FABRIC ANALYSIS.

(Continued from April issue.)

Artificial Silks.

These silks during the last ten (or more) years have come in strong competition with the true as well as wild silk fibre, although for a fact are more expensive than the

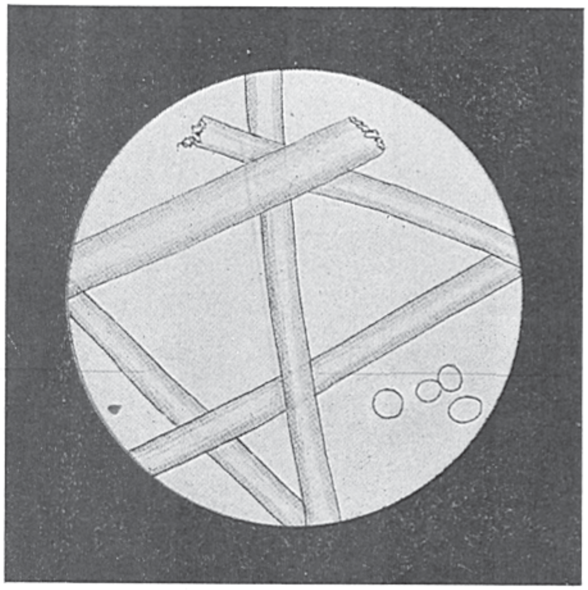

Fig. 44

latter. They are more lustrous than true and wild silk, also stiffer. They do not possess the same smooth feel, being also inferior in strength and elasticity as compared to true silk, neither do they possess the scroop, characteristic to the latter. They can in most cases be detected from true silk, the microscope readily showing their difference in structure. Artificial silks appear under the microscope like a glossy, thin stick, without any structure at all. The most often met with kinds of artificial silk are Chardonnet, Viscose, and Cuprammonium.

CHARDONNET SILK.

Fig. 44' shows specimens of this silk (magnified) giving also cross sections. They are nitro-cellulose prepared from cotton or wood pulp, which is dissolved under pressure in a mixture of ether and alcohol and the viscous solution forced through small openings. The filaments are spun dry, the solvent evaporating and leaving the nitrated cellulose. Three, four or more filaments are spun together and the threads denitrated by immersion in a 5 to 20 per cent solution of ammonium hydro-sulphide, and finally washed, dried, and dyed to any color.

VISCOSE SILK.

In the manufacture of the same, cellulose is treated with strong alkali and carbon bisulphide; the resulting viscose dissolved in water and the solution filtered and forced through jets into a solution of ammonium chloride, which reprecipitates the viscose. Fig. 45 shows specimens of filaments of this silk, magnified, also cross sections of it.

CUPRAMMONIUM SILK.

The same is made either by the *Linkmeyer* or the *Thiele* process.

In the first process, the cuprammonium solution of cellulose is coagulated by the addition of a solution of caustic alkali, the threads remaining blue and transparent. The compound is dissociated by water, copper hydroxide being deposited in the thread. When the copper is removed by treatment with dilute acids, the decolorized threads remain perfectly transparent.

In connection with Thiele's process, a highly concentrated solution of cellulose in cuprammonium solution is passed through wide openings into a vessel containing a substance (*i. e.*, ether) which slowly precipitates the cellulose. The threads are then drawn out to extreme fineness by means of glass rollers revolving in acid.

Fig. 46 shows (magnified) three filaments of cuprammonium silk.

Tests by Burning.

A very simple method of discriminating between fibres of vegetable and animal origin is by the manner in which they burn. Vegetable fibres are composed of carbon, hydrogen and oxygen; silk, in addition, contains nitrogen; and wool, nitrogen and sulphur.

WOOL is rather difficult to ignite, the flame is more or less lifeless and the fibre when burnt curls up and forms a bead of burnt matter, and owing to the presence of sulphur gives off a disagreeable odor of burnt horn.

VEGETABLE fibres burn with a flash, and give off little smell. Cotton burns readily in a free supply of air and leaves little residue; linen does not burn as readily as cotton.

Distinguishing Wool and Cotton.

