

The background of the cover is a collage of various weaving-related documents. It includes several grid-based charts with intricate patterns, some of which are partially obscured by the text. There are handwritten notes in Finnish, such as "loimi- ja kudel- mallista pomsia yhdistet 23." at the top center. Other visible text includes "33 5428 5428 5428" in the top left, "345" in the top right, "Thread from A B C D E" in the middle, "P C" in the lower middle, and "3-752 K" in the bottom left. The overall aesthetic is that of a technical manual or a collection of historical weaving patterns.

# MASTER WEAVER

**BI-MONTHLY BULLETIN  
FOR HANDWEAVERS**



**Z-HANDICRAFTS  
FULFORD, QUE., CANADA**

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# MASTER WEAVER

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BI-MONTHLY BULLETIN FOR HANDWEAVERS

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## UNUSUAL YARNS • 2

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We have finished with natural (that is not spun) vegetable materials. Now the classification of other, out-of-the-way yarns is much more difficult. If we were publishing a periodical for spinners we would probably dwell at length on all sorts of fur-bearing animals, but such information would be hardly of any use to weavers. What remains falls into several classes which can be taken in any order: ribbons, metal, plastics, beads, quills, feathers. We shall start with ribbons because most of them are woven and thus resemble in behaviour standard textiles.

RIBBON should be the most obvious, the most logical yarn for many projects. Not only that for its weight it is stronger than any yarn spun from the same fibers, but being strong it is at the same time very soft, it is already flat (no need for processing), and has a definite width (no problem with the sett of warp).

Small samples of ribbon fabrics made on a frame loom do not present any difficulties. We wind the ribbon around the frame, leaving narrow spaces (1/32") between warp ends, and taking care not to twist it. The weft is wound on a small flat shuttle again without twisting. The shed is open with a very smooth picking stick or very large needle, but not with half-heddles or heddle-reed. Beating must be done very carefully; the beater (comb) should have the same sett as the warp. Or we can beat on a changed shed with a dull knife or a ruler, like in an inkle loom.

But when we try to do the same on a full size loom, either floor, or table, everything goes wrong. The ribbon gets twisted during warping, then beaming, threading, and even during weaving. The weft is not only twisted, but also crushed.

And we must remember that every twist in warp or weft is a mistake which cannot be just left there; it must be corrected, unless of course we want a hit-and-miss effect; then there are no difficulties whatsoever, but it is doubtful whether we shall like it.

Therefore we shall be concerned only with fabrics made of flat-lying ribbon in both directions. We shall take as an example a ribbon  $1/6$ " wide, and we shall describe all weaving operations in logical order.

Warping. Probably on a bet one could make a ribbon warp with standard equipment: a reel, or a mill, taking only one end at a time and being extremely careful about the crosses. But it would be an experience not easy to forget.

By far the easiest method is sectional warping. If our sections are 2" wide we need only 10 bobbins on the rack. These bobbins must be prepared beforehand, unless we can buy ribbon already made into bobbins. Making the bobbins means simply that we wind them very carefully, so as not to twist the ribbon.

The bobbins should be placed on the rack one above another if possible; at any rate all in one vertical section of the rack.

The normal raddle of the sectional equipment will be useless. We must make a makeshift raddle by driving 11 nails (1" finishing) in a piece of wood about  $3/4$ " x  $1\frac{1}{2}$ " x 4", which can be attached to the tension box or directly to the slabstock in front of the section to be warped. The nails are driven in a straight row  $1/5$ " apart.

When warping, it is safer to separate layers of warp with heavy paper. Strips  $1-15/16$ " wide should be prepared in advance.

Threading. Normal flat steel or wire heddles will have a tendency to fold or crush the ribbon. Very heavy cord heddles will be much better because the knot is wide enough to support the whole width of the ribbon. We could also try to bend the eyes of wire heddles into rectangles about  $1/4$ " wide, but it will be a slow operation.

Sleying. We must order a reed No.5, because this number is seldom in stock. In threading and sleying we can follow one of two methods: either do the threading without a hook using only our fingers, or use the hook and disregard the fact that the first few inches of the ribbon will be crumpled.

