MASTER WEAVER

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Z-HANDICRAFTS
FULFORD, QUE., CANADA

MASTER WEAVER

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SATINS & SATEENS.

I do not know whether the story is true, but this is the way it is told. You may believe it or not.

Regardless of what the historians say, one of the main factors which caused the decline of the Roman Empire was the price of silk. Silk, recently introduced from the Orient, became so fashionable that the citizens were buying it at any price. And the price was more than "any": it was the price of gold pound for pound. One pound of silk = one pound of gold. By our present standards it would amount to $ 500 for one pound of silk, or about 150 times more than what we are paying now.

Not only that the price was high but the silk yarn was not availbale at all. Thus the silk merchant had a choice of either re-selling the fabrics imported from the Orient, or of unravelling the imported cloth thread by thread and use such "reclaimed" yarn for weaving.

Under such circumstances it is no wonder that the weavers tried to invent fabrics which would show all the silk that was in them on one side of the cloth. It meant for them a neat profit of 250 dollars on each pound of a finished fabric. Not bad, even by our standards!

And according to the legend this is how the Satin Weave has been invented.

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Satin is a weave which throws most of the warp to one side, and most of the weft to the other side of the fabric in the same way as it happens in all twills of the type 1:N (1:2, 1:3 etc.). However the length of floats in satins is of a much higher order than in twills used for tweeds and similar purposes. Long floats mean of course poor wearing qualitites, but the fabrics made for the appearance were not supposed to be practical. Evidently the old Romans were as keen on "keeping up with the Joneses" as we are. Incidentally - long floats make the fabric very soft, and glossy.

When there is as much weft on one side as warp on the other we call such Satin "a true satin". When it is mostly warp on one side, but not so much weft on the other we have plain Satin. Obviously here the silk or other expensive yarn will be in warp, when the weft may be slightly heavier and cheaper. Finally when we have very closely woven weft and comparatively open warp, the fabric is Sateen. This is the kind very often woven by hobbyists because it is faster in warping and threading, although more difficult in weaving.

In Satin the points where the weft crosses the warp (ties) should not lie on a diagonal. They must be staggered in a special way which we shall describe later. All Satins are Broken Twills of the type 1:N, where N is 4 or more

SATINET.

With four frames we have several broken twills. They all are of the 1:3 type (over one under three). None of them is a real Satin, but they are the nearest thing, and therefore called Satinet (or Satinette) = imitation Satin. Here are three examples:

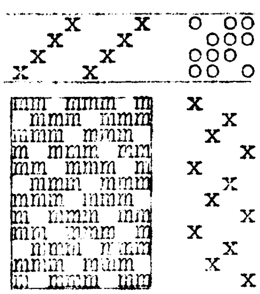

Fig.1

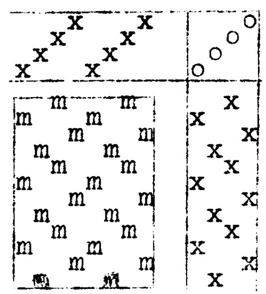

Fig.2

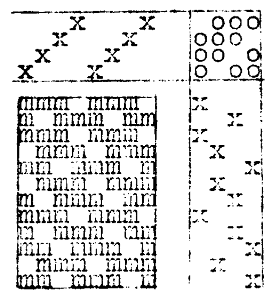

Fig.3

Fig.1 and 2 show the same fabric from both sides, and fig.3 - a variation in treadling. The easiest imitation of satin on 4 frames is the Sateen, i.e. satin with weft effect We set the warp more open than usual, and use a soft, glossy, and comparatively heavy weft. It is important to use the same colour for both: warp and weft.

SATIN

A real satin must be woven on 5 frames at least. When making the project of a satin we start with the draw-down of one repeat of the fabric. Since the threading of a satin is always straight (1,2, 3,4,5 etc.) the draw-down of one repeat gives us also one repeat of treadling (compare figs.1,2, and 3). Or, if we use straight treadling (which is rather unlikely), then the draw-down is identical with the tie-up.

