FABRIC ANALYSIS.

(Continued from January issue.)

How to Prepare Yarns and Fibres for Microscope.

Yarns to be examined under the microscope, whether in their pure state or liberated from a woven or knitted, etc. fabric, after proper removal of all dirt, so that the passage of

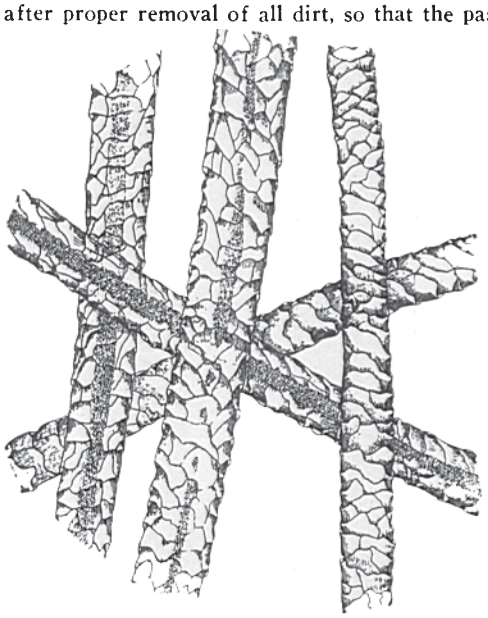

Fig. 20

the light will be unrestricted, are then untwisted by hand, in order to transfer the yarn back into a mass of loose fibres; selecting then a proper amount of these fibres for testing. Immersing the fibres to be tested, whether in the raw state or taken from yarns or fabrics, in boiling water, or better still in glycerine or Canada balsam, will increase their transparency. The fibres thus prepared are then separately laid, side by side, on a glass slide and covered with a thin cover glass and are then ready for magnifying.

Wool.

Wool viewed under the microscope appears as a solid rod-shaped substance, the surface of which presents a peculiar scaly appearance, being covered externally with small plates or scales, the edges of which either protrude from the body of the fibre or are only surface markings. These scales are more strongly and regularly developed in proportion to the fineness of the wool. The cylindrical shape of the wool fibre is best observed (when viewed under the microscope) where two fibres cross one another. A central core of medullary matter, running longitudinally in the fibre is sometimes visible, particularly in the coarser types of wool.

Fig. 20 shows five wool fibres as seen by means of the microscope, and of which three of the fibres show this central core of medullary matter, previously referred to, which however is missing in the other two; all five fibres being specimens of coarse long staple wool fibres. In the better classes of wool, this medullary portion is entirely absent, its presence or absence depending upon the breed, health and care of the sheep and also the part of the body upon which the wool is grown.

Besides their scaly surface structure, wool fibres are characterised by their wavy structure, technically known as the *wave of the crimp* being another item depending upon the breed of the sheep; the finer the quality, the more of these waves to one inch of fibre.

Yarns made of wool are classed as wool spun and worsted. The latter, in opposition to the woolen yarn, consists of wool fibres brought by means of combing and drawing parallel to each other, the first mentioned process at the same time combing out of the stock any fibres below the standard length for which the machine is set, and for which reason worsted yarn means a yarn composed of wool fibres nearly all of a uniform length.

These two points, parallelization as well as equalization of the fibres, characteristic of worsted yarn, constitute the principle difference between worsted and woolen yarn. The parallelization of the fibres in a worsted thread will be readily noticed by its smooth surface as compared to that of wool spun yarn, which presents a fuzzy surface in order to assist in the formation of the nap in the finishing of the fabric.

To ascertain the length of the fibres used in a thread, liberate the individual fibres composing the same by untwisting, and when a comparison of the length of fibres used can be readily made.

To illustrate the difference between a woolen and a worsted thread, the appearance of its roving or sliver previously to spinning is given in Figs. 21 and 22, and of which Fig. 21 shows a condensed woolen sliver (roving) previous to spinning, Fig. 22 showing a combed and drawn worsted sliver previous to spinning.

Having given a description of a true wool fibre, the analyst may be called upon to ascertain in a lot of wool, yarn, or a fabric the cause of imperfections, *i. e.,* the presence of poor wool fibres, chiefly among which are found *untrue* fibres and *kemps.*

UNTRUE FIBRES.

Under true or even fibres, we classify those having a nearly uniform diameter throughout their entire length, whereas, fibres wanting this character are termed untrue or uneven, the latter being characterized by variations in diameter on the same fibre, a feature which will seriously interfere with the working quality of the wool. Specimens of untrue fibres are shown in Fig. 23 which will readily show that where these abnormal forms occur, there are changes in the form and size of the outer scales as well as in the diameter of the fibre, consequently the internal structure of the fibre must be equally affected, thus reducing the strength and elasticity of such fibres. It is well known that a chain is no stronger than its weakest link, and, in a similar manner, we may say that the strength of a wool fibre is proportionate to its smallest cross section; so that the buyer, in judging of such a wool would measure its value to him by this very defect. Untrue fibres are found most frequently in the fleece of inferior bred or neglected sheep, or are the result of sickness of the animal. In some instances we find a sudden

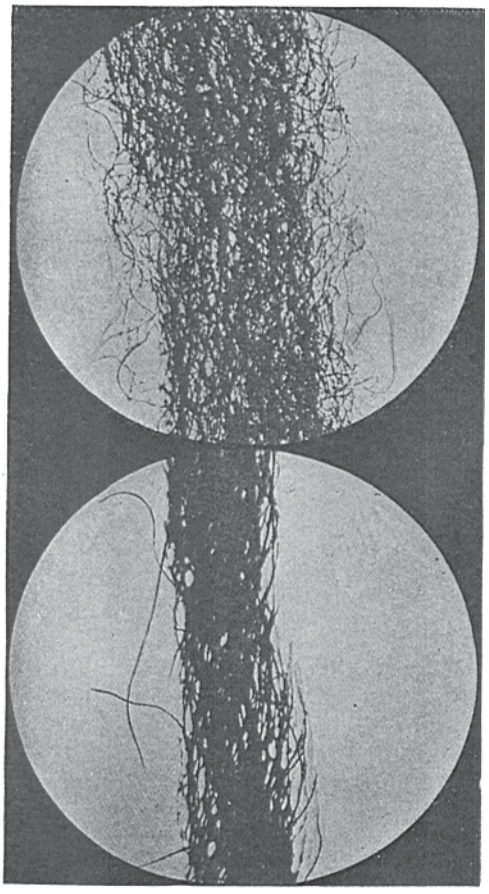

Fig. 21

Fig. 22

contraction in diameter of the fibre at certain points, which is frequently sufficient to give the edge of the fibre a decidedly notched appearance, whereas in other cases we find a more gradual contraction.

KEMPS.

They are another kind of imperfect fibres met with in wool. The characteristic of an ordinary kemp fibre is a hair of dead silvery white, thicker and shorter than the good wool. Kemp fibres do not seem to differ considerably in their chemical composition from the good or true wool fibres, but possess no absorbent power, thus resisting either entirely, or partly, the entrance of dyestuffs, in the latter case producing

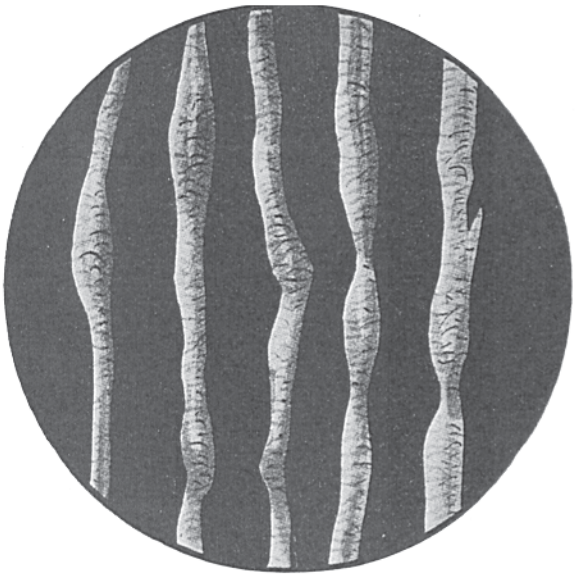

Fig. 23

a different shade from that imparted to the good fibres of the same lot, hence kemp fibres will be readily detected in dyed lots of wool, yarns or fabrics. The presence of kemp fibres in a lot of wool will also result in poor spinning and poor yarn, since they will not thoroughly combine with the good wool, neither will they felt.

Fig. 24 shows four different kempy wool fibres and of which *A* shows a kempy fibre, seen by reflected light; *B* a fibre, part wool and part kemp, seen by reflected light; *C* a fibre, part wool and part kemp, seen by transmitted light and *D* a fibre, part wool and part kemp, with kempy part opaque when seen by transmitted light.

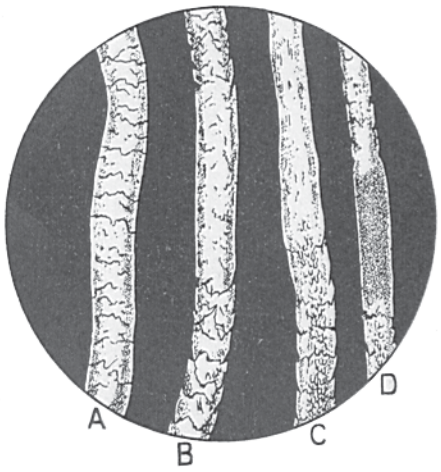

Fig. 24

COMPARING HAIR AND WOOL.

Examining hair (wool is only a variety of it) under a powerful microscope, we find that the same lies straight and even, and presents a comparatively smooth surface compared to the serrated surface of the wool fibre. Figs. 25 and 26 are given to explain subject, and of which the first shows a wool fibre treated with caustic soda, and the latter a hair (human) treated in the same way, so as to show the serrations distinctly.

Other animal fibres used by the textile industry are: the coverings obtained from the Cashmere Goat, the Angora Goat, the Alpaca, the Camel, the Common Goat and the Cow, also the hair of the Horse.

CASHMERE WOOL AND HAIR.

The same are the covering of the Cashmere Goat, *viz:* a soft, woolly, white or grayish undercoat, and a covering

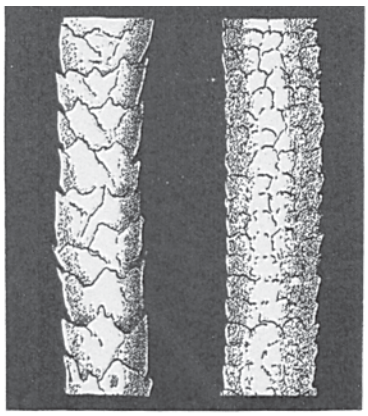

Fig. 25 *Fig. 26*

of long hairs. The woolly undercoat is the valuable fibre, and is true wool fibre in its structure, varying in length from 1¼ to 3½ inches and possesses no medullary substance. The outer hairs are of a length of from 3½ to 4½ inches, and possess the central or medullary substance, as shown in Fig. 27.

MOHAIR.

Mohair is the name given to the hairy covering of the Angora goat. It is of a pure white color (more rarely gray)

Fig. 27

rather fine, more or less curly, of high lustre, and on an average of from 5 to 6 inches long, although in some cases it may be as long as 12 inches. The outer scales are extremely delicate, and can only be observed with high powers, if at all. They are regular and encircle the whole hair, giving the fibres a spotted appearance all over their surface, as shown in Fig. 28, illustrating such fibres magnified. In most cases the pith is absent, although it is sometimes seen in the form of a canal occupying more than one half of the diameter of the fibre.

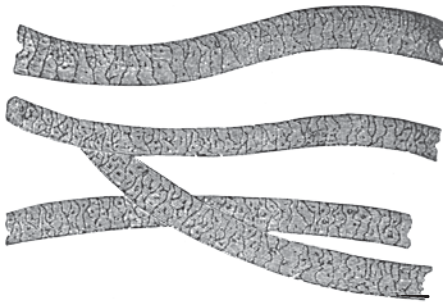

Fig. 28

Besides the mohair, there grows upon the Angora goat a short, stiff hair (kemp), a relic of the common goat. Its presence depends upon the kind of breed, being nearly nil in the pure animal. This kemp fibre in mohair always reduces its value, in proportion to the amount that is present.