MASTER WEAVER

BULLETIN FOR HANDWEAVERS

MARCH 1954

FULFORD · QUEBEC · CANADA

INFORMATION SERVICE

We shall try to help you with your own weaving problems, answering technical questions, supplying necessary information, finding books, and periodicals, and locating supplies.

Here are the rules of our service:

1 - Each question will be answered by letter.

2 - If the problem is of a general interest we may print the answer in the Master Weaver independently from the letter.

3 - There is a fee of one dollar which should accompany each question. This is returned immediately if we cannot answer your question.

4 - If the question is of such a nature that it cannot be answered in 500 words, we may either give you information about books or other publications discussing your problem, or advise you what would be the cost of a complete answer.

5 - We shall try to answer your letters immediately. In exceptional cases when we shall have to consult sources not readily available, it may take up to two weeks.

6 - To avoid misunderstanding, your questions or problems should be presented with all details.

Send letter to: Z - Handicrafts, Fulford, Que., Canada.

MASTER WEAVER

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March 1954 No.14

THE LEASE AND THE LEASE-RODS.

We can risk the statement that of all the parts and accessories of a weaving loom the lease rods (not "leash") are most often misunderstood. On one hand we have weavers who get panicky whenever they see lease rods being pulled out of the warp, and on the other those who make it a principle to never weave with lease rods in. Who is right?

First of all what is a lease? It is such an arrangement of ends of warp, crossed singly, in pairs, or even in fours, which keeps the ends always in the same order regardless of what may happen to the rest of the warp. If this order were not preserved the beaming would take a very long time, and in certain cases it would be even impossible. Should the lease be dropped after beaming the threading although possible will be difficult, and later on during weaving we shall discover that we have a lot of twisted ends which give an uneven tension to the warp and a wavy line to the weft.

Depending from the method of warping, we may have only one lease in the warp, or two - one at each end. In old English terminology the first of them has been called "portee cross", and the second "porrey cross".

A lease is not the only way of preserving the order of ends in a warp, but it is the easiest and the most efficient way.

The role of lease rods is two-fold: first they secure the lease itself, and from this point of view they are necessary only as long as the lease is needed. For instance after the loom is threaded the lease can be dropped, since the ends are kept in order by the heddles. Thus except when the threading does not produce tabby, and when at the same time there is a possibility of re-threading the loom, the lease rods might be removed.

The second role of the lease rods is to keep the back shed in the proper shape. This shed should have a definite size, and it should be as clear and free from tangled ends as the front shed.

If two or more ends of warp twist around each other, which may easily happen during beaming, they form a shorter shed than all other ends (fig.1). This means that there will be more tension on these twisted ends than required. Difference in tension results not only in a wavy line of weft (with elastic warp it disappeares soon enough), but it may stretch the twisted ends permanently so that after being too tense at first they become too slack later on. This produces in the fabric uneven areas alternately too open and too firm, thus spoiling both the appearanc

and the quality of the cloth.

In fine weaving we have still another factor. If the front and the back sheds are of widely different size (fig.2) there is a slight

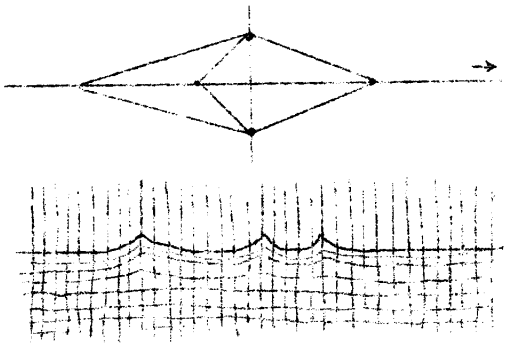

Fig.1

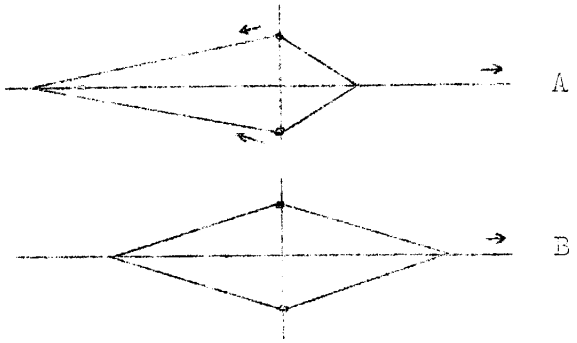

Fig.2

sliding movement of the warp through the heddle-eyes each time the shed is opened or closed. This movement may not amount to more than a very small fraction of an inch, but it is quite sufficient to break the yarn if the latter is fine and not resistant to friction. Even if the yarn is not actually broken, the friction in heddles will raise lint on the warp ends, which later on will show as a fluffy line running all across the fabric.

