any and every width, it is evident that contraction in width has no influence on the desired result. Moreover, certain standard widths being recognised in the various trades, these being obtained very accurately by the milling and tensioning operation in length, the yield, under these conditions, has a direct influence on the weight of the piece. For example, if a cloth 40 yards long weighs 1 lb. to the yard, and the cloth was 40 lbs.; if this be rolled up to 20 yards, supposing there is no loss in rolling, the piece will still weigh 40 lbs., i.e., 2 lb. to the yard or per.

So that the contraction in length directly influences the weight.

This, however, in one sense, is not true, since the more a piece is milled, the greater is the loss in fibre, which is particularly so in the case of woollens. This loss of fibre can only be estimated by experience, but since a manufacturer never puts material into a cloth to mill out, the deduction that follows will give an accurate idea of what may be expected. Another influence to be carefully noted is the heat employed in the various finishing operations. For example, it is found that finishing woolen and worsted cloths, if the heat rises above 100° F., the weight of fibre will diminish considerably; the same may be said of finishing satin cloths, if the heat rises above 100° F., a loss in weight occurs—probably due to the contraction between the fibres. Certain cloths, such as silks, laces, etc., are not so marked, but the influence of heat on finishing cloths should be carefully noted, and if felling China clay, etc., has been used, is as often the case with cotton goods, a careful estimation of the pure fibre should be made.

A long experience with woolen and worsted goods in all their forms, i.e., as unions, dress-faces, goods, serges, coatings, melons, etc., is summed up in the following:

**The Least Loss in Weight is Finishing.**—For ordinary goods allow about 6 lbs. on the calculation weight. For example, a cloth in the grey weight of 40 lbs., in the finished state it should weigh 25 lbs. For face goods allow about 7 lbs. on the calculation weight, i.e., a cloth in the grey weight of 30 lbs., when finished should weigh 20 lbs. These members will, of course, vary slightly, according to the yarns, etc., employed, so that the matter can be thus summarily dismissed. The above must be taken as a general rule; but the details should be further considered.

For example, suppose the analyst has decided that a cloth on the lines laid down, has found the counts of weave, the number of ends and picks per inch, and weight per yard of the finished cloth. Then the following points must be successively decided:—

1. Set the cloth in the loom;
2. width in the loom;
3. picks per inch woven;
4. length in the loom;
5. width in the loom;
6. weight per square yard calculated.

Each of these points must be dealt with in detail, and then to render thorough comprehension easy, an example shall be fully considered.

**The Set in the Loom.**—This is the unexperienced manufacturer’s difficulty, and, in fact, will be to any one a matter of estimation, since cloths, as already stated, may be covered considerably in width during finishing; and variation in width will directly influence the thread per inch. For example, if a cloth 32 inches wide has 64 threads per inch, and when finished measures 30 inches, then

\[ \text{As } \frac{30}{32} = 0.9375 \text{ picks per inch in finished cloth} \]

Inversely, then, a cloth having 68 picks per inch as analysed, will have been set 64 threads per inch, and 32 inches width when finished to 30 inches. In estimating the set in the loom, then, the finishing must be taken into account and based upon this.

**List VIII.** shows a variation of about 2 inches for narrow width, and 4 inches for broad width, in the set in the loom. If the sets finished and in the loom are known, the width may be deduced by direct proportion. Taking the finish to be 0.9375 picks per inch to be 64, and the threads per inch in the loom to be 68, then a width of any desirable finished width may be taken, say 30 inches, and the width in loom decided by the relative number of threads finished and in the loom as follows:

As 68 : 64 :: 30 : 32 inches wide in the loom.

(3) **Picks per inch woven.**—Finding the picks per inch woven is similar to finding the threads per inch in the loom, both depending upon shrinkage in finishing. The shrinkage warp is varied very considerably; but taking List VIII, as a guide, and allowing a per cent. for contraction in length, then 68 picks per inch woven will give 30 inches. In other words, the picks per inch will vary in direct proportion to the length of the finished and greasy cloths respectively.

(4) **The Length of Warp.**—This is the most important and critical calculation, since a little attention has been directed. In its simplest form the question may be put as follows: How many yards of warp will the warp take-up in weaving? The first take-up will be influenced by the tier-in and starter of the loom, and can only be estimated when the time comes; but an allowance of 1½ yards per 1000 yards under ordinary circumstances should be ample. The second matter is one of much importance, since it affects the calculation, which we are considering, but also calculations relating to allowances for backing and figuring cloths. The take-up in the case of single cloths must first be considered, and reference to Diagrams 25 and 26 will render this easy of demonstration. If a piece of single cloth is cut from a plain cloth, and if constructed perfectly will give an equal curve in both warp and weft; and since the warp threads change for every pick, it is evident that the take-up in the case of plain weave will be more than in the case of twills. Now, in the case of single cloth, the angle of warp and weft, or vice versa, should be one of 60 degrees, and the triangle as shown will have relatively 1 yard for 4½ for hypotenuse, and 1732 for the base; consequently, any line drawn straight through the centres of the warp and weft will be automatically by the bases of all triangles similar to ABC, will represent the length of cloth, while finish hypotenuses will represent the forenamed length of cloth; or, 1732 yards of cloth will require 2 yards of warp, there being a take-up of 3 yards of warp in all, which is expressed as a fraction is about 4½; so that for a perfect plain cloth, finished strictly to the theoretical conditions laid down, 2 yards of warp will yield about 8½ yards of cloth.