Tying-in. A/ If the threading was done without a hook we proceed as follows. We take a flat stick (an odd lease rod) slightly longer than the width of the warp, and tie its both ends to the breast piece so that the stick lies flat. Then glue the warp ends one by one to the stick (use fast drying glue). The stick should be marked every 1/5 of an inch for an easier spreading of the warp. When the glue is dry we lace the stick to the apron.

B/ If the threading was done with a hook, we do not try to keep the ends flat or straight. We tie them as usual in bunches and lace to the apron. To straighten out the warp before weaving we open one tabby shed and insert a flat stick. Then, starting at one edge we untwist the warp end by end, checking each end all the way to the warp beam.

Heading. Take any soft and heavy yarn and weave an inch or so. Do not pull the edges in.

Weaving. This is the worst part of it. We must use a flat shuttle preferably of the same length as the width of warp; with very wide warps: as half of the width. This makes unwinding of the weft easier. After throwing the shuttle we straighten the ribbon. It should lie flat and straight at a small angle to the fell. This is because even with fine ribbon there is still some take-up, and if we stretched the weft tight and parallel to the fabric, we would have pulled-in edges.

The real difficulties start now.

Beating. If we beat very lightly so as not to crush the ribbon, the weft will be too widely spaced. If we beat hard then the weft will be crumpled.

One way of getting over this snag is to experiment with different tensions of warp from very slack to very tight, with different types of beating (light, hard, fast, slow, pressing), and with different sizes of shed. If none of this helps we shall proceed as follows:

Throw the shuttle and straighten the weft. Close the shed to prevent twisting, but do not change it completely. Beat so as to bring the weft as close to the fabric as necessary even if it gets crushed. Keep the shed closed. Now grasp firmly the edge on the side from which the weft was thrown between the index and the thumb. Grasp

also the free weft on the other side. Pull very hard and fast. This should flatten the ribbon. Change the shed and press the beater very gently.

If even this trick does not work, there is only one thing left: sectional beating. We make a small comb by pushing 5 pins through a piece of heavy cardboard or a sliver of soft wood. The pins should be spaced  $2/5$  of an inch and should be all in one row.

Now, after the ribbon has been brought as close to the fabric as possible without crushing it, we insert the pins into the ribbon, close to its lower edge, and between the warp ends; only the point should penetrate the fabric. Then we pull forward very gently. This must be repeated in every section, that is every two inches all across the fabric.

A completely different approach to the problem would be to make the ribbon stiffer, by starching it or impregnating with wax. Then normal beating would be sufficient. The starch could be removed later on by washing, and the wax by dry cleaning.

So far we were dealing with a comparatively narrow ribbon. A still narrower one,  $1/8$ " set at 6 ends per inch would be easier to work with. But if we try wider ribbons,  $1/4$ " or more, the difficulties will multiply. Then we shall have to make special heddles, either by bending the eyes of wire heddles, or by replacing eyes with mails. The mails are small metal or plastic disks. They have a horizontal slit in the centre (for the ribbon) and two holes, one above and one below the slit for the cord loops. But making the mails at home would be extremely difficult.

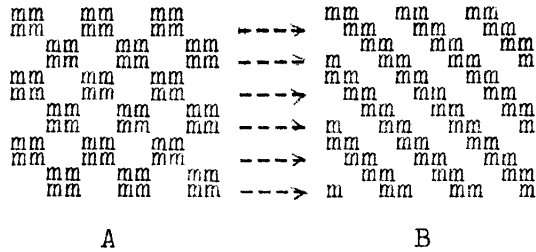
The threading should be only plain (1234). We use four shafts but in most cases we shall weave only tabby. Very effective patterns can be woven by alternating colours in both warp and weft. With very narrow and comparatively stiff ribbon we can experiment in 2:2 twill, or better twill mixed with tabby.

Regardless of the difficulties weaving of ribbons is worth trying. A good fabric of this type always attracts attention, and incidentally sells very well too.

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# T W I L L S

The most common type of twill (2:2) is a development of Basket weave. We have pointed it out already, but we may as well repeat this statement. A 2:2 basket (fig.1 A) has all floats of two in warp



A

B

Fig.1

and weft, and is a soft and weak weave. A 2:2 twill has also floats of 2 both in warp and weft but is much stronger. The only difference between the two is that every other pick of weft in basket has been shifted to the right (in our illustration) by

one warp end. This made the fabric stronger and also the weaving much easier. Since we have no more parallel picks of weft, there is also no danger of two shots being twisted in the same shed; therefore the weaving can be done with one shuttle and with normal rhythm.