This effect is entirely negligible with such heavy yarns as for instance 10/2 cotton, particularly mercerised, but may have disastrous effects with single linen finer than No.30.

Since the friction here is between the yarn and the heddles - the harm done depends on what kind of heddles we use. The best from this point of view are cord heddles since they are soft enough to move together with the yarn so that there is hardly any sliding. The second best are good quality, well polished round wire heddles.

Thus the rules of using the lease rods are as follows:

1. We do not gain anything by removing the rods, except when finishing a warp.

2. The rods should not be removed whenever we may want to re-thread the loom, and when at the same time the threading has no tabby.

3. The distance between the rods and the harness should be the same as the average distance between the harness and the fell (last pick of weft, as in fig.2 B.

4. In working with fine yarns the lease rods must be in place. Even if they are not required in beaming (sectional warp), they should be inserted later on.

5. For the same reason as in 3 the rods must be tied to the loom frame so that they cannot move with the warp.

There is not much to be said about the mechanical properties of lease rods. They should be slender and springy, so that they bend easily when there is a tangle in the warp - instead of breaking the ends. They must have well rounded edges, and be perfectly smooth. They should be polished but better not varnished - the warp ends cut through the varnish. And finally they must have a large hole at each end.

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P I L E W E A V E S - 1.

C O R D U R O Y.

All pile weaves require some additional operations when compared with flat weaving, and many of them additional equipment as well. Corduroy is one of the simplest, as far as weaving is concerned, but the cutting of the pile takes more time than in other methods.

Corduroy belongs to weft-pile fabrics. It means that the pile is first woven as weft before it is cut. The pile itself after cutting is really neither weft not warp since at least theoretically its direction is perpendicular to both.

What is peculiar about the pile in corduroy, is that the depth (or height, or length) of the pile can be increased only at the expense of its density. The longer the pile the further apart it stands, and the more the background becomes visible. A nother peculiarity of this weave are rows or ridges of pile running always parallel to the warp. We can partly eliminate them by staggering the pile, but then the cutting becomes very difficult.

Thus the weave: 1-st - cannot produce a thick pile, 2-nd - the ground is often if not always visible, 3-rd - the pile is formed in ridges. This makes it unsuitable for rugs except very light ones. The classical application of corduroy were fabrics for clothing, rather fine and expensive to make ("corde du roi" = corded fabric of the king). These are rather beyond the reach of a handweaver, since the cutting of fine and short floats requires special machinery.

The same properties however which make corduroy unsuitable for heavy rugs, make it desirable in cases when the fabric has to be washed. Most pile fabrics take a long time to dry, because of the lack of air circulation in the pile. Corduroy is not so bad from this point of view and can be used such different articles as bath mats and place mats. Then it has one more peculiarity: it drapes well in the vertical direction (along the pile ridges), so that it makes good hangings, curtains, bedspreads etc.

One more advantage of this weave is that the pile appears only where it is cut, not like in velvet, or chenille. Thus by cutting only a part of the surface of the fabric we can produce patterns.

If we do not start the description of the weave with drafting, it is because corduroy can be woven on practically any draft which produces floats of any length in weft. Floats which skip 5 warp ends can be already used for making the pile. The only condition is that the weft besides forming floats must tabby with the warp for a short stretch between the floats. Thus nearly all overshot drafts (except overshot on opposites), spot weaves - particularly all-over spots, lace, huck (10x10 or 14x14), waffle, M's-and-O's, and many other can be used for weaving corduroy. The treadling is changed, of course, and the weft will be different than usual.

There are however special drafts, better adapted to the requirements of the weave, and it is only the latter that we shall discuss. Even so their number is rather high and we shall limit ourselves to a few typical variations.

Regardless of the draft, the principle of forming the pile is always the same and it is shown in fig.1. In A we have a cross-section

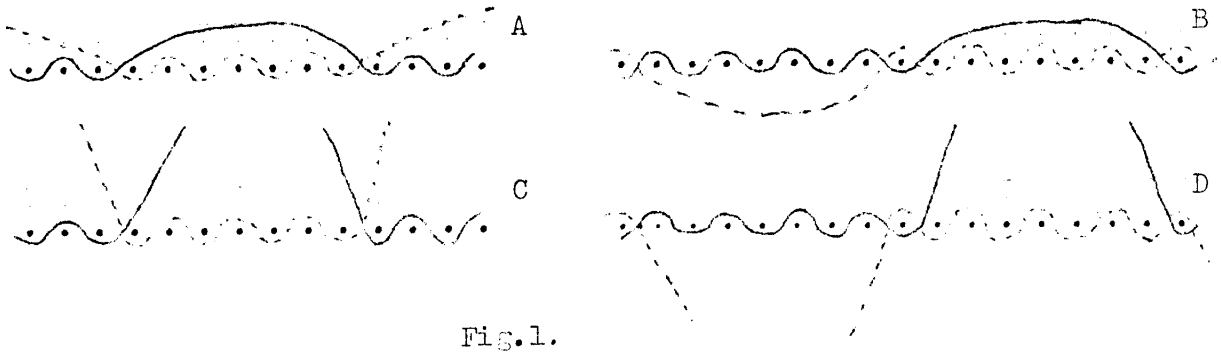

Fig.1.

