MASTER WEAVER

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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 4322413421 34 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:

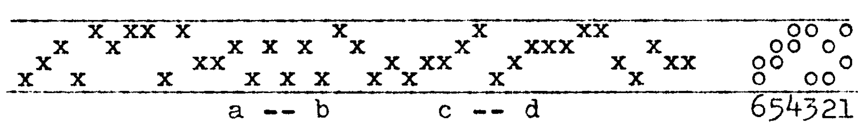

Fig.1

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:

16254336135551314242421132666513

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:

1625433613555131424232113266513.

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.

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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 <u>second</u> 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 <u>not</u> 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.

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

<u>Purpose</u>. 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.

<u>Method.</u> The <u>threading draft</u> 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 <u>corrected</u> to eliminate long floats and accidental patterns.

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

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

As final checking, a full <u>draw-down</u> 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

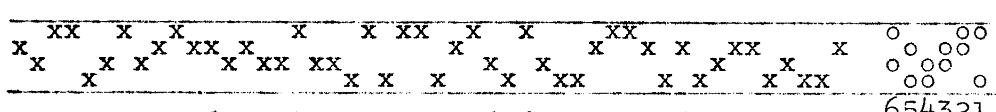

Fig.2

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.

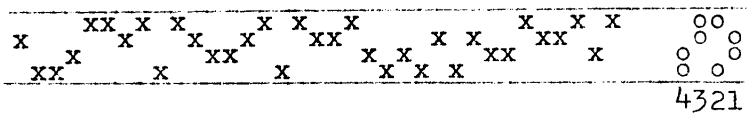

Fig.3.

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.

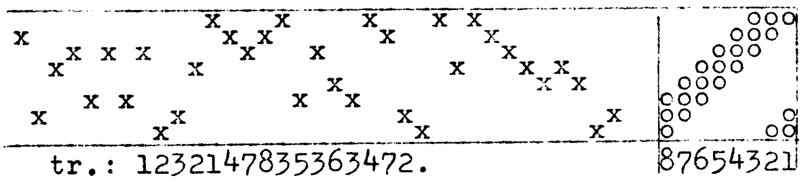

Fig.4

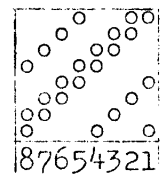

Fig.5

tr.: 1232147835363472.

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.

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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

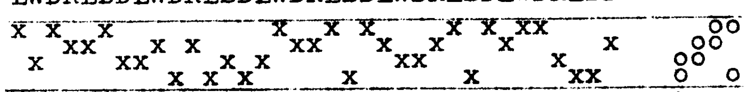

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Fig.6

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.