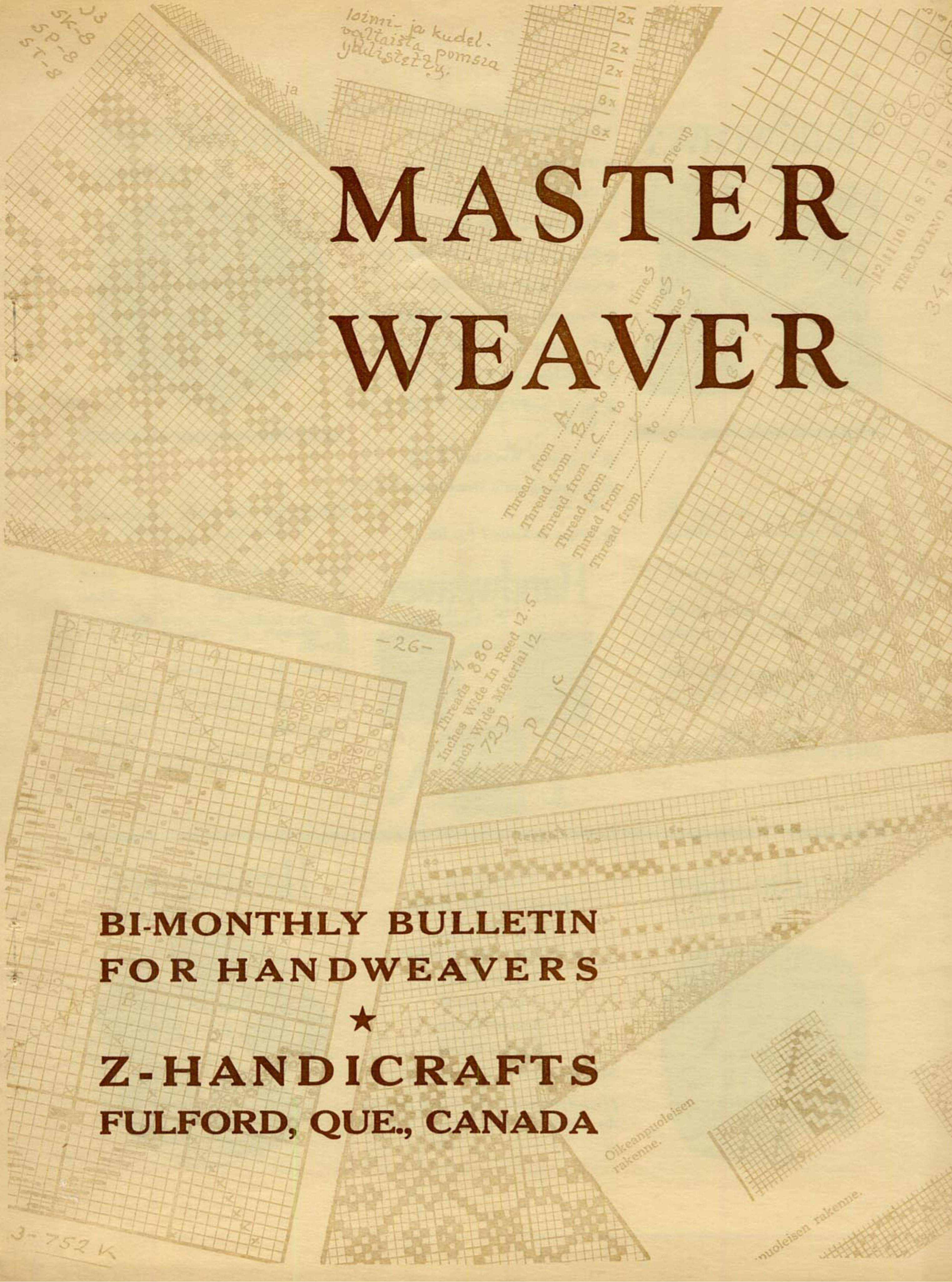

MASTER WEAVER

BI-MONTHLY BULLETIN FOR HANDWEAVERS

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MASTER WEAVER

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March, 1956 No.26

ACCIDENTAL WEAVES.

(Drafts based on Theory of Probability)

We must assure the Reader at the start, that the drafts, we are going to speak about are not based on any mathematical equations, formulas, or tables. Just the contrary: they are based on disorder.

