DRAFTS FOR DOUBLE WEAVES.

By "double" we understand weaves which have two layers of cloth woven at the same time, and either: 1 - independent of each other, 2 - stitched together, 3 - penetrating each other to form a pattern.

In the first case the two layers can be either joined on one side (double width, or semi-circular fabrics), or on both edges (hose, circular fabrics). Theoretically they can be completely separated i.e. not joined at all, but there is hardly any point in weaving such cloth.

When they are stitched together, the two layers are either woven in the same weave, and the same count of cloth (double tabby, double twill, etc), or in different weaves (one simpler weave provides a lining for the other) and different counts of cloth. The stitching may form a pattern, and padding weft (wadding) may be inserted between the two layers (quilt weaves).

Finally when the two layers penetrate each other so that a pattern is formed we have double pattern weaves. The simplest may be woven on 8 frames in tabby, the most involved require a draw-loom with a double harness. Often there are two warps and two wefts - one fabric is then closely woven and makes the ground when the other is rather loose and stands out on the flat background (tissue weaves). Again the two layers may be free (in case of small patterns) or stitched together.

Before we can discuss all these weaves we must understand the principle of drafting double weaves. Although their theory may be quite simple, the drafts are certainly not. First of all we have to distinguish in the threading draft two kinds of warp ends: these which make the first layer, and these which form the second. Even when they are of the same grist and colour they should be marked differently. The same applies to the weft, i.e. to the treadling draft. In all we should use four different symbols for weft and warp.

The draw-down is the most difficult part of the draft. In single layer fabrics we always assume that the warp is of one colour and the weft of another, whether this is true in the practice or not. With two layers we must have two colours for each layer, i.e. four colours. These can be designated either by colours (which in print is rather expensive) or by symbols. But even with these four colours it is impossible to show in the draw-down the actual texture of the fabric since the draw-down is only two-dimensional and cannot represent two layers of the fabric on one surface of paper. Thus even with four colours or symbols we can get the draw-down of the upper layer only. However we assume that the fabric is open enough to show us through the spaces left in the upper layer, whatever there is to be seen of the lower layer.

Fig.1 shows a draw-down made in the familiar "white-and-black" of a double cloth with independent layers. It is obvious that the draw-down is misleading: it shows a fancy twill instead of two layers of tabby. The same draft made in four colours or rather symbols of colours (fig.2) is hardly any clearer, until we go to the trouble of marking the floats both in warp and weft (fig.3). Now the upper layer becomes visible and can be recognised as tabby. The lower layer still remains a mystery. What can we do to see the other side of the fabric? Well, we can reverse the tie-up by replacing the empty spaces in the

tie-up draft with ties, and the ties - with empty spaces (fig.4). Now after making another draw-down we have the view of the back of the fabric with only glimpses of the front layer.

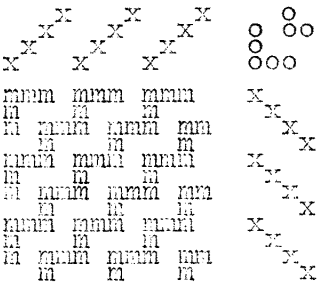

Fig.1

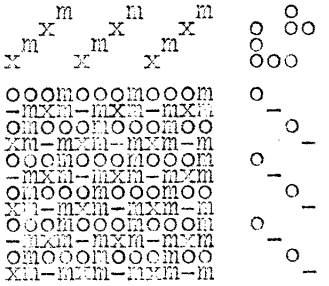

Fig.2

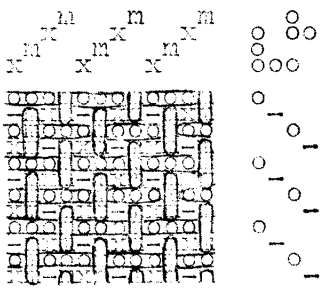

Fig.3

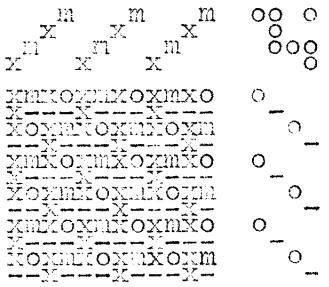

Fig.4

In figures 2 and 3 the horizontal (weft) floats are "ooo", and the vertical (warp) ones "mmm". "-" and "x" are glimpses of the lower layer. In fig.4 horizontal floats are "---", and the vertical "xmx". "m" and "o" belong to the upper layer.