We can learn a lot regarding the constituents of wool and cotton by viewing the burning, or newly-extinguished, fibres through a microscope. The wool fibre, as it gets hotter through the presence of flame, divides up into a series of bubbles, which become expanded, as shown in the left in Fig. 47, by the contained gas generated by the decomposition. These globes swell considerably, and fuse together, because their exteriors become converted into a kind of melted glue. The fibres curl and bend under the influence of heat, and finally become masses of tiny, hollow, hard balls much greater in diameter than the original fibres. In reality they are collections of thin-shelled spheres merged together irregularly. Heat drives the sulphurous gas hither and thither in the fibres as bubbles which get enclosed by the melting horny keratin. As the gas expands, the shells do likewise, and eventually become so thin that they break and liberate the offensive gas. The mass is melted and re-melted until all the gas has been driven out, when the spheres fall together as a mere conglomerated mass of charred substance or carbon.

It is noticeable that soon after the flame has been withdrawn from wool fibres, the latter become extinguished, as there is not a sufficient balance of combustible material remaining to allow continued burning on its own account.

A most interesting and effective experiment can easily be made to demonstrate the basic composition of a fabric, say for example a flannel, to ascertain whether it is wool or cotton, thus: Cut off for this purpose a square inch, or less, and lay it between two strips of glass that are tightly bound together with fine wire. It is then placed in front of a clear fire (almost between the bars, say) and within a few min-

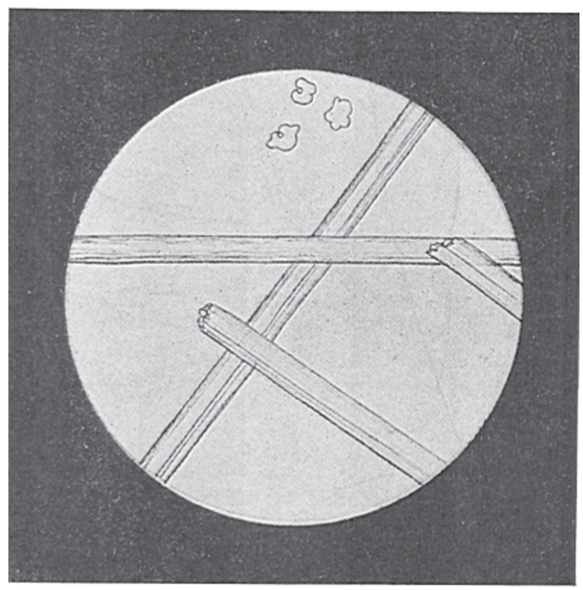

Fig. 45

utes, if its constituents are wool fibres, it will change to a deep reddish brown hue—a kind of glue. If it is then magnified, the fibres will be found actually melted and run together to form a bright reddish substance that splits up into flakes or odd pieces. The result is different from that previously described, owing to the absence of flame-generated bubbles. Imagine that you had woven strings of white glue, and that you melted these until they became a cake of substance of the ordinary color—the result will resemble that obtained by heating a piece of all wool fabric in the way described.

Upon lighting a piece of cotton flannel, the fibres burn completely away except for a white residue of mineral ash. There is no bubbling or fizzling of material meantime, but simply a steady, or at times a rapid, sustained flame.

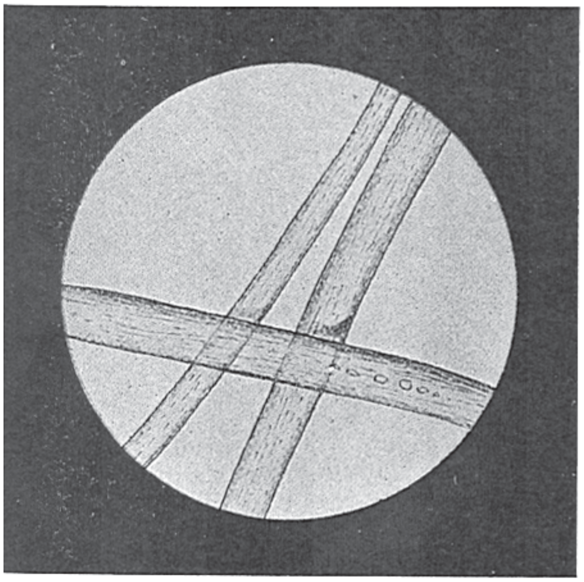

Fig. 46

When a piece of cotton flannel is then laid between glass and heated by fire in the same way, as described with all wool flannel, the fibres then will simply shrive to half or quarter their original diameter, and blacken. A kind of juice, which breaks into cakes as it dries, appears around it, but the material does not melt as does the all wool flannel.

