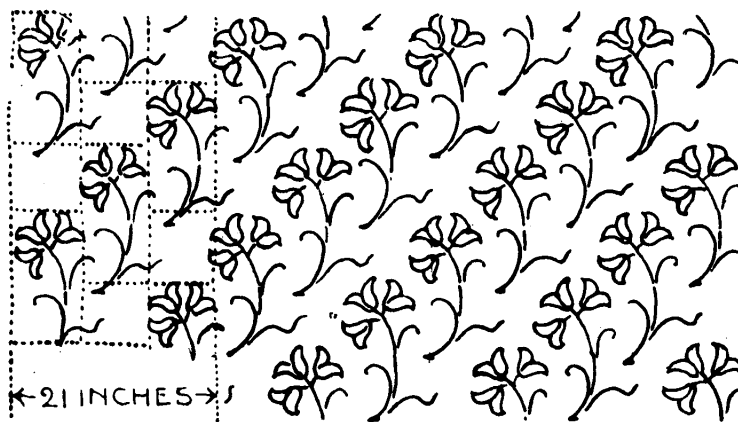
96. DIAGRAM OF PATTERN WHICH DROPS ONE-THIRD OF ITS DEPTH.

This is effectually done by counteracting the vertical tendency of the lines in one division of the repeat by horizontal lines in

97. PATTERN WHICH DROPS ONE-QUARTER OF THE DEPTH OF REPEAT.
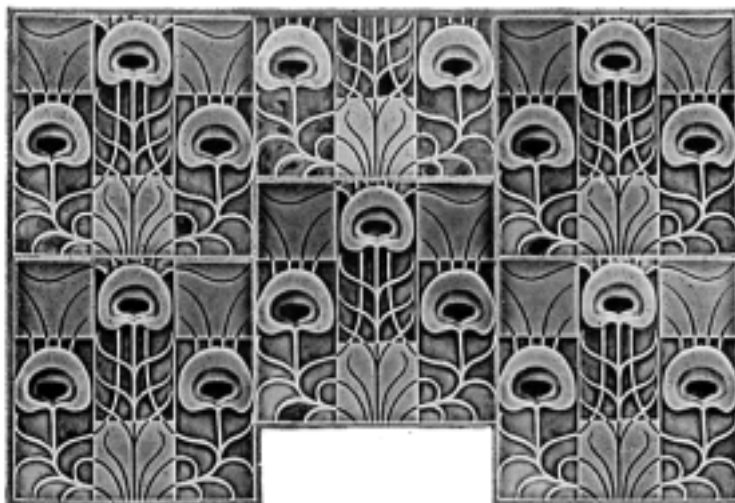
98. STEP PATTERN WHICH IS NOT A DROP REPEAT.

the other (93). Counteracting *diagonal* lines give, in the same way, diamonds (94).*

Further uses of the step, in lieu of the diamond, will be apparent when it comes to the discussion of freer patterns designed on its lines.

There is one form of step pattern which does not really constitute what is understood by a drop repeat. The second strip in diagram 95 drops slightly ; but the third reverts again to the level of the first (or, if it can be said to drop, it takes a step out of all proportion to the last). As a consequence any such features as the flowers at the top of the repeat would, in recurrence, give a sort of zig-zag line.

True, a drop pattern may recover itself in the third repeat; but only on the condition that it drops just half its depth. A drop of one-third its depth recovers itself only in the fourth

* Another variety of the drop pattern in which the unit is not merely of the proportions of a double square, but is built deliberately upon the two squares counterchanged, is shown on page 101.

99. PATTERN WHICH DROPS ONE-THIRD OR TWO-THIRDS OF ITS
DEPTH—UNIT OF REPEAT SUBDIVIDED AS IN 98.

strip (96); a drop of one-fourth its depth, only in the fifth
(97), and so on. In a drop-repeat, properly so-called, each
successive strip drops, and drops always the same distance.
It does not jump up and down. The repeat in diagram 95
is really two strips wide; it does not drop; and there is no
mechanical reason why the two flowers, any more than the
stems (indicated in the lower part of it), should be repeated.

The peacock feather tile (98) is not a regular drop
pattern; it drops in the second row two-thirds of its depth;
but in the third it starts afresh on a level with the first.

The tile pattern above (99), on the other hand, is designed
to drop regularly two-thirds of its depth, and would recover
its level naturally in the fourth row, as would a pattern de-
signed to drop only one-third of its depth. As a matter of
fact, though it drops two-thirds if we work from left to right,
from right to left it drops only one-third. That may read as
if it were impossible, but if you work it out on paper you will
find it is so.

Patterns of which diamonds, or equivalent ogee shapes,
are the basis (100), have always an air of being drop patterns;

but they do not really work on that plan unless the pattern in the diamonds or ogees also drops. But this sort of "false drop" plan is useful. The framework of severe lines steadies the ornament, which yet may be varied ; and there is perhaps a charm of unexpectedness in the result. One starts sometimes with the idea of a drop pattern (101) which develops, nevertheless, into a pattern which works only on square lines. There is no harm in this, so long as it is not necessary that the pattern should step in the working—which it may be.

It has been shown how no new principle is involved in designing on waved lines. They are but another version of the straight-lined skeleton, and amount to the same thing, except that their curves give the designer a lead which he is often wise to take.

Working upon the lines of the diamond, of which the ogee shape is the curvilinear equivalent, he would not so easily have arrived at the fret pattern (102) overleaf. Starting
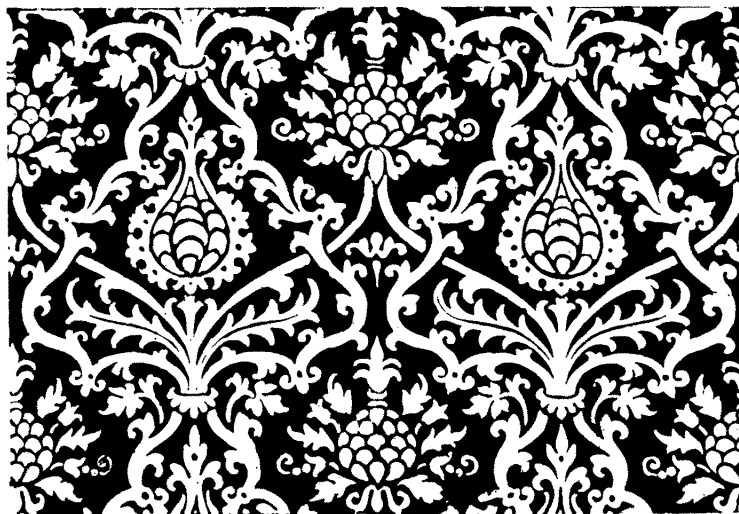
100. "FALSE DROP" PATTERN.

101. "FALSE DROP" PATTERN.

with opposite wave lines, filling each ogee with a square, and just making pointed encroachments upon this, he arrived almost inevitably at what he did.

Another very useful form of "false drop" is where the unit of design occupying, let us say, a diamond or ogee, is turned over in the dropping. A sprig pattern, for example, in which the sprigs are alternately reversed—one row of flowers turning from left to right the other from right to left —may with advantage be planned on the diamond; but the fact that the sprig in the diamond which drops is not a repeat of the first, but the reverse of it, removes it from the category of drop patterns proper. The unit is now the *double* diamond; and that no longer drops in repetition.

This may appear to the reader a mere verbal quibble not worth discussing; but it has a very practical bearing upon design. If, for example, the unit of design occupying diamond B in diagram 104 (see page 82) were reversed in diamond C, it would naturally be reversed also in the two quarters at a a,
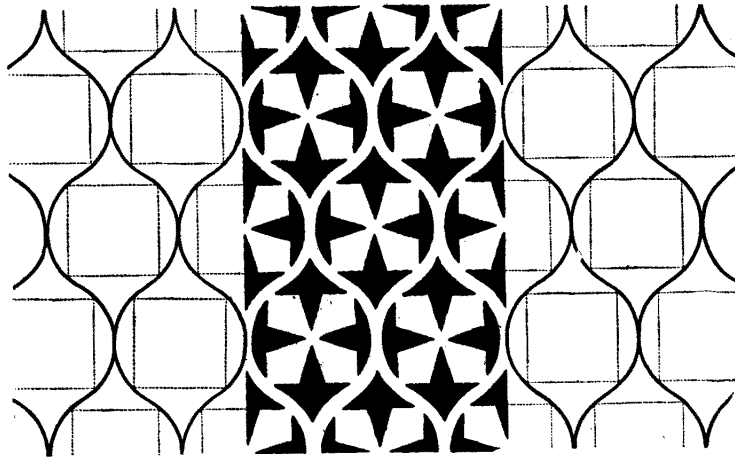
102. FRET DESIGNED ON OGEE AND SQUARE LINES.

and would not join on to the half unit at A facing the same way as at B, and the pattern would not work.

Every fresh skeleton plan is a boon to the designer; for, working upon any fixed proportions (such as the conditions of any manufacture are sure to lay down for us), we fall inevitably into certain grooves of design; and all opportunity of varying them is to the good. It is because they offer each its own particular lines of construction (by which design cannot but be influenced) that it is worth the designer's while to puzzle over the various plans upon which pattern may possibly be built.
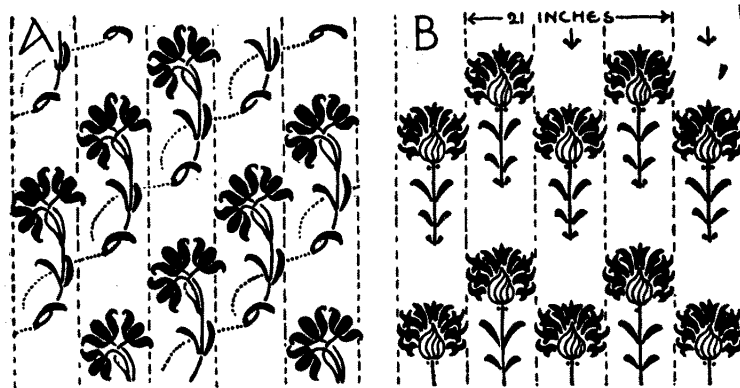
103. DIAGRAMS SHOWING DROP AND STEP REPEATS WITHIN THE WIDTH OF MATERIAL.