To find the draw-down we proceed as follows: we draw first a square with as many divisions in both vertical and horizontal direction as the number of harness-frames. For instance 5 by 5 for five frames (fig.4). Next we find out or figure out so called "move". This is the distance in the horizontal direction between two "ties" or black marks on our draw-down. The move for 5 frame satin is either 2 or 3. Only one of them in the same piece of weaving. Let us say that we decided to take 2 as our "move". We place the first "tie", or a black square, or a cross in the first column and the first row (fig.4). To find the next tie we add 2 (move) to the number of column (1) which makes 3. Therefore we place the second tie in the third column of the second row. Then we add 2 again and get 5 as the proper column for the next tie. But to find the fourth tie we must add 2 to 5 which makes 7, and we have no 7th column. Therefore we count the first column as 6, and the second as 7. Thus the fourth tie comes in the 2-nd column. The last tie is then 2 + 2, or the 4-th column.

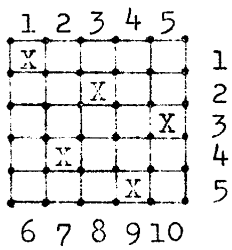

Fig.4

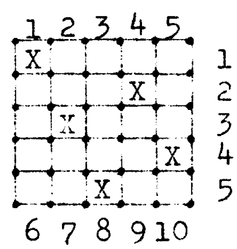

Fig.5

We mentionned that the "move" for a 5-frame satin is either 2 or 3. How then the draw-down would look if we adopted the number 3 instead of 2? Fig 5 shows this second possibility. We start as before in the left hand upper corner. Then we add 3 to 1 and get 4. This is the tie in the second row. Then we add 3 to 4 and get 7, or the same as 2. Then 2 plus 3 is 5 and this is the fourth tie. The last tie is 5 + 3 = 8, and the 8-th column is the same as the third.

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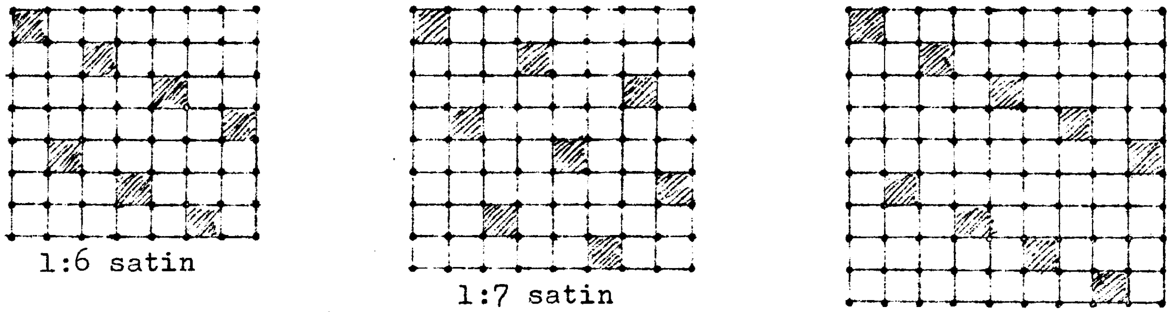
How do we figure out the move? The rule is as follows. Find two numbers which give a sum equal to the number of frames. None of these numbers can be 1; the two numbers cannot be divided one by another, or by any other number at the same time.

Thus for 5 frames we have only 2 and 3. Either 2 or 3 can be the Move. We could decompose 5 into 4 and 1, but 1 is not allowed by the rule.

For 6 frames we have: 1+5=6; 2+4=6; 3+3=6; 4+2=6; 5+1=6. The first and the last combination will not do, because they include number 1. Four and two are no good either because 4 can be divided by 2. Finally 3 and 3 are also out of the question since 3 can be divided by 3. Therefore there is no satin on 6 frames.

With 7 frames we have the following possibilities: 1-6, 2-5, 3-4, 4-3, 5-2, 6-1. The first and the last are out. But the remaining numbers: 2,3,4, and 5 are all good for the Move. Does it really mean that we have four different Satins with 7 frames? Not quite. If we make the four draw-downs each based on a different number, we shall see that they are all very similar and that the only difference is in the sequence in which the ties follow each other. To get two really different satins we have to go beyond 10 frames!