It is advisable for a "beginner" in three-dimensional fabrics to perform with each new draft all the above operations, i.e. first draw it down as if it were a single-layer fabric, then use four symbols as in fig.2, then outline the floats, and finally draw the other side of the fabric. The first two drafts are necessary because in many books particularly about ffdustrial weaving either of them (often only the first) may be used to illustrate the fabric, and no threading or treadling drafts are given. The last two are equally important at least in the beginning, because they help the weaver to visualise the actual structure of the cloth.

Of course the drafts for two separate layers, semi-circular, and circular fabrics will be always the same. Two shuttles, one for each layer, will give separate layers. When double-width fabric is required only one shuttle weaves both layers. It makes two shots in one layer, then two in the other. For instance: 1,3,2,4 (fig.5). The fold in the fabric is made between the shots 3 - 2, and again between 4 - 1. Now it is obvious that only the direction in which the shuttle travels decides on the position of the fold. If we start from the right on treadle 1, then the fold will be on the right, and vice versa. For circular fabrics the treadling will be: one shot in one layer, then one shot in another, for instance 1,2,3,4. Here the direction of the shuttle does not matter.

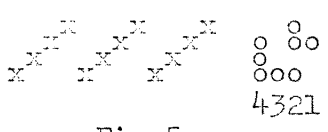

Fig.5

The twill can be woven on the same principle as tabby. The number of heddle-frames will be always double, compared with the same twill woven in single layer. Thus the simplest double twill can be woven on 6 frames (fig.6). The tie-up has four parts or quarters. We shall call them further: NW (North-West), NE, SE, and SW.

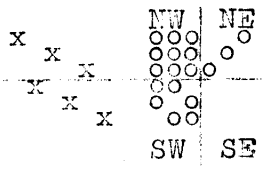

Fig.6

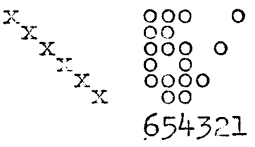

Fig.7

The NW, and SE parts serve to separate the layers of fabric. NW keeps frames: 4, 5, and 6 out of the way, when the twill is woven on frames: 1, 2, and 3. SE is doing the same for the other layer woven on frames 4, 5, and 6. The SW part of the tie-up serves to weave one layer, and NE - to weave the other. The threading in fig.6 is quite clear, because the two layers are separated but not very convenient. If preferred, the draft on the fig.7 can be used, Here the threading is simple, but the tie-up not so clear. The treadling for a circular fabric in both drafts will be: 142536, and for a double-width cloth: 124531642356.

Here however two additional factors come into play. One is the twill itself: as we know 1:2 twill becomes 2:1 on the opposite side of the fabric. Another is the direction of the diagonal. If we are weaving a double-width fabric, we would like probably to have the same uninterrupted diagonal all across the fabric after it is opened. The same may or may not apply to a circular fabric.

The twill on top of the upper layer should be the same as the one on the under-side of the lower layer. This is why in fig.6 NE part of the tie-up is just the reverse of the SW. If instead of the tie-up in fig.6 we would use the one in fig.8, we would have two identical layers of cloth, which means that after opening the fabric we would have one half of it woven in 1:2, and another in 2:1 twill.

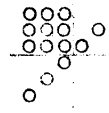

Fig.8

"Opening" a double-width fabric means reversing half of it, or turning it over. At the same time what has been on the left comes to the right, and vice versa..So that if we want a diagonal running in the same direction after opening, it must run in the opposite direction when being woven. In fig.6 both diagonals (NE, and SW) have the same direction. In fig.9 the directions are opposed, and it is this last tie-up which should be used. Or the tie-up may remain as before but the treadling will be changed. It is rather probable that a simple threading will be used, as in fig.7. Then the treadling for a circular fabric with a continuous diagonal will be: 162534, and for a double width fabric: 126531462354.

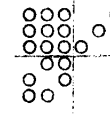

Fig.9

The same applies to other twills and to other weaves as well: the general principle of making a draft for a double fabric is to divide the heddle-frames into two groups: one for the upper, and one for the lower layer, and thread these two groups independently. If both groups have the same count, we alternate one heddle in the first group with one heddle in the second group.

