FABRIC ANALYSIS.

Twist.

Testing for Twist.

(*Continued from June issue.*)

Fig. 75 shows the Twist Counter built by Henry L. Scott & Co., Providence, R. I., having a capacity of testing threads from one to ten or twenty inches. The standard machine is equipped with a dial graduated from 0 to 50 for both right and left hand twists. Movable or quick return dials that can be reset after each test, are furnished when so ordered. The drive is made with cut gears and the jaws are self-opening. The graduations of the bar are ½ inch. The apparatus is mounted upon an iron base and finished in hard-baked black enamel and nickel plate.

When a folded yarn is being tested, it will be found of help to insert a needle between the threads (close up to the fixed jaw) and slide the same along, as the threads are untwisted; the operator then can easily determine when the thread is free from twist. When the thread is single, however, this process cannot be adopted, but by examining the thread through a microscope with which the apparatus is then fitted out, the point at which the thread is free from twist can be accurately determined.

Testing for Take-up in Folded Yarns.

When threads are twisted together in the production of folded yarns, a certain amount of take-up or contraction takes place, which has a material influence in determining the resulting length or counts of the yarn, and also its cost. The amount of take-up of each thread varies according to the number of turns per inch and also according to the bending power of the individual threads. Thus, if the diameters of the threads are unequal, or one thread is softer than the other, the bending power of the threads will be unequal, and different lengths of each yarn will be required.

Special twist testers are built whereby the amount of take-up of each thread can be readily found. The jaws, between which the threads are suspended, are so arranged that a separate tension weight can be placed on each minor thread, and any required number of turns per inch, either taken out or inserted, by revolving the hand wheel in the proper direction. The amount of contraction is determined by measuring the distance moved by the tension weights.

Fig. 76 shows a Twist Counter used for ascertaining the turns of twist per inch in double and twist yarn, showing also the amount of take-up caused by this twisting, *i. e.,* the original length of the minor threads. The apparatus also can be used for ascertaining the amount of twist in single yarn.

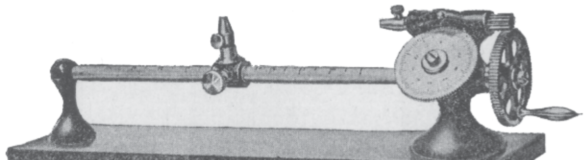

Fig. 75

As seen from the illustration, the apparatus consists of two clamping devices *a* and *b,* each supplied with a screw knob for holding the thread to be tested on both of its ends. *c* is a dial, numbered so as to show at a glance the number of turns imparted to clamp *a* and thus the number of turns of twist taken out (or inserted, if so required) of the thread tested. To permit the testing of different lengths of yarn, clamp *b* is arranged movable, *i. e.,* can be moved up or down on the three sided guide rack *d,* secured to the latter by a set screw on its back (only the knob of the latter is seen slightly to protrude back of the large screw) by means of which the take-up measurer is secured to the required position on guide rack *d,* so as to adjust clamps *b* from that of *a* to the length of thread to be tested. The counting attachment of the device consists in counting-dial *c* (which is turned by means of handle *e*) and two pointers, one of which, the pointer *f,* as is situated on the outside of the counting-dial, registers the individual turns of twist, whereas the other pointer, as placed on the counting-dial, indicates tenths and hundredths of turns of twist in the yarn. The counting-dial *c* is numbered to permit the reading of either left or right hand twist in the yarn.

To operate this twist tester, open the large screw shown on top of the take-up measurer and pull the latter out, as far as it will go; adjust the exact distance required between clamps *a* and *b* to suit the length of thread to be tested, allowing besides sufficient length of thread on each end to give both clamps a good grip on the thread to be tested.

Now place your measuring arrangement so that zero (0) on the dial is opposite pointer *f,* and in turn place thread to be tested (under fair tension) into clamps *a* and *b,* and release the knob of the take-up measuring device, giving in turn to the spring as is inside of the casing (and which spring was depressed before) a chance to expand and thus take up any slackness of the minor threads when untwisting

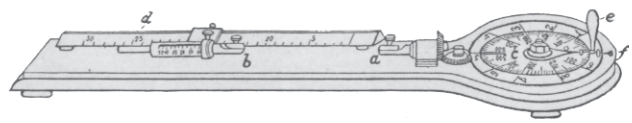

Fig. 76

the compound thread. Now turn the counting disk *c* by means of handle *e.* The turning of the latter (by means of gearing shown) is in turn transferred to the thread to be tested in the ratio of 1 : 10. For the pointer located in the centre of the dial the ratio is 0 to 1000, the pointer being moved by hand, if so required.

When the compound thread has been untwisted, insert a needle between the minor ends (singles) the twisted thread is composed of, and see that the twist originally imparted to the compound thread is removed, moving the needle for this purpose gradually to and fro until the same can pass unrestricted from clamp *a* to clamp *b;* all the twist having been removed, its number of turns are read from dial *c.*

Next ascertain the amount of extension of the minor threads (singles) during the test, the latter being expressed in millimeters.