IX. SMALLER REPEATS.

Width of repeat divisible into width of material—Repeat two-thirds or two-fifths of width of material—Full width repeat seeming smaller—Variety in apparent uniformity—Weavers' ways of doing it—Same principle applied to larger design—Method and haphazard—More complicated system—Other plans for disguising precise order of small repeats.

As a rule the designer is anxious to get the most out of the space he has to deal with. The use of the drop, it has been explained, enables him to go even beyond the width of his material. But it is not always that he wants the whole width allowed. There are reasons of economy and use (economy of design no less than of manufacture) which make it necessary at times, and especially in certain classes of design, that several repeats of the design should occur in the width of the stuff. If the repeat is on horizontal lines it must clearly be contained exactly twice, or three, or four, or more times in the width;

F
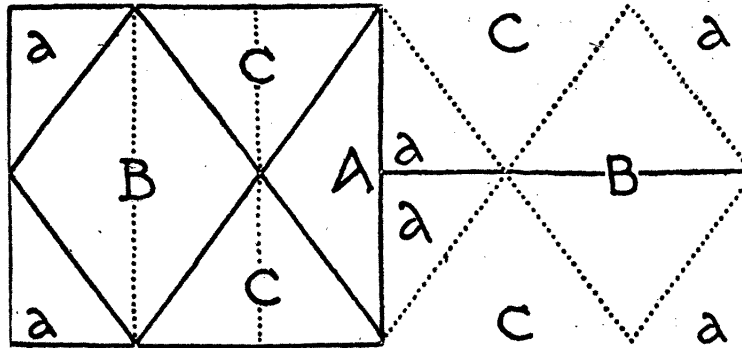
104. DIAGRAM SHOWING PLAN OF DROP REPEAT TWO-THIRDS OF
THE WIDTH OF MATERIAL.

otherwise, when the material comes to be joined up, the design
will not match, without cutting the stuff to waste.

A drop-repeat within the width of the material does not,
it should be mentioned, entail a corresponding drop in joining
or hanging.   Suppose the material in diagram A (103) to be
wallpaper 21 inches wide, and the repeat to be only 7 inches
wide, and drop just a third or two-thirds of its length.   In that
case the paper will hang not as a drop but on level lines.
The step pattern B, on the other hand, which recovers itself
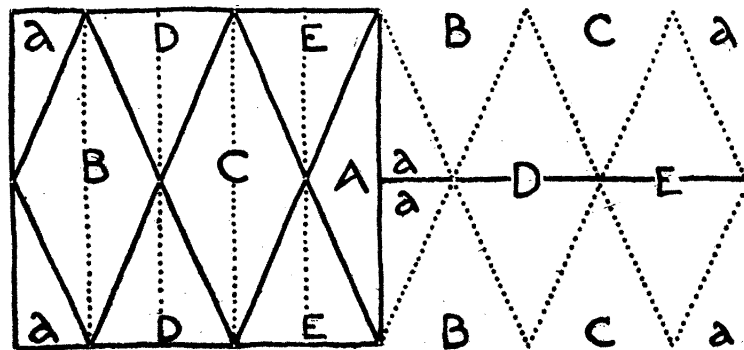
105. DIAGRAM SHOWING PLAN OF DROP REPEAT TWO-FIFTHS OF THE
WIDTH OF THE MATERIAL.

106. DROP DESIGN SCHEMED ON A DIAMOND TWO-THIRDS OF THE
WIDTH OF THE MATERIAL.

after the first repeat, will hang in corresponding fashion, dropping in one strip 7 inches, and in the next recovering itself again.

The "drop" offers yet further possibilities in design, and makes possible a repeat measuring, not merely a half, a third, a quarter, but two-thirds of the width of the material, or two-fifths of it, or two-sevenths, and so forth.

If, as in diagrams 104 and 105, you divide the area of possible repeat vertically into three, or into five, a pattern designed on a diamond the width of two divisions will work as a drop. All that is necessary is that the half diamond A on the one side and the two quarter diamonds a a on the other should join on. They form, in fact, together the unit of the repeating pattern—supposing, that is to say, diamonds A, B, C in the one case (104), and A, B, C, D, E in the other (105), to be filled in the same way.

The design (106) on page 83 shows a 21 inch material of which the design is schemed on a diamond 14 inches by 21 inches.

Ceiling pattern 107 works on a similar plan ; but, as it happens to turn over within the diamond, it works also as a drop-repeat 7 inches wide by 14 inches long. The block from which it is printed measures 21 inches by 14 inches.

The repeat, however, in such patterns is not dependent upon the filling of the diamonds all alike. So long as in diagram 104 the half diamond A and the two quarter diamonds a a make one complete diamond, and the two half diamonds C C another, the three diamonds (A, B, and C) may be occupied each with a separate figure. The design (108) on page 86 is planned upon the system of diamond divisions measuring two-thirds the width of the material. The diamonds (A), of which only half would occur in the width of the stuff, are occupied by sprays of foliage, and through the zig-zag space (B) between (equivalent to the other two diamonds) winds a separate growth.

There are many occasions on which it is advisable to reduce pattern to a scale far less than the mechanical con-

7 in. | 7 in. | 7 in. | 7 in.
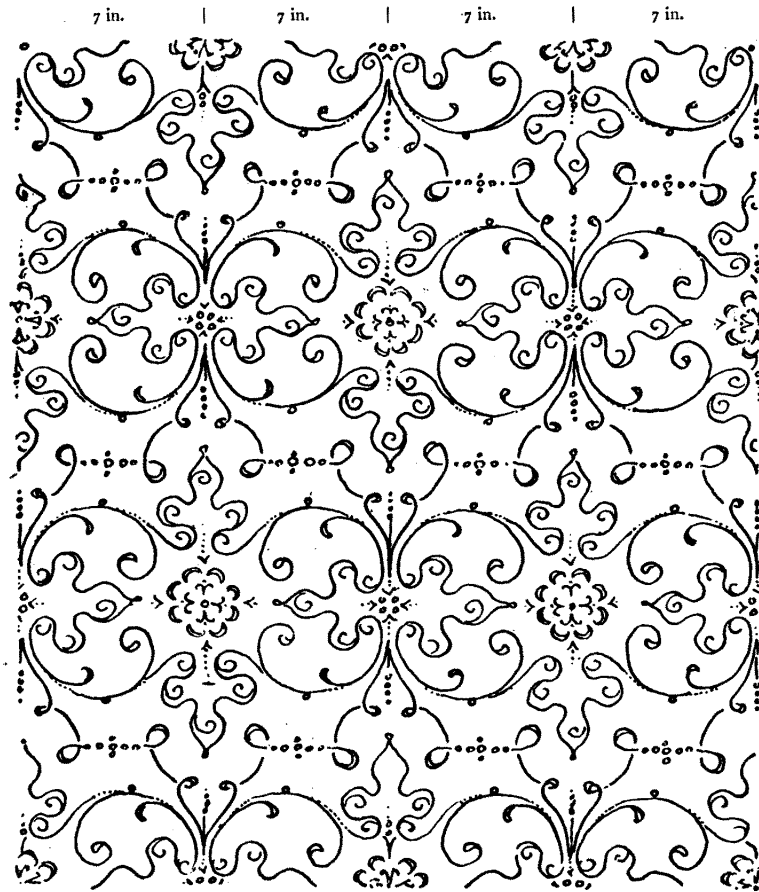
107. DROP REPEAT 7 INCHES BY 14 INCHES PRINTED FROM A BLOCK 21 INCHES BY 14 INCHES.

ditions would allow. In that case it may nevertheless be well to take advantage of those conditions in order to get

variety, which, though not perhaps immediately apparent, is always pleasing when it is discovered. What is in effect quite a small repeat may, in point of fact, occupy the full width of a wide material.

An expedient that is often useful is to set out the lines of your pattern as if for a small repeat, and within those lines allow yourself all possible liberty. For example, you may devise a small sprig pattern, and then amuse yourself by playing variations upon it, so as to suggest perhaps, even in mechanically produced pattern, something of the freedom of handiwork—at all events avoiding the mechanical effect of too obvious repetition. In the Byzantine piercing (109) on page 87 a pattern of interlacing bands is diversified by filling the geometric spaces with sprigs as it were accidentally dis-
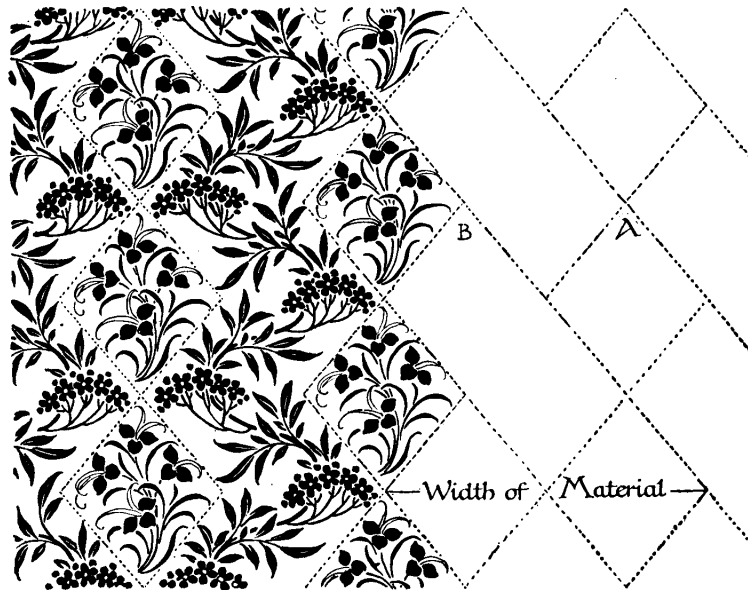
108. DIAGRAM OF DROP REPEAT ON DIAMOND LINES, THE DIAMONDS NOT FILLED ALL IN THE SAME WAY.
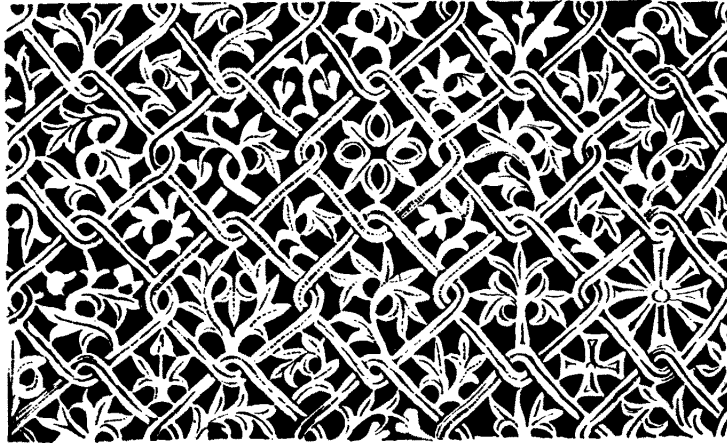
109. BYZANTINE PIERCED WORK WITH GEOMETRIC DIVISIONS
ENCLOSING ORNAMENT WHICH DOES NOT REPEAT.