The common characteristic of all twills is that in their basic, pure form they always produce a diagonal. But they can be woven in a number of ways, so that the diagonal may form any angle with the weft, not necessarily  $45^\circ$  as in fig.1 B. It may be "slow" or "fast" that is with an angle of more or less than  $45^\circ$ . The diagonal may change direction from time to time, or it may do it so often that it will be invisible for all practical purposes

The number of twills is unlimited, and therefore we could not possibly describe all of them. The best we can do is to classify twills according to their different properties.

The first factor which describes a twill is the length of floats in weft on both sides of the fabric. In industrial weaving the symbol which gives the length and relative position of floats consists of a solid line, which represents a pick of weft, with numbers above and below this line. The numbers indicate the length of floats. The numbers above the line are floats on the face, and the numbers below the line are floats on the back of the fabric. Thus  $\frac{2}{2}$  means: "over two and under two" (warp ends). There is one float of two on the face and one float of two on the back.

A twill  $\frac{1}{3} \frac{2}{1}$  means: "over three under one over one under two". There will be a float of three and a tie (single) on the face, and a float of two and a tie on the back.

In handweaving we use simpler notation: 2:2, or 3:1:1:2, but it means the same. Incidentally the sum of all numbers gives the number of shafts on which this twill can be woven.

Twills may have one diagonal (2:2) or more; for instance 3:1:1:2 twill has two diagonals on each side of the fabric.

Twills may be "balanced", that is all floats on both sides of the fabric are of the same length: 2:2, 3:3, 4:4.

A special class of twills is of the 1:N, or N:1 type. "N" stands for any number at all. For instance: 1:2, 2:1, 1:3, 3:1, 1:4, 4:1, 1:5, 5:1, 1:6, 6:1, 1:7, 7:1. Higher twills of this type (higher than 1:3) may be used to weave satins.

Twills which produce diagonals all across the fabric are called "biased". We may have right-hand or left-hand diagonals. Left-hand (LH) diagonal starts in the left upper corner of a drow-dawn, and right-hand (RH) diagonal in the right upper corner. A fabric which has a RH diagonal on the face, will have a LH diagonal on the back.

Reversible twills have both sides of the fabric identical except for the direction of the diagonal. All balanced twills are reversible, and all 1:N, or N:1 twill are not. A 3:1:1:2 twill is not reversible, but 3:1:1:3 twill is.

Warp-face twills have no floats in weft on the face. For instance: 1:N, 1:3:1:2, 1:4:1:2. If the twill is woven as 50:50 fabric (the same number of ends as picks per inch) then the back of a warp-face twill is a Weft-face twill. If the fabric has more ends than picks per inch then the face will be a warp-face twill, but the back should not be called "weft-face".

For true Weft-face twills the number of picks per inch should be even to, or higher than the number of ends per inch, and then the twills will be: N:1, 2:1:3:1, 2:1:4:1, etc.

Fig.2 shows several twills mentioned above. When comparing the sequence of floats in weft with the numerical notation of the twill we must realise that 3:1:1:2 twill is the same as 1:2:3:1;

3:1:1:3 - the same as 1:3:3:1, 1:4:1:2 - the same as 1:2:1:4 etc. It all depends on which particular float in weft we have selected as the beginning of the repeat, and whether we read from the left, or from the right.

