TWO-HARNESS METHOD

Weaving with two harnesses (two sets of heddle-frames) at the same time is a method which can be used in connection with nearly all pattern weaves. Its advantage is that the total number of frames is comparatively low, so that multiblock patterns can be woven without recourse to special shedding machines such as dobbies, jacquards etc. For instance 5 block damask would require 25 frames and as many or more treadles in a single harness loom, but only 10 frames and 5 treadles in a two harness one.

This is the main advantage. Incidentally there are other:
1. The threading is very simple.
2. The weave can be changed without re-threading the loom, sometimes even without changing the tie-up.
3. All possible variations of a most involved pattern can be woven on the same simple tie-up.

The disadvantages are:
1. The method requires a special loom. Only very few looms for single harness can be converted into two-harness ones.
2. The setting up of the loom and its adjusting is difficult.
3. The method works best with elastic yarns such as wool or cotton. The less elastic the yarn, the longer (from slabstock to breastbeam) must be the loom.
4. The wastage in warp is slightly higher than usual.

The loom frame has all the essential parts of a single-harness loom, but it has much more space in the back (i.e. between the batten and the slabstock). This is because in this space we have two instead of one harness. The front harness hangs close to the batten and it has usually 4 or 5 frames. It is called ground harness. It may be of a counterbalanced type with a shed regulator, or a double tie-up jack type. Single tie-up jack type is not to be recommended. This first or ground harness is operated by treadles. The frames are about 3" higher than usual and they have long eye heddles. The length of eyes is 3" or thereabouts.

The second, back, or pattern harness hangs at a distance of at least 12" from the first, and not less from the slabstock. This distance is a very important factor, on which depends the performance of the loom. With such yarns as single linen it may even twice as much. This second or pattern harness has heddles with short eyes, but the heddles are much longer than the standard ones. The length of these heddles depends on the distance from the heddle to the batten, the larger this distance - the longer the heddle. The number of frames in the back harness is equal to the number of blocks in the pattern woven, with the exception of double weaves, where it is twice the number of the blocks. The frames are operated by hand. They are sunk in normal position and raised when in operation.

Each warp end is threaded both through the back and through the front harness (fig.1). The frames of the back harness can have only two positions: raised or sunk. But the frames in the front harness have three positions: raised, sunk or neutral (half way between raised and sunk). This third position.is the one which makes all the difference between plain weaving and the two-harness method.