If one is very careful while burning a piece of cotton flannel with a flame, a sort of skeleton of the fabric consisting of white ash in the minutest of specks or atoms in strings will remain for a time as shown at the right in Fig. 47. It will, however, fall apart at a mere breath. All vegetable fibres burn similarly.

Distinguishing Cotton and Linen.

To distinguish cotton and linen, used in combination with each other in the construction of a fabric, by the burning process, unravel for this purpose the fabric so as to form a fringe half-an-inch long of both warp and filling. The fringe is then set on fire, and the flame acts differently according to the nature of the material. In a pure linen fabric where both warp and filling fringe has been burned, it will be seen that the flame has also burned the cloth both at the top and the sides. In a fabric similarly treated, but consisting of cotton warp and linen filling, the flame from the linen fringe attacked the cloth, while the cotton fringe burned down to the filling without attacking the fabric.

This difference in the action of the flame is easy to understand. The cotton consists usually of 95 per cent of cellulose, which burns very quickly without giving out sufficient heat to ignite the woven fabric. The linen yarn, on the other hand, is composed of only 75 per cent of cellulose, the remainder being gummy and resinous matter which, when ignited, gives out a much greater quantity of heat, and causes the combustion of the cloth.

Linen and *cotton* threads in one fabric can be also distinguished by tearing. Linen threads are much stronger than cotton and if it is as difficult to tear a fabric warp-way as it is filling-way, it is fairly certain the cloth is pure linen, or at any rate made from only one kind of fibre. After a little practice in tearing cloths, one can distinguish the difference between linen and cotton by the sound of the tear. Linen gives a dull sound, while that caused by tearing cotton is sharper. It will be also noticed that the broken ends of the linen threads have a pearly appearance, the fibres being irregular and lustrous, while the ends of the threads are untwisted, owing to the fibres being so rigid. The ends of the cotton threads, on the other hand, show a cleaner break, and the threads are dull in appearance with the fibres being curled instead of straight.

Silk.

Silk burns in the same manner as wool, but as there is no sulphur present in the fibres, no pronounced smell of horn is evolved. Silk fibres may be distinguished from cotton, linen and other vegetable fibres, by curling up when exposed to a flame, similar to wool.

Weighting of silk is also ascertained by burning the thread. If it is pure silk and properly dyed, it will take fire with some difficulty, and the flame will go out as soon as the fire is withdrawn, in turn leaving a nearly jet black mass, the same as wool. Weighted silk takes fire readily, and once burning, will smoulder, leaving a refuse, retaining the shape of the yarn or fabric tested.

Burning threads of weighted silk will show the following results:

The threads do not burn but only heat up red, *i.e.*, smoulder, leaving a refuse somewhat retaining the shape of the thread.

The threads by burning turn into a spongeous cinder, somewhat like baked coal, showing a heavy curl.

The resulting ashes turn into a curly mass resembling burnt animal matter like hair, horn, etc., and afterwards become very light, crumpling to a powder when touched.

Fig. 48 shows a fabric, metal weighted, showing that it does not burn readily but heats red hot and retains its straight form. The portion of the fabric exposed to the fire has retained considerable of its original texture.

Fig. 49 shows a heavily weighted sample of silk, clearly indicated by the cinder-charred end, *i.e.*, by the blisters appearing in long form from top to bottom, or left to right. If blisters boil we have a sure sign of sugar weighting, which, however now is only little used. Sugar weighting may be detected by chewing and when the taste will indicate whether this is the case or not.

Fig. 50 shows a heavily sugar weighted silk fabric, from which sugar bubbles were oozing during the fire test.

If, while burning, the silk fabric reaches a red heat and blisters appear simultaneously, the same as a rule indicates that the sample was weighted with metal and tannic acid.