The case of the 8-frame satin is rather unexpected. Of all the combinations: 1-7, 2-6, 3-5, 4-4, 5-3, 6-2, and 7-1, only the pair: 3 and 5 gives a Satin. On the other hand it is a very good satin. Fig.6 shows the comparison of the 8-frame satin with a 7 and a 9-frame ones. It is much superior to both because the distance between the ties is about the same in all direction, and there is hardly any trace of a diagonal.



1:6 satin 1:7 satin 1:8 satin

Fig.6

Higher satins are of course getting better and better, inasmuch as less and less of the wrong side shows on the right side of the fabric, but at the same time the floats are getting longer, and the fabric softer, and weaker. Therefore the higher satins must be woven in very fine yarns with a very close sett of warp. For the "coarse" satins (up to and including 8 frames) we can use standard yarns easily available, but for the "fine" satins we must first look for a supply of yarns which are rather out of the way, such as silk of at least 25,000 yds/lb. To find the proper sett of warp compare the article in MW 28. In the second table the factors are given only for 1:4 and 1:7 satins. For higher satins this factor will be closer to 1.

In the table which follows we give all satins which can be woven with 5 to 16 frames. The numbers opposite the satin number are the "moves", and the reader should be able to figure outthe drawdown on the same principle as in the example given for 5 frames.

No.of frames:	Satin:	Moves:	The best move:
5	1:4	2,3	2,3
6	1:5	none	
7	1:6	2,3,4,5	
8	1:7	3,5	3,5
9	1:8	2,4,5,7	
10	1:9	3,7	3,7
11	1:10	2,3,4,5,6,7,8,9	3,8
12	1:11	5,7	
13	1:12	2,3,4,5,6,7,8,9,10,11	5,8
14	1:13	3,5,9,11	
15	1:14	2,4,7,8,11,13	4,11
16	1:15	3,5,7,9,11,13	

Of all these satins the best are: 1:4 and 1:7 for an 8-frame loom, and 1:14 for a 16-frame one. The second best are: 1:9, 1:10, and 1:12. The best moves are given in the above table.

In the next issue of the Master Weaver we shall describe practical applications of the Satin Weave to both traditional and modern weaving.

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GADGETS ...

A gadget is a simple and cheap mechanism which is supposed to make the life easier. This is my own definition, and the stress is on "is supposed to... ", meaning that really most gadgets do not perform at all or very poorly.

One might say that all our civilisation is based on gadgets. And all of them are working just so so. The really important ones are somehow never invented. Such as a tire which would not skid on ice, or a cooking ustensil which would make soft-boiled eggs just the way you like them (the latest in this line I have seen, advertised as "novelty" has been invented some 4,000 years ago in Egypt, I believe). Or a dripless teapot. Or an ashtray where on could extinguish a cigarette without burning one's fingers and making a smelly mess. And the funny thing is that all these gadgets could be, and often were invented, but for some reason never put on the market. There must be some dark powers behind the throne who watch, lest our life became too easy.

What is true about life in general is also true about handweaving. Here also we have gadgets, and true to the principle, they also do not work. And here again they could work, or even they did work some centuries ago - but not now. We shall enumerate only the worst examples, and the reader undoubtedly will find many more.

Let us start with the looms, or rather different "improvements". The loom itself no matter how bad cannot be called a gadget. One of the improvements for instance is a drum with pegs in it sitting on top of the loom, and opening the sheds. In principle it is a cross between a Jacquard and a barrel organ, and as often happens with cross-breeds it inherited only the limitations of both parents. It reduces weaving to very few and simple weaves and does not help in any way *). But it is expensive all right.

Another sort of misdirected inventiveness produced the prefabricated warp. Spools with ready-made warp to be put on a shaft in the back of the loom. Well, why not? It saves time and worry involved in warping - it certainly does. But then a power loom saves time and worry involved in handweaving. If we buy ready made warp, why then not buy ready-made fabrics? Whether such inventions work or not is incidental. It is the principle which is completely wrong. A craftsman enjoys his work and does not want somebody else to do it for him.

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*) To be fair, the same gadget has its merits when used for occupational therapy, particularly for mental cases who can not remember the order of treadling.