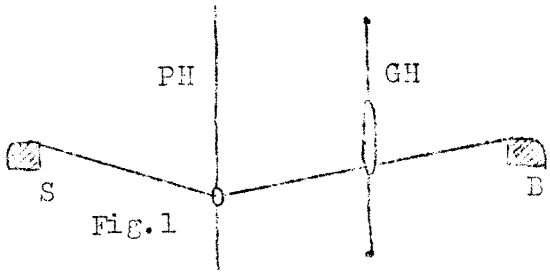

Fig.1

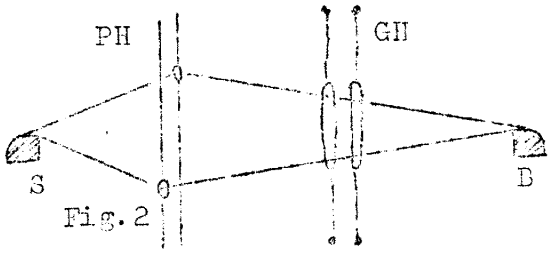

Fig.2

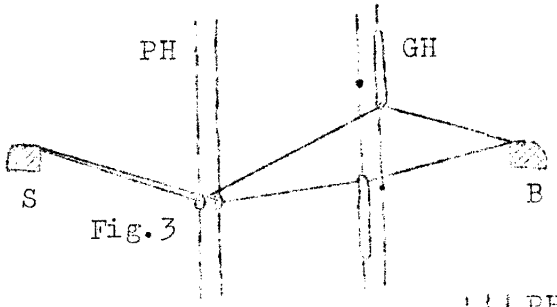

Fig.3

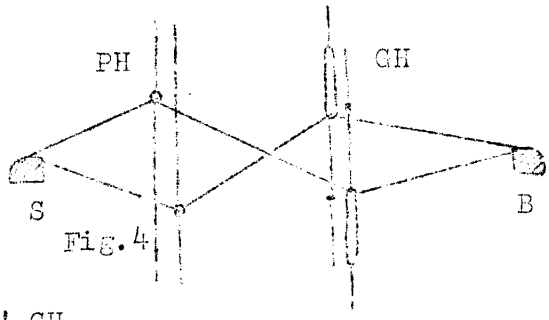

Fig.4

S - slabstock
B - breastbeam

PH - pattern harness
GH - ground harness

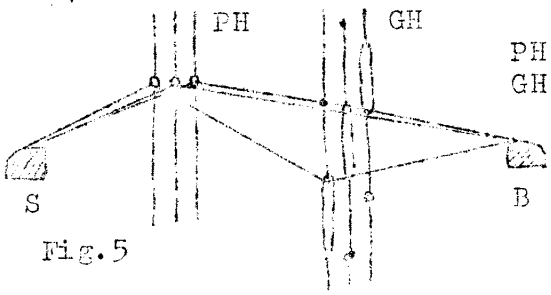

Fig.5

In fig.2 the front heddles are neutral, when one of the pattern heddles is raised, and the other sunk. We can see that the shed is opened by the action of the pattern harness only - the ground harness does not work. In fig.3 the situation is just the opposite: although both pattern heddles are sunk, the shed is opened by the front harness only - the position of the pattern harness has no influence on the shed. The same phenomenon is illustrated in fig.4. Here the pattern heddles are are working actually in the opposite direction to the front heddles, but the final effect is as if only the ground harness were working. Finally in fig.5 we have a case where the shed is opened by the combined effort of both harnesses. The lower part of the shed is sunk by the action of the ground harness - the corresponding warp end passes through the raised pattern heddle (a) and then through the sunk ground heddle (A). The upper part of the shed is raised partly because ground heddle C is raised, and partly because heddle B is in neutral position, but pattern heddle (b) is raised. Thus the end A will be sunk and the end C raised independently from the action of the pattern harness, but the end B may be either sunk or raised, according to the postion of pattern heddle (b). If this heddle is sunk we shall have two ends down and one up in our shed; if it is raised - two ends up and one down, which may for instance change 1:2 twill into 2:1 twill.

One of the obvious applications of the two-harness method is to perform two entirely different weaves on the same fabric. Since each harness may be threaded quite independently from the other, we have no difficulty in doing it. One weave is done when all ground

heddles are in neutral position, and the other when all of them are either sunk or raised, but not neutral. The first weave is threaded on the pattern harness, the second on the ground harness. In practice however this method is seldom used for this particular purpose.

The main object of the two-harness method is to weave the ground on the front harness, whatever the ground may be, and the pattern on the back harness. For instance if we have 3:1 twill in the ground (fig.6) it can be turned into 1:3 twill by raising some portions of the pattern harness. Consequently the pattern will appear in 1:3 twill on the background of 3:1 twill.

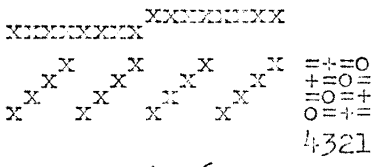

Fig.6

The tie-up here has three kinds of ties: "o" for sinking shed, "+" for rising one, and "=" for neutral. In practice, for instance with a counterbalanced harness, "o" are normal ties, "=" similar ties but about 3" longer, and "+" - no ties at all. Thus when we depress treadle 1, frames 1 and 3 are in neutral position, frame 2 is raised and 4 - sunk. The position of warp ends in heddles 1 and 3 depends then on pattern harness. The latter has all heddles sunk when not in operation so that finally ends 1,3, and 4 would be sunk and 2 - raised. With treadle 2, frames: 2,3 and 4 will be sunk, with 3 - 1,2,3, and with 4 - 1,2,4. All this as long as the pattern heddles are down. The loom will work then as if it had the tie-up for 3:1 twill (fig.7). But if we raise all pattern heddles, the warp ends threaded through ground heddles 1and 3 in case of treadle 1, - 2 and 4 for treadle 2 and so on will raise also, and the loom will work as if it had a tie-up for 1:3 twill (fig.8). Thus by sinking or raising the whole pattern harness we can weave either 1:3 or 3:1 twill. Finally if we raise only part of the back harness, the fabric will be woven partly in one and partly in the other twill. For instance in fig. 6 we can raise frame A in pattern harness. Then the left hand part of the fabric will be woven in 1:3, and the right hand part in 3:1 twill.