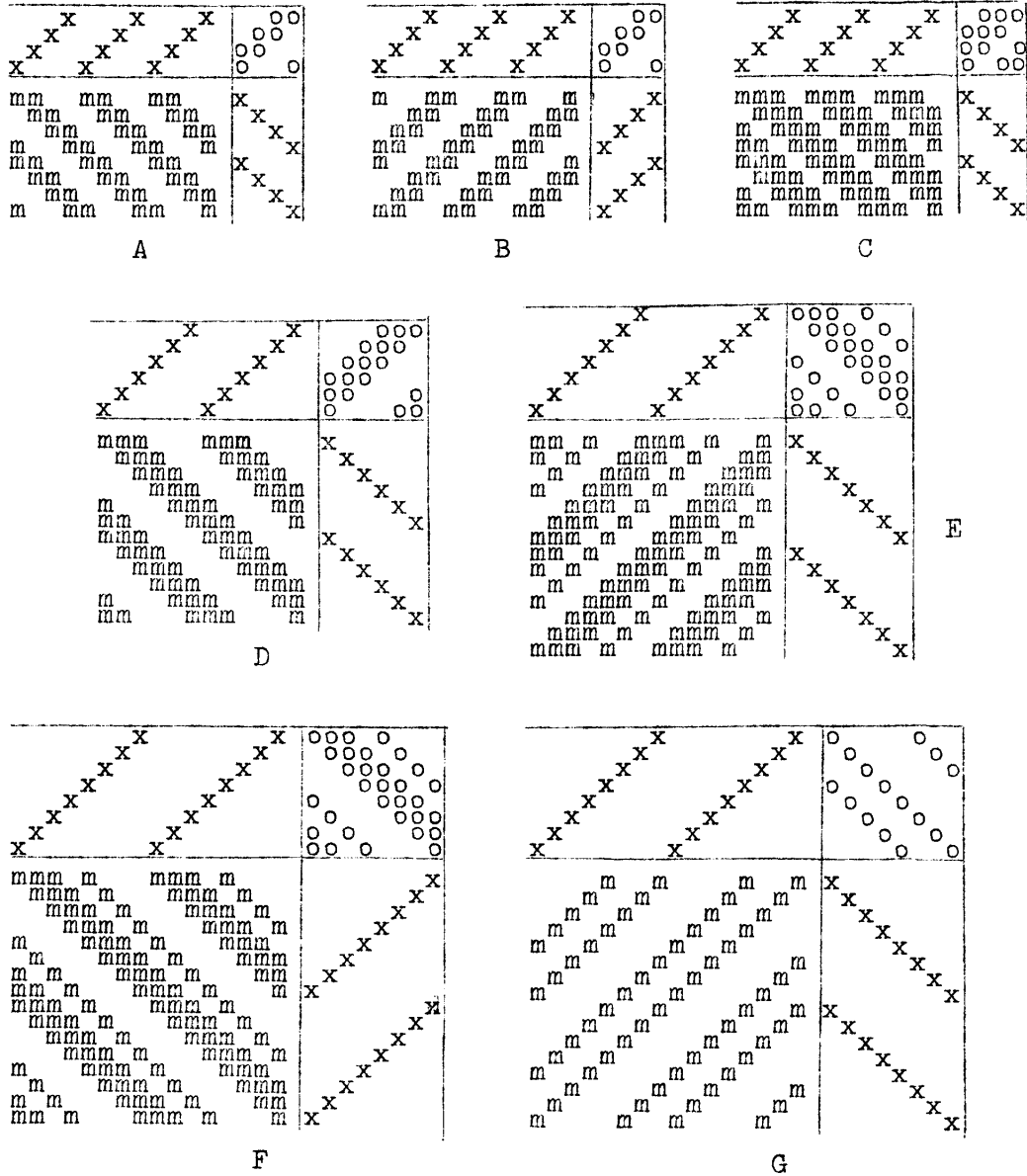


Fig.2

All twills in fig.2 are biased. "A" is LH 2:2 (balanced); "B" - RH 2:2 (balanced); "C" - LH 3:1 (weft-face); "D" - LH 3:3 (balanced); "E" - RH 3:1:1:2 (not reversible); "F" - LH 3:1:1:3 (reversible); "G" - RH 1:4:1:2 (warp-face).

One may have doubts at this point whether all this terminology is really necessary. What does it matter whether the dia-



gonal is LH or RH, whether the twill is reversible or not. It matters in one case: when we make yardage for clothing. If we want to make a coat and have a fabric which is not reversible, then we shall find out that the tailoring is impossible, because the diagonal will run always in the same direction, regardless of how we turn the fabric. We cannot turn it by  $90^\circ$  because that would substitute warp for weft, and the two have different properties (like shrinkage etc), even if they are of the same yarn. Thus goods sold by the yard must be made in reversible twills only. When weaving just a length for one article in not reversible twill we must make half of it with LH and another half with RH diagonal. All in all it is better to avoid not reversible twills in this type of work.

