FABRIC ANALYSIS.

Universal Textile Calculations.

There are two different systems of calculations used in the manufacture of textiles, *viz:* (1) Such as have a constant weight with a varying length, the fineness of the thread increasing as the count rises, and (2) Such as are diametrically opposite to this in principle, the length being constant while the weight varies, the fineness of the thread increasing as the count decreases.

Table A.

Material.	System.	Weight in Grains of 1yd. of 1's Yarn.
All yarns	Metric	14.11
Worsted	Continental	14.11
"	English, American	12 5
"	French (Roubaix)	9.93
"	French (Fournies)	4.97
Spun silk	French, Swiss	14.11
"	English, German, American	8.33
Cotton	English, German, Swiss, American	8.33
"	French	7.05
Linen, hemp	Almost universal	23.33
Ramie	English	23.33
"	Continental	14.11
Woolen	Yorkshire skeins	27.34
"	West of England	21.87
"	American Run	4.375
"	German	4.81
"	Belgian, French (Sedan)	4.72
"	French (Elbeuf)	1.96
Raw silk	Ounce system	437.5

With reference to the first system, Table *A* gives different gradings of yarns used in the various countries of Europe as well as here, quoting in every instance the respective *standard* to use to ascertain its count as well as its corresponding equal counts in any other yarn. By *standard* we mean the number of grains which one yard of 1's yarn weighs.

The Rule by which these examples are figured is:

Multiply standard weight given in Table *A* with number of yards tested, and divide product by weight in grains.

If for example 30 yards of cotton yarn spun by the English system weigh 8.33 grains, what is the count?

$\frac{8.33 \times 30}{8.33} = 30$'s count. *Ans.*

Another Example: If 30 yards of woolen yarn weigh 34.15 grains, what are the counts in (*a*) American Run system; (*b*) German counts; (*c*) Yorkshire skein; (*d*) French (Sedan), and (*e*) Elbeuf (France) counts?

(*a*) *American Run:*

$\frac{4.375 \times 30}{34.15} = 3.843$ — practically $3\frac{7}{8}$ Run. *Ans.*

(*b*) *German Count:*

$\frac{4.81 \times 30}{34.15} = 4.22$ German count. *Ans.*

(*c*) *Yorkshire Count:*

$\frac{27.34 \times 30}{34.15} = 24$ Skeins, Yorkshire count. *Ans.*

(*d*) *French* (Sedan) *Count:*

$\frac{4.72 \times 30}{34.15} = 4.14$ French (Sedan) count; also the Belgian count. *Ans.*

(*e*) *Elbeuf* (France) *Count:*

$\frac{1.96 \times 30}{34.15} = 1.42$ Elbeuf count. *Ans.*

Another Example: If 30 yards of worsted yarn weigh 24.5 grains, what are the counts in (*a*) American and English; (*b*) Continental; and (*c*) Roubaix (France) systems?

(*a*) $\frac{12.5 \times 30}{24.5} = 15.3$ Count. *Ans.* Practically 15's single or 2/30's worsted (on the light side) American or English count.

(*b*) $\frac{14.11 \times 30}{24.5} = 17.27$ Count. *Ans.* Practically 17's single or 2/34's worsted (on the light side) Continental count.

(*c*) $\frac{9.93 \times 30}{24.5} = 12.11$ Count. *Ans.* Practically 12's single or 2/24's worsted (on the light side) French (Roubaix) count.

Another Example: If 30 yards of spun silk weigh 18 grains, what are the counts in (*a*) American, English and German systems, and (*b*) in the French and Swiss counts?

(*a*) $\frac{8.33 \times 30}{18} = 13.88$ Count. *Ans.* Practically single 14's or 28/2's, American, English and German count.

(*b*) $\frac{14.11 \times 30}{18} = 23.5$ Count. *Ans.* Practically single 23's to 24's, or 4/2 ply French and Swiss count.

Table B.

Material.	System.	No. of Yards of 1's Yarn which weigh 1 Grain.
Raw silk	Dram system	36.5
"	Denier system	637.26
Woolen	American grain	20

With reference to the second method of calculating previously referred to, the length in this instance remains constant while the weight varies, *i. e.*, the fineness of the thread increases as the count decreases; the figures in Table *B* indicate the number of yards of 1's yarn, which weigh one grain; therefore the number of grains which the given number of yards in any system weighs indicates the counts in that system. Thus, if $36\frac{1}{2}$ yards of raw silk weigh 4 grains the yarn is 4-dram silk.

The Rule by which these examples are figured is:

Multiply standard length given in Table *B* by weight obtained in grains, and divide the product by the number of yards tested.

Example: If 70 yards of yarn weigh 10 grains, what are (*a*) the counts in American grain, (*b*) Raw silk figured by the dram system, and (*c*) that by the denier systems.