Another item of the same kind are easy to change wire or even cord ties of fixed length for the lower tie-up. The idea is to speed up the tying up of a loom. Unfortunately the ties nearly in all cases must be adjustable. If they are not we have either poor sheds or too much friction. It is possible to build a loom with fixed ties, but so far we have no such loom on the market.

Then there is the "race board". A flat board attached to the batten so that the shuttle slides on a solid support. Excellent idea used for some 200 years or more. But... Originally it has been designed for a flying shuttle. With a hand shuttle it works only if the length of the race-board is the same as the width of the warp. Otherwise the weaver hurts his fingers each time he throws the shuttle.

What then about the flying shuttle? Too many weavers get unreasonably excited over this gadget before even trying to see how it works. It is a perfectly legitimate piece of equipment for weaving wide fabrics - such as could never be woven with a hand-shuttle. It requires a lot of skill and it is certainly a hand-operated device. But when used on narrow warps for pattern or texture weaves it is a hindrance, and then it works actually slower than a hand-shuttle. What we object to in the case of flying shuttle is, that whoever uses it for other purposes than wide fabrics means mass-production, and mass-production is not compatible with crafts. But it would be as bad if somebody employed for mass-production highly skilled "shuttle-pushers" who can work as fast with a hand-shuttle as with a flying one. Thus the very invention is not bad in itself, but it is either impractical or unethical - always with the exception of very wide fabrics.

Since we are on the subject of shuttles, let us see what we have in the line of hand shuttles. Most of them are too light, too low, and too narrow, but this is besides the point. Bad as an average shuttle is, an "improved" one is still worse. Like open shuttles with a strange cross-section which is supposed to fit the shed. Shuttles with two or three bobbins on a single shaft. Then shuttles with rollers at the bottom, metal tips etc., - all reminiscences from the early types of power-shuttles.

Speaking about shuttles we may mention that there is such a thing as ready-wound weft tubes. You buy them, place them in the shuttle, and... sometimes they work. It all depends on the size of the shuttle. But even if they worked there is still the same objection as in case of ready-made warp.

Electric bobbin winders are a borderline case. Should a craftsman use them or not? One can have a principle: No Power in Handweaving. After all if we can use power-winders, then why not power-warping-mills, and power-looms? But the question is not as simple as that. So far none of the gadgets under discussion could save us much time even if it worked. But if we could prove that an electric winder works much faster than a hand model, we would have a point in its favour. But does it?

In the case of standard yarns good hand winders (e.g. converted spinning wheel) are as fast as electric ones, and much easier to control. But when it comes to fine weaving, particularly with yarns sold on skeins, the amount of work involved in winding one skein on tubes, or bobbins becomes a problem. And it is still a problem when one tries to do it on an average electric winder. Neither hand nor electric winders are fast enough. Personally I use a 1/4" electric drill which is far from being satisfactory because of the lack of proper control. And then I feel a little guilty about it. If I am a good craftsman I should have enough time to do it all by hand. With No.100 silk (deniers) it takes about 5 hrs to re-wind one pound. No use going faster because the yarn will break more often. With a very good hand-winder it will take only slightly more - perhaps 6 hrs. But who can turn a crank six hours at a stretch?

Therefore we can say that as far as standard yarns are concerned the use of an electric winder is not justified, but when working with fine yarns we definitely need some sort of a winder: stronger than an electric bobbin winder, but better controlled than an electric drill. Perhaps some of the existing electric winders can do the trick.

There is another class of gadgets, which in principle are quite legitimate, and which were used even before the industrial revolution, but which are now either misused or so poorly built that they can not be of any use to anybody.

Let us take as an example a Doubling Stand (described elsewhere in the same issue). It is very useful and as cheap as it can be. But the only model I know about which is available has all possible faults and drawbacks at an exorbitant price, although the information about the functioning and proper design of such a stand is free for the asking.

Finally there is a class of gadgets, which <u>are</u> properly constructed and not too expensive, but unfortunately not properly understood by the weavers. We do not sympathise as a rule with the manufacturer. After all it is he who gathers when we all toil. But sometimes even his lot is not to be envied. I heard a story about a loom-maker whose worst difficulty in promoting his looms was to explain to the customers why the loom has six treadles and "only" four harness-frames. Well! This is only partly the fault of the manufacturer who either cannot supply the customer with easy to follow instructions, or cannot train his agents to demonstrate the equipment, but largely the fault of the weaver who just does not take enough pains to learn more about the fundamentals of weaving. Those "misunderstood" gadgets are sometimes excellent pieces of equipment as for instance warping mills, shed regulators for counter-balanced looms, pattern harnesses for 4-frame looms, and so on. They should never be acquired unless the weaver understands perfectly how they work.

