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.

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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 one 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.

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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 ones to 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 .

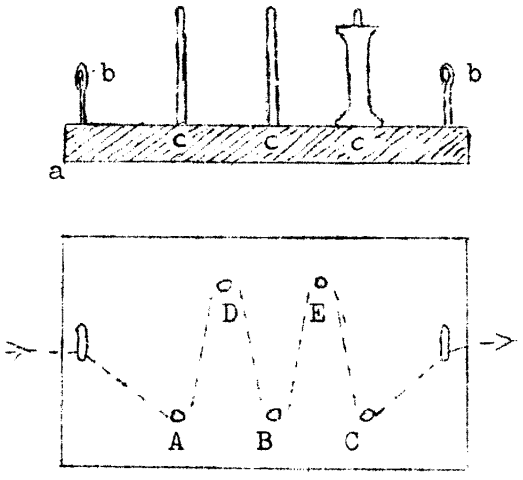

Fig.1

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 bobbin. 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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