of the fabric parallel to the weft, before the pile is cut, and in B - after. It becomes obvious from the drawing that the height of the pile is equal to one half of the distance between two rows. The pile may be all on one side as in fig.1 A and B, or on both sides as in C and D. However with all other factors remaining unchanged the pile on one side will be twice as thick as in the letter case. The pile may be of the same length on both sides, or not. Finally we may have short and long pile on the same side. We shall return to this last case since it presents the best solution of the problem of covering the ground.

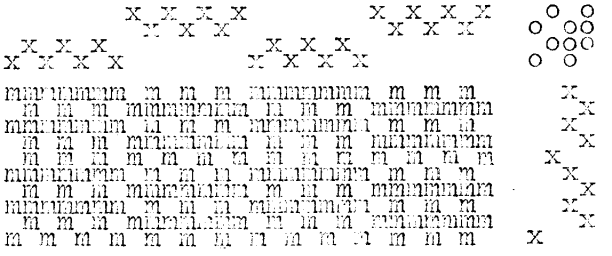

Fig.2.

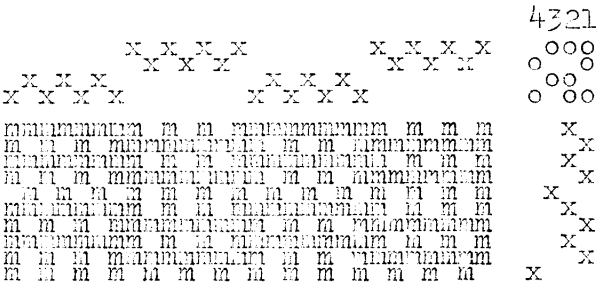

Fig.3.

Fig.2 shows a typical draft for corduroy. The draw-down shows floats of 7, with 3 repeats of tabby between rows of floats. The tie-up is for a counterbalanced loom and it this case the distinction is important since usually the floats are cut on the loom, and if they were formed on the lower surface of the fabric, they could not be cut until after weaving.

The same draft with slightly different tie-up can give longer floats (fig.3), but at the same time the pile is not so well interwoven with the ground, which means a weaker fabric. It may be noticed that in both cases we use a binder on treadles 3 and 4. This binder is necessary to cut the floats in the warp which are formed at the back of the fabric, and to hold the fabric together after the floats in weft are made into pile. In practice the shots of pile weft (treadles 1 and 2) come much closer together than on the draw-down, and consequently the binder may be used not so often.

We have to distinguish here between the yarn used for the pile weft, the binder and the warp. The pile weft is comparatively heavy, soft, and with only a light twist. The warp of medium weight because a very fine one would not hold the pile well enough. The binder very fine and strong. Since the ground is visible here, the colour of warp and binder should of the same shade as the pile weft, or slightly darker. As an example: 8/2 cotton for warp set at 20/",

16/2 cotton for binder, and 4/2 wool (1120 yds/lb) for pile. This will give a pile about 3/16" deep.

If longer pile is wanted we extend the halves of one repeat of the threading draft as in fig.4. Here the distance between two rows of pile will be about 3/4" and the length of the pile - 3/8".

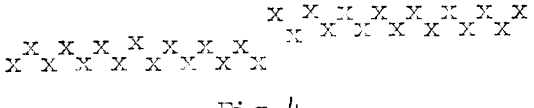

Fig.4

For long pile another draft may be preferable, because in the draft on fig.4 a too large portion of the pile weft is woven as tabby. This part is lost since the fabric doeas not need to be that strong. Fig.5 shows another draft where the tabby part is much shorter.