With the two-and-two twist there will be less take-up, since there are relatively fewer intersections. The calculation for take-up in this case will be two threads X 2 (1732) intersections = 54494 yards of cloth from 2 threads X 2 (intersections = 6 yards of warp, the take-up being 536 in 8 yards; or about 4½. Another important calculation is that for the 8-end satin, which is as follows:

- 6 threads X 2 (1732) intersections = 9244 yards of cloth from warp
- 6 threads X 2 (intersections = 60 yards of warp, probably the take-up being 536 in 30 yards, or about 5 yards take-up. In this case, however, warp and weft are supposed to be equal in width, while actually the warp will do most of the binding. In warp-woven cloths, the warp being almost straight, the yield of cloth is almost the same for warp and weft. In the case of warp-woven cloths, the warp being straight throws all the bending upon the warp; but in the case of the cloth is constructed strictly according to the principles laid down, the calculations for take-up will be precisely similar to the calculations for take-up in ordinary cloths, since the diameter of the warp, and the width and hypotenuse of the triangle formed. Note should, however, be made of the fact that this size of the weft, picks per inch, shrinkage of the wool, and weighting of the warp beam all influence the take-up to some degree.

In weaving striped patterns of intricate construction, such as camed stripes, or any single cloths in weaves which are weaves in which weaves are combined to produce a pattern, the warp and weft are both used, and principles are a good indication of what may be expected, and the need for an extra beam must be judged accordingly. Many weaves, however, use different wetting capacities may be woven from the same of the warp is good; but, of course, all the sett will be used when the warp and weft are weaving with the most intersections; thus the extent of the various weaves-may influence the use or otherwise of our extra beam.

A method employed at times with success for these and backed cloths is to beam certain sections of the warp slacker than the other sections. The use of an extra beam may, by these means, be avoided; but its application is very limited. In dealing with backed and double cloths, the same principles apply, with certain modifications. For example, working out, on the lines of the above calculation, a three-and-two twill with a 8-end satin back, the following result is obtained:—

- 70 yards of warp = 1732 yards of cloth
- 64 yards X \(\frac{1732}{1732} = 64 \) yards of backing warp
- 64 yards of cloth

The take-up in the case of double cloths will be a compound of the single and backed (Cotton) the take-up in both face and backed cloth must be calculated and then the take-up for ties, whether in warp or weft.

We are quite aware that practical men may object to the above system, which, to the best of our knowledge, is here attacked systematically for the first time; but we believe that the above system works out coincidentally with the best results obtained in practice, it must at once be admitted that there is a great deal of theory, and that it is worthy of the attention.

(To be continued.)

**NEW DESIGNS.**

**CANVAS CLOTH.**

**Design A** is for a canvas cloth of a peculiar make, woven grey, bleached, or piece-dyed in any or all the fashionable shades. It is an 8-shaft, 8-end draft, 18 to the round. We give particulars for one quality: 26 red, 3 in a dent, 20 warp picks; 30 picks per inch on the warp, the particulars may be varied: i.e., if a more open texture should be thought necessary, a finer grist of warp and warp, with less yarn in picks and red, will be required.
COTTON DRESS MATERIAL.

Design B will be found a novelty, either as a jacquard figure or for printing on the fashionable dark-blue ground with a white effect. We have given every salient point for carrying it out to a repeat, which can easily be done by observing the run and repeat of the figures in a diagonal form. This would form a very interesting study for those who wish to become proficient in designing. Space will not permit us to develop it fully, but quite sufficient is shown to give the idea of construction. Although the ground is shown as tabby or plain, it will be evident to practical manufacturers that a twill or satin ground may be formed, always observing that the figure is formed by the weft picks, the full black dots showing this effect. Should a satin ground be decided upon, it ought to measure, both by the warp and weft, the extent of the figure, so as to obviate any break in the runs. There is no figure, whatever space it may occupy, but some one of the satin twills will coincide with the figure; for instance, taking one hundred and eleven, (rather a odd quantity of ends or picks to measure), the 3-shaft satin or twill ground would measure it 37 times for a repeat. If this design should be produced we would recommend for bleaching in white or light-dyed tints, that it be woven in the grey, with 40's warp and weft, 96 ends and picks per inch. This will give a good finish, a neat and very handsome effect on a good foundation. If dark blue ground (either plain or satin), then the weft must be well bleached white or cream, very light prussian, straw, or maize; but under any colour arrangement it will be found requisite to have the colours fast and very pure. A fabric formed from the particulars given ought to be satisfactory, either for the home or export trade. We simply give these details from a belief that they will suit buyers, but of course the goods may be made from this design to meet many varieties in the way of vestings, negligees, shirtings, blouses, etc.