Those of our subscribers who have read the article about the Third Dimension, may remember that in modern weaving we often try to create an irregular structure of a fabric, when the traditional weaving employs only orderly textures. But as irregular as this structure is, it must be uniform, or else it will not be functional. But how to reconcile these two contradictory requirements? Uniformity means, or it appears to mean order, and the irregularity is disorder.

The solution which will satisfy both conditions is: irregularity on a comparatively small surface, regularity on a large one. In practice: irregular draft repeated a sufficient number of times to create a uniform all-over effect.

Once this is understood, our only problem is how to make an irregular draft. We have suggested once that one way of doing it is to mix several units of different weaves in the same draft (MW 17), and then weave them one after another. If there are, let us say, five different units, then we shall have 20% of the fabric woven in 5 traditional textures, and 80% in a completely accidental way. We must check of course these 80% of the fabric on the draw-down, and remove from the draft what is not practical. But otherwise we have an 80% accidental draft, which should (and does) satisfy the requirement of irregularity.

The next step is obviously a 100% accidental draft, which will give not 80 but 100 percent irregularity. Now, how can we achieve this effect without falling into one of the two possible pitfalls: lack of functionality, and accidental regularity? And this is where the theory of probability comes in.

One way of getting an irregular draft would be to select the heddles at random. But due to certain peculiarities of our brains, these random numbers cannot be chosen consciously. If we try to write down a row of numbers from 1 to 4 in an irregular order, like: 1421 432241342134 etc., we may discover later on that really we are following a certain order, for instance of plain or broken twill, or that we avoid certain numbers, and "favour" other ones - all this because of our more or less conscious likes and dislikes. Thus, if we want to have a perfectly accidental sequence of numbers, we must use some sort of a mechanical device.

The simplest form of such a device would be a pack of cards made specially for this purpose. We may take for instance 100 filing cards, and write No.1 on 25 of them, No.2 on another lot of 25, and the same with No.3 and No.4. Now shuffle, and count as many cards, as there are heddles in our proposed draft, or rather in one repeat of this draft. Then we read them and mark on the graph-paper one after another.

What we have now is a purely accidental draft. According to the theory of probability, the numbers will be fairly evenly distributed, without however any particular pattern, or repetition of the same combination of numbers. This sounds like perfect solution of our problem: uniform irregularity. But it is not.

Because the same theory of probability says that if we keep on experimenting long enough, we may, and eventually we must get sooner or later the most unlikly combinations of numbers, such as No.3 repeated 13 times in a row, an inch or so of pure twill, or even a whole repeat of monk's belt, or of honeysuckle. It is true that such accidents happen very seldom, but we can never tell, when they will happen. It may be at the end of a long series, but it may also happen at the beginning.

Therefore we cannot take such a draft for granted, but we must examine it carefully, and eliminate whatever is not practical. In most cases we must look only for two undesirable combinations of numbers: those which would produce too long floats, and those which would give biased or diamond twill. All other accidental patterns are so unlikely, that we do not need to worry about them.

Before we even start making an accidental draft, we must decide what kind of a fabric we are going to weave, and what is the longest float permitted. For instance if the longest float is of 5, then obviously we must eliminate floats of 6 and longer. We can do it by correcting the draft (cutting out portions of it), or still better by starting again with our pack of cards until we get a satisfactory result. In fig.1 we have an accidental draft for 4 frames and a standard tie-up:

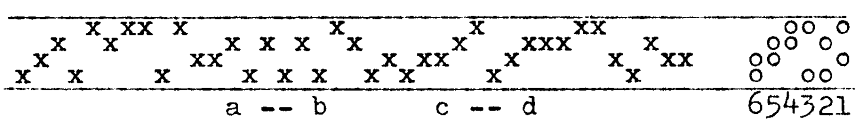

Fig.1

The draft is good enough, except that from "a" to "b" it will produce a float of 6 whenever treadle No.2 is used, and that from "c" to "d" we have 6 heddles all on a diagonal. This will not show until and unless we shall have a similar combination in treadling, e.g.: 345634. Then a short but very distinct diagonal will be formed.

Consequently we must correct the part from "a" to "b", for instance by eliminating two heddles: one on frame 1, and one on 3. But we may leave the part from "c" to "d", and wait until we have the treadling. Then the draw-down will show us what to do next.