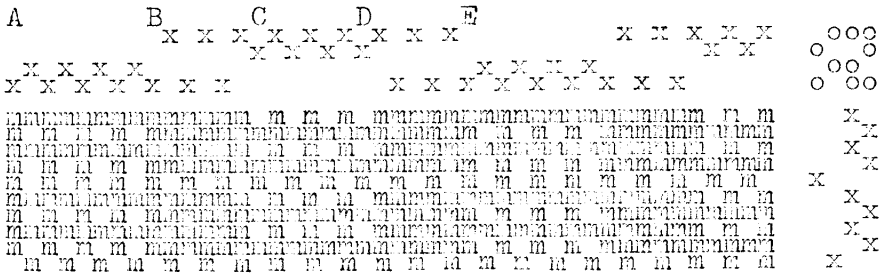

Fig.5

To compensate for this we shall have to use more shots of binder, and only experiment will show how many more. The draft such as given in fig.5 is only an example and the parts: A-B, B-C, C-D, and D-E may be made shorter or longer. The longer the parts B-C and D-E, the longer the pile, and the more economical the draft, but at the same time the fabric becomes very weak unless plenty of binder will reinforce it

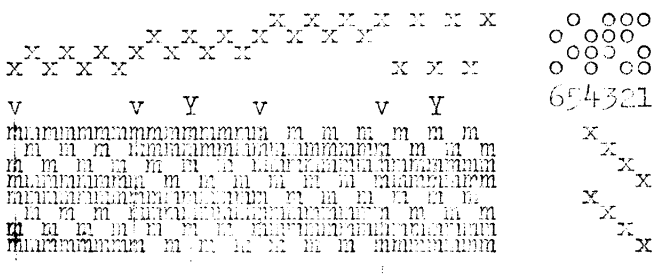

Fig.6

If we want the pile to be more uniformly distributed we can try the draft on fig.6. Here the binder (tr.:5,6) is optional since the tabby portions in other sheds overlap. But the cutting of pile presents a problem. If we cut in "v" we have pile of even length, but the cutting itself is very difficult. If on the other hand we cut in "Y", none of the floats is cut in its center and consequently we have pile of two different sizes: one nearly 3 times as long as the other. The diagonal which shows on the draw-down is hardly visible in practice, and in any case it can be broken by treadling 1324 instead of 1234, or 4321.

If for any reason we should like to have pile on both sides, we may use the same draft as in fig.6 but with a different tie-up (fig.7). Here the first shot of weft from the top will produce a float on the front of the fabric from A to B, and another one on the back from C to D. The second shot: floats from B to C, and from D to E, and so on. The floats will be much shorter than in fig.6. Since the tabby does not overlap we have to use the binder - otherwise the fabric would have vertical slits below A, B, C, D, and E.

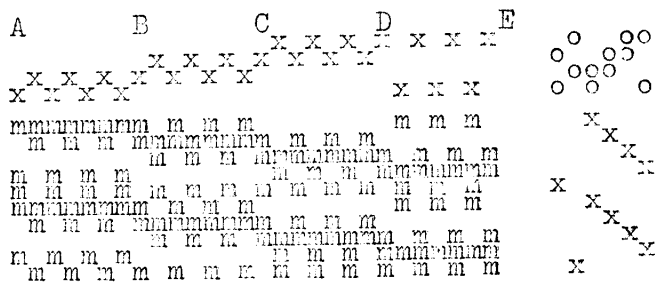

Fig.7

We may notice here that the threading draft as well as the tie-up is practically identical with many overshot drafts. Thus corduroy can be woven on overshot drafts of this type, the only difference being in treadling.

In drafts discussed so far the pile has been more or less uniform. We may change its depth very easily by changing the length of portions A-B, B-C, C-D and D-E in the draft on fig.7. For instance the draft on fig.8 has short pile at first then it gets longer towards the center of the draft and shortens again at the end.

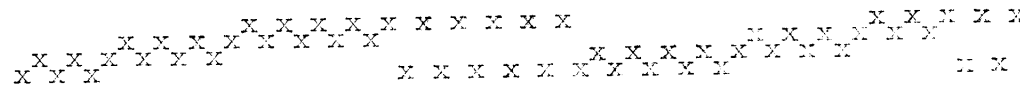

Fig.8

In some cases we may want pile of different depth to cover the ground between the rows of long pile. Here rows of short pile are "planted" in the middle of the empty space. Since the short float is in the center of the long one, both can be cut at the same time (fig.9) without such difficulties as in case of the draft in fig.6. The draft is shown in fig.10. Long floats appear between A and D, and D - G. The short ones: from B to C, and from E to F. The binder must be used quite often otherwise there would be no ground from B to C, and from E to F.