persed. In this particular instance the foliated ornament
does not repeat at all. But it might very well have done
so. There are, however, two dangers in playing any little
game like this; the one, that you may get confused as to
the particular units which must join ; and the other that,
failing system in the variation, the changes may be sufficient
to throw the design out of balance, and allow certain units
to assert themselves detrimentally. It is consequently well
worth the pains of any one engaged in designing small repeats
to work out the various plans upon which sprays and so forth
may be schemed, so as not to recur quite obviously, and yet
to fall surely into satisfactory lines.

Weavers have, in fact, perfected a system by which the
danger of apparent lines in small repeats is minimised.
Some of these arrangements * give, it will be seen, diagonal
lines, others afford a ready means of avoiding them.

How they arose out of the necessities of weaving is not

* " Sateens " they are technically called.
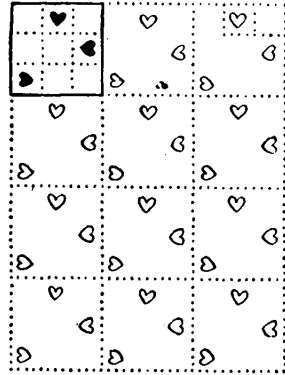
110. DIAGRAM OF THREE-SPOT
REPEAT.
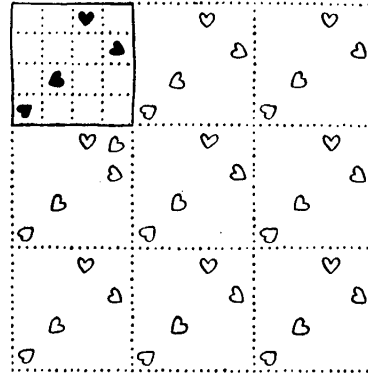
111. DIAGRAM OF FOUR-SPOT
REPEAT.

here the question. Nor is it necessary to go into the matter of "ends," "counts," "picks," "treads," and other technicalities familiar enough to the expert in weaving, and to those who are not, more puzzling than explanatory. But, as they may be helpful to designers of no matter what kind of pattern so
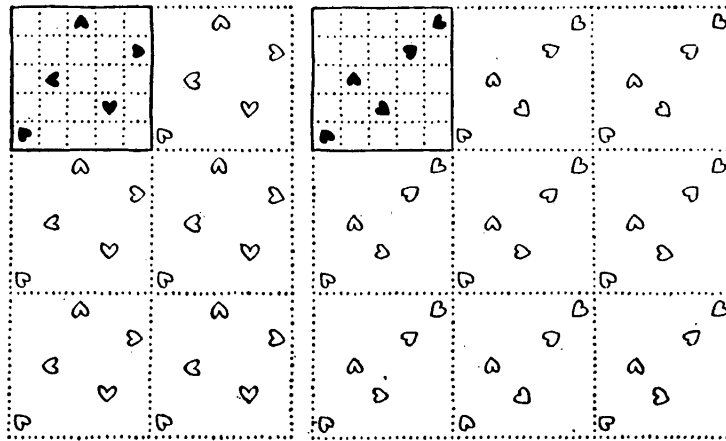
112. DIAGRAMS OF FIVE-SPOT REPEAT.

long as it repeats, it is worth while giving them for what they may be worth.

The designer begins by dividing his repeat into squares 3, 4, 5, 6, 7, or 8 each way, as shown in the corner of each diagram. He has then to occupy 3, 4, 5, 6, 7, or 8 of these squares in such a way that in any row of squares, from top to bottom or from side to side, one of them, and one only, is inhabited.
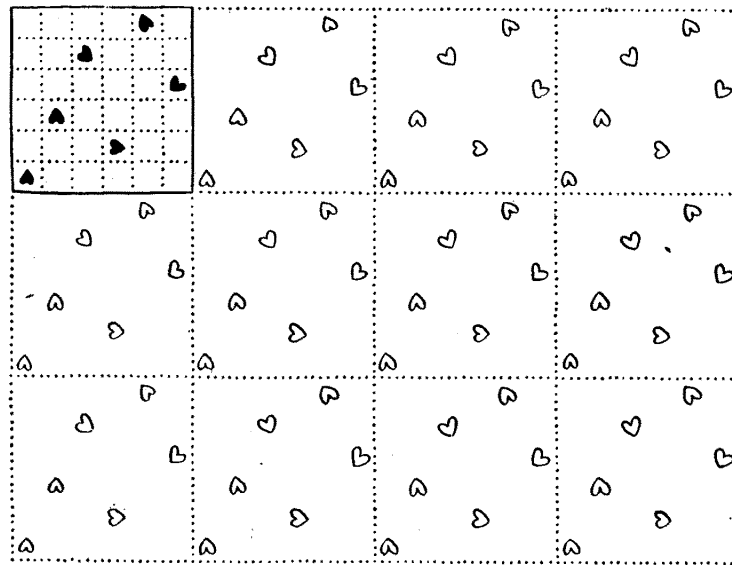
113. DIAGRAM OF SIX-SPOT REPEAT.

How this works out in the repeat—whether it takes a stripe or not, and what stripe, is shown by the repetition of this group of squares in outline.

In the diagrams, the heart-shapes, it will be seen, face all ways about, to show how, at the option of the artist, the spray or whatever it happens to be may be varied.

The application of such a principle as this to design on a comparatively large scale as in the ceiling paper on page 92
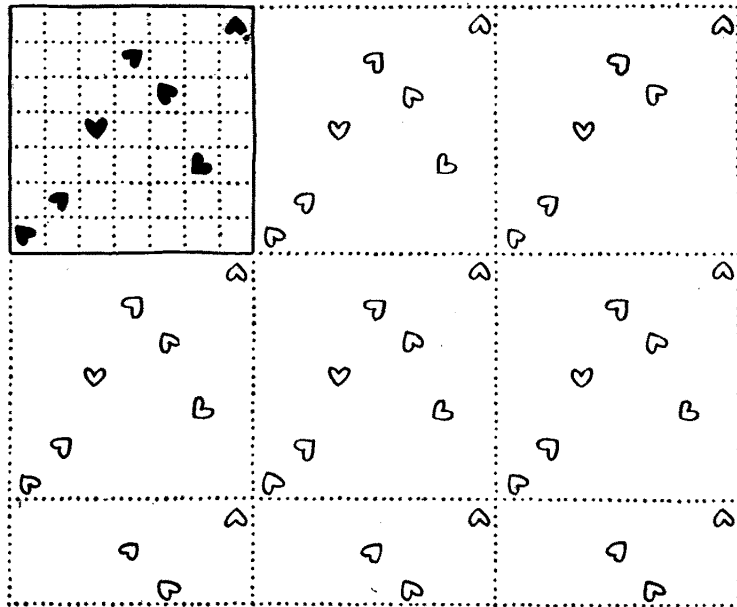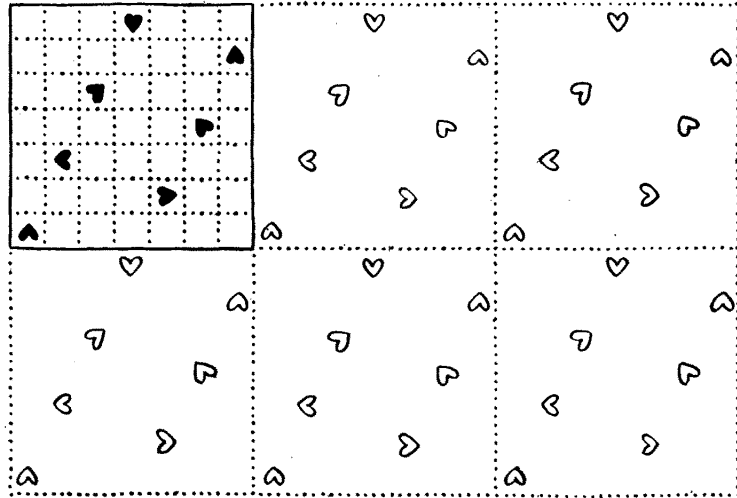
114, 115. DIAGRAMS OF SEVEN-SPOT REPEAT.
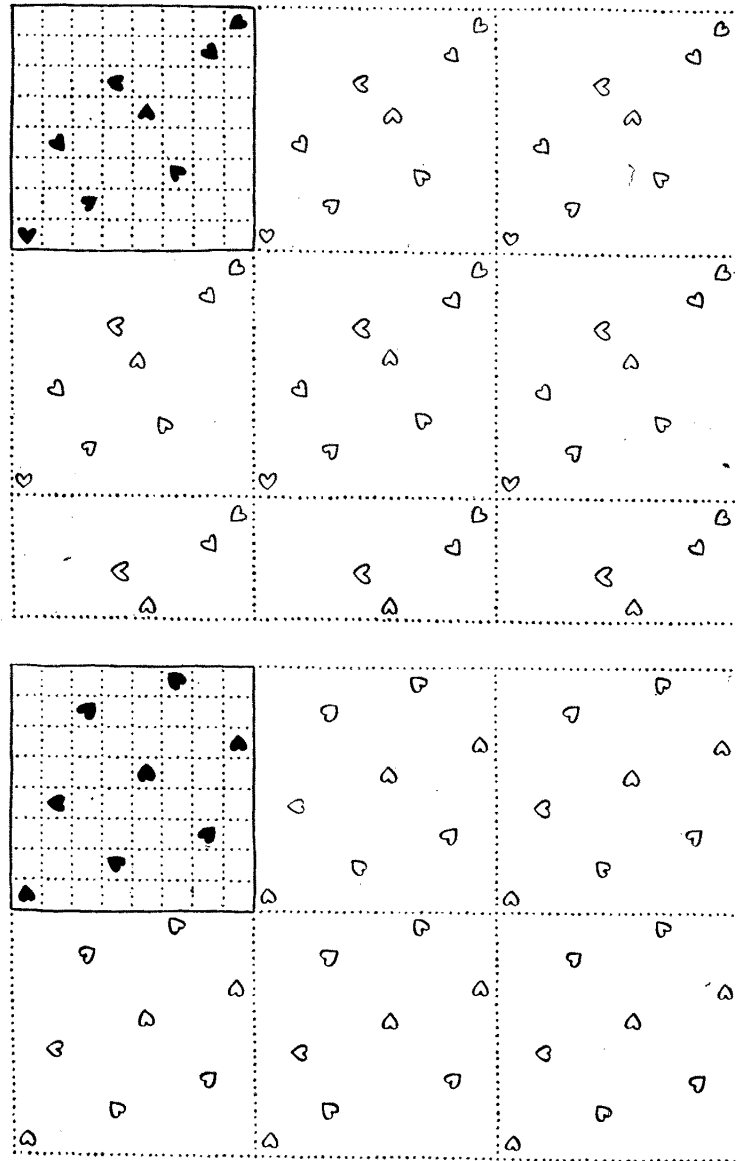
116, 117. DIAGRAMS OF EIGHT-SPOT REPEAT.