As we mentioned before, the pattern harness is seldom operated with treadles. Usually it hangs on cords from pulleys. These cords can be pulled from the front of the loom. One or more pattern frames are selected and pulled up; then the handles are fixed in slots or other arrangements of this sort for the duration of one block of pattern.

The warp ends are threaded singly through the ground harness, but usually in groups of 4 or 8 through the pattern heddles. One group should contain one or more full units of the weave. In double weaving however both harnesses must be threaded singly. Each block of pattern has two pattern frames - one for each layer of the fabric.

Fig.7 Fig.8

2. Drafting.

Because of the complexity of this method it is advisable at least in the beginning to work out all problems in form of draw-downs. The draw-down for two.harness method is made in a slightly different way than in case of single-harness loom. In fig.9 we have the pattern harness (3 frames) at the top of the draft, then the 4 frames of the ground harness below. The top right hand corner of the tie-up draft is for the pattern frames, the lower left hand - for the ground. The tie-up for

the pattern frames really does not exist at all - it is marked on the draft to indicate the order in which the frames are used.

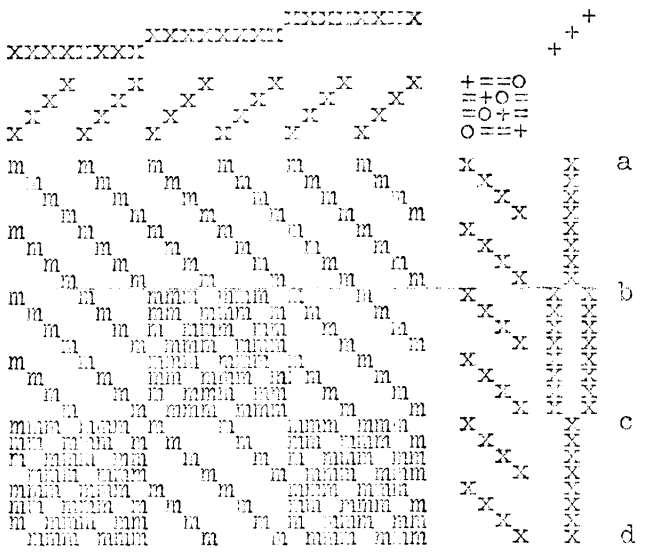

Fig. 9

When making the draw-down we disregard at first the pattern and mark down only the ends sunk by the ground harness (fig. 9 from "a" to "b"). Then we take row by row the heddles which are in neutral position (=) and look up to the pattern harness to find out whether the corresponding end is raised or sunk, to mark it accordingly. For instance in line "b" all heddles on frames 2 and 3 are neutral, so that they will be sunk in the central part of the draft corresponding to frame 2 in pattern harness, and raised on both ends below the frames 1 and 3, which are raised. Thus in this line we mark black all heddles on frame 1 of the ground harness, and these on frames 2 and 3 which are below the sunk pattern frame. In the next line we shall mark black everything on ground frame 2, and these ends on neutral frames 1 and 4 which are threaded through the pattern frame no. 2. In the last part of the draw-down from "c" to "d" pattern frame 2 is raised and 1 and 3 sunk, so that the blocks which were woven in 1:3 twill are now 3:1 twill and vice versa.