Of course there are also good gadgets even in weaving. They are the ones we did not discuss in this article. On the other hand by a peculiar coincidence we have never heard about them.

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CROSS WEAVE 2

PICKETS & RIDDLES.

FOR FOUR HARNESS-FRAMES

In the set-up described in the previous article we were able to weave Gauze, different kinds of Leno, and of course plain Tabby (MW No.30, last 3 lines of page 7). And still we did not use but three frames. With all four frames in operation we can have two additional weaves.

Pickets are vertical stripes of Gauze alternated with tabby, and Riddles are blocks of Gauze with tabby all around. Fig.1 shows the first, and fig.2 - the second of these weaves. Gauze is marked with "o", and tabby with "+". It should be obvious from these two figures that, if we have a set-up which weaves the Riddles, we can also weave the Pickets, but not the other way around. In other words Pickets is a much simpler weave than the Riddles.

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Fig.1

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Fig.2

Pickets can be woven on the following draft (fig.3) simply by alternating the two treadles, provided that the loom is properly set. However, unless we take special precautions this will not be a very satisfactory fabric: good in the part woven as Gauze, but very poor in the tabby part. The picks of weft are spaced quite far apart in the Gauze, and we can not help but have the same spacing in the tabby.

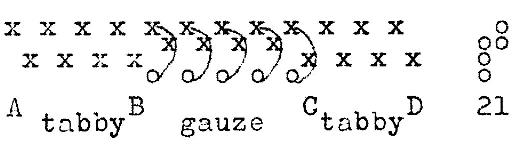

Fig.3

Therefore we can not produce a 50:50 tabby. To prevent the tabby from being too open and weak we can set the warp from A to B and from C to D much closer than is usual for tabby (let us say twice as close). This will compensate to a certain extent for the weft being too far apart.

Weaving of Riddles is a much more involved business. We shall use all 6 treadles for our tie-up as in fig.4, and the same threading draft as in fig.3. This time however the sett of warp will be uniform all through. In other words the Gauze will be set closer than it could be otherwise, and tabby will be set a little more open than usual.

We do this because now we shall have tabby stripes all accross the fabric and not only between the blocks of Gauze, and if we "corrected" the vertical stripes of tabby as described for the Pickets, we would spoil the horizontal ones. Therefore we must use other methods of adjusting these two different textures: of Gauze and Tabby There are two different ways of doing it, but before we shall describe them, let us have a look at our new tie-up and try to understand what all the treadles are for.

6	5	4	3	2	1
O			O	O	O
O	O	O	O		O
O	O	O			
		O		O	O

sinking shed

6	5	4	3	2	1
	O	O			
				O	
			O	O	O
O	O		O		

rising shed

Fig.4

First of all we have here two tabby treadles: 2 and 4. But strangely enough we need here three treadles to weave tabby. This is because when we weave straight tabby the doups tangle in the shed, and we have to clear it first. Treadle 6 is doing just that. It lowers all frames but the 1-st, which means that it pulls up, and straightens the doups. We do not throw the shuttle when treadle No.6 is depressed. The order of treadling for tabby is then: 6,2,6,4.

Treadle No.2 opens the Gauze shed, and the treadling for simple Gauze is 3,4 (no need of treadle 6). How good is the shed on treadle 2 depends on how well is the loom adjusted. We have discussed this point in the last article on cross-weaving. At any rate this shed should be wide enough for the shuttle to be thrown, and not pushed through.

Treadle 1 is similar to No.2 but it opens the tabby shed only part way: from A to B, and from C to D in fig.3. The rest of the shed remains closed. This treadle as well as the next one is used in weaving the Riddles.

Treadle 5 opens only a very narrow shed, which must be enlarged with a pick-up stick before the shuttle can be thrown.