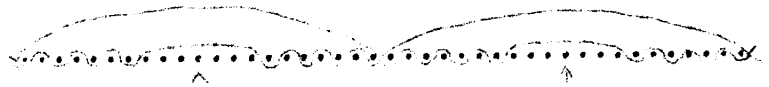

Fig.9

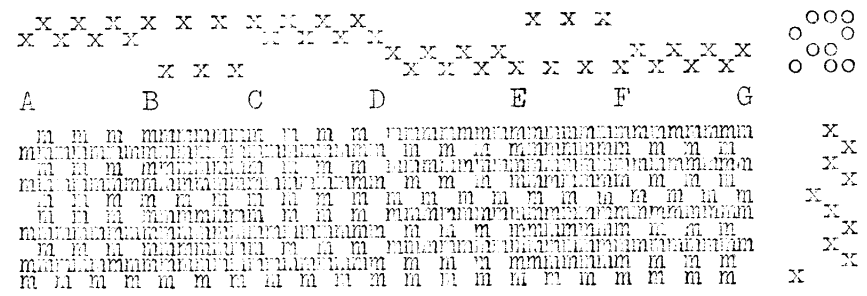

Fig.10

The colour combinations in corduroy present quite a few problems and the whole subject is too involved to include it here. We shall come back to it in one of the next issues of the Master Weaver. We may mention here that it is possible to weave four block patterns in colours on 4 frames.

We have already remarked that it is important to have the pile on the front of the fabric, even if the pile is cut later on. Thus all tie-ups given here should be reversed for weaving on rising shed looms.

If we use counterbalanced looms without shed regulator, we may have some difficulties with the sheds, since most tie-ups are unbalanced. Then the loom should be adjusted so that the pile sheds (e.g. 1 and 2 in fig.10) will open fully - then the binding sheds will be a little narrow, but it matters less, since the binder is used not so often

as the pile weft.

The cutting of pile has been done in old times with a special tool not available at the present. We have to use scissors. They should have long, very narrow blades, and dull but not curved points. It may be difficult to find such a model. Then at least one blade must be straight. Since the point is usually very sharp we can round it a little on a whetstone. This is to prevent the blade from digging into the ground and cutting the binder. Finally the blades should be very sharp to start with, and kept sharp at all times. When cutting, keep the warp under tension, insert the straight blade under the row of floats right in the center and cut, pushing at the same time the scissors forward. With short floats this operation is rather slow.

The last quarter or half of an inch of the fabric next to the edge may remain uncut, and later on turned under and stitched to the back. Thus the pile will reach right to the edge. Consequently the edges, since they are not going to be cut anyhow, may be threaded in plain twill (1234).

The fabric is cut on the loom after 6 inches of weaving or so. After it is taken off the loom it should be spread on a table and brushed vigorously in all directions.

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Let us take as an example of a complete project in corduroy a bedspread 2 by 3 yards. We shall use for warp 10/2 cotton set at 20 ends/". Thus we shall have about 800 ends, and the length of warp will be 7 yds. The bedspread will have a seam in the center but in corduroy it will be practically invisible. The threading draft based on the one in fig.10 is shown in fig.11.

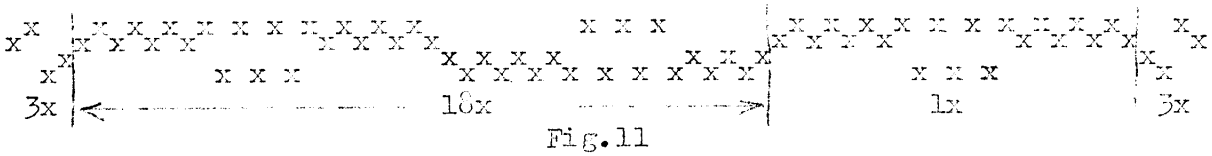

Fig.11

The binder may be 20/2 cotton. The pile - wool 2 or 3 ply, about 1000 yds/lb. All three yarns of the same colour.

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Some of our readers complain that their copies of "Master Weaver" are damaged in mailing. Unfortunately we cannot send the bulletin in envelops without increasing the subscription rate. However those who wish to have their copies better protected can send us self-addressed envelops of appropriate size (four for the remaining issues in 1954). The envelops cannot be sealed, so they must be of the type made specially for printed matter.

TWO-HARNESS METHOD - 2.

TURNED TWILLS.

Of many weaves which can be woven advantageously on a two-harness loom the turned twills are the most typical. For that matter many looms of this type are built exclusively for weaving the "D" class (Dimity, Dornick, Diaper, Damask). Perhaps before we go further we shall give definitions of all these terms. Except for damask they are all obsolete, but they have no corresponding terms in our modern language, and consequently we do not hesitate to bring them back to life in their proper meaning.

Dimity (not Dimity cord) is turned 1:2 twill, i.e. twill in which one part of the fabric is woven as 1:2 (weft passes over one and under two warp ends), and the other as 2:1 twill. In plain weaving 2-block pattern can be made on 6 frames, 3 on 9, 4 on 12 and so on. It has always a diagonal.