The tie-up is not accidental, and it should not be, because from the tie-up depend the general properties of a fabric, and if we intend to have a balanced fabric (where both sides could be used), it is better not to complicate the situation. In case of a 4-frame draft, a standard tie-up is the answer (although we do not need to use all 6 treadles). With a higher number of harness-frames we shall use one of the biased twill tie-ups.

The treadling draft should be as accidental as the threading draft. This does not mean that the same sequence of numbers must be used for both, although it can. If we want to take advantage of all 6 treadles a new sequence must be worked out. This time we shall use a pack of cards with 6 numbers, e.g.: 20 with No.1, 20 with No.2, and so on. We can also use ordinary playing cards, but it will take several packs to get a sufficient number of cards from 1 to 6.

The treadling draft is a more difficult problem than the threading, and we shall have to make corrections nearly in every case. First of all we do not want a very long repeat in treadling - it is difficult to memorise and slows down the weaving. Then for purely technical reasons we cannot have more than 2 shots of weft in the same shed. Also we must avoid any long repetition of a pair of treadles since this will produce long floats in warp regardless of the threading draft used (unless the two treadles are opposed). For instance in the treadling directions:

1625433613555131424242113266651 3

we must make the following changes: eliminate one of the three fives, replace one of the pairs 42 with any other number, and finally take out one of the sixes. The corrected sequence will be as follows:

16254336135513142423211326651 3.

Even this however is not the end. Now we must make a complete draw-down of at least one repeat and a half in both directions: warp and weft. When we are satisfied that this draw-down does not show any overlooked mistakes such as long floats or accidental patterns, our preliminary work is finished and we may start to plan the warp. When only one kind of yarn is used, the "planning" means figuring out the number of warp ends and the length of warp. But when the warp is mixed or multiple, we must distribute it in such a way, that the most interesting components will be shown in the floats, and not lost in the background. Some of the harness frames in an accidental draft produce more floats than other frames, and this factor must be taken into account when planning the warp. We can not go into details of this subject, as it has more to do with designing than with weaving proper.

****

The question now is whether the suggested method of finding accidental drafts with packs of cards is the only one. Certainly not. Any accidental sequence of numbers found anywhere will do. The point is how to recognise such a sequence. For instance a telephone directory is quite reliable. We look at the last column of numbers, and mark down those which we may need, overlooking all higher numbers. This method will give us drafts up to 10 frames (count zero as ten). Pages of a book opened at random (with a knife inserted between pages) can give the answer provided that we look always at the second number from the end, and that the book is thick enough. The last number is no good, because it is always odd on the right, and even on the left.

Dice are all right, but only when one die is used for drafts up to 6 frames. A pair won't do, because it gives too many 6's and 7's. Roulette is perfect for our purpose and there are small models quite cheap. Bingo is as good. In both cases we look only at the last decimal: if it is more than our number of frames we simply reject it. For those who can make division in memory here is another system: Take the whole number and divide it by the number of frames in the draft. The result of the division is of no importance - we consider only the rest which cannot be divided. E.g : 27 divided by 4, gives 3; 29 by 4 gives 1; when the division is complete we call it 4, and not 0 since there is no frame No.0.

But one should not use mathematical tables of any kind (e.g logarhytmic, or trigonometric). Even the last decimal follows some sort of a mathematical pattern, and cannot be depended upon to give the desired irregularity.

****

Now, let's recapitulate what we have discussed so far:

Purpose. We use accidental drafts whenever irregular structure, so called texture, or three-dimensional effect is required, particularly when we are trying to get this effect with plain, smooth yarns.

Method. The threading draft is made first with a purely accidental sequence of numbers which indicate the frames. Special, or ordinary playing cards, dice, etc. will give the desired sequence.

This draft must be checked and corrected to eliminate long floats and accidental patterns.

The tie-up is not accidental. It should be of the standard, balanced type. Any number of treadles can be used.

The treadling is made in the same way as the threading draft, but with shorter repeats.

As final checking, a full draw-down must be made in each case, and carefully examined.

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We shall take now a few practical examples. In fig.2 we have

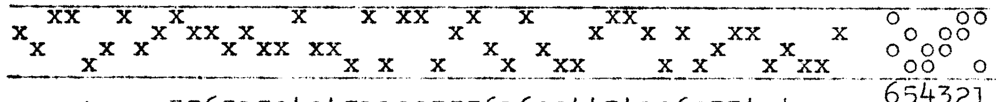

Fig.2

tr.: 356515242451122355616224434126233424.

a draft which gives the longest floats of 6 in both direction. It has been made with the help of a telephone directory. Only one correction was necessary in treadling to cut down a float of 7.