118. CEILING PATTERN DESIGNED ON THE PLAN OF SIX-SPOT
REPEAT.

is explained by the diagrams which follow (119). In the first
is shown the occupation of six squares by forms not yet care-
fully considered. In the second these begin to take leaf
shape extending somewhat beyond the boundary lines. With
the more careful drawing of these leaves and the breaking
them up into feathery composite foliage, the design takes its
final shape.

A further application of the idea is shown in yet another
diagram (120) in which only the main features of the design
are distributed systematically. The position of such heavier
and more emphatic masses determined, it is safe to sketch
in the more delicate connecting scrollwork quite freely.
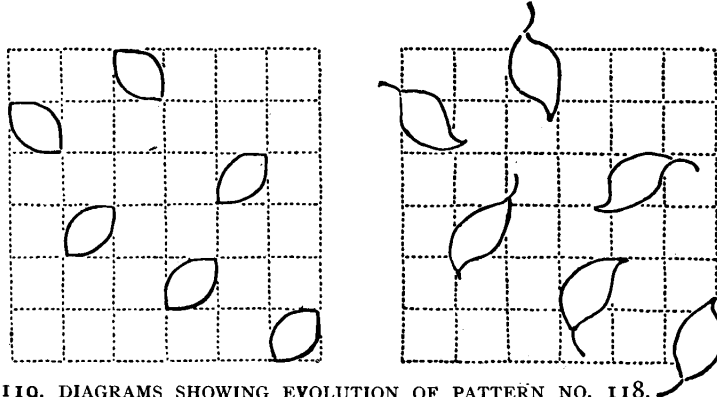
119. DIAGRAMS SHOWING EVOLUTION OF PATTERN NO. 118.

Similarly the squares (one in each row) may be reserved,
not for the pattern, but as spaces free from ornament (121),
places of rest, where the eye can appreciate the quality of
plain material. The diagram insists, for emphasis' sake, upon
the squareness of the spaces left, but in a finished design the
scaffolding lines would of course not be there.

An alternative to the more systematic manner—and one
which appeals to the ungovernable frame of artistic mind—
is to begin with sprays or whatever they may be on the
margin of the repeat, and work gradually to the centre,
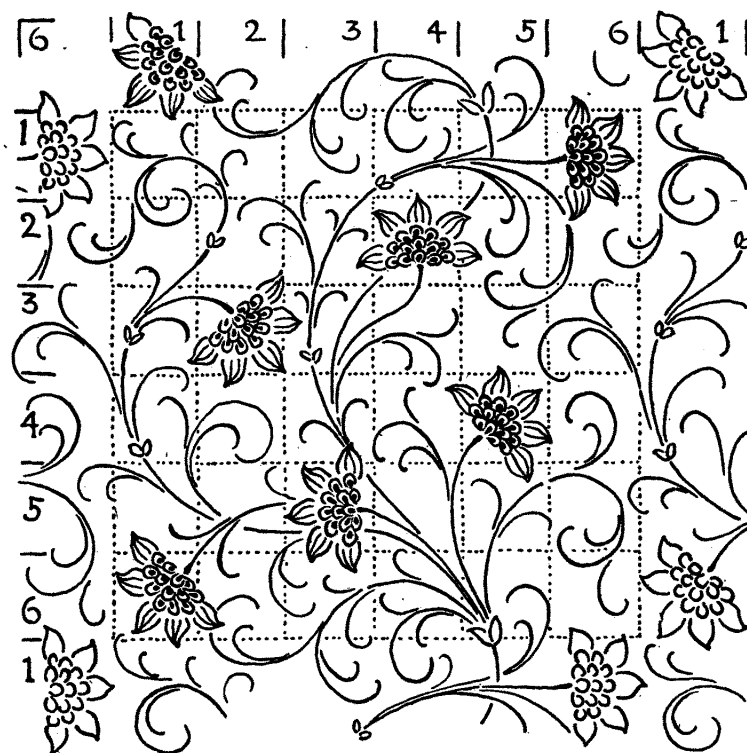
120. DIAGRAM SHOWING DISTRIBUTION OF FLOWERS ONLY ON THE
PLAN OF A SIX-SPOT REPEAT.

trusting to the guidance of artistic instinct. That seems, perhaps, the readiest way; but it is in the end the longest—if ever it leads to anything but disappointment.

The full possibilities of the systematic principle, are indicated in the last of this series of diagrams (122), designed to show the successive stages by which, first, six of the squares are occupied with leaf forms; then, in a similar way, six other squares with spirals; then others in succession with flowers, stars and butterflies. The result is not a pleasing pattern—that was not aimed at—but an unmistakeable chart
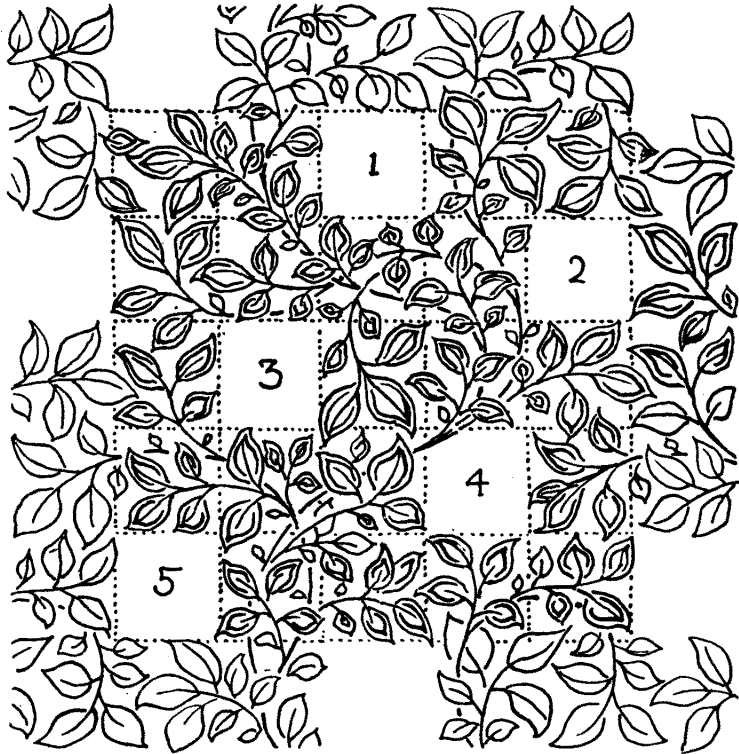
121. DIAGRAM SHOWING DISTRIBUTION OF OPEN SPACES IN THE
GROUND ON THE PLAN OF A FIVE-SPOT REPEAT.

of the steps by which the designer may proceed to fill out
his design. It should be useful also as an indication of the
way in which, employing always the same or similar sprays
or whatever they may be throughout his design, he may vary
their colour. Let the five features represent five tones of
colour, and the monotony of a single spray of ornament
would be vastly relieved. Let the sprays be further slightly
(more or less accidentally) varied in design, and an element
of mystery would be introduced which seldom fails to add
to the charm of pattern.

Two other plans upon which sprays, &c., may conveniently be distributed are worth showing (diagram 123).

Mark on the sides of a square central points, and from these to the corners draw parallel lines obliquely across. That will give you a centre square and eight parts of corresponding squares. Complete the four squares which want least to make them perfect, and you will have a cruciform unit of five divisions, no one of which is in a vertical or horizontal line with another.

