The Identification of Textile Fibers

By Dr. Louis J. Matos

In examining undyed wool fibers of any grade under the microscope, attention should be given to some fibers that appear distinctly white; also in dyed wool some fibers appear to be but slightly stained. These fibers are known as *kemps* and are generally devoid of the characteristic markings that

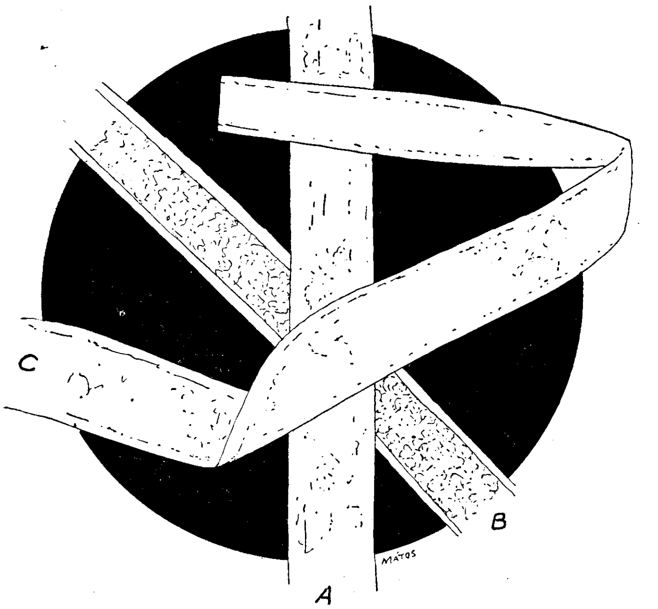

Fig. 25. Kemps. A and B. Roundish kemps, usual form. C-Flat kemp. Scarce.

distinguish the normal wool fibre. Kemps are somewhat horny in texture, appear flat, and are essentially dead fibers. They occur in almost all wools, some wools being distinctly "kempy," while in others such fibers seldom occur. They may be mistaken for vegetable fibers, but the alkali solubility test will confirm the identity, Fig. 25.

A very important chemical test to distinguish vegetable fibers from animal fibers, including natural silk, is to char a small portion of the sample in a dry test tube over a bunsen flame. In the mouth of the test tube place a small slip of red and blue litmus paper, and note the reaction of the fumes on the color of the paper. If the red paper changes to blue, the fibers are of animal origin, while if the blue paper changes to red, the fibers are vegetable. Animal fibers contain nitrogen, which during the heating is liberated in the form of ammonia, an alkali, which changes the red paper to blue. Vegetable fibers when treated as above give off acetic acid which changes the blue paper to red.

Natural silk is classed as an animal fibre, although it is a product of the silkworm. There are two commercially important silks, the ordinary natural silk, and the tussah, or wild silk. The chemical reactions of both of these are practically the same, but the microscopic characteristics are widely different and require notice.

Natural silk, in the raw state, always appears as a double filament. Each fiber is cemented to the other with the natural sericin or gum that is secreted by the worm during spinning, Fig. 26. Boiled-off silk appears as a single filament, quite clean and free from any gum. The filament in cross-section is *round.*

Tussah silk, on the other hand, though double, is distinctly flattish in the raw state, and besides shows under a moderately high power microscope striæ running lengthwise, Fig. 27. The size of the filaments of this kind of silk is relatively larger than that of the natural silk.

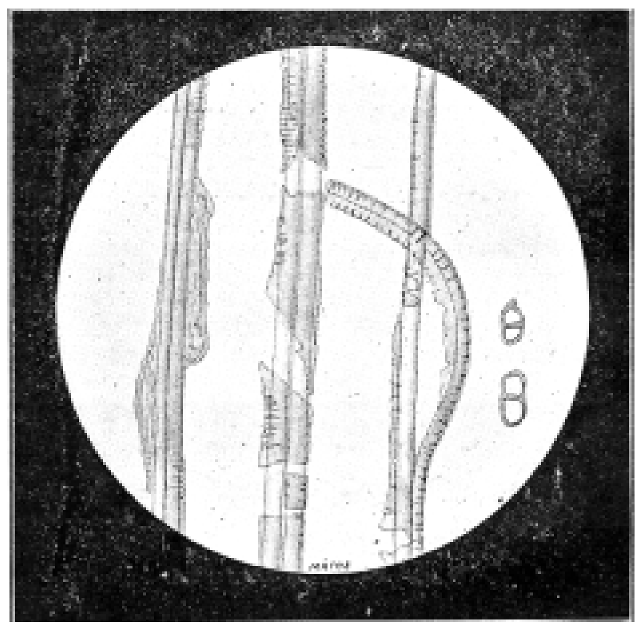

Fig. 26. Raw silk fibres. Here is seen the natural silk gum or "glue" known properly as sericin, binding the double filaments together.