In fig.3 the same sequence was taken for both: threading and treadling. Therefore only 4 treadles could be used. To avoid a diagonal as the result, the order of treadles in the tie-up has been "broken". The longest float here is only 4.

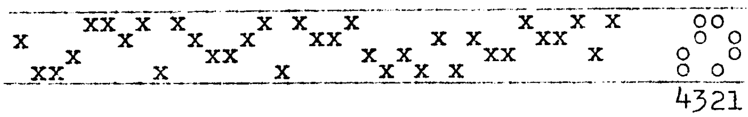

Fig.3.

tr.: 31124434143223414334212131322433424.

This sequence resulted from the "book-&-knife" method. Strangely enough no corrections were necessary, but the treadling turned out to be too long, and has been replaced with another one, found experimentally on the loom.

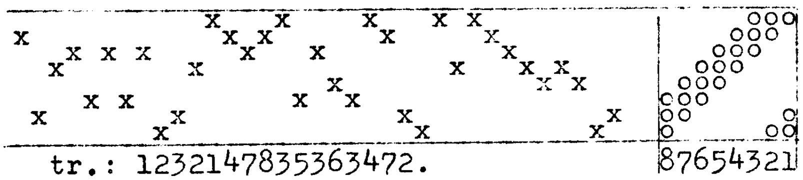

Fig.4

tr.: 12321478355363472.

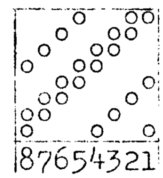

Fig.5

In fig.4 we have a draft for 8 frames. Instead of figuring out the treadling, the second part of the threading draft has been used for treadling with one correction. In multiharness drafts we have quite a choice of tie-ups, and this may help us. For instance in the above example most of the floats are of 6. If we find them too long, there is no need to change the draft. We simply change the tie-up so as to have the average float shorter, as in fig.5. It is true that due to the purely accidental character of our draft, this does not mean that there won't be even a single long float, but it is very unlikely. Of course here as with other drafts of this type we must make the final checking on the draw-down.

There is one consolation for those who do not like paper work: the draw-downs do not need to be very large. We can proceed in the following manner: 1) find the threading draft in any way described above; 2) decide upon the tie-up; 3) make a draw-down with only one shot of weft on each treadle, and eliminate long floats in weft if any; 4) find the treadling experimentally on the loom.

One final remark: it may seem that, since there is no particular order in the drafts, then we can make any number of mistakes in threading and treadling. This is not true. A mistake made in drafting will not show because it will be repeated regularly. But a mistake in threading (just in one repeat) or in weaving, will have much worse effect than a mistake in traditional pattern weaving. In pattern weaving the pattern attracts the attention and covers mistakes. Here the fabric although irregular, is uniform, and even one thread out of place will show, particularly with mixed or multiple warps.

****

Practical Project with an Accidental Draft.

Coat length in heavy wool. two ply, about 800 yds/lb, set 10 ends per inch. Colours: red (R), black (B), dark grey (D), light grey (L), white (W). Warp: L W D R L B D (take two tubes of D, two of L, one of W, one of B, and one of R). Warp seven ends at a time. Use paddle or warping mill.

Threading draft is shown in fig.6 with the order of colours above the draft. One repeat is equal to 3½".

LWDRLBDLWDRLBDLWDRLBDLWDRLBDLWDRLBD

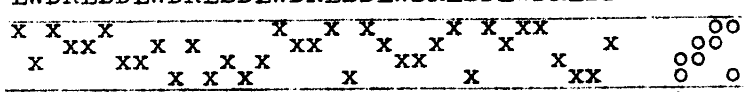

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Fig.6

Treadling (colours marked above the number of treadles):

DBLRDWLDBLRDWLDBLRDWL
131221321134423421421

The weft is the same as warp. This is of course contrary to the rules, but in case of an irregular structure there is little difference if any.

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PROBLEMS IN TEACHING — LESSON 12

DRAFTING.

The next problem is how to get any one of the 64 variations of a three-block pattern directly, without going through the whole process of finding first the eight two-block variations, and then developping the 64, and finally selecting the one we like best. Even on paper the operation would be too long.

