FABRIC ANALYSIS.

Silk.

(Continued from March issue.)

Weighted Silk. In order to make up the loss caused by the boiling-off process as well as in some instances for the purpose of defrauding the buyer, silk is weighted. Fig. 38

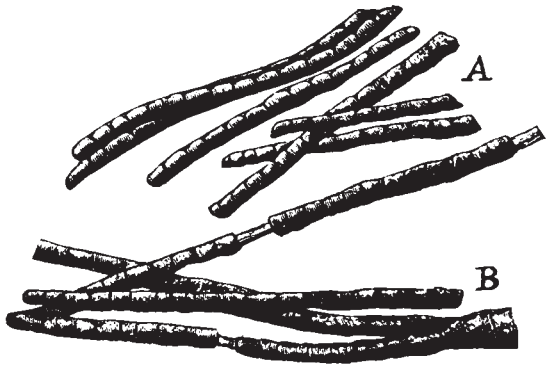

Fig. 38

shows (magnified) silk that has been weighted, *A* showing a weighting of from one and one-half to twice the weight of the silk; *B* showing a weighting increased to from three and one-half to four times the weight of the silk.

Very interesting is the examination of these silks by Roentgen rays. The Roentgen photography is employed in the examination of silk that has been charged to differently high degrees, and these pictures take the place of the chemical analysis which is often difficult with such charges as consist of salts of iron. The stronger the charge is, the greater is its resistance to perlucidation. Consequently upon the negative plate the uncharged silk gives the darkest, and the most heavily charged the lightest likeness, since the strongest charge is the least penetrable for light.

Cotton.

When viewed under the microscope, fully matured or ripe cotton fibres have the appearance of spirally twisted bands or ribbons, with finely-granulated markings. A grooved appearance will be also noticed on account of the cell walls being thicker at the edges than in the centre.

Fig. 39 illustrates cotton fibres, of which *A* shows two unripe or dead fibres, by which is understood that such fibres have not attained full maturity. Their detection is very important, since their presence is very detrimental to yarn and fabric. They are recognizable by the very thin transparent filaments, which, though ribbon shaped, are not twisted, and do not exhibit the slightest trace of lumen in the cell. *B* shows a specimen of a half ripe fibre, and which is a medium between ripe and dead fibres, and in conjunction with the latter, according to amount present in a lot of cotton, depreciate its value to the manufacturer, such fibres being the result of the cotton being removed from the pod before fully matured. *C* shows two specimens of matured or fully ripe fibres. These are hollow nearly throughout their entire length, with the exception of the end which had not been attached to the seed. This hollowness of the ripe fibre allows the dyestuffs to penetrate, and produce evenly dyed yarns or fabrics, whereas unripe or dead cotton, which practically has no central cavity, is very difficult to dye, and frequently appears as white specks on dyed pieces, particularly in such as are dyed indigo blue or turkey red.

Mercerized Cotton.

Although mercerization of cotton has been carried out on a large technical scale for many years, it is well known that to ascertain whether a particular sample of cotton has been mercerized or not, is no easy question to ask, more so if required to ascertain the degree of mercerization to which a particular sample of cotton has been subjected. Fibres which have been thoroughly mercerized exhibit very distinct microscopic characteristics. It is, however, found to be very difficult in many instances to say with certainty whether fibres have been mercerized if such fibres are taken from fabrics which have been mercerized on an industrial scale. Those who have practical experience in mercerizing will readily understand why this must be the case. In many instances the individual fibres have been only incompletely penetrated by the caustic soda solution, and frequently some of the fibres have not been mercerized at all. The strength of the caustic soda solution used has also a very considerable influence upon the microscopic appearance of the fibres. Among other causes which tend to make the method of microscopic examination difficult in practice should further be mentioned the application of certain finishing operations, such as the Schreiner finish, after mercerization. Mercerized cotton exhibits increased affinity for the substantive cotton colors.

Mercerized Cotton Compared to Cotton as well as Silk.

Two typical classes of mercerized cotton must be considered, *viz:* such as mercerized without and with tension. The silky lustre in mercerized cotton depends on the stretching, mercerization without tension producing shrinkage and no lustre to the cotton thus treated.

If comparing cotton fibres not mercerized with cotton fibres mercerized but without tension, the latter, if viewed under the microscope, in their outer appearance somewhat resemble silk. The fibres look smoother and more uniform, and the lumen is contracted either entirely or in places. Cotton treated with strong caustic soda, without tension, is capable of absorbing about 40 per cent more of the substantive cotton colors and of the sulphur colors than is ordinary non-mercerized cotton.

If we examine under the microscope cotton fibres which have been mercerized under tension (the process which in practical work is known as mercerizing) we find that such fibres resemble silk more closely than such cotton as has been mercerized without tension. The lumen often becomes obliterated altogether, the spirals, *i. e.*, the characteristic twist of the raw cotton fibre disappear, showing us smooth, uniform, silk like, straight rods.

Treating the fibres with cuprate of ammonia, the lumen reappears if dealing with mercerized cotton, but not if dealing with silk.