Or, again, mark on the sides of a square two points *a* and *b*, dividing them into three equal parts, and from *a* draw oblique lines to the corners, and from *b* to *b* lines parallel with them. That will give you four complete squares and twelve portions of corresponding squares. Complete as in the last case, the four of these which are most nearly perfect, and two of the half squares not opposite one to the other, and you will have a unit of ten divisions no one of which is in a
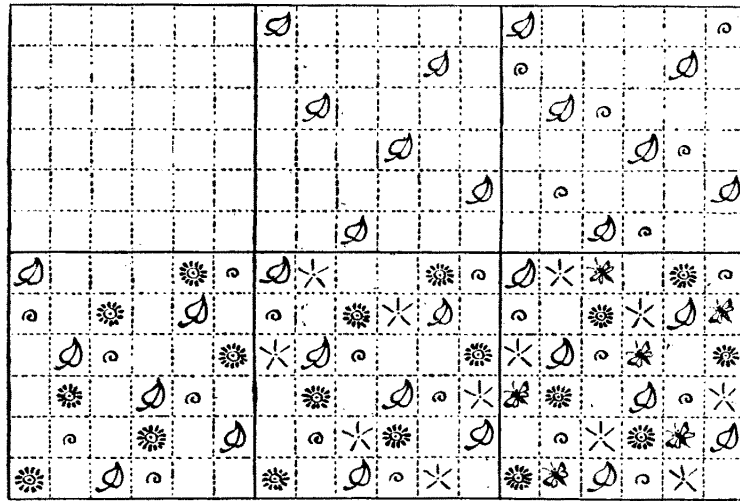
122. DIAGRAM SHOWING FURTHER DEVELOPMENT OF THE PRINCIPLE OF DISTRIBUTION ALREADY EXPLAINED.
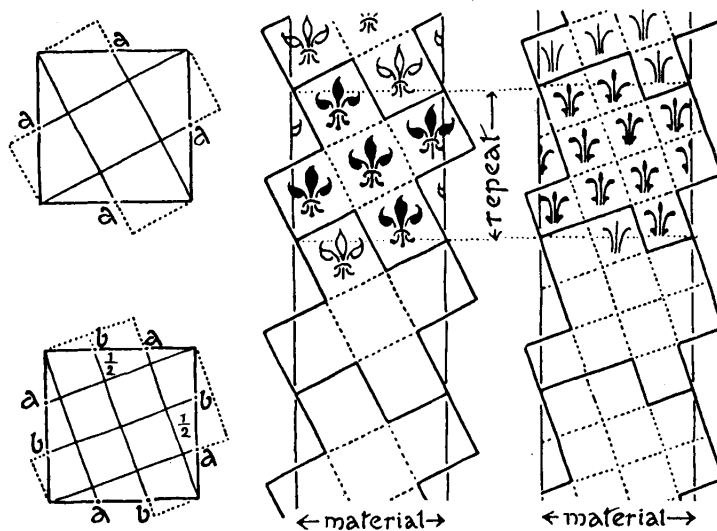
123. DIAGRAMS ILLUSTRATING ANOTHER PRINCIPLE ON WHICH
SPOTS MAY BE DISTRIBUTED.

vertical or horizontal line with another. The result is in either case a square lattice askew. It is shown in the diagrams above both in repeat and in relation to the width of the material.

Any pattern occupying these squares would, if it followed the slope of the lattice, take slanting lines, and little or nothing would be gained. But in an upright spray, more especially if there were in it a marked vertical line, as, for example, in a fleur de lis, the upright tendency of the diaper would contrast with the lines of the plan, and the order of repetition would not be too apparent. Remove the trellis of scaffolding, and it would take one some time to make out the precise order in which the diaper was sprinkled about.

The value of systems like these is just that. It makes the order of an obvious repeat less obvious.

G

X. SUNDRY SCAFFOLDINGS.

Importance of variety of plan—Area of pattern not confined to area of repeat—Excursions compensated by incursions—Lines thus disguised —Wave-lines, turned over, result in ogee—Wave-lines result from working within narrow upright lines—Uprightness of narrow repeats counteracted by lines across—Diagonal wave-lines to connect features forming horizontal band—Designs obviously based upon slanting and horizontal lines—Wave-line from side to side of broad repeat—Scaffolding of an old Louis XVI. pattern.

INEVITABLY as repeated patterns fall into the lines of the square, the diamond, or perhaps the triangle, those were not by any means invariably the lines on which the designer set to work. Reference has been already made to some possible scaffoldings; others remain for consideration; and, in view of the vital way the lines on which a man works influence his design (one plan suggesting what another does not so much as allow), it is important that he should have the widest possible base of operations.

Beginners, by the way, seem always to be unnecessarily bothered by the *shape* of their repeat—square, oblong, diamond, or whatever it may be. I have seen it somewhere stated, for their guidance, that they need not confine the lines of their design to it. Indeed they need not. It would be safe to say that, except in mere diaper, they must on no account do so. If they do, the line of the repeat, not crossed by ornament at all, will assert itself, very probably in a way that is anything but desirable.

Even in a comparatively open pattern with plenty of plain ground, as in the printed stuff on page 99, a marked vertical

124. TURNOVER PATTERN REVEALING THE VERTICAL LINE ON
WHICH IT IS REVERSED.

line results from keeping the pattern entirely within the width
of the repeat. In textile design it is sometimes thought
advisable purposely to confine the pattern in this way, so that
it may have the appearance of completeness when made up
in furniture or upholstery. As a rule it is expedient, even
where the design is mainly contained within the width of the
stuff, to block the gap in the ground which would occur where
two strips join by carrying comparatively insignificant, but
sufficiently substantial, portions of the pattern across it.

125. DESIGN ALMOST BUT NOT QUITE SELF-CONTAINED WITHIN
THE WIDTH OF THE STUFF.
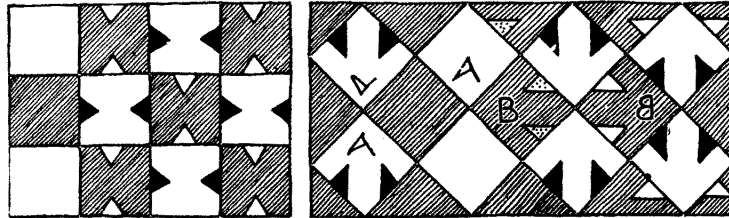
126. DIAGRAM SHOWING CONSTRUCTION AND DEVELOPMENT OF
COUNTERCHANGE PATTERNS.

A test by which to judge the competence of a pattern-
designer is the way he manages to give you in his designs
features extending far beyond the limits of his repeat, obtain-
ing by that means a bolder scale and a freer line than are
otherwise to be got.   There is no great art in thus exceeding
the limits of the repeat.   One has only to remember that
excess on one side of it must be compensated on the other.
It is a question of addition and subtraction.

This is very plainly shown in those geometric patterns of
which the scaffolding forms part of the design.

Given a checquer of black and white, any inroad of the
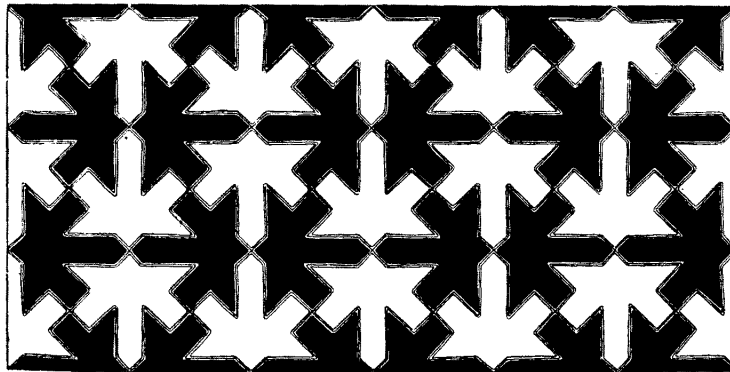
127. ALHAMBRESQUE COUNTERCHANGE PATTERN CONSTRUCTED
ON THE LINES OF DIAGRAM 126.
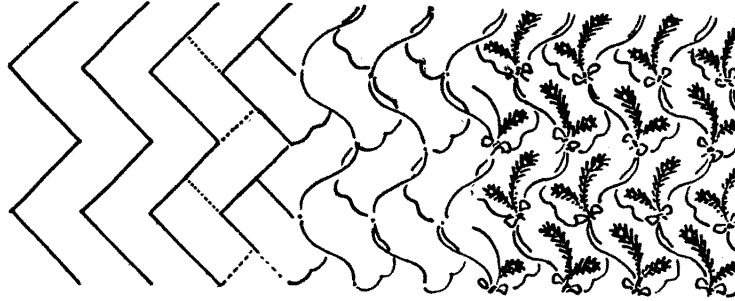
128. DIAGRAM SHOWING CONSTRUCTION AND DEVELOPMENT OF
RIBBON AND FEATHER PATTERN, DIAGRAM 129.

black into the white has only to be followed by a correspond-
ing inroad of the white into the black, and you have a well-
balanced pattern.
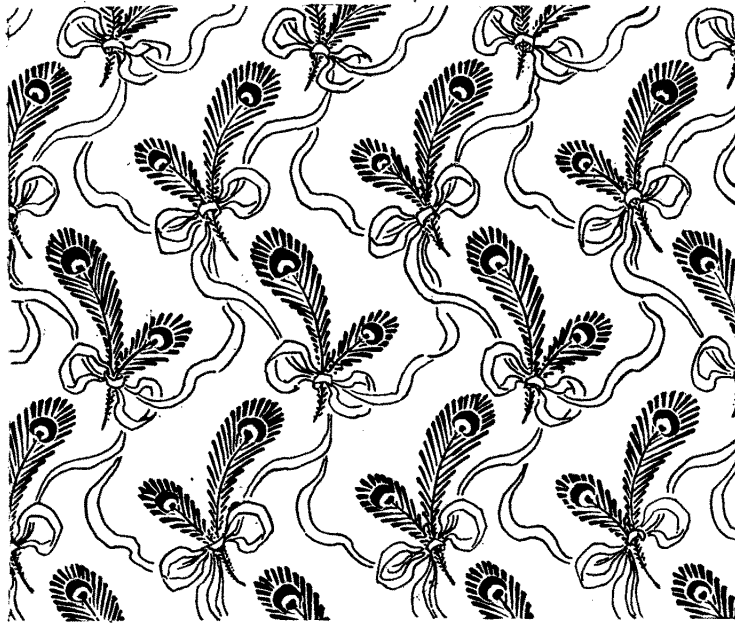
129. RIBBON AND FEATHER PATTERN CONSTRUCTED ON LINES OF
DIAGRAM 128.