Dornick (but not Dornick twill) is a similar weave based on 1:3 and 3:1 twill. In plain weaving 4 frames are required for each block of pattern. It can be biased or broken. When it is broken it may be sometimes called rough damask or just damask, but this extension of the meaning of the word "damask" is rather confusing and should be avoided. The proper term for such an imitation of damask is "damassé", another obsolete word.

Diaper (again has two meanings). Any turned twill as long as it is not damask proper. Thus both dimity and dornick are diapers, but besides those any twill of higher order (1:4, 1:5, 1:6 etc) if turned but not broken into a satin will belong here.

Damask is a turned satin. Since satin is a broken twill of the type 1:N where N is more than 3, and where the breaking of the diagonal is done according to certain rules, not every twill 1:4, 1:6 etc even if broken is necessarily damask. However in practice such twills are seldom woven and it is either biased twill (which gives diaper) or satin which gives damask. In plain weaving the simplest damask can be woven on 10 frames - 5 frames per block of pattern.

We should like to emphasize that all these terms belong to the 18-th century hand weaving, and that no better or simpler terms have been used in hand weaving since.

To compare the number of frames needed for the above weaves both with single and two-harness looms we give the table below:

weave:	blocks:	single harness:		two-harness loom:	
DIMITY	2	6 frames	6 treadles	5 frames	3 treadles
"	4	12 "	12 "	7 "	3 "
"	8	24 "	24 "	11 "	3 "
DORNICK	2	8 "	8 "	6 "	4 "
"	4	16 "	16 "	8 "	4 "
"	8	32 "	32 "	12 "	4 "
DAMASK 1:7	2	16 "	16 "	10 "	8 "
"	4	32 "	32 "	12 "	8 "
"	8	64 "	64 "	16 "	8 "

It is obvious from the above that hardly any pattern with more than two blocks can be woven on a single harness. It is not even the number of frames which gets too high, but the number of treadles. With two-harness method we can go easily into higher damasks with a reasonable number of frames and a very low number of treadles, which is still more important.

There is another point here worth consideration. When we speak about the total number of frames used in two-harness method, some of them are pattern frames. This means that not only they are not operated by treadles, which makes weaving so much simpler, but also that they contain very few heddles. For instance if we have a profile for 5 block damask like the one in fig.1, where each "m" is equal to 2 units of

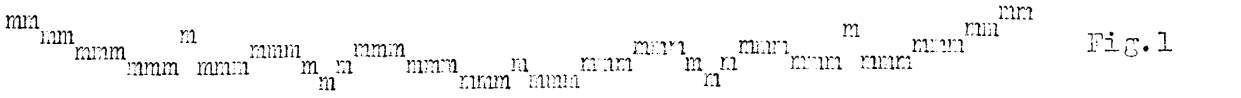

Fig.1

damask (10 ends), we need for the whole draft (590 ends) only 59 heddles on all 5 pattern frames, an average of 12 heddles per frame. The position of these pattern frames will be changed only 27 times during the weaving of one square, compared with nearly 600 movements of the ground harness. Thus the pattern harness really does not matter very much in weaving of turned twills. Once we have a loom with 10 pattern frames, it is as easy or difficult to weave a two-block, as a 10-block pattern.

The real problem in drafting for two-harness method is the tie-up. In all turned twills woven on single harness looms we design