The uncurling of the natural twist in a cotton fibre when mercerizing under tension is essential for the production of its silky lustre, since when cotton is mercerized under tension and thus cannot shrink, the first effect of the lye is to straighten the fibre, and after that to re-curl it the other way. By this time the fibres have swollen, so that when they curl up again (this time in the reverse direction) they then present a rounded and not a flattened section. This second twist causes the surface of the fibre, smoothed by the swelling it has undergone, to catch the light at different angles, and thus to produce the lustre. When examined by the microscope, the use of elliptically polarized light is necessary to bring out the new twistings. There is, however,

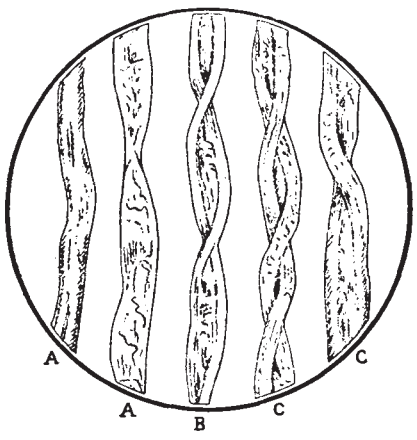

Fig. 39

a possibility that the lustre is due to the joint action of chemical and physical agencies.

Some chemists claim that the mercerizing lye acts on one or more of the inner layers of the fibre, causing them on rinsing to exert a stretching effect on the outer cuticle of the fibre, with the result of smoothing it, and making it lustrous by increasing light reflection.

To Ascertain the Degree of Mercerization.

For the purpose of examining a pattern of either cloth or yarn with a view to ascertaining the strength of caustic soda with which it has been mercerized, a range of patterns mercerized with different strengths of soda should be prepared for the purpose of comparison. If colored samples are to be examined, it is necessary either to discharge the color by means of any of the well-known agents or the standard patterns must be dyed to approximately the same

shade with dyestuffs similar to those which have been used in producing the pattern under examination. The patterns are then immersed in the iodine solution for a few seconds and washed. With careful observation the degree of mercerization can be ascertained with fair accuracy.

Fig. 40

It is however not always an easy matter to tell by means of the microscope whether cotton threads found in a sample have been mercerized or not, since, as mentioned before, during the process of mercerizing the inner fibres of the hank are relatively protected against the action of the caustic soda, in turn of which many of the fibres will retain their charac-

Fig. 41

teristic twisted form of untreated cotton. It is therefore essential to supplement a microscopical examination by a chemical test.

Other Vegetable Fibres.

FLAX, when viewed under the microscope, as shown in Fig. 40, has the appearance of long grasses or reeds, with bamboo-like joints or nodes, arranged at regular intervals. The cell wall is regular in thickness and leaves a narrow

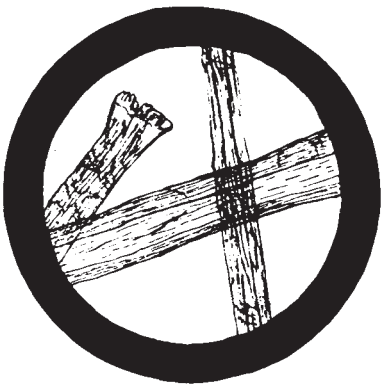

Fig. 42

internal channel, which, if visible, appears as a fine dark line. When bleached, flax (*i. e.*, linen fibre) becomes snowy white and lustrous.

Tow yarn, made from the waste in flax spinning, may be distinguished from linen yarn by its uneven, rough and knotty appearance, due to containing particles of shives, from which linen yarn is free.

JUTE, if viewed under the microscope, is shown to consist of stiff lustrous and cylindrical fibrils, the walls being irregular in thickness, with a comparatively large central opening. Fig. 41 shows specimens of jute fibres magnified.

RAMIE. These fibres are about twice the breadth of that of cotton, and appear under the microscope as a broad flat ribbon. Ramie fibres in the raw state have a soft, silky feel, but by pulling the staple, this quality becomes reduced and gives way to more or less harshness in the feel. Fig. 42 shows specimens of the fibre magnified.

HEMP. A view of the fibre as seen under the microscope, is given in Fig. 43. It somewhat resembles that of flax, being however coarser and consequently stronger.

Comparing linen threads, principally such as used in heavy stuffs, under the microscope with cotton threads, the former are more or less irregular in their diameter, and in their length there are some parts stronger than others, whereas cotton

Fig. 43

threads are of a more regular character. The difference will be more readily seen in goods that are ironed and where in the fabric, linen threads show larger, *i.e.*, more prominently in some places than in others. A good procedure is to examine the fabrics by holding them up to daylight and when the regularity of cotton threads will be then noticed at once.

(To be continued.)

THE CONSTRUCTION OF CURVED TWILLS.

These weaves are a combination of our 27, 45, 63, 70, 75 and 80 deg. twills; the latter two systems are only little made use of. As the name indicates a curved twill effect is given to the new twill weave.

The 45 deg. twills are the foundation for this system of fancy twills, the different steep twills, as well as the mate reclining twill obtained from said foundation twill forming the basis for the construction of the curve of the new weave.

As a rule, the 45 deg. twill forms the harness chain for the curved twill, the drafting (drawing-in) for the various different fancy twills used corresponding to the systems of steep twills or reclining twills they refer to.

Six examples are given to explain the construction of these weaves.

Weave Fig. 1 has for its foundation the $\frac{5}{3}$ 8-harness twill, using in rotation always 4 threads every time of 45, 63, 70 and 63 degree twill, giving us for the repeat of the curved twill 16 warp-threads and 8 picks.

Drawing-in Draft: 8-harness, fancy draw (see *dot* type below weave).

Harness Chain: The $\frac{5}{3}$ 8-harness regular twill.

Weave Fig. 2 has for its foundation the 6-harness even sided twill, having 4 threads of the regular twill exchange with 4 threads of its mate 63 degree twill, the curved twill repeating on 8 warp-threads and 6 picks.