Here is a list of twills up to 8 shafts:

Reversible: 2:2, 3:3, 1:2:2:1, 4:4, 1:3:3:1, 1:1:2:2:1:1,  
1:1:2:1:1:2.

Not reversible: 1:2, 1:3, 1:4, 2:3, 1:1:2:1, 1:6, 2:5, 3:4,  
1:1:4:1, 1:2:1:3, 1:2:3:1, 1:1:1:2:1:1, 1:7, 2:6,  
3:5, 1:1:1:5, 1:1:2:4, 1:2:1:4, 1:2:2:3, 1:2:3:2,  
1:1:1:3:1:1, 1:1:1:2:1:2.

When selecting twills for a higher number of shafts than 4, one should beware of "false" twills, even if they look all right in a numerical formula. Thus 1:2:1:2 is the same as 1:2 (3 shafts instead of 6); 1:3:1:3 = 1:3; 2:2:2:2 = 2:2. We may use these twills exceptionally to avoid overcrowding of shafts, particularly with warp-face fabrics woven in sticky wool. Twill 1:2:1:2 has one superiority over 1:2 - it can produce tabby, which may be of importance when we use tabby and twill in the same piece of weaving.

In the next article we shall take up twills which do not produce continuous diagonals, that is are not biased.

We shall discuss practical problems of weaving twills at the end of this series, and then we shall have to spend some time on projects for yardage in general whether in basket or twill.

It would help if the Reader took the above list of twills and made draw-downs of all of them. The threading and treadling are always straight, and the tie-up must be found from the draw-down.

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COLOURS  
IN

CRACKLE

If we take a very simple draft of Crackle weave with four blocks of pattern, each block being used only once, we can weave each block in a different colour if we so desire. Fig.1 shows how this is done.

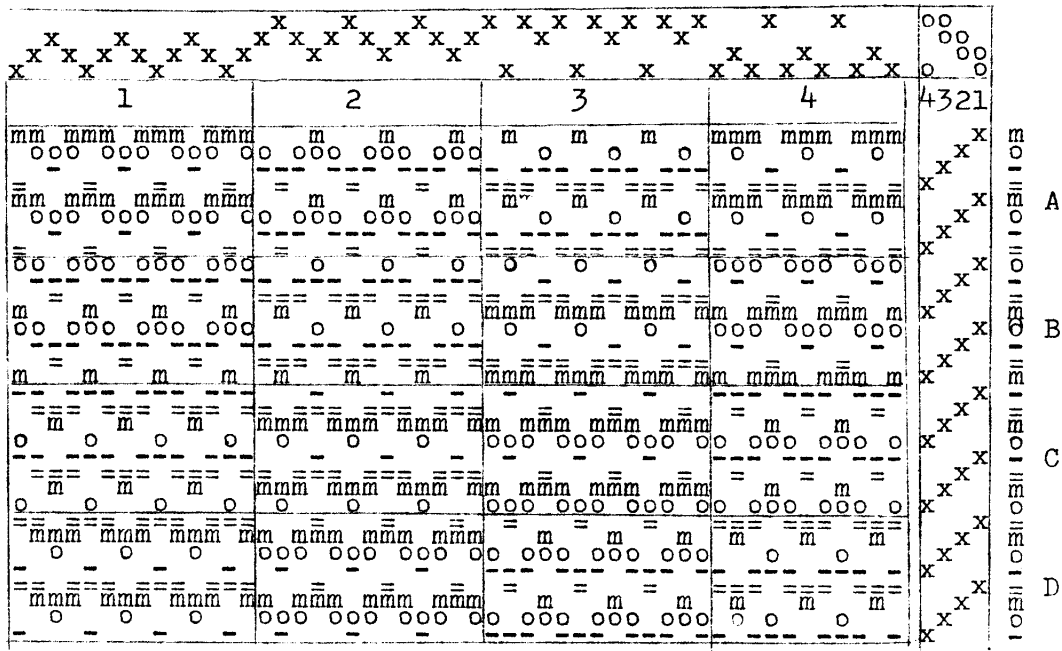


Fig.1

The treadling never changes, although for practical projects we would change the tie-up so as to be able to alternate the feet. What changes is the order of colours.