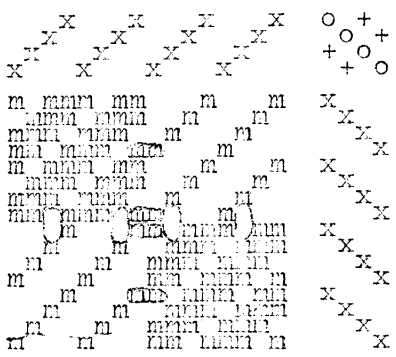

Fig.2

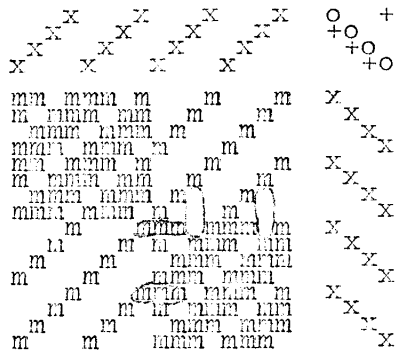

Fig.3

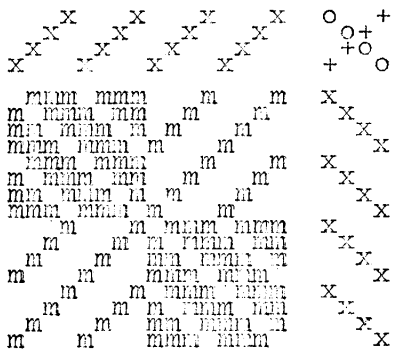

Fig.4

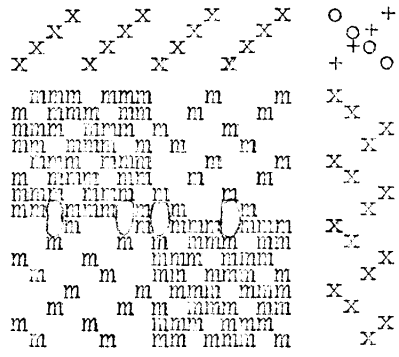

Fig.5

the tie-up so that the blocks of pattern are clearly "cut" from one another, i.e. that no floats either in warp or in weft cross the border line between two blocks (comp. "The Logic of Tie-Ups" in MW 3, 1952). But what happens in the two-harness method? Let's look on the floats

in the draw-down on fig.2. There are 4 floats in weft and 4 in warp crossing the line between blocks. With a different tie-up (fig.3) the blocks will be cut on two sides and "uncut" on the two remaining ones. Finally with the tie-up in fig.4 we have all blocks cut properly. We may notice at the same time that the diagonal in fig.2 and 3 runs in the same direction in both blocks of the pattern, when in fig. 4 twill 3:1 has a left hand, and twill 1:3 - a right hand diagonal.

When instead of a biased twill we have a broken one, the situation remains the same, i.e. the same tie-up will serve in both cases. However the treadling must be 1,3,2,4 or 4,3,2,1 but not 1,2,4,3 or 2,1,3,4. In other words the first and the last treadle in the repeat of a biased twill must remain the same when changing from biased to broken twill. Fig.5 shows what happens when we do not follow this rule. Here the blocks are cut in the vertical direction but not so in the horizontal. There are 4 floats in warp which cross the line.

In figures 2,3,4, and 5 we have omitted completely the pattern harness since in all four it is always in the same position.

Thus we have found two principles which seem to guarantee the success in cutting the blocks: 1-st the diagonals in two adjoining blocks must run in opposite directions; 2-nd each repeat of broken treadling must start and end with the same treadle as in the biased treadling. We shall see later how to apply these principles to other twills than dornick.

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WEAVING TERMINOLOGY.

Counter-marche. (fr.Fr."contre-marche") It is hard to say whether the confusion started already in French or only later on in English. Originally "marche" meant the same as treadle (thus "Marchure" means treadling), and a counter-marche was the same as a lamm. Now in double-tie-up looms we distinguish between the short lamms, and long ones, calling the latter - counter-marches. There is logic in that "counter" because the long lamms move in the opposite direction to the short ones, but "marche" is positively wrong. Why not call it "counter lamm", or just long lamm?

The double-tie-up loom is called accordingly "counter-marche loom", which really means a loom with lamms (any lamms). "Double-tie-up" itself sounds artificial, but "Swedish" which is supposed to mean the same, really does not mean anything at all. All kinds of looms are and always were used in Sweden.

Sinking and Rising Sheds. The terminology itself here is flawless. But its application not so. For instance the jack-type looms are obviously of the "rising shed" type. It means that the whole warp remains "sunk", and the sheds open by rising a part of the warp. The same applies to the table looms. But it is wrong to say that a counter-balanced loom works on the principle of "sinking shed". The shed opens in two directions. Each treadle no matter how tied will pull down one part of the warp and rise another. If necessary it can even leave some of the warp ends in the neutral position, as for instance in two-harness method (MW 13).

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PROBLEMS IN TEACHING LESSON 1.

DRAFTING.

A weaving draft is a distorted picture of the reality. It must be distorted since the reality has three dimensions and the paper only two. But it tries to show the weaver as clearly as possible what is actually happening on the loom during the weaving. It shows how the loom has been threaded, how the treadles are tied to the frames, in what order they must be used, and finally what kind of cloth is being woven. Additional verbal explanations speak about the yarns used, the number of ends (threads) in warp, the way the warp is passed through the reed, and so on.

The drafting itself is concerned only with threading, tie-up, treadling, and with the result of these three factors i.e with the way in which the threads are interlaced in the fabric.

A complete draft is a simplified view of the loom seen from above with the weaver (invisible) at the bottom of the picture. It has four parts:

1. The threading draft.

It shows the heddle-frames (or frames, or harness-frames, or leaves, or shafts, or healds, or incorrectly "harnesses"). All of them together should be called a harness. Each frame is represented by the space between two horizontal lines (these lines are often omitted later on). The heddles are shown as crosses or black squares.