Horizontal rows
of Ogee shapes
with zigzag
intervals
between
them

130. LATE GOTHIC VELVET PATTERN.

131. PATTERN IN WHICH WAVE-LINES DIVERT THE EYE FROM
VERTICAL.

That explains itself at a glance in diagram 126. But more
intricate-looking patterns come about in precisely the same
way.   The inroads of the black into the white diamonds at A
have only to be compensated by identical incursions of the
white into the black diamonds at B, and you have the unit
which gives the very satisfactory counterchange (127) at the
bottom of page 101.   The two (black) bites out of one square
are paid for by two (white) bites out of the other.

Practically the only way to avoid the lines of open space

Repeat
& its
subdivision
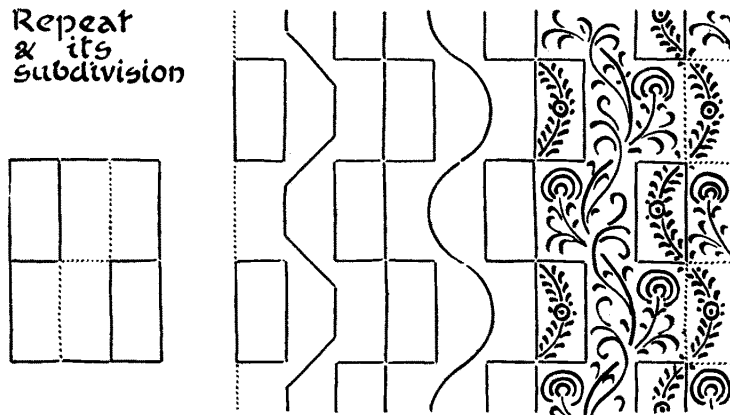
132. DIAGRAM OF SCAFFOLDING AND THE LINES OF A PATTERN
RESULTING FROM IT.
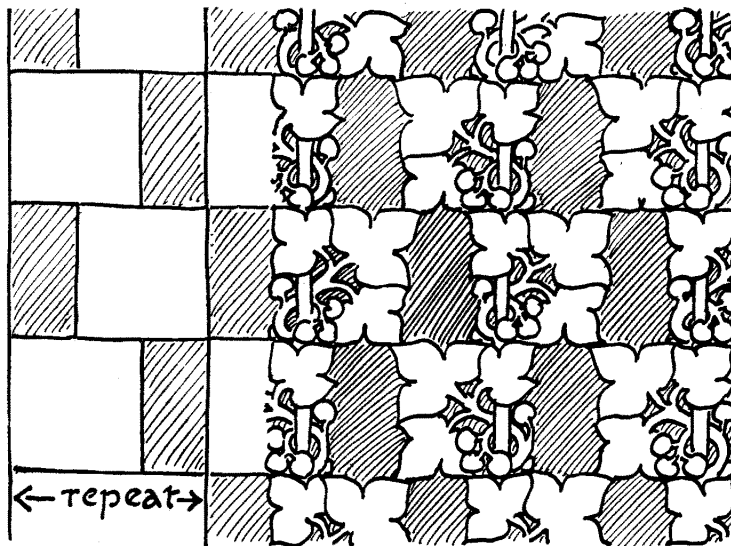
←—repeat→

133. ANOTHER PATTERN BUILT ON THE SAME LINES AS 132.

134. OLD DUTCH PRINT.

which result from keeping the unit of design within the lines
of the repeat is, to cover so little of the ground with it, to
leave so much space about it, that it resolves itself into some
sort of a sprig or spot pattern.

They may be disguised by designing within, not squares

or diamonds, but some such broken geometric scaffolding as would be given by say four of the shapes in diagram 127 (which would themselves repeat on the lines of the diamond) or within some equally broken but less regular shape. For my own part, I have never thought that worth doing. It might, however, be worth while to design a narrow flowing pattern, in which it was desired to avoid anything like a vertical direction within the lines of a zig-zag (128) or of the slanting "herringbone" (128) which results from continuing the diagonal lines until they meet at right angles. It is long unbroken lines in one direction which are so apt to assert themselves.

In an old Italian velvet (129) the above-mentioned diagonal brick lines have been adopted as the plan of a peacock's feather pattern tied together by ribbons, which mark, not precisely the brick, but a flowing-lined variant upon it.
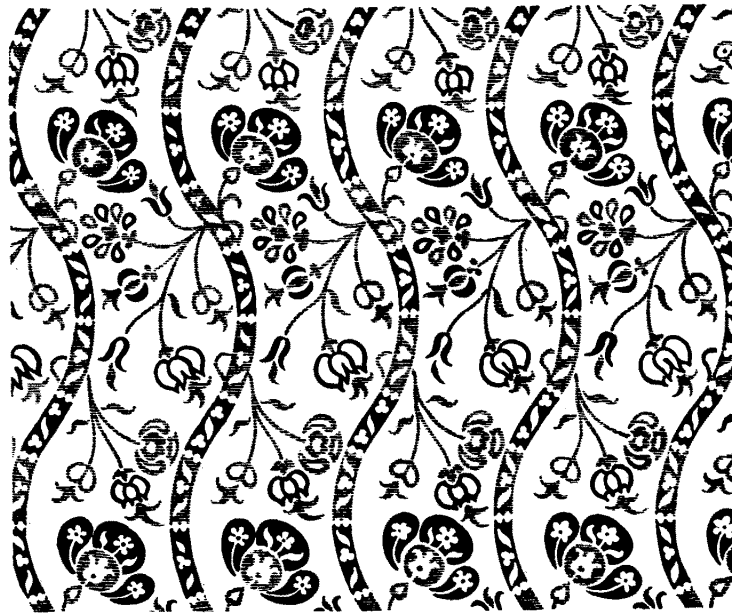
135. CRETAN WOVEN PATTERN.

136. PATTERN ON WHICH THE HORIZONTAL LINE IS DELIBERATELY
MARKED.

A vast number of excellent patterns have been frankly built upon the ogee, which curved variety of the diamond seems, wherever it is employed, to command acknowledgment.

The late Gothic patterns of which that on page 103 is a type, seem to be the result of simply opening out an ogee pattern, dropping the ogee shapes, that is to say, some distance apart, so as to give zig-zag bands between. These are still to be traced in the design illustrated, though the ogee shapes are no longer intact.

Not every pattern in which the ogee occurs, was necessarily designed upon its lines. One may start with a scroll, and the turning over of the wave-lines gives at once the ogee.

The wave-line itself comes (though it may seem like a contradiction in terms to say so) of working upon narrow upright lines, or between them. There is no readier means of counteracting the too upright tendency of a long narrow repeat than by lines or bands waving from side to side of the confined space.

Even when the space is not narrow, as in the design (131) on page 104, it may be convenient to anticipate any possibility of vertical lines by carrying the eye alternately from left to right and from right to left.

A scaffolding which leads to new developments in design is to be got by means of a trellis which divides the rect-

A.   B.   C.
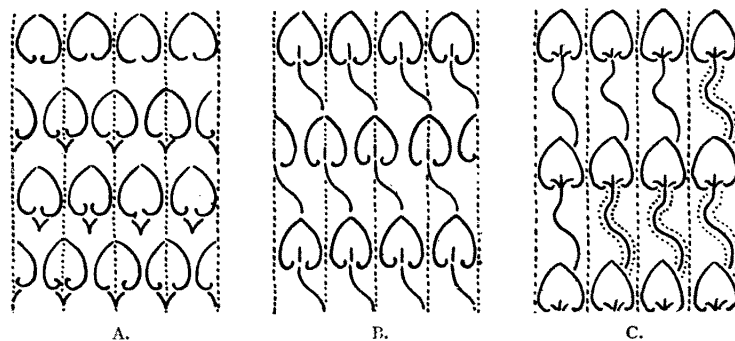
137. DIAGRAMS OF SCAFFOLDINGS.
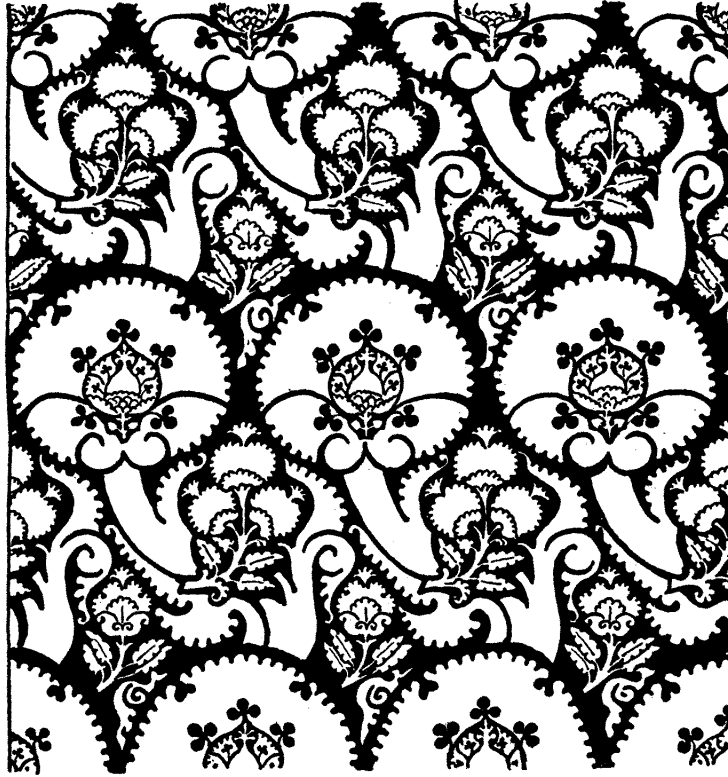
138. SILK BROCADE ON THE LINES OF DIAGRAM B.

angular area of repeat into six parts, grouping them as (132) on page 105. If these lines are repeated a broad space reveals itself between the smaller oblongs which, when it comes to occupying it with pattern, results almost inevitably in a wave-line as does the zig-zag chain of parallelograms between.