This type of treadling looks very much like bound weaving, and if we eliminate the binder (not shown in fig.1 anyhow) we shall have bound Crackle.

The main object of bound weaving is not only to do away with the binder, but first of all to cover the warp completely with weft. This cannot be done by treadling alone. The warp must be very open (for rugs 6 to 10 ends per inch), the weft soft and bulky, and the beating very hard. As a result we have no take-up in warp but plenty

in weft so that we must leave a lot of weft in each shed. Otherwise the edges will be pulled in to the point where further weaving is impossible.

Much finer fabrics can be also woven in bound crackle simply by using yarn about 4 times finer than the one for rugs, and setting the warp twice as close. But then the weaving is very laborious because of the very high number of picks per inch.

When making our own patterns in colour we must realize what exactly is happening, and this is why we made the draw-down in fig.1. This draw-down is divided into 16 areas: 4 blocks of pattern (1, 2, 3, and 4 in threading) woven in 4 different ways, that is with four variations of the order of colours (A, B, C, and D). The last column to the right of the treadling draft indicates colour. Let us suppose that "m" is black, "o" - red, "-" - yellow, and "=" - white.

The first thing we can notice when looking at the draft is that in no area we shall have pure colours. They are always blended because each area is woven with two rows of floats produced by two treadles, and each treadle carries a different colour. For instance area 1-A has floats "m" and "o".

Thus areas 1-A, 2-D, 3-C, and 4-B will be red-black; areas 1-B, 2-A, 3-D, and 4-C - yellow-red (orange); areas 1-C, 2-B, 3-A, and 4-D - yellow-white; and areas 1-D, 2-C, 3-B, and 4-A - white-black (grey).

If we want areas of pure colour we must use two shots of the same colour in each repeat of treadling. For instance if in fig.1 we shall make both "o" and "-" red, then we shall have pure red in areas: 1-B, 2-A, 3-D, and 4-C. The remaining areas will be blended.

Finally if we want two pure colours, we must use each of them twice, for instance: black, black, white, white. This will give us pure black, pure white, and grey.

Keeping all this in mind we can start designing patterns. We use profiles as in the former article about Crackle (MW 66).

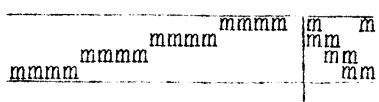


Fig.2

Fig.2 shows a profile and short tie-up of a draft similar to the one in fig.1. Please note that the short tie-up is not the same as the real tie-up, because the

the short tie-up corresponds to the units of threading and not to the shafts. Thus short tie-up in fig.2 is the same as the tie-up in fig.1. When making a draw-down under the profile we mark the colours with letters, not symbols used in fig.1. In the treading all 4 shots of one repeat are marked in one horizontal line. Fig. 3 is a step-by-step illustration of how this is done. Compare with the first repeat of treading in fig.1.

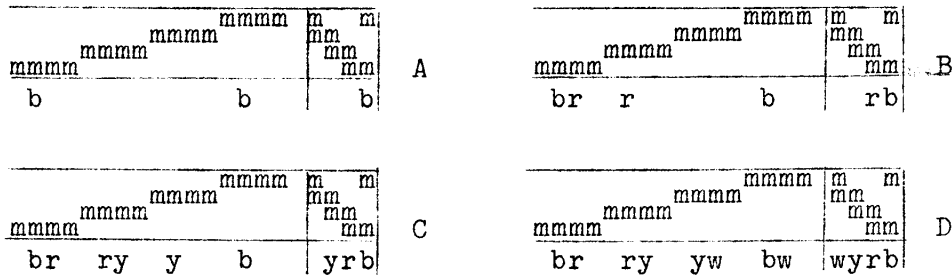


Fig.3

In this way we fill all colours in the treading and in the draw-down. The short draw-down should not even try to include all repeats of treading actually used. Their number in bound weaving is always very high. We simply mark the depth of each block in inches. For instance if one "m" means one unit (4 warp ends) then it will take about 1/2" in threading. Therefore each line of treading, or one square on graph-paper should also correspond to 1/2" regardless of how many picks of weft it will take to weave it. The latter can be established only on the loom.

The following short drafts give examples of patterns. For simplicity's sake we use only two colours. More can be easily added.