Both results obtained are based on the metric measure and in turn can be changed over to the yard measure, if so desired.

Example: Suppose that by testing 20 *cm.* length of thread, you find 90 turns of clamp *a* (*i. e.,* 90 turns of twist was in the 20 *cm* of thread) and that your take-up scale shows 11 *mm* stretch for the minor (single) threads; then proceed with your calculation thus:

One meter $(100 \times 90 \div 20) = 450$ number of turns of twist yarn tested, and

0.011 (= 11 *mm*) : 0.2 (2 *dm* or 20 *cm*) : : *x* : 1 (*m*)

$0.011 \div 0.2 = 0.055 = 5.5\,\%$ extension of the minor (single) threads in testing, *i. e.,* their loss in length when originally twisting them.

100 (twist) : 105.5 (single) :: *x* : 100 and

$100{,}000 \div 1{,}055 = 94.8$, or 1 meter of yarn single will produce 948 *mm* twist.

One meter = 39.37 inches, will then give us

$450 \div 39.37 = 11.43$, or practically 11½ turns of twist was inserted *per inch* in the thread thus tested.

To ascertain the twist in a single thread, set clamps *a* and *b* about 2 to 4 *cm* apart from each other (guide rack *d* is divided by metric system) and insert the thread to be tested, fastening the clamps and turning the counting-disk *c* by means of handle *e.* The turning of the latter, as previously explained, is in turn transferred to the thread to be tested, in the ratio of 1:10. The filaments composing the thread in turn are untwisted until they rest side by side, and then the amount of twist that was in the (2, 3 or 4 *cm*) thread tested is read-off on the counting-disk, there is no take-up in twisting to be taken into consideration in connection with single yarn.

Another make of a Combined Twist Counter and Take-up Measurer is shown in its perspective view in Fig. 77, showing on its right hand side the twist counting portion of the apparatus consisting of a geared hand wheel meshing with a smaller gear fast to the end of the shaft that carries on its other end one of the clamps for holding one of the ends of the thread to be tested. In its centre this shaft carries a worm wheel that operates the measuring dial. On the left of the illustration is shown a weight, placed there to exercise the necessary tension on the thread when untwisting the latter, indicating at the same time the amount of its elongation (*i. e.* the percentage in loss of length to the minor threads in the process of twisting) on the scale shown on top of the rod holding the other clamp.

The scale for setting the distance of the two jaws, holding the thread for untwisting, is shown on the base of the apparatus, the extension portion of the apparatus being movable in a slide way, and held in proper position (after knowing the length of thread to be tested) by means of the large screw shown between the two posts. In the same slide way is mounted (movable) a plate presenting either a black or white surface as a background for examining the thread handled, using the white side of the plate up when dealing with a black or dark yarn, and the black side up when dealing with a white or light colored yarn, in this way simplifying work. Connected to the same upright as carrying the background plate, is a magnifying glass, to make examination of twist (present or not present) easier work.

EFFECT OF TWIST ON LENGTH AND COUNTS OF COTTON YARN.

Single as well as ply yarn can be twisted in either one of two directions — namely, right or left. The ply yarn may be twisted in the same or in the opposite direction from that of the single yarn of which it is composed, but in most cases the ply yarn is twisted in the opposite direction from that of the single yarn.

If two single threads are twisted in the same direction as the single strands are twisted, the ply yarn becomes brittle and shrinks in length. From two hanks (840 yds.) of 32's doubled with 18 turns per inch, only about 720 yds. of 2-ply yarn are obtained.

If, however, these two hanks are twisted in the opposite direction from that in which the single yarn was twisted when spun, 855 yds. of 2-ply yarn are obtained.

The shrinkage of yarn under the first-named conditions is well known; the increase in length, however, is seldom taken into account, although both are very important factors in manufacturing. In the above example there is an increase of 15 yards in the length of the hank when two hanks of 32's are twisted with 18 turns per inch. The cause for this increase is that a slack twist of 18 turns per inch not only does not reduce, but in fact increases the length of the yarn when the single yarn and ply yarn are twisted in different directions. This increase in the length of the single thread takes place in all cases where the twist is reversed when twisting the ply yarn, but is overcome by the twisting of the two threads around each other when the number of turns is increased sufficiently.

The normal twist (that is to say, the twist by which the 2-ply thread is just one-half the length of the two single threads) is twenty-four turns per inch for 2/32's. It is evident that the exact length cannot be determined exactly for each kind of yarn, on account of the many conditions that affect the increase or decrease in length by twisting. This change in length depends upon the kind of material and twist in the single yarn, whether the yarn has been twisted from cops or has been previously spooled, whether the yarn has been steamed, etc. The weight of the traveller and the speed of the spindles, as well as the temperature of the spinning room, also have their effect.