Yet another diagram (133) on the same lines shows that even when the square lines of the plan are insisted upon, something like wave-lines result.

Another obvious means of counteracting the uprightness of very narrow repeats is to cross the upright lines, and

139. SIXTEENTH CENTURY VELVET ON THE LINES OF DIAGRAM C.

140. PATTERN IN WHICH THE DIAGONAL LINE WAS AN AFTERTHOUGHT.

perhaps the waved lines within them, by features which give a pronounced band either in the horizontal or in the diagonal direction. The tendency of the narrow turnover in the Dutch print (134) on page 106 is effectually overcome by the pronounced horizontal line of birds, though the direction of the stalks into which they develop helps also in the same way.

In the Cretan weaving (135) on page 107, though the wave-

lines are not actually broken by the flowers, they form in repetition compact bands, which go far to stop their upward tendency. One seems to read in that case very plainly the genesis of the design—a narrow repeat dictated by the loom ; wave-lines, to take from its straightness ; emphatic bands of flowers, to stop the upward direction of the pattern ; and further breaks in the colour of the wave-lines, with the same object. The plan might be described as a trellis consisting of upright wave-lines and straight lines crossing them horizontally.

It is true that horizontal lines of the kind here shown result, whether the designer will or no, from the repetition of any feature which nearly takes up the full width of the repeat.
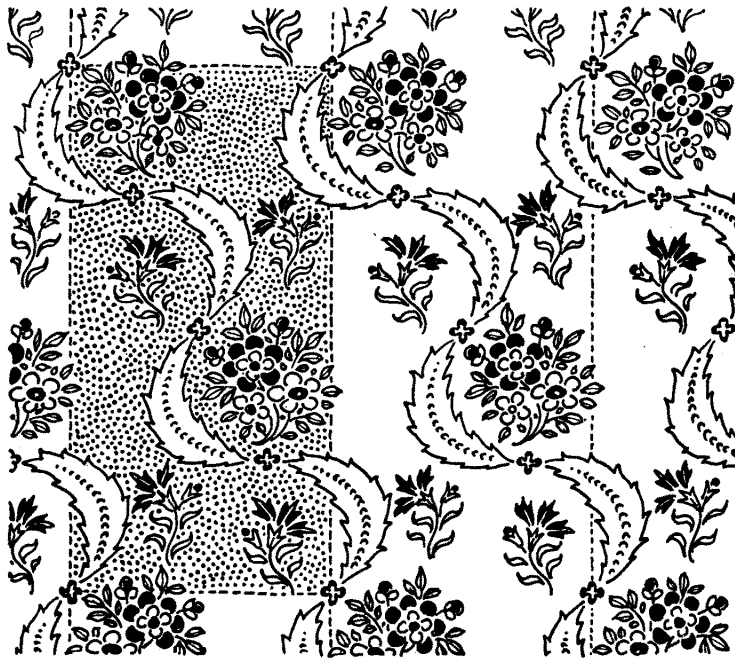
141. PATTERN IN WHICH THE STARTING-POINT WAS A DIAGONAL
WAVE.

H

It was very likely that which gave the hint to weavers ; but they were not slow to take it, and to turn it to very deliberate and constant use.

No designer will doubt for a moment that the long leaves in the pattern (136) on page 108 are an artifice by which to stop the flow of blossom and sprays, and to steady the effect.

A natural thing to do in a narrow turnover pattern (with a view to interrupting its straight-up direction) is to plant, as in diagram A, 137, a prominent feature, occupying nearly, if not quite, the full width of the stuff, alternately in the centre of the strip and centring with the joint between the two strips. (This applies, of course, just as much to the repeats which recur several times in a single width of the material.)

Diagram B (137) brings us to something like the plan of the fifteenth century pattern (138) on page 110, and may be resolved into a diamond scaffolding. But, if the strips or the repeats are narrow, and there is a fair amount of space between the alternate bands of features, flowers let us call them, any lattice of stalks connecting them, whether on diamond or ogee lines, would be too long-drawn-out for beauty. A single line from flower to flower would be much more satis-factory—from which results (whether we mean it or not) a diagonal stripe—more or less ingeniously to be disguised as in the fifteenth century silk on page 110.

Diagram C (137) explains the genesis of some of the most sumptuous patterns of sixteenth century brocaded velvets (139). Their starting-point seems to have been a huge conven-tional flower or pine-apple, occupying nearly, if not quite, the entire width of the material, recurring, of course, at intervals, with one broad waving stem from flower to flower, not, it is clear, running behind the flowers in a continuous sweep, but appearing rather to stop against the flower below it : at all events the flow of the line is not continuous. The puzzling thing at first about these handsome patterns is that you don't

142. FIFTEENTH CENTURY PATTERN AND ITS SCAFFOLDING.

follow the logic of the design.   I am inclined to think there
is none ; that the designer did not bother himself about the
repeat ; that he trusted to the bigness of the pattern, the
sequence of which one can seldom see, and takes too readily
for granted.

I can speak quite positively as to the process by which
my own design (140) on page 112 came about. The starting-
point was there the flowers ; the diagonal growth was, not
precisely an accident, but an afterthought.

143. SICILIAN SILK PATTERN AND ITS SCAFFOLDING.

In the pattern (141) on page 113, on the other hand, it is
clear that the start was a diagonal line waving gaily from corner
to corner of the repeat, and that the sprays of flowers were
put there to steady the effect.   For the diagonal stripe came
at an early date not merely to be accepted but to be insisted
upon as an acceptable feature in design—which to unpreju-
diced eyes it still is.

There seems to me no room for doubt that patterns such

1 | 2 | 3 | 4 | ←—Width of repeat—→
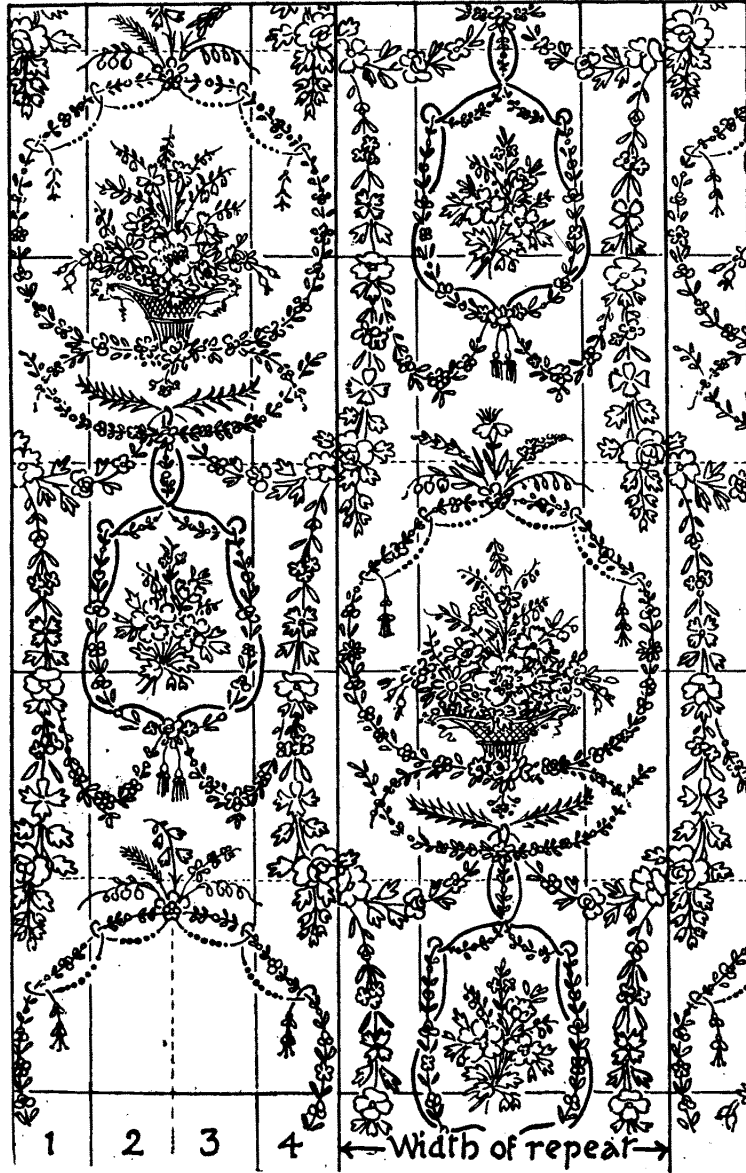
144. PLAN OF A FRENCH DESIGN OF THE LOUIS SEIZE PERIOD.

as that (142) on page 115 were deliberately planned on the horizontal and slanting lines indicated in the lower part of the diagram ; or that the Sicilian silk (143) was built up on the same sort of scaffolding.

The scaffolding of a design by a French designer of the period of Louis Seize (144) is interesting and instructive. The heavier of the vertical lines give the width of the material (rather more than two widths are shown), the finer of them stand for the pencil marks which the artist ruled for his guidance. The horizontal help lines mark the length of the repeat and its subdivision into four parts, two of which give the drop. It will be seen that he has divided the width of the material also into four parts, two of which (2 and 3) are reserved for the central features of the design, whilst the other two (1 and 4) confine the hanging wreaths (which frame the central features) within easily manageable areas. It is plain that the scaffolding lines assist him in carrying these wreaths from one width of the material to the other. You feel, in fact, that without this scaffolding he would not easily have arrived at a composition which even those who have no sympathy with the style of it must admit to be exceptionally graceful.