If the ash left after burning a weighted sample on a porcelain plate forms more than one per cent of the original weight,

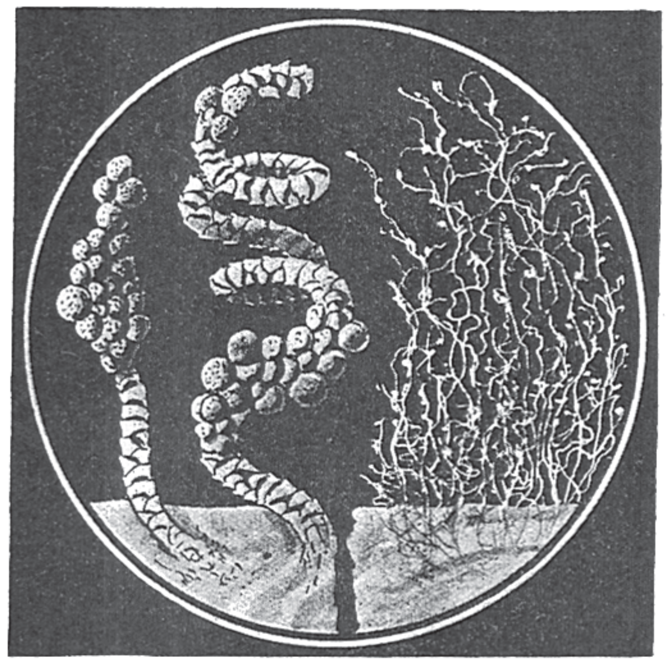

Fig. 47

the silk has been loaded. If the ash is brown in color, it indicates iron; if white, and is turned brown by the application of sulphide of ammonia, tin is indicated; while brownish-black indicates lead.

Iron weighting is always used for black silk; tin, tannin, and albuminoids for white and light colors; and lead, in conjunction with iron, for black, or separately for light colors.

It is evident, however, that the burning test can only be employed for material in bulk, and is of less value in determining the fibre constituents of a mix in yarns or fabrics.

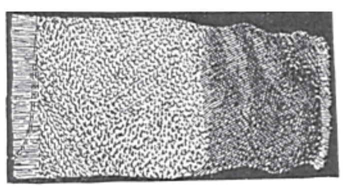

Fig. 48

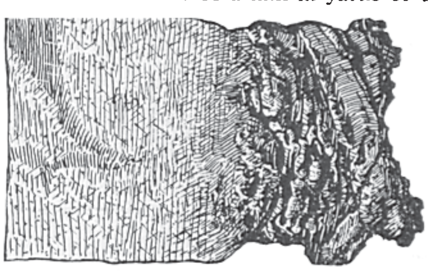

Fig. 49

Artificial silk may be distinguished from true silk by its inferior strength and elasticity, also by its greater inflammability.

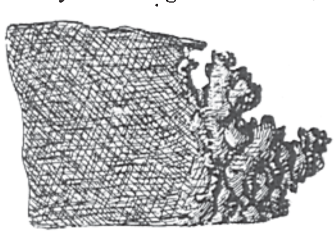

Fig. 50

Distinguishing Artificial from True Silk.

Artificial silk has become a most important textile fibre and is extensively used, and, for a fact, the demand for it is greater than the supply. It is readily distinguished from true silk by its shining bright lustre, as well as that it possesses less elasticity than true silk. It cannot stand as much tensile strain as does true silk, the former breaking more readily.

Combustion, *i.e.*. burning is another good test; true silk, being an animal product burns much slower than the artificial product.

Wetting artificial silk threads makes them very tender, whereas true silk retains its strength.

Treating Artificial Silk Threads.

In order that artificial silk threads may receive the maximum benefit from the denitrating solution, which will ensure their uniform bleaching and dyeing, according to a late British Patent, 10,858, they are mounted on specially constructed bobbins, so formed that while there is a cylindrical winding surface, the silk is wound only on a series of radial points.

Old Experimental German Dyes Are Causing Trouble.

According to the Daily Trade Record it is claimed that the dyes which are making the trouble at the present time in this country are really old German experimental dyes which have been dug up here, there and elsewhere and are now coming to the surface in fabrics. Because they were German made they were thought to be perfect. Those who had used them had forgotten all about them but they are now reappearing and it is really these colors and not American dyes that are creating all the disturbance. They were made before the fast alizarine dyes had been perfected, it is claimed.