When working with 3 block patterns we should either memorise or keep handy: 1-st the rules of producing the 8 basic variations of a 2-block pattern, and 2-nd: the table of the 64 variations.

Let us take as an example variation 4E (page 9 MW 25). This is derived from 1E, which again is the same as E. We go back to lesson 11 (page 10 MW 24) to see how E was obtained. At the bottom of the page we have an explanation: E is a derivate of D. For the time being we do not read any further, but turn to D, just two lines above: "D is the reverse of A". Consequently we go back to A, which is quite simple: it is the pattern squared, or "woven-as-drawn-in".

Now we know what is the first step. We must take our profile, whatever it is, and square it block by block. If our profile is the one in fig.1, the treadling (short directions of course) will be: twice tabby (T), once block 1, twice block 2, twice 1, twice T, twice 1, twice 2, once 1, and twice T. It does not matter at this point whether we actually draw the pattern or just write down the treadling.

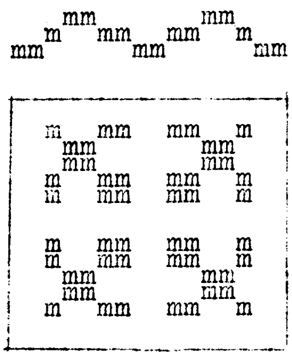

Fig.1

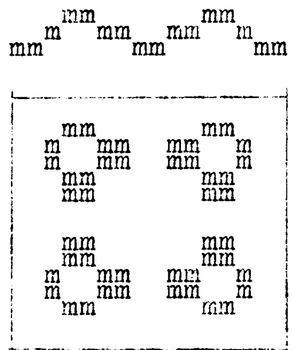

Fig.2

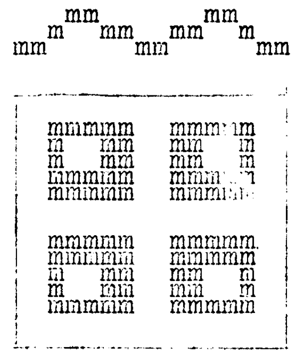

Fig.3

Now we come to "D" which is the reverse of "A", i.e. instead of block No.1 we take block No.2, and vice versa. The result is shown in fig.2, and the treadling is: T - 2x; 2 - 1x, 1 - 2x; 2 - 2x; T - 2x; 2 - 2x; 1 - 2x; 2 - 1x; T - 2x. The next step is to read the instructions under "E": we replace block 2 by both blocks together, i.e. we add block 1 in the fig.2 whenever block 2 is used. What we get is fig.3, and the treadling: T - 2x; 1+2 - 1x; 1 - 2x; 1+2 - 2x; T - 2x; 1+2 - 2x; 1 - 2x; 1+2 - 1x; T - 2x.

Now we may forget all about the two-block variations and carry our profile and the last draw-down to the table of 64 variations in lesson 12. We must replace now the tabby part of our draft with a block of pattern. Since we have now three blocks of pattern, and not two, as before, we shall call the lowest line of the profile: bl.No.1, the next: bl.No.2, and the top one: bl.No.3. Our variation has the number 4E. We have already E. What is then 4? In the directions on page 10 we read " in the 4-th (row) - No.3 (block)". This means that instead of tabby we shall use block No.3. If we do it we shall have Fig.4. Well this is tabby replaced by block 3. But the figure is not symmetrical. Therefore whatever we added in the vertical direction must be also added in the horizontal one. And finally we have Fig.5, which is the pattern we are looking for. The treadling is: 3 - 2x; 2+3 - 1x; 1+2 - 2x; 2+3 - 2x; 3 - 2x; 2+3 - 2x; 1+2 - 2x; 2+3 - 1x; 3 - 2x.

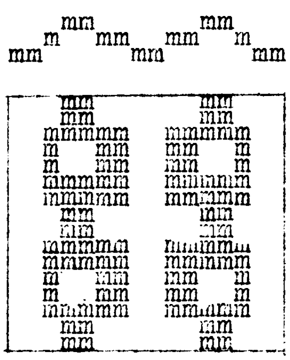

Fig.4

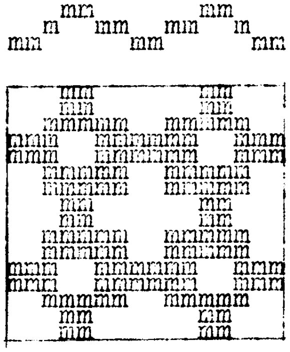

Fig.5

We are not going to discuss 4 block patterns for two reasons: the number of variations is too high, and the way we get 4 bl. from 3 bl. is exactly the same as the method of getting 3bl. from 2 bl.patterns, which we described right now. For that matter, once we understand how to develop 8 variations into 64, we can work out variations of even a 10 block pattern. And we may remember as well that the old weavers of the 18-th century, although probably illiterate, could solve similar problems quite easily.

