# DESIGN.

DESIGN, in the *Weaving Manufactures*, ſignifies the pattern of any ornamented piece of cloth, when the ornaments are woven in the loom along with the fabric. A ſpecies of paper is uſed to lay down theſe ornaments to a ſcale, which is called deſign paper, and which ſerves to direct the weaver in his ſubſequent operations. In every ſpecies of ornamental weaving, the whole deſign is effected by the leaves of claſped twine, which move the various threads of that part of the yarn, which is ſtretched in the loom, and which is called the warp. Theſe leaves are called heddles in Scotland, healds in Lancaſhire, and may probably be known by other names in different parts of the country. The paper upon which the deſign is to be drawn, is ruled from top to bottom with a number of parallel lines, the intervals between which repreſent certain portions of warp. Theſe, being again croſſed by other parallel lines at right angles, the latter repreſent that part of the yarn which is inſerted by the ſhuttle, and which is called the woof or weft. The deſign-paper, when ruled, has the appearance of a number of ſmall ſquares, and in theſe the deſign is inſerted with a black lead pencil, or with any kind of water colour, very frequently with vermilion, or red lake. Every interval upon the paper may be ſuppoſed to repreſent either one or more threads. When it will not occupy too much ſpace, and when the deſign requires particular delicacy of ſhape, the moſt accurate way is to make every interval repreſent only one thread. At other times it frequently repreſents two, and ſometimes more.

The five figures in *Plate* IV., *Miſcellany*, repreſent the uſual modes of drawing deſigns for the ſpecies of ornamented cloth moſt commonly made in Great Britain. Different ways of effecting ornaments in the loom are practiſed, according to the fabric of the cloth, and the purpoſe to which it is to be applied. In the lighter manufactures of the ſilk, lawn, and muſlin trades, now chiefly uſed as ornamental parts of female dreſs, the fabric is generally ſo flimſy, that, when ornamented in the loom, the figures, in order to have any ſhow, muſt be compoſed of yarn, much coarſer than that which forms the ground or fabric of the cloth, and this yarn is ſometimes dyed of different colours. Being moſt convenient in general, and the patterns more eaſily changed, the weft, or woof, is moſt frequently uſed for this purpoſe. *Figures* 1 and 2, are repreſentations of this kind of work. In *fig.* 1, every ſquare of the deſign-paper is ſuppoſed to repreſent one thread both of warp and woof. In *fig.* 2, it is ſuppoſed to repreſent two. For the application of theſe deſigns to the purpoſes of mounting looms, ſee the article DRAUGHT and *Cording*.

In the heavier branches of the manufacture of cloth, ornaments are effected without any alteration in the fineneſs of either warp or woof, and moſt frequently without any change of colour. The *figs.* 3 and 5, refer to theſe kinds of work, and the ſquares in each of theſe may be ſuppoſed to repreſent any number of threads from three to eight, according to the fineneſs of the cloth, and labour beſtowed in ornamenting it. *Fig.* 4, is alſo a kind of ornamented cloth of the dimity kind of a ſtout fabric. Each ſquare upon the deſign repreſents one thread. For the application of theſe, ſee the reſpective articles DIAPER, DIMITY, DORNOCK, and DRAW-LOOM, eſpecially the laſt.

When deſigns are drawn upon paper, the diſtance of the lines is generally ſo much more than the diameters of the threads which they repreſent, that the figure upon the cloth will often be very different both in ſize and appearance from the deſign. To calculate this accurately is an important part of the buſineſs of a ſkilful manufacturer. The rules, therefore, for this, with references to the plate, will be found in the reſpective articles to which they refer.

Some general remarks upon the principle of deſigning ornaments upon cloth, and upon the analogy which ſubſiſts between the figure of any flower or pattern, when drawn upon plain paper, when reduced to the deſign-paper, and when woven into the cloth, may, however, be uſeful to thoſe who poſſeſs an adequate knowledge of the art of manufacturing plain cloth, but who are not equally converſant with the various branches of ornamental weaving.