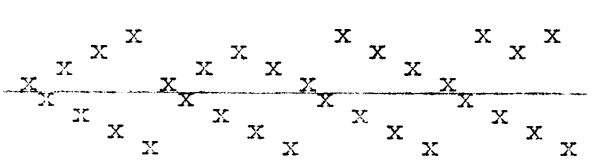

Fig.10

For instance in fig.10 the upper four frames are threaded for diamond twill, and the lower four - for a biased twill. It depends on the tie-up and treadling, whether the twill will be 1:3, 2:2, 3:1, plain, or broken. Supposing that we make a cushion cover with one side in broken twill and the other in diamond pattern, we have to decide first on the twill - only then we can proceed with the tie-up. If the broken twill is 3:1, and the diamond - 2:2, we place ties for 2:2 twill in the NE section of the

tie-up and the ties for 3:1 twill (but reversed) in the SW (fig.11).

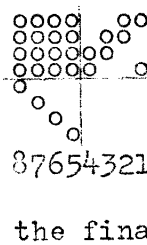

Fig.11

The SE corner remains empty, and the NW filled with ties. As explained before these last two section of the tie-up serve only to keep the two layers apart. The treadling for the upper layer will be then: 432143412341, and for the lower layer: 5768. These two treadlings must alternate since both layers are woven simultaneously, and the final treadling is: 45372618453746182537461 8. In the same way any two weaves can be combined into a double fabric.

As stated previously, the two layers can be stitched together. However, if they are stitched it means that they will penetrate each other in spots, and that some of the first layer will be visible on the second, and vice versa. Stitching does not mean necessarily additional heddle-frames. It is quite easy to make a stitched double cloth on 4 frames.

Since two sections of any double-cloth tie-up are just separating the two layers, it is enough to change anything in these two sections (NW and SE) to have these layers stitched. For instance if in the tie-up on fig.8 we just drop the central tie in the NW corner (fig.12) we shall have one stitch every 6 picks and every 6 ends. If we want it tighter we may add one tie in the SE section (fig.13). It would be unwise to do more than this - the two layers would become too closely mixed.

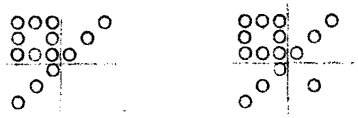
Fig.12

Fig.13

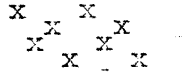

Fig.14

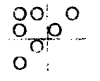
Fig.15


Fig.16

When working with 4 frames, stitching should be limited to one tie only. Even then it is quite visible. Fig.14 shows the theoretical (seldom used in practice) draft for two layers of tabby. The treadling for a circular fabric: 1324. To stitch the two layers we can either eliminate onetie in the NW corner (fig.15) or add one in the SE corner (fig.16). After the threading draft is changed into a conventional one, the tie-up is changed accordingly. On fig.17 we have the new tie-up as well as the draw-down. "⊕" - is the stitching tie, and "=" - the stitches visible on the upper side of the fabric. If we compare this draw-down with the one on fig.2 we shall notice that not only the stitches from the lower cloth are visible on the top, but that some floats in the warp become shorter. This is because they in turn become "stitches" visible on the other side of the bottom layer.

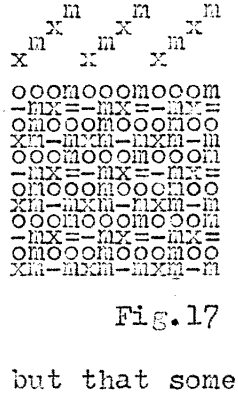
Fig.17

Very often stitches obtained by changes in the tie-up are not satisfactory - they lie too close together and spoil the appearance of the fabric. They can be more widely spaced in one direction by using an additional treadle - stitching treadle (1 on fig.18) In treadling this treadle is used only from time to time instead of treadle 4. E.g. 5432543251 32.

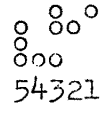

Fig.18

If it is necessary to space the stitches further apart in the horizontal direction as well - an additional heddle-frame must

be used. In our example on fig.17 the stitching takes place on frame no.4. The heddles on this frame are then distributed on two frames and only one of them used for stitching (fig.19). The treadle 1 is as before the stitching treadle. When an additional frame is used, the stitches may be as far apart as desired. In fig.19 every other heddle is transferred from the frame 4 to the frame 5. But if we transfer to the stitching frame only every third, or forth etc. heddle - the stitches will be much farther apart.

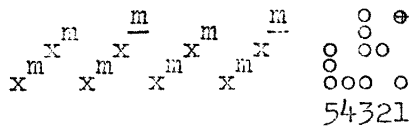

Fig.19.

The above remarks form just an outline of the theory of double weaves. We shall discuss in the coming issues the joining of unequal fabrics, patterns in double weaves, and a few simple tissue weaves.

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