****

MULTIPLE WARPS.

There is a little confusion about the terminology of "multiple" warps. A "double" warp is one prepared separately on two warp beams. A "triple" one - on three beams. Therefore a "multiple" one would require a number of warp beams, and since it does not, there is a misunderstanding somewhere.

The only reason to have more than one warp is that in certain cases warp-ends required in the same piece of weaving are not all of the same length. To take an extreme case: in velvet weaving (warp-pile fabric) the pile warp may be as much as 6 times longer than the ground warp. If this fabric has a pattern, each block requires a separate warp, because it uses the yarn up at a different rate. Here we shall have then a real "multiple" warp.

A similar case but not so extreme are all "tissue" weaves, of which the simplest is double weave with raised pattern. Here we must have two warps and two warp beams. The ground warp is kept tight, and the pattern warp loose during weaving, which gives the relief to the fabric. Even if the difference in tension is not more than 10% it requires two warp-beams because at the end of a 20 yard warp one set of ends will be 2 yards longer than the other, and this difference cannot be compensated in any way on the same beam.

But when the difference in tension is not so great, we can have multiple warps beamed on the same warp beam. They are prepared separately and beamed together. The process of beaming is rather difficult because one warp must be kept very tight and the other quite loose when beaming.

Those are multiple warps. On the other hand we have warps made of different yarns mixed together in the same warp. There is nothing "multiple" about them. They are simply warps of mixed yarns, or "mixed" warps.

In this latter case there may be still a difference in tension between the different kinds of yarn used, but this as a rule can be easily adjusted by tension boxes of one kind or another.

****

The first real difficulty, when we use different yarns in the same warp is the choice of <u>the sett of warp</u>. For instance we have 90% of fine and 10% of very heavy yarn in warp. What is the sett? The answer is: the same as for fine yarn alone, or nearly so. The opposite is olso true: when we have mostly heavy yarn and little of the fine one, set the warp as for heavy yarn alone. But the case is not so simple when there is 50% of one and 50% of the other. This is because the sett depends not only on the amount of fine and heavy yarn, but also on the way they are mixed. If they alternate i.e. one fine follows one heavy, the sett is more open, than in case when they come in groups: several fine, and several heavy ends.

Therefore we cannot have a strict rule, and we base the sett on an "average" of all the counts of yarn used in ohe repeat. Once the average count is established we look up the sett in one of the tables (e.g. MW 8/1, and 19/3).

How do we find this "average"?

When all yarns are of the same kind, e.g. all single linen, the case is comparatively simple. We must establish first one repeat in warping i.e. one group of warp-ends, which is repeated over and over in warping. For instance: 5 ends of No.18, 3 ends of No.30, and 2 ends of No.4. Now we multiply the number of ends in each group by the count, add all these products together and divide by the total number of ends in one repeat. Thus: 5 times 18 = 90, plus 3 times 30 = 90, plus twice 4 = 8; 90+90+8 = 188; This divided by ten (number of ends in one repeat) gives us 18.8 or about 19. We shall use this No.19 to find the proper sett of warp in our tables or graphs.

When we have still the same yarn but some of it is single, some two-ply, and some three or four-ply, we must first reduce all the counts into corresponding singles: 20/2 is the same as 10, 16/1 is 16, and 4/8 is ½. Now 3 x 10 + twice 16 + ½ = 62.5. This divided by 6 gives 10.4 or just 10.

But when all kinds of yarns are mixed together in a warp, the problem is more involved. Since each yarn has a different count, we have to express them in the same way or we shall never find the average. There are two ways of doing it. Either we convert all numbers into metric ones (see MW 21/1), or instead of numbers we use the yards per pound.