When an oblique or curvilineal figure is drawn or painted, either upon canvas, paper, or any other ſubſtance, no impediment exiſts to prevent the artiſt from drawing every oblique ſtraight line at whatever angle of obliquity he chuſes, nor from forming whatever curves will add to the beauty of the picture. But, when an imitation of this is to be transferred to deſign-paper, and from thence to cloth, the ſame facilities do not exiſt, and the utmoſt which the moſt ſkilful weaver can effect is only the neareſt poſſible approximation to the original from which he copies. Every perſon at all acquainted with weaving knows, that the threads of warp are ſtretched in the loom, forming ſtraight lines parallel to each other, and that theſe threads are interſected by the woof at right angles. No oblique pattern can, therefore, be formed in the loom, except by varying the point in the warp, where the interſection ſhowing the pattern appears, and every change of this point muſt be at leaſt equal to the diameter of one thread. Now, if we ſuppoſe that there are equal quantities of warp and woof in a web, and that a ſhift of one thread of warp is made, to the right or left, every time that a thread of woof is paſſed acroſs, the diagonal line produced will form invariably an angle of 45° both with warp and woof. The diagonal here, then, is produced by the reſolution of two equal forces, acting at right angles to each other. But an obliquity, confined invariably to an angle of 45°, would produce a very limited range of patterns indeed. *Figs.* 1 and 2, are ſpecimens of ſuch as may be effected by it. It becomes, therefore, neceſſary, in more extenſive deſigns, to vary the obliquity of the angles frequently, and this can only be done in two ways.

1ſt. By ſhifting the point of interſection over more than one thread of warp, which will render the angle formed by the diagonal line and warp greater, and that by the diagonal and the woof leſs than 45°, or

2d. By inſerting more than one thread of woof without ſhifting the point of interſection, the effect of which will be exactly the converſe of the former.

It is to be obſerved, that by the diagonal line is only meant the apparent line which is preſented to the eye; for as the ſhifts are at right angles, each will form either a ſquare or parallelogram, the true diagonal of which is intended to be repreſented, and the means uſed are therefore only approximations to this.

When the deſign (*fig.* 5.) is examined, as all the ſquares forming the flower are black, whilſt thoſe which repreſent the ground are vacant, every ſhift, when minutely inſpected, is evidently at right angles, although the general effect, when viewed at ſome diſtance, has the appearance of diagonal or curved lines. But, were this pattern woven upon a fine cloth, the diameters of the threads would be ſo much leſs than the meaſures of the ſquares which repreſent them upon the paper, that the angular corners which give the edges of the flower the appearance of being dented, would totally

totally diſappear, unleſs very minutely inſpected, and the flower upon the cloth would be much ſmaller than that upon the paper.

The following table of the angles, formed between the diagonals of parallelograms, whoſe ſides are in the ſame ratio to each other as thoſe upon the deſign-paper, has been calculated to aſſiſt in reducing the drawing of deſigns, as nearly as poſſible, to correct imitations of the drawings or paintings from which they are taken.

TABLE ſhewing by inſpection the angles of obliquity formed by colouring the ſquares of deſign paper for weavers, both by the warp and woof, from 1 to 9 ſquares each way; the line of woof being taken as the baſe.

| Squares of Warp. | Squares of Woof. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 45° | 27° | 18° | 14° | 11° | 9° | 8° | 7° | 6° |
| 2 | 63 | 45 | 34 | 27 | 22 | 18 | 16 | 14 | 13 |
| 3 | 72 | 56 | 45 | 37 | 31 | 27 | 23 | 21 | 18 |
| 4 | 76 | 63 | 53 | 45 | 39 | 34 | 30 | 27 | 24 |
| 5 | 79 | 68 | 59 | 51 | 45 | 40 | 36 | 32 | 29 |
| 6 | 81 | 72 | 63 | 56 | 50 | 45 | 41 | 37 | 34 |
| 7 | 82 | 74 | 67 | 60 | 54 | 49 | 45 | 41 | 38 |
| 8 | 83 | 76 | 69 | 63 | 58 | 53 | 49 | 45 | 42 |
| 9 | 84 | 77 | 72 | 66 | 61 | 56 | 52 | 48 | 45 |

The angles may be continued down to 1° and up to 89°, as follows: By the warp the number of ſquares to be coloured for one ſquare of woof will be for 85°, 11 ſquares; for 86°, 14 ſquares; for 87°, 19 ſquares; for 88°, 29 ſquares; and for 89°, 53 ſquares. And reverſing the operation for the ſame numbers the angles will reſpectively be the complements of thoſe quoted, *viz.* 11 ſquares 5°; 14 ſquares 4°; 19 ſquares 3°; 29 ſquares 2°; and 53 ſquares 1°.