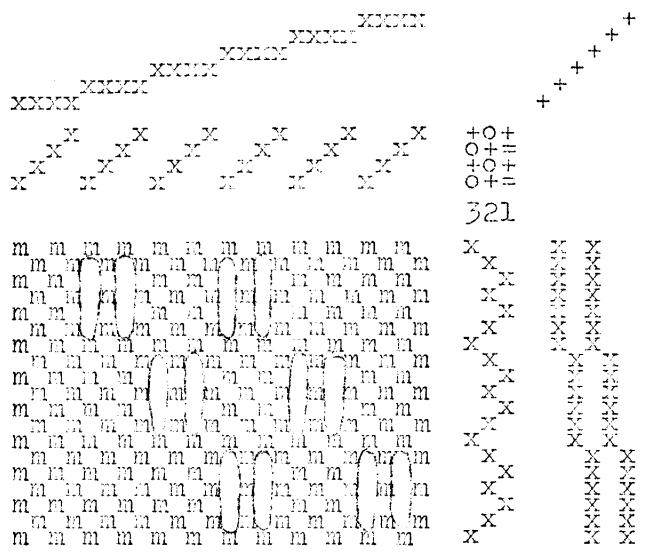

Fig. 10

Let us take another example (fig. 10). This is a sort of a spot weave. It may be all-over pattern, or plain spots (but not lace). With the same threading but a different tie-up it could be dornick, or summer-and-winter, or crackle, or a number of other weaves. There is no real economy in weaving plain spot weave in this way, but we have selected this example for its simplicity. Treadles 2 and 3 are tabby, and since they have no neutral ties they will always weave tabby regardless of the position of the pattern frames. Thus when making the draw-down we disregard completely the pattern harness as long as we work with these two treadles - we simply mark tabby all accross. However, when treadle 1 is used there is nothing to mark down at first since it has no sinking ties. The only ends which can be sunk depending on the position of pattern frames, are the ones threaded through the frames 1 and 3 in the ground harness, because these frames

are in the neutral position. The third line of the draw-down has pattern frames 1,3,5,6 sunk, which means that below these frames the warp ends threaded through ground frames 1 and 3 will be sunk - the remaining ones are raised. In the second part (from "b" to "c") pattern frames 1,2,4,6 are sunk, which produces floats in warp corresponding to the pattern frames 3 and 5. Finally from "c" to "d" similar floats will be formed below pattern frames 4 and 6.

Thus the drawing down of drafts for two harness looms has two stages: first we mark down all the warp ends which are sunk by the ground harness, because these will be sunk regardless of the position of the pattern harness. Then row by row we fill in the ends which in the ground harness have neutral position, and which at the same time are sunk by the pattern harness.

In the articles to follow we shall discuss typical weaves which are best adapted to this method, and finally the application of the method to the construction of a draw-loom, where each pattern heddle can be operated independently.

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FROM THE CLASSICS

John Murphy - "Treatise on the Art of Weaving".

Taste.

Since taste therefore is essential in every department of fancy weaving, as well as in other works of genius, while at the same time it is so very difficult to distinguish between a good taste and one of an inferior kind, it would be of use here to inquire what is the standard by which the different tastes of men might be compared, so as to discriminate between the true and the false. As this, however, would lead to a discussion, which, to some might appear foreign to the present undertaking, I shall content myself with quoting a few remarks on taste from Dr. Blair, referring the reader who wishes more information on this subject, to the second, third, and fifth of his lectures on Rhetoric and the Belles Lettres. "Taste," says he, "is the power of receiving pleasure from the beauties of nature and art." - "Nothing that belongs to human nature is more general than the relish of beauty of one kind or other, of what is orderly, proportioned, grand, harmonius, new, or sprightly." - "But although none be wholly devoid of this faculty, yet the degrees in which it is possessed are widely different. In some men only the feeble glimmerings of taste appear, the beauties which they relish are of the coarsest kind, and of these they have but a weak and confused impression; while in others, taste rises to an acute discernment, and a lively enjoyment of the most refined beauties. In general we may observe, that in the powers and pleasures of taste, there is more remarkable inequality among men than is usually found in point of common sense, reason, and judgment.".

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