For instance we have the following warp: 5 ends of No.500 (deniers) silk, one end of No.1½ linen, 10 ends of No.8/2 cotton, and 3 ends of 4/2 wool. The situation is hopeless unless we convert all numbers into yds/lb. Thus: 1½ linen is 450; 8/2 cotton - 3360, 4/2 wool - 1120, and 500 silk - 9000. Now we add: 5 x 9000 = 45000; 1 x 450 = 450; 10 x 3360 = 33600; and 3 x 1120 = 3360. In all - 82410 and divided by 19 = 4337. Since in our warp cotton prevails, we may as well exchange this again into cotton number: 4337 over 840 is close enough to No.5, and the sett of warp can be based on this number. If we weave tabby, or mostly tabby, the table in MW 19/4 will give the sett as 27 ends per inch.

When working with novelty yarns, which often have no number at all, or when the number is meaningless, also when we use homespun yarns, or twist several yarns together, we can still find out the number of yards per pound. We can cut off 10 yds of the yarn, weigh it, and calculate how many time more would make a pound. If we have no means of doing it at home we may ask a friendly drugstore to do it for us.

****

When we have the sett, we can easily figure out the total number of warp ends, and start warping. Several warps on several warp beams are not a problem. Each warp is made and beamed separately. Two warps on the same beam are also made separately, and no difficulty can be expected in warping. Thus real multiple warps are the easiest onesto prepare.

Warping of mixed warps is another matter. Even if we do not intend to get any particular effect from the different tension of different warp-ends, we must adjust the tension according to the nature of the yarn. For instance if we warp at the same time linen and nylon and give the same tension to both, it will leave linen unchanged but it will stretch nylon. This may result not only in a general crepe effect, but even produce loops in linen when the tension is released.

Thus the first principle of adjusting the tension is: the more elastic is the yarn, the less tension it should have during warping. In estimating the degree of elasticity we cannot rely on general rules, e.g.: that wool is more elastic than linen, and nylon more than cotton, etc., because it depends also on the way the yarn is spun. And then there are yarns mixed in spinning, as wool and nylon etc.

The best way to check the elasticity is to measure and cut off one yard of the yarn, and stretch it on a table alongside a measuring tape. Then pull until it breaks and note at what length the breaking occured. Then take another yard of the same yarn and stretch it again, but stop just below the breaking point. Release and measure again. You will notice that some yarns come all the way back to the original length, and some do not. Let us suppose that the first sample breaks at 40". Then we stretch the second one to 39½". After it is released it may have 37". Now we subtract 37 from 39½ which gives us 2½. We may say now that the elasticity of this yarn is 2½" per yard. In the same way we may measure the elastitity of all yarns used in the same warp.

To adjust the tension we must use some sort of brakes which would keep various warp ends at different tension. These are called tension boxes, but they should not be confused with tension boxes used in sectional warping. The purpose of the latter is to give the same tension to all warp-ends, or just the opposite of what we want.

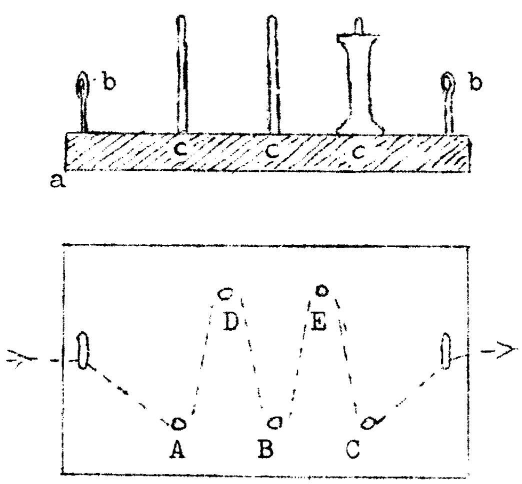

Fig.1

Fig.1 shows the kind of tension box which we shall use It is so simple that it can be made easily at home. Its main part is a heavy piece of hardwood, about 10" x 10" x 2" ("a" fig.1). In this piece we shall have two screw-eyes ("b"), of the largest size available, set one on each side. Besides this we must drive five 3" nails in the block ("C"). Before we do this we should drill pilot holes, otherwise we shall split the wood or bend the nails. When the nails are in place, we cut off the heads. The exact location of the screw-eyes and of the nails is not important. It should be more or less as in fig.1. Now we place on each nail a shuttle bobin. The best type are the short ones but comparatively thick. The height of the screw-eyes should be about one half of the length of the bobbins.