To underſtand this table it is neceſſary to obſerve, that the left hand column from top to bottom contains the number of ſquares, coloured upon the deſign-paper, and forming the edge of the flower by the warp, or contained between one or more ſpaces from top to bottom of the paper. The croſs columns at the top contain the ſame by the woof, or acroſs the deſign, and the figures, where the one column croſſes the other, give the angle which the diagonal of a parallelogram, whoſe ſides are in the ratios of the two numbers to each other, would form with the baſe or croſs lines. When the number of coloured ſquares each way is equal, the angle is always 45°, and in all others the angle formed by the croſs ſquares is always the complement of the ſame number from top to bottom. The minutes have been thrown away, being unneceſſary in practice, and the neareſt degree, whether a little more or leſs, taken.

When a pattern is to be reduced from a common drawing to a deſign for weaving, this table may be of conſiderable uſe; for if a croſs line be drawn upon the original, the angles of obliquity may be taken with very conſiderable accuracy by a line of cords, or any of the uſual mathematical proceſſes, and a reference to the table will ſhew the number of ſquares which, when coloured, will produce the effect moſt nearly ſimilar. Curve lines are formed merely by changing the angles of obliquity, as frequently as neceſſary. When it is deſirable to make a ſmooth uniform line, it is always beſt to ſhift only one ſquare at a time, and make the ſhifts more frequent; for when many are ſhifted, the ſquare corners will be always too apparent; but where a rough edge is wanted, theſe may be reſorted to.

The calculation of the ſize of the flower upon the cloth, compared with that upon the paper, is merely a caſe of ſimple proportion. In order to calculate correctly, the greateſt number of ſquares coloured from right to left, and from top to bottom, muſt be counted, and the ſize of the flower each way meaſured; for deſign-paper is ruled to many different ſcales. The number of the reed, or, which is the ſame thing, the number of warp-threads in a given breadth, is then to be aſcertained, and alſo how many threads are repreſented by each ſquare. Theſe points being fixed, the ratio of the one to the other will be readily found. A ſingle example, taken from the damaſk flower, (*fig.* 5.) will illuſtrate this.

The ſquares coloured from right to left, counting from either extremity, are 107, and the meaſure is $5\frac{1}{8}$ inches.

From top to bottom the ſquares are 113, and the meaſure $5\frac{3}{8}$ nearly.

Let it be ſuppoſed that this pattern is to be wrought upon what is called a five leaf damaſk, containing 2400 threads in the compaſs of 37 inches. Every ſquare will then repreſent five threads either way; and the threads contained in the warp of one flower will be 535.

Then as 2400 : 37 :: 535 : 8.2479, or nearly $8\frac{1}{4}$ inches. The flower, therefore, upon this ſcale, will be $3\frac{1}{8}$ inches broader upon the cloth than upon the paper, and the exceſs of length will be found by a ſimilar proportion.

But were the ſame flower to be wrought as a ſpot, only two threads would be repreſented by each ſquare, and the number of warp-threads would be 214 in each flower. Suppoſe then the muſlin to be figured, to contain 3200 threads in 37 inches, the proportion would be

As 3200 : 37 :: 214 : 2.474, or nearly $2\frac{1}{2}$ inches. In this caſe the ſame flower, on the cloth, would be leſs than one-half of its breadth on the paper. The great diſproportion in the ſize of the two flowers depends partly upon the difference in the number of threads repreſented by one ſquare, and partly by the fineneſs or ſet of the webs. In the firſt, the ratio of decrement is *directly* as 2 to 5; in the ſecond, *inverſely* as 12 to 16.

When looms are mounted to work fanciful patterns, if the range is not too extenſive, heddles are uſed, which are moved by levers or heddles attached to them below by cords, and which are preſſed down by the weaver's feet. When the range of pattern becomes too extenſive to render this mounting convenient, another apparatus is adopted, which will be found in the articles DIAPER, MOUNTING, and the moſt extenſive in that of DRAW-LOOM. The more common mountings belong to the article DRAUGHT and *Cording*.

