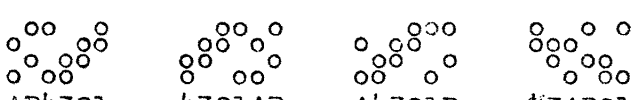
THE LOGIC OF TIE-UPS

To many weavers who can read at a glance a threading draft, and can follow easily most involved treadling directions, the tie-up is still something like a magical formula to be learned by heart. The tie-up is as logical as any other part of a weaving draft, but for various practical reasons it is seldom used in its pure and clear form. Thus we might discern between "theoretical", easy to understand tie-up which we would expect to accompany every draft, and its more "practical" variation, often obscure and enigmatic which we actually find in most cases.

A theoretical tie-up can be used in practice, provided that we have a sufficient number of treadles, but it seldom will be an easy one to work with. Thus it must undergo certain modifications, such as shifting the position of treadles, or distributing the work of one "theoretical" on two "practical" treadles. To understand the principle of a tie-up we must study it in its pure form, but if we want to work with it, we must in addition take under consideration all the different factors which influence the efficiency of treadling.

The first tie-up which we shall discuss is so called "standard tie-up". It is really standard only on counterbalanced looms with a 4 frame harness. Such a loom works most efficiently when the same number of frames is tied to each treadle. Tying two frames to a treadle we get the highest possible number of sheds (or combinations of frames) namely six, and this is why c.b. looms with 4 frames are supplied with 6 treadles. These 6 combinations are: 12, 13, 14, 23, 24, and 34, but we seldom tie the treadles in this particular order. For weaves which use a continuous threading (twills, overshot, and crackle) the tie-up may be one of the following:



where A and B are ground or tabby treadles, and 1, 2, 3 and 4 - pattern treadles.

Since the pattern treadles can be arranged in 16 different ways, and the tabby in two ways, the total number of possible variations of a "standard tie-up" is onehundred and eight. This number does not contain all less logical arrangements of treadles, which are still more numerous.

Weaves using a not continuous threading draft *) such as Summer-and-Winter have a different arrangement of treadles, but always the same two groups: one for the ground and one for the pattern (fig.1).

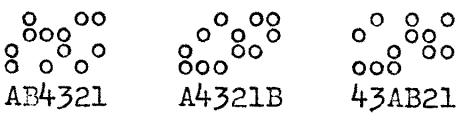


Fig.1

Here the pattern treadles have two kind of ties: one operating the pattern proper (frame 3 or 4) and the other bringing down one of the front frames which do not influence the pattern, but which cut large blocks into short floats of equal length. To understand the logic of this particular arrangement of ties we may visualise what would happen if we disconnected one of the ties. By removing the upper tie we shall get no pattern whatsoever on one side, and one continuous row of floats on the other side of the fabric.

*) a continuous draft is one which does not "jump" from frame 1 to 3, or 2 to 4, and vice versa.

By removing the lower tie we shall have tabby alternated with very long floats where the blocks of pattern should be. Thus the tie-up has really three parts: a (fig.2) binder, b - pattern, and c - which gives the texture peculiar to the weave. The same division of the draft will apply to all spot-weaves. Of these three parts a and c

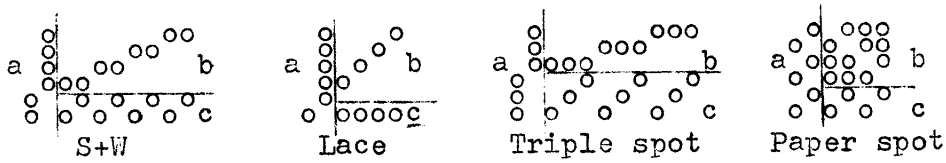


Fig.2

remain always the same, or rather the same in principle, when b changes according to the pattern woven. Let us suppose, that an anlysis of pattern (see "Analysis of patterns" in the same issue) gave us a short tie-up draft which looks like the one on fig.3. To develop it into a full S+W tie-up we first double the ties since each block of pattern

Fig.3

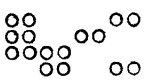


Fig.4

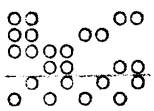


Fig.5

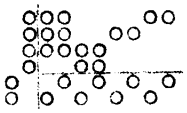


Fig.6

requires two treadles (fig.4). Then we add the ties for the front frames which give the proper texture (fig.5). Finally we complete the tie-up by adding tabby treadles (fig.6).

The tie-ups for diamond twills even when woven on as many as 16 frames are quite clear, as long as they are drawn in their "theoretical" form. E.g. in the tie-up on fig.7 except for the two tabby treadles, we can see an exact reproduction of one quarter of the pattern. This is true at least for twills threaded in plain diamond, not in double-point of M or W type, where the pattern will be more involved than the tie-up. From the tie-up we can judge also what kind of texture the fabric will have, whether it will be firm or rather loose. In the tie-up on fig. 7 the right hand lower corner gives a firm fabric with floats of from 1 to 3, when the left hand upper corner has floats from 2 to 7. Thus we may expect a fabric of uneven texture with one part of the pattern raised.