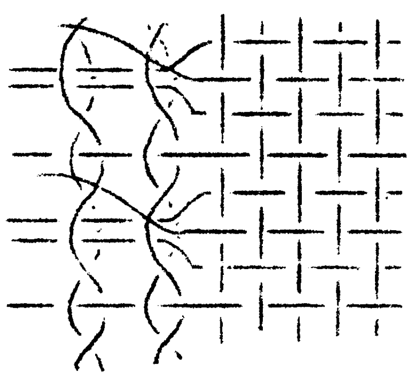

Fig.5

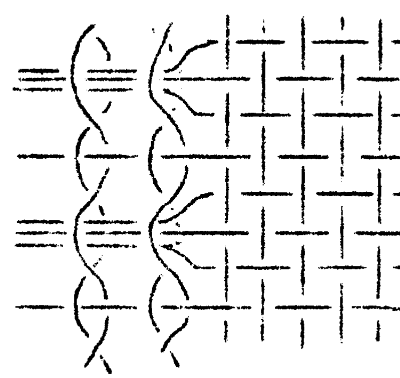

Fig.6

The whole difficulty of weaving Riddles is in the difference between the number of picks per inch in tabby and in Gauze. The widely spaced weft in the Gauze must be somehow compensated in tabby, Fig.5 shows the first method. We treadle as follows: 3,4,1,4 What happens is that in the Gauze part of the fabric the shot of weft on treadle 1 goes entirely above the fabric (makes a long float) and the two shots 4 and 4 come into the same shed. But in the tabby part each shot of weft comes into alternate tabby sheds. Thus for every four shots of weft in tabby, we have only two (counting 4 and 4 as one) shots in the Gauze. This make the tabby spread at about the same rate as gauze.

The only problem now are the floats which cross the blocks of Gauze. They must be cut close to the fabric. This leaves the vertical edges of each block of Gauze a little untidy, but contrary to what we might expect, they do not frey, and they stand washing very well. Still this method should be reserved for rather fine fabrics, closely woven. On the other hand it is the only fast way of weaving Riddles on 4 frames.

The second method (fig.6) uses a different treadling: 3,5,3,4. Here we have no floats to be cut later on, and the fabric is perfect, but the weaving is slower than in the first method, because of the shed on treadle 5.

We have already stressed the importance of a very accurate adjusting of the tie-up. Let us not take for granted that all ties should be of the same length - not at all. Particularly the difficult sheds No.3 and 5 require a lot of experimenting with the length of ties.

As is obvious from our two articles about cross-weaving, it is not an easy technique, nor a simple one. This is the reason why we do not go into more involved multiharness cross-weaving.

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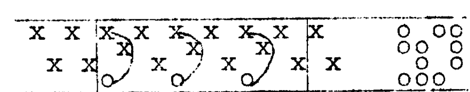
PRACTICAL PROJECT.

A scarf in rayon. Woven in a Cross-Weave to get very open and soft texture. Threading draft:



Warp: 8/2 rayon ecru or ivory.
No.of ends: 306.
Sett: 18 ends per inch.
Reed No.9, two ends per dent.

Width in reed - 17". Finished - about 15".

Weft the same as warp, or slightly different shade.

Treadling: 1,3,4; or 1,3,2,3.

The main difficulty in making this project, as in all cross-weaves, is to get good sheds, particularly shed No.1 Place a roller as described in the last article over all warp ends which are threaded through the doups, and then weave several inches of tabby (2,3) to get the slack in the warp. Adjust the tie-up, the tension of warp, and the tension of springs on the roller until the shed No.1 is wide enough.

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DOUBLING STAND.

The usual reason for throwing two or more different yarns in the same shed is that we intend to get colour or texture effects which otherwise would be impossible to produce. The simplest example is the hit-and-miss "pattern" of several colours wound together on the same bobbin. Or it may happen that we want to show just a trace of colour here and there on an otherwise uniform background. This is done quite often with metallics.

Whatever the reason we are often faced with a problem of winding two or more yarns on the same bobbin. These yarns are often of a very different nature, and the winding from two tubes anything but easy. But even if we succeed in making a comparatively good bobbin, two things will happen in weaving: 1-st - the two yarns will run parallel to each other most of the time, so that one of them may be completely covered by the other on one side of the fabric; 2-nd - we shall have nearly always loops at the edges because it is next to impossible to wind two yarns at exactly the same rate. If one of them is slightly longer than the other, then it must produce loops.