(*a*) *American Grain:*

$\frac{20 \times 10}{70} = 2\frac{6}{7}$ American grain count. *Ans.*

(*b*) *Raw Silk, Dram System:*

$\frac{36.5 \times 10}{70} = 5.22$ Dram silk count. *Ans.*

(*c*) *Raw Silk, Denier System:*

$\frac{637.25 \times 10}{70} = 91.03$ Denier silk count. *Ans.*

Proof: 5.22 (dram silk in example *b*) × 17.44 (deniers equal to 1 dram) = 91.0368 deniers silk count, being the same answer as obtained in example *c*.

Another Example: Consider a union fabric composed of organzine warp and worsted filling, and for both of which you have to find the count.

Four yards of each system of threads (warp and filling) are obtained by cutting the cloth with the aid of a templet (one-tenth yard square) drawing out 40 threads of each system. The four yards of warp weigh .44 grains, and the four yards of filling weigh 1.67 grains. Ascertain the counts of the organzine expressed in the dram and denier system, the worsted filling in the regular (yard) system, as well as the metric system.

In connection with the warp, you have to consult Table *A*, and in connection with the filling consult Table *B*, proceeding in the same way as previously done, using the standard, the number of yards used as well as their weight in grains, in their proper position.

Warp: Multiply standard of dram with weight expressed in grains, and divide the product by the number of yards tested. Calculations in our example will be thus:

$\frac{36.5 \times .44}{4} = 4$ Dram silk. *Ans.*

Calculating the same yarn but using the denier scale, we simply substitute the denier standard 637.26 for the dram standard 36.5, and proceed as before, thus:

$\frac{637.26 \times .44}{4} = 70.09$ Denier silk. *Ans.*

Now, coming to the filling, to be expressed in our regular worsted grading as well as the metric system, we find the following two calculations necessary:

Worsted standard multiplied by yards of yarn tested, the product divided by its weight, thus:

$\frac{12.5 \times 4}{1.67} = 30$'s Worsted count. *Ans.*

Now, calculate the same yarn, but use the metric system, substituting the metric standard 14.11 for the regular worsted standard 12.5 used in the previous calculation and which will give us:

$\frac{14.11 \times 4}{1.67} = 34$'s metric.

It must be remembered that the counts obtained in this way from a sample of cloth are only approximate as there is a certain amount of loss during the scouring, bleaching, dyeing and finishing processes, which may or may not be compensated for by the curvature of the yarn (take-up) due to the shrinkage of the threads in crossing each other (weave) which causes the length of each thread to be greater in its yarn state than that of the finished cloth from which our sample for testing was taken. The increase in the length of the thread, noticeable when it is put under slight tension, enables a good estimate to be formed of the amount that the cloth has shrunk in weaving and finishing, and it is only by estimating and allowing for the loss due to finishing, etc., on the one hand, and the gain due to shrinkage in weaving and finishing on the other, that the actual counts can be obtained. No general rule can be laid down here, experience is the only guide. Preserving records of calculations of samples of cloth and yarn thus tested, will greatly simplify your labor by using them for comparison with new tests.

Changing Cotton "Yard System" to "Metric System" and Vice Versa.

The French system of numbering cotton yarns is based upon the metric system. The relation between fineness and weight or length for weight is exactly the same as in the English yard system (as used in this country, Great Britain, Germany and Switzerland) using a fixed weight and a variable length.

The fixed weight employed (in the metric system) is 500 grammes, and the number or count of the yarn is indicated by the number of hanks (each 1,000 metres long) required to weigh 500 grammes.

EXAMPLE: If 27,000 metres weigh 500 grammes, the resultant counts are 27's or 27 times the unit of length.

The French reel being made 1.428 metre in circumference, then:

1 round ..... = 1.43 metres = 56¼ inches.
70 rounds = 1 lea (échevette) = 100 metres
700 rounds = 1 hank (échevaux) = 1000 metres

700 rounds × 1.43 metres gives only 999.60 metres length of yarn theoretically; in practice the superposition of the threads gives approximately the 1,000 metres.

The proportion existing between the "Yard" and the "Metric" system is:

Yard System:

768.08 m (840 yds.) weighing 453 grms. (1 lb.) = 1's cotton yarn by the yard system.

Metric System:

1000 m weighing 500 grms. = 1's cotton yarn calculated by the metric system.

$$\frac{\text{1's Yard counts} \times 768.08 \times 500}{1000 \times 453 \times \text{Metric counts } (.0847)} =$$

$$\frac{\text{Yard counts}}{\text{Metric counts}} = \frac{1}{0.847}$$

RULE: (Using *constant* number 0.847)

Yard counts × 0.847 = Metric counts.
Metric counts ÷ 0.847 = Yard counts.

Another *constant* number sometimes used is 1.18, used inversely, thus:

Yard counts ÷ 1.18 = Metric counts.
Metric counts × 1.18 = Yard counts.

The former is the correct proportion and more accurate, on account of "closed" fraction resulting, as will be seen by using both *constant* numbers, with one example.

Using *constant* number 0.847

20 (Y. c.) × 0.847 = 16.94 (M. c.)
16.94 (M. c.) ÷ 0.847 = 20 (Y. c.)

Using *constant* number 1.18

20 (Y. c.) ÷ 1.18 = 16.94 + (M. c.)
16.94 (M. c.) × 1.18 = 19.98 + (Y. c.)

Artificial Silk Counts, Mercerized Cotton and Spun Silk Counts.

The discovery of artificial silks was made on the Continent in Europe, and consequently the numbering of these artificially produced yarns was originally calculated on the same basis as true silk *i. e.* on the Italian denier scale.

This system of numbering artificial silk yarns still holds good, with the result that in making comparisons with mercerized cotton and spun silk yarns, a great deal of confusion arises.

The standard hank used in the calculation of artificial silk yarn counts, according to the London Silk Conditioning House, is equal to 476 metres, approximately 520 yards, and the system of numbering is such that the weight in *deniers* of this length of yarn constitutes the count or number.

It will be understood from this that the coarser the yarn the higher its count will be an exact antithesis of cotton, woolen and worsted yarn numbering. Another debatable point is the equivalent weight of the Italian denier, since the latter varies in different districts. The London Silk Conditioning House gives the weight of a single denier as .001875 ounces or an equivalent of 533⅓ deniers in one ounce or 8533⅓ deniers to the pound avoirdupois.

From this data it will be easy to solve any problems involving the conversion of a denier count into a spun silk or cotton count or *vice versa.*

EXAMPLE. What is the equal in cotton as well as spun silk of 150's denier artificial silk?

Remembering that according to the London Silk Conditioning House, 150's denier indicates that a length of 520 yards of artificial silk weighs 150 deniers we can easily ascertain by proportion the yards per lb. and divide them by the cotton or spun silk standard 840.

EXAMPLE: Ascertain Yards of 150's deniers artificial silk, technically known as *fibre silk.*

520 : 150 :: x : 8533.33 = 29582.2 yards in one pound 150's denier artificial silk.

29582.2 ÷ 840 = 35.21. *Ans.* Practically 150's artificial silk equals single 35's cotton or spun silk or 2/70's cotton or 35/2's spun silk.

Calculations thus given result in the following

RULE: To convert a denier count into a single cotton or spun siuk count, "Divide 5282.5 by the *denier* count given."

PROOF (of above example):

5282.5 ÷ 150 = 35.21. *Ans.*

This explains at the same time the ready conversion of cotton and spun silk yarn counts into fibre silk, *i. e.,* artificial silk counts using

RULE: Divide 5282.5 by the cotton or spun silk yarn count.

EXAMPLE: Convert 35.21's cotton or spun silk (as a proof of previous example given) into fibre silk count.

5282.5 ÷ 35.21 = 150's denier fibre silk count. *Ans.*

EXAMPLE: Convert 35's single cotton or fibre silk or 2/70's cotton or 70/2 fibre silk into the denier fibre silk count.

5282.5 ÷ 35 = 151 deniers, fibre silk count. *Ans.*

Drop in Wool Consumption.

Less wool was used by manufacturers in February of this year than in any month since monthly consumption reports have been issued by the Bureau of Markets, Department of Agriculture.

FEBRUARY consumption was 27,500,000 pounds, grease equivalent, compared to 63,700,000 in February a year ago, a decrease of over 50 per cent.

Consumption of wool during February, 1919, in classes by pounds, was: grease, 17,772,920; scoured, 3,467,457; and pulled, 1,946,441. Massachusetts used the most wool, followed in order by Rhode Island, Pennsylvania, New York, New Jersey, New Hampshire, Connecticut, Ohio and Maine.

Strikes and the inability of small manufacturers to secure wool because Government auctions were on a cash basis, are two of the reasons given for the decline in consumption during February.

To the old soap bath there is now added 2 lbs. to 5 oz. "Brilliant Green" and 3 lbs. "Fast Red." These should be dissolved separately, and added to the soap bath through a hair sieve. A good boiling up of the ingredients should now be given, after which the goods are worked in it for twenty minutes, and then lifted while the bath is freshly boiled up again. The goods are now re-entered and worked for twenty minutes while the bath is cooling, when rinsing and brightening with a weak sour bath of sulphuric acid is given, and the material is rinsed, dried and steamed on a stretcher frame to lustre.

When the above proportions of dye are given, the result will be a blue-black, and for a deep jet shade the respective quantities must be increased.

For example — 3½ lbs. of *Brilliant Green* and 3 lbs. 5 oz. of *Fast Red* will be required, together with 12 ozs. of *Azo Yellow* to sadden the shade.