The tension box is placed on a bench or table between the bobbin-rack and the warping frame or mill. It may be necessary to clamp it to the bench. Now we pass all the warp ends of one portee through both screw-eyes and then around as many bobbins as required. Thus the yarn which requires the least tension will go straight from one end to the other without touching the bobbins; when the yarn which needs the highest tension will go around all bobbins. In between we have the following combinations (the yarn always on the outside of a bobbin): 1) - B - ; 2) - DE - ; 3) - ABC - ; 4) - AE - ; 5) - ADC -; 6) - ADBC - ; 7) - ADBE - ; 8) - ADBEC - ; The tension of individual ends may be easily adjusted during warping without cutting the yarn by slipping them on and off the bobbins.

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Yarns cannot be mixed indiscriminately. Some of them due to the difference in twist may tangle in warping or weaving. What we must avoid is to mix hairy, loosely spun yanrs with smooth and wiry ones particularly of an opposite twist. It is always safer to try a new mixture before making a warp. We cut about a yard of each kind of yarn and as many pieces of each as there are in one repeat, tie them at one end, hang on a nail, twist together the whole length and then try combing downwards. If they tangle so that they cannot be separated by stretching we may expect trouble in weaving.

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Beaming is not difficult if it is done through a raddle, but not through a reed, heddles and lease-rods. When we use yarns of very different count, the layers of warp should be separated with a very heavy paper, or sticks or both. This is because the heavy yarns create empty spaces under the paper, and the next layer may break through.

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In threading, the only difficulty we may expect is the tangling of the warp ends, but this problem is encountered as well in any kind of weaving particularly with fine yarns. Make a hitch-knot with an elastic around a large bundle of freely hanging warp ends, and tie the other end of the elastic to a treadle (not too tight). Single ends will slip out of this knot without tangling.

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The last problem is the sleying. In doing it we must remember two things: 1-st - avoid friction, i.e. do not put too many ends in one dent; 2-nd - the spacing which we get in the reed is not permanent. If we intend to have empty dent or dents, we must think in advance how the fabric will behave when in use. When the yarn is slippery, all empty spaces will close sooner or later leaving a very untidy texture. But for instance wool on wool will behave much better. The same applies to such yarns as boucle, chenille, and all rough texture yarns. Otherwise, if the yarns used are more conventional, keep when sleying to the same principle as when figuring out the sett of warp: the number of ends in each dent should be proportional to the square root of their count. If one 4/4 goes into one dent, then there should be two ends of 8/2, or four of 32/2.

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MOCK LENO.

This is not really a weave, but as the name indicates, an imitation of a weave. Real leno (or rather gauze, or cross weave) is used whenever a firm but yet a very open texture is required. The weaving of leno is not quite easy however, and attempts were always made to replace it with a simpler method. Unfortunately most of these "Mock Lenos" look very well on the loom, but change their appearance very soon in washing. The only exception are lace weaves, when properly planned. The general principle of changing any lace into imitation of leno is to use two counts of yarn: very heavy for the ends and picks which form the floats, and very fine for the tabby.

We shall take as an example 6;6 huckaback lace (fig.1). Nothing is changed in threading, tie-up, or treadling. But all warp ends threaded through frames 2 and 3 will have a very heavy and rather stiff yarn, when the ends in frames 1 and 4 will be several times finer.

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x x    x x      oo
 x      x      o o
   x      x   o o
  x x    x x  oo
              4321
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tr.: 313242.

Fig.1

The sleying is different too. One half of each repeat must go into one dent. Thus: 1-st dent - 121; 2-nd - 434; and so on.

In treadling heavy yarn is used with treadles 1 and 4, and the fine one with treadles 2 and 3. It should be the same yarn as for warp. For instance we can take 20/2 cotton, and 8/2 linen, set at 30 ends per inch, always three ends per dent in reed No.10. Instead of 8/2 we can have 4 single linen, or even 3/2 (2 ply No.3) cotton.

For warping, read the article about Multiple warps in this issue of MW. In weaving we should try to get a 50:50 fabric.

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FROM THE EDITOR

In the next issue we shall continue and conclude our discussion about Standards. We receive quite a lot of letters on this subject, and we shall be able to quote quite a few.

We shall start in our lessons of drafting a new series on Analysis - of yarns, fabrics, and patterns.

From now on we shall try to prepare a certain number of sample cards for projects described in each issue. Right now we have samples for both: Accidental Drafts (project on page 6), and the Mock Leno (page 12). These samples will be sold at the usual price of one dollar per sample.

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