We could avoid making loops by using a shuttle with two bobbins, or still better - two shuttles. But in this case not only that the weaving will be slower, but the two wefts will be still more exactly parallel.

Fortunately there is a very simple accessory used by hand-weavers for centuries, called a Doubling Stand. It can be made at no cost in a very moderately equipped home workshop.

Fig.1 shows the stand and gives an idea as to the principle on which it operates. The base (A) is a 1" board about 8" by 10". To the center of the shorter side of this base we attach a narrow vertical board (C) with two 2" screws. The size of the vertical board is about 1" x 2" x 30". Half way up we fix to this post another smaller horizontal board (B) - 1" x 4" x 7". It has a 3/8" hole right in the center. Finally at the top of the post C we drill a small hole to fit a piece of heavy wire D (old coat hanger). about 7" long. We bend the wire so that it makes a loop at the end directly above the hole in B. Another similar hole (G) is made close to the base of the post C. A piece of the same wire 8" long and straight fits into this second hole, but it must be easy to remove when not in use.

Now we must find a piece of pipe or tube, metal or plastic about 3" long and which would fit into the hole in B. It is easier to start with the tube and then make the hole to fit. If nothing can be found at home we can find a piece of copper tube in any garage. Both ends must be smoothed out, and the tube pushed into the hole so that its lower end will slightly project. Finally we make a few more small holes (same size as G) in the base A. One hole under the hole in B, and 3 more around it at a distance of 2".

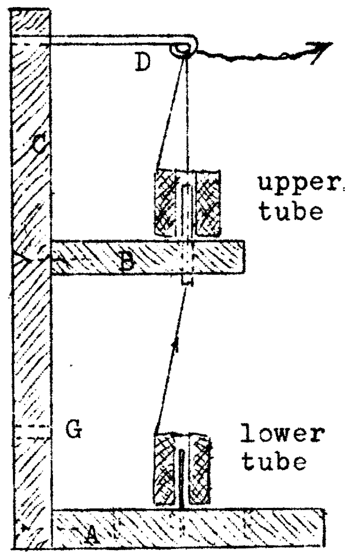

Fig.1

And again we cut a few pieces of the heavy wire, all about 3" long. They will be inserted when necessary into the holes in the base.

Regardles of how many yarns are going to be wound together we always place one tube of yarn above the hole in B. If there is only one more tube of yarn we place it in the center of the base after having first inserted a piece of wire in the central hole. Then we take the end of the yarn from the lower tube, and thread it through the hole in B (pipe and all) and through the upper tube of yarn. Then both yarns: from the lower and the upper tube go through the loop in D. When we start pulling (as indicated by the arrow), both yarns unwind, but the upper one winds itself slowly around the lower yarn. In this way both yarns will be of the same length. The threading of the yarn through the hole and the upper tube can be done with the help of a wire heddle.

If one of the yarns is on a bobbin, then we place the 8" wire in the hole G and put the bobbin on the wire. The rest of the set-up is as before. If we have two lower tubes, they go on two 3" wires in the base (both off center). One bobbin can be on the horizontal wire and one or two tubes on the base off center. The cones of yarn do not need any support, but if they are of any size it is hard to put more than one on the base. A cone can be also used on top of the shelf B provided that a hole is made first in the top of the cone.

When using the doubling stand one must remember that the smaller the top tube - the tighter will be the twist of the combined weft. But in any case the twist is not too hard. Even with a very small tube we have only one turn for every 3 inches. However in the same piece of fabric this twist should be always about the same.

For perfect edges it is advisable not to wind the weft bobbins directly from the doubling stand, but first wind the combined yarns from the stand on a large warp bobbin trying to keep the layers of weft as level as possible, and then rewind the weft on shuttle bobbins.

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IN THE NEXT ISSUE: - Design Made Easy - Projects in Satins - Rep Weave (Warp-face patterns for 4 frames) - Analysis of Large Patterns. (This last article has been delayed for lack of space).

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