The frames are numbered from the bottom up, so that the frame nearest to the weaver is always No.1. The heddles are seldom numbered; if so it is customary to number them from the right to the left. Thus on the draft in fig.1 the 1-st heddle is on frame 4, the 2-nd on 3, 3-rd on 4, 4-th on 1, 5th on 2 and so on. We shall thread the loom in the same order: the first warp end in a heddle on frame 4, the second on frame 3, 3-rd on 4, 4th on 1 etc. As far as the threading is concerned the draft is not necessary - we could give simply Threading Directions, thus: 4341234121432143412341214321. But the draft shows much better the arrangement of heddles that the directions.

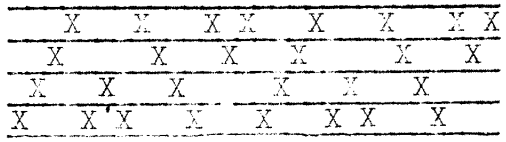

Fig.1

This is not the only way of representing the threading of a loom. Different countries and different times used other symbols than the ones shown above but the idea is always the same.

2. The Tie-Up Draft.

The tie-up means the way in which different treadles are tied to the frames. We place this draft either to the left or to the right of the threading draft, but exactly in line with it. In the tie-up draft we have both horizontal and vertical lines. One space between horizontal lines means one frame, as before. One space between vertical lines means one treadle. The frames are numbered here in the same way as in the threading draft; the treadles in most cases from the

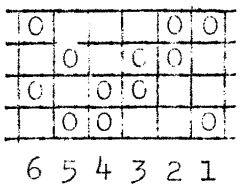

fig.2

right. Thus if we have 4 frames and 6 treadles (fig.2) it gives us 24 squares in the draft. Any kind of a mark in one of the squares means that the frame which is in line with the square is tied to the treadle immediately below the square. Circles, black squares, or crosses can be used. Thus the draft on fig.2 reads: treadle No.1 is tied to frames 1 and 4; tr.2 - to 3 and 4; tr.3 - to 2 and 3; tr.4 - to 1 and 2; tr.5 - to 1 and 3; tr.6 - to 2 and 4.

There are looms in which two symbols or even three must be used to show not only to which frame a treadle is tied, but <u>how</u> it is tied. But this belongs to higher methods of weaving.

<u>3. The Treadling Draft.</u>

This shows us in what order to use the treadles. It has only vertical lines and the spaces between them correspond to the treadles in the tie-up draft. The treadling draft is always placed directly under the tie-up draft. Any kind of marks can be used. It is read always from the top down. Thus the draft in fig.3 means that the first shot of weft is made when the treadle No.6 is depressed. The second on treadle 5. The third on treadle 4 and so on. Here again instead of a draft we could give Treadling Directions, which in our case would be: 6543216512 3465. This is done very often when the weaving draft is given not complete, i.e. without its last part. Then the treadling directions take much less space than treadling draft, and can serve as well. Sometimes numbers are used on the treadling draft, instead of plain marks, but this practice is not justified.

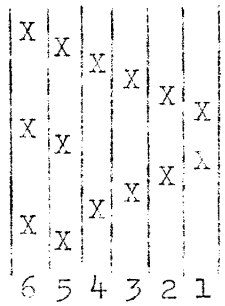

Fig.3

<u>4.The Draw-Down.</u> (or Block-Out, or Development)

This is a simplified picture of the woven fabric. Simplified, because it is all made on the assumption that the warp is white, the weft black, and that they both take exactly as much space, regardless of their actual size (count, grist) and colour. Thus a black square means that in this particular place the weft is on top, and a white square - that the warp covers here the weft.

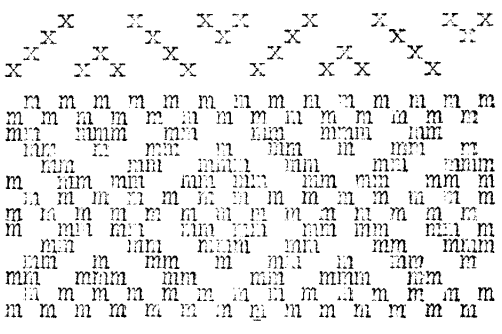
Fig.4

Now if we assemble all four parts we shall have a complete weaving draft. To use less space we shall eliminate the lines (fig.4). We won't need the numbers either, once we remember in which direction they go. We can see now that all the four elements of the draft are exactly in line: what is frame No.1 in the threading draft is the same in the tie-up. What is treadle No.6 in the tie-up is the same in the treadling draft. And finally that the draw-down is in line with both the treadling and the threading. A weaving draft in which the four parts are not aligned is practically useless.

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