It is well worth while working out for oneself plans of this kind, as a means of compelling the invention out of the ruts sure to be worn by continually working on the same lines.

XI. THE TURNOVER.

A weaver's device—Doubles width of pattern—Exact turnover not desirable where conditions do not make it necessary—Balance must be preserved—Use of doubling over in border design—Suited to stencilling and pouncing.

To the practice of folding or doubling over in the vertical direction, may be traced a large class of bi-symmetrical designs. Mere doubling makes a sort of pattern; and some of the steadiest and most satisfactory designs rely to a large extent for their symmetry and steadiness upon the reversing of their lines.

To the weaver the "turnover" (145) is a veritable god-send, enabling him, without increase of cost or trouble, to double the width of his pattern. It does not even involve the cutting of more cards; it is simply a question of the gear of the loom.

So obvious is the advantage of the "turnover" to the weaver that the device might well have originated with him. But that is a point upon which it is useless to speculate. A man has only to double a sheet of paper and he can with one action of the knife cut out the two halves of what when it is opened out is a bi-symmetrical pattern.

Once invented the "turnover" proves the easiest and simplest means of doubling without more ado the width of a pattern.

Apart from the fresh facilities afforded by it for broader pattern planning, and the much larger scale of design which it makes possible (observe how very narrow is the strip turned

over in what is in effect a bold Gothic tapestry (146), designers generally, even though they may have no technical grounds for so doing, will "turn over" the lines of a design, partly perhaps with the idea of economising draughtsmanship, but chiefly with a view to the value of the steadiness of effect to be obtained by that means. They permit themselves, how-

ever, in that case (or they lay themselves open to the charge of rather niggardly invention), considerable variety of detail within those steady lines. When rigidly exact repetition is no part of the conditions imposed by manufacture, it is almost incumbent upon the designer to assert his freedom, and not, for example, to suggest that his printed pattern is woven. He does well to avoid making one side of his design a mere reflection, as it were, of the other;

145. BYZANTINE "TURNOVER" PATTERN.

and in particular its too mechanical turnover at the axis (147).

The absolutely strict turnover of any but the most rigid pattern, especially when the main stem is its axis, is so unsatisfactory that weavers often arrange their looms so that there is a central space of some inches (S) in which there is no turning over (148).

There is no occasion or excuse for the objectionable mechanism when, as in printing, the conditions do not compel it.

Although it adds greatly to the interest of a pattern in which the main lines are reversed to introduce, if the con-
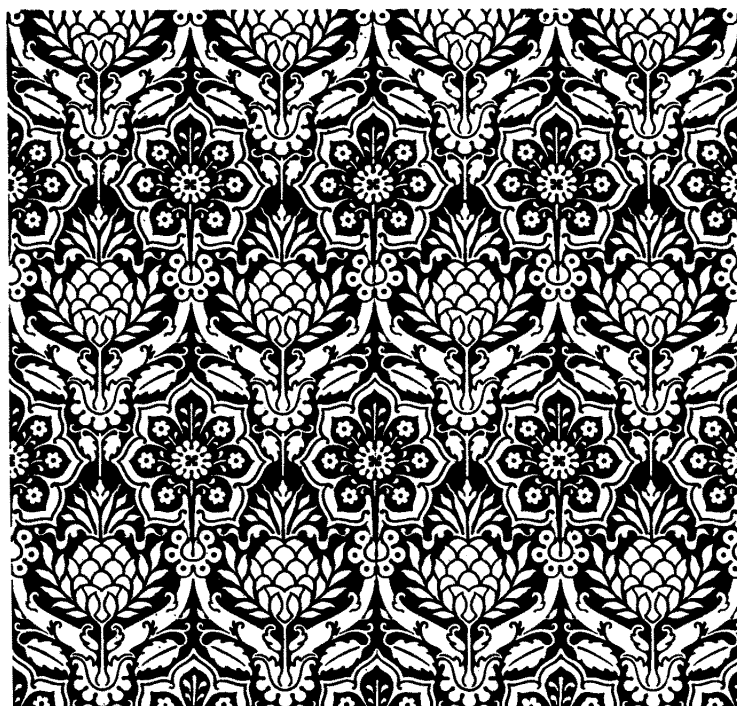

146. GOTHIC "TURNOVER" PATTERN.

ditions allow it, variety of detail, it is not safe to take liberties with the lines themselves or with the proportions of the opposite masses, else the balance of the design, which it is most important to preserve, may be lost. It is essential, too, that, for example, any two opposite features should be precisely opposite, and that their branches, curving from the central
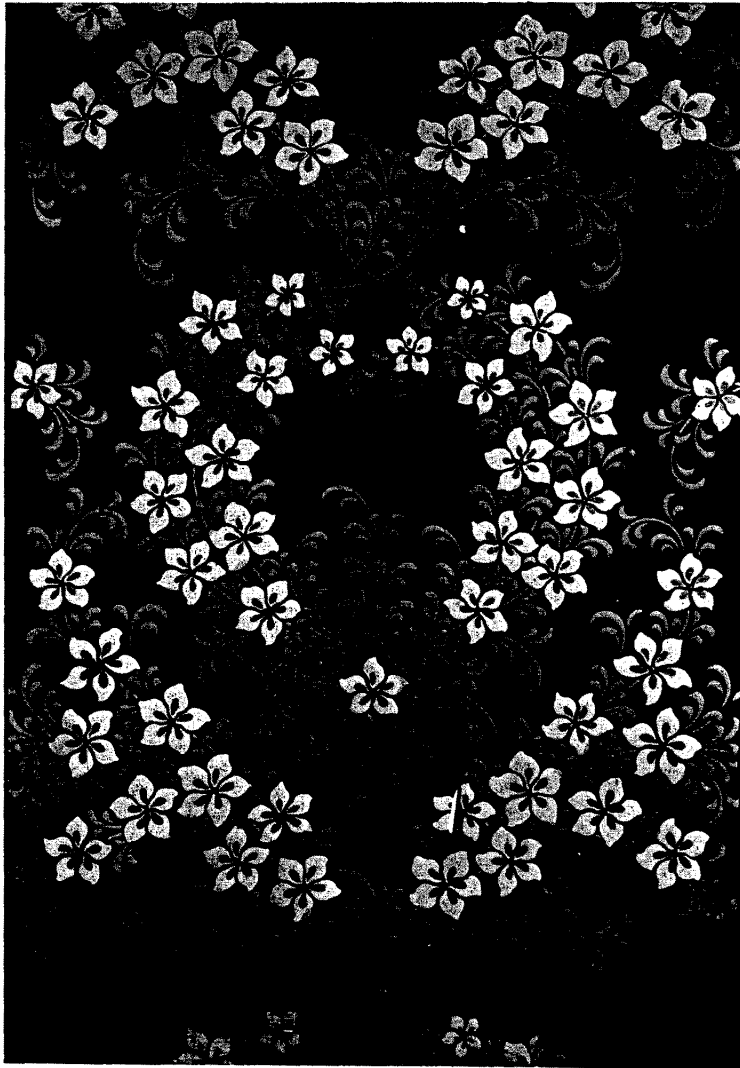
147. *QUASI-*"TURNOVER" PATTERN.

stem or towards it, should turn, like the spirals on page 124 (149), on precisely the same level. Inaccuracy in either of these respects, though it may pass in a drawing for artistic freedom, is almost sure, in repetition on the wall, to give the impression that it is out of the straight. The eye expects a level ; and it is strange how slight a deviation from it will produce an unfortunate effect. And so with any departure from the upright. In what concerns the equilibrium of a pattern it is impossible to be too mechanically exact.

A common device in design is to turn over the *unit of*
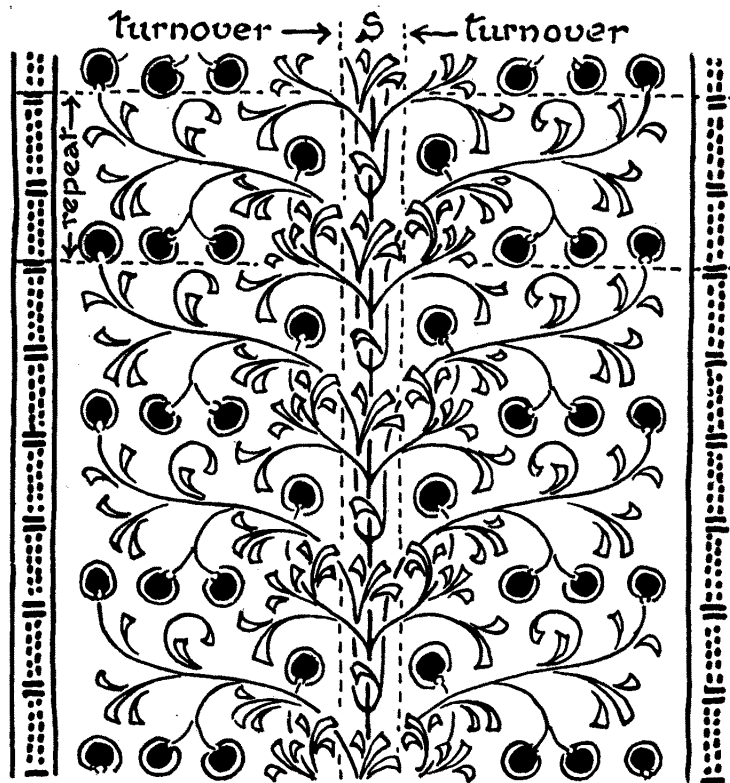
148. TURNOVER DESIGN WITH CENTRAL STRIP NOT TURNED OVER.