## DESIGNS FOR WEAVING.

*Fig. 7.*
*Similar Spots*

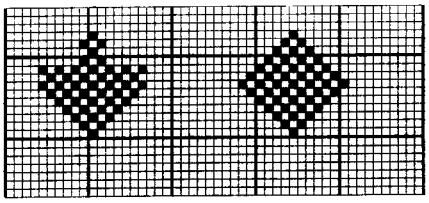


*Fig. 8.*
*Dissimilar Spots*

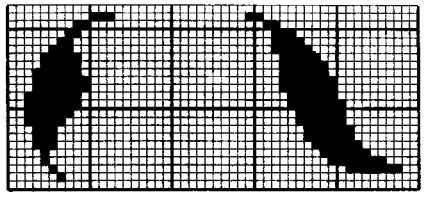


*Fig. 9.*
*Dornock*

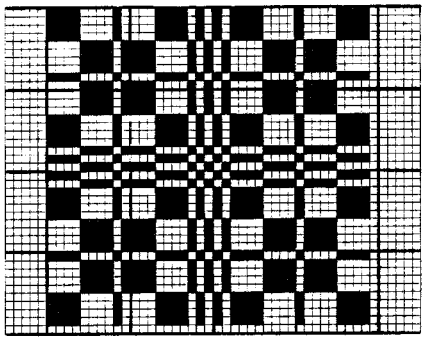


*Fig. 10.*
*Dimity*

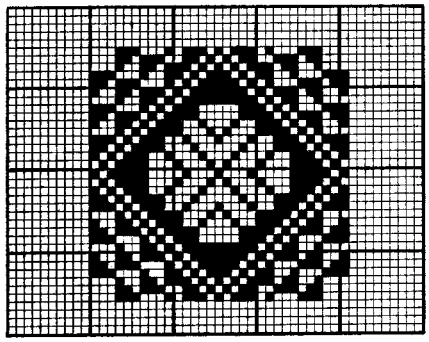
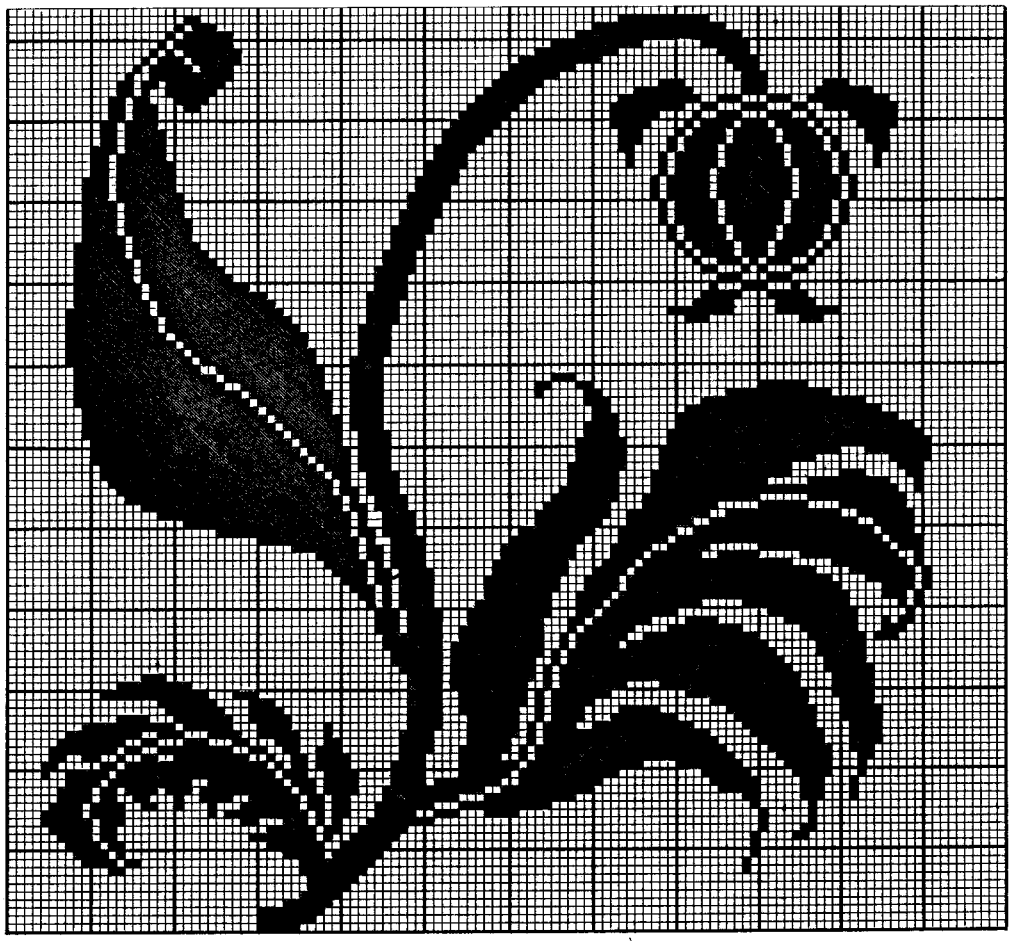


*Fig. 11.*
*Damask*



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