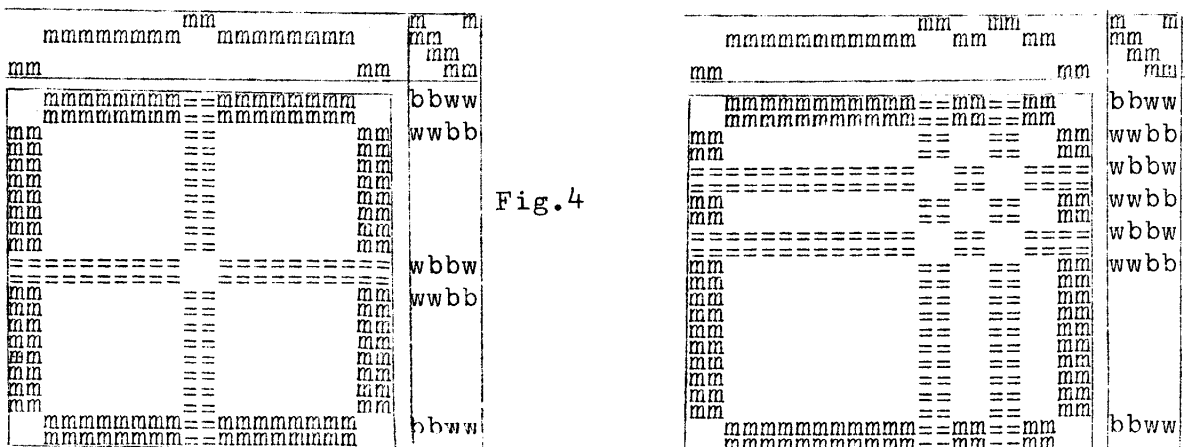


Fig.4

In fig.4 both profiles have only 3 units in threading. This was necessary to avoid overlapping blocks in pattern. Both profiles are woven on exactly the same principle, the same order of colours in treadingling. The first profile may be considered as original, the second as derivate.

In all cases borders will be necessary, even if very narrow. In threading they are just plain twill: 1234, or 4321, whichever fits better. In treadingling it is better to experiment. We can try for instance: bbbw, wwbb, bwww.

PRACTICAL PROJECT.      A Rug 36" by 45".

Warp: 8/4 cotton, natural; sett - 8 ends per inch; reed No.8; one end per dent; No.of ends 304. Threading:

x x	x x	x x	x x	x x	x x	x x	x x	oo	oo
x x	x x	x x	x x	x x	x x	x x	x x	oo	oo
2x	6x	24x	6x	6x	24x	6x	2x	4321	

Pattern:

mm	mmmmmmmm	mm	mm	
mm	mmmmmmmm	mm	mm	
mm	mmmmmmmm	mm	mm	bbww
mm	mmmmmmmm	mm	mm	wwbb
mm	mmmmmmmm	mm	mm	
mm	mmmmmmmm	mm	mm	wbbw
mm	mmmmmmmm	mm	mm	bwwb
mm	mmmmmmmm	mm	mm	bbww
mm	mmmmmmmm	mm	mm	wwbb
mm	mmmmmmmm	mm	mm	
mm	mmmmmmmm	mm	mm	wbbw
mm	mmmmmmmm	mm	mm	bwwb
mm	mmmmmmmm	mm	mm	bbww

Weft: heavy two ply wool (No.2/2)  
 b - black, or dark grey, w - white.

Treadingling:

1w 3w 2w 4b 1b 3b 2w 4w 1w 3b 2b 4b  
 - to make one inch.

1w 3b 2w 4b to make 3".

1b 3w 2b 4w      " 12"

1w 3b 2b 4w      " 3"

1b 3w 2w 4b      " 3"

1w 3b 2w 4b      " 3"

1b 3w 2b 4w      " 12"

1w 3b 2b 4w      " 3"

1b 3w 2w 4b      " 3"

1w 3b 2w 4b      " 3"

1w 3w 2w 4b 1b 3b 2w 4w 1w 3b 2b 4b  
 - to make one inch.

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ERRATA. Please, correct the tie-up in the Practical Project in Master Weaver 66, page 12. It should be:

oo o  
 oo o  
 oo o  
 oo o

Sorry!

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I N D I V I D U A L . W E A V I N G   L E S S O N S

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