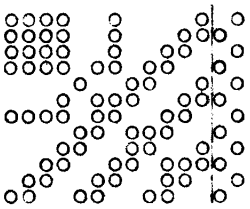


Fig.7

Turned twills (diapers, dornicks, damasks) have only two basic components in each tie-up, each of them being a tie-up for a simple twill, and one just the reverse of the other. This basic tie-ups are repeated in the main tie-up as many times as there are blocks in the pattern both in the horizontal and in the vertical direction. For instance if we weave a pattern with a short tie-up draft as on fig.3 in 1:2 twill, then we shall use the two following tie-ups as the basic ones:  and  To develop the short draft into a full tie-up we replace each "o" on the short draft with the second basic tie-up, and each empty space with the first. These two basic tie-ups are satisfactory only when they can be placed one beside another in any position, without having any ties lying opposite each other across the dividing line. Then we say that the blocks in the draft are properly "cut", i.e. have a clean outline. If this condition is not fulfilled (fig.9) we shall have long floats crossing the line between two blocks of the pattern.

Fig.8

Thus the tie-ups in fig.10 are right, and those in Fig.11 are wrong.

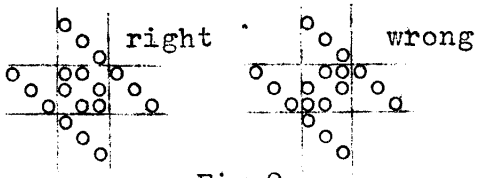


Fig.9

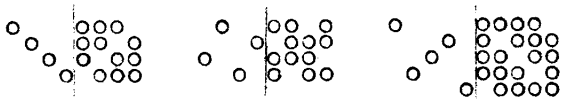


Fig.10

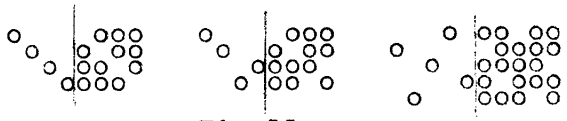


Fig.11

What we said about the turned twills applies to the double weave as well. Here also we have two basic tie-ups and they are part of the main tie-up. However the condition concerning the "cut" of blocks does not apply here. As an example of a tie-up for a four block pattern in double weave we shall take again the short draft on fig.3 and we shall replace each "o" with the basic tie-up a on fig. 12, and each empty space with tie-up b. The whole is quite clear (fig.13) as long as we have the lines dividing the 16 basic tie-ups. After these lines are erased it becomes a puzzle, except perhaps for experts.

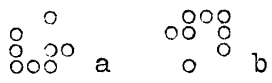


Fig.12

We cannot discuss here all possible weaves, but as far as the tie-up is concerned the above ones are the most typical, and the same principles will apply to any other weave with an exception of tie-ups for the two-harness method, which we shall take separately later on.

So far we have been speaking about tie-up drafts in their "theoretical" form. But most of them would not be very suitable for actual weaving. This is beaause we have to use both feet alternately to achieve rhytm and efficiency in weaving. Now, for instance, the tie-up on fig.7 requires a continuous treadling from the left to the right and back, which is a slow process.

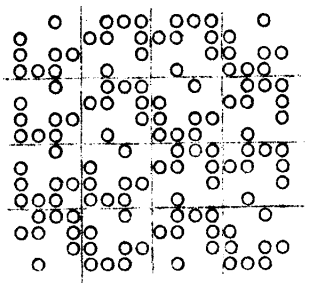


Fig.13

Much more practical tie-up will be the one on fig.14. Here the treadling is much easier and faster but all similarity between the tie-up and the pattern is gone.

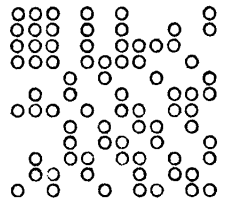


Fig.14

Very often the theoretical tie-up must be rearranged, because there are not enough treadles, to use it in its original form. For instance: a triple spot-weave requires 3 treadles for each block of pattern. Thus a 3-block pattern which can be woven on 6 frames asks for 11 treadles at least, or for 26 if all combinations of blocks are woven. In such a case we have to simplify the tie-up and use two or more treadles simultaneously. For instance treadle marked "x" on fig.15 must be replaced with two treadles on fig.16. Even so certain combinations will be impossible ("y" on fig.15), and either the pattern or the tie-up must be changed. Since every loom has too few treadles (4-frame one should have fourteen) the weaver must often develop a lot of ingenuity in adapting tie-ups to his limited technical means.

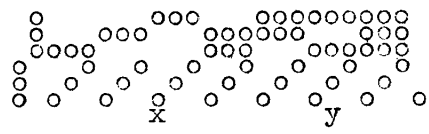


Fig.15

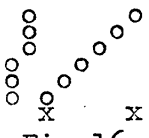


Fig.16

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