Expriments with yarn of different counts made from the same material and twisted under the same conditions to determine the change in length by twisting have been carried out and the results are shown in the following table:

COUNTS.	TURNS PER INCH.												
	8	10	12	14	16	18	20	22	24	26	28	30	
12	840	832	825	817	810	800	790						YARDS.
14	843	838	833	824	815	806	790	773					"
16	848	843	838	831	823	816	809	787	772				"
18	856	850	843	836	830	822	814	805	796	763			"
20	862	855	848	841	835	833	828	822	816	786	761		"
22	863	858	852	846	840	837	835	829	823	800	775	752	"
24	862	860	856	852	846	840	837	832	829	809	790	769	"
26	863	862	859	856	850	846	840	836	831	816	802	788	"
28	864	863	861	858	856	849	843	840	836	824	812	801	"
30	865	864	862	860	857	852	847	843	839	831	822	813	"
32	866	865	863	861	859	855	850	845	841	835	830	826	"
34		866	864	862	860	857	853	848	844	840	836	832	"
36			865	863	861	859	855	849	846	843	840	837	"
38				864	862	860	857	853	849	845	842	839	"
40					863	861	858	854	850	846	843	840	"

The numbers at the left of the table indicate the counts of the single yarn; those at the top of the columns the number of turns per inch in the 2-ply yarn. The yarn was made from first quality 1¼ in. staple and spun on a ring frame. The number of turns of twist in the single yarn was equal to four times the square root of the count.

For example, in 20's yarn there were 4 × 4.47 = 17.8 turns per inch. The yarn was spooled for twisting and twisted dry.

According to this table, two hanks of 24's doubled with 10 turns per inch will measure 860 yds. when twisted. This represents an increase of 2.4 per cent. The consequence is that 840 yds. of the twisted yarn is 2.4 per cent lighter than 1680 yds. of the single yarn. It will be necessary to spin the single yarn to 29's in order to have the 2-ply equal to 15's (2/30) yarn with 10 turns per inch.

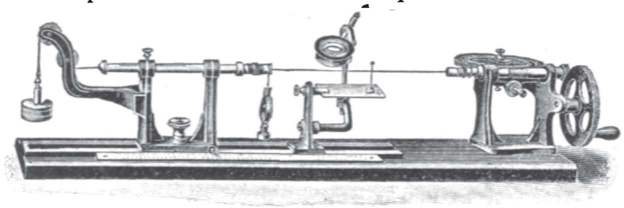

Fig. 77

On the other hand, if 2/30's yarn is doubled with a hard twist of 30 turns per inch, 1680 yds. of the single yarn measures but 813 yds. when doubled, a loss of 813 yds. per hank, or 3.21 per cent.

If a 2400 end warp 900 yds. long is made from this yarn, the calculated weight will be as follows:

(900 × 2400) ÷ (840 × 15) = 171.4 lb. The actual weight, however, will be 176.9 lb., a difference of 5½ lb. on 900 yds. of warp.

If the single yarn is spun finer, in this case to 31's, in order to obtain a 2-ply yarn of the required size, several other difficulties arise. First, the higher count involves a higher cost of production, because no spinner can spin 31's at the same price as 30's. Again, the 31's when twisted will not be as strong as the 30's yarn.

Turning to the table we find that its use is very simple. Take, for example, a 2/30's to be twisted with 12 turns per inch. The table shows that two hanks of 30's will measure 862 yds. when doubled with 12 turns per inch. The increase in length is 22 yds., and the yarn will be 2.6 per cent too light.

(To be continued.)

Dyeing and Cleaning.

D. B. Lake, in an article in the Journal of Physics and Chemistry, explains that the apparent displacement of a dyestuff in a dyed material or its masking by another dyestuff is due to the solvent or peptising action of the water, and is independent of the second dyestuff.

The fact that dyeings made at a high temperature do not bleed so readily as those made at a lower temperature he ascribed to the coagulation of the dyestuff. It will be found that acid dyestuffs on wool bleed less in hot water if dyed from an acid bath, probably due to the coagulating effect of the acid.

The laws suggested by Bancroft for the adsorption of an acid dyestuff in various acid baths hold when the saturation capacity of the fibre has been so decreased that the "cutting down" effect of the various anions can be manifested.

In a number of dyestuffs examined, Lake found that the more the dyestuff is irreversibly adsorbed the less completely and readily is it adsorbed at a low temperature, and the less will it bleed, other factors remaining the same.

A detailed treatment of the methods available for the removal of stains are given by Lake, classified as follows: (1) Mechanical removal; (2) solution in a liquid; (3) peptising in a liquid, (*i. e.,* removing dyestuffs with hot water); (4) peptising with a solution (*i. e.,* removing dyestuffs with sodium carbonate solution); (5) peptising with peptised colloid (*i. e.,* removing stains with soap); (6) peptising in two stages (*i. e.,* removing paint by treatment first with oil and casein and then with soap); (7) adsorption by solids (*i. e.,* removing grease with Fuller's earth or blotting paper); (8) peptising with a liquid and adsorption by solid; and (9) change of substance forming the stain.

The removal of soot from cotton by dilute caustic soda Lake considers to be due to the peptisation of the soot by the preferentially adsorbed hydroxyl ions forming a soot colloid soluble in caustic soda.