Chemically, the wild silks are not as readily acted upon by reagents as the true silk, and the microscope affords the best means of identification. The parallel chemical reactions of wool and silk are as follows:

Reagents	Wool	Silk
Schweitzer's reagent.	Insoluble after ½ hour immersion.	Dissolves.
30% solution of caustic potash.	Dissolves. On adding a few drops of a 10% solution of nitro-prusside of sodium: turns violet.	Dissolves. No change in color.
Saturated solution of carbonate of soda, without heating.	Wool dissolves, but is precipitated upon adding water.	Silk is not attacked.

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THE CONSTRUCTION OF WEAVES.

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Fig. 559. Cross stripe on a 12-leaf filling satin.
Fig. 560. Check on a 6-leaf thousand-square weave.
Fig. 561. Check on 8-leaf radiating twill.
Fig. 562. Check on 8-leaf crepe.
Fig. 563. Check on 8-leaf basket.
Fig. 564. Check on 8-leaf modified basket.

Fig. 566.

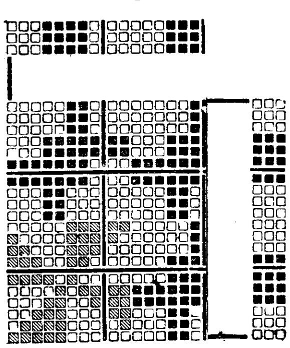

Fig. 565. Check on a 6-leaf thousand-square weave.
Fig. 566. Check on a 10-shaft thousand-square weave.
Fig. 567. Check on a 12-shaft combination weave.

Power Transmission in Textile Mills

By Charles L. Hubbard

Bearing Proportions.

The relation between the diameter of the shaft and length of the bearing depends upon the maximum pressure of the shaft against the bearing, expressed in pounds per square inch of "projected area," the latter being obtained by multiplying the diameter of shaft by length of bearing in inches. If, for example, a journal 3 inches in diameter by 10 inches in length carries a total weight of 3,000 pounds, the pressure per square inch will be $3{,}000 \div (3 \times 10) = 100$ pounds.

The allowable pressure depends upon the speed of rotation, the material and finish of the bearing surfaces to some extent, and largely upon the quality of the oil used and the thoroughness with which it is applied to all parts of the bearing. For the conditions of general transmission work tests show safe bearing pressures ranging all the way from 100 to 600 pounds per square inch, depending upon the speed and method of lubrication.

As the exact pressure to be provided for is not known under ordinary conditions, and furthermore as the length of bearing cannot well be changed for each piece of work, it is customary to assume a relation between diameter and length of journal which shall be safe for a given class of work. Thus for line-shafting and general power transmission a ratio of 2.75 may be taken for speeds below 100 r. p. m., while for speeds of 100 to 350 r. p. m., the ratio should be at least 3 to 1. The catalogs of a number of manufacturers of bearings show the standard length to be four times the diameter, while short-length bearings for lighter work have a ratio varying from 2.5 to 3, according to the make. Extra-short length bearings for special conditions are also made, with a ratio of about 1.6. For head and line shafts and general transmission work, the standard length of bearing should always be used as the bearing then runs cooler and requires less attention.

Linings.

Bearings are lined with a softer metal than the shaft for two principal reasons. If the bearing were of a material approaching in hardness that of the shaft, abrasion or scoring

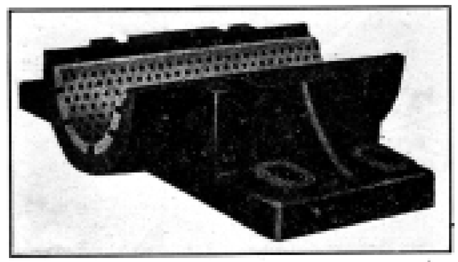

Fig. 40. Anti-Friction Bearing.

would take place should the oil fail to flow properly or the bearing become dry for any other reason. With the bearing lined with some softer metal, abrasion is confined to the lining, which is easily renewed without damage to the shaft.

Even though the frictional heat is sufficient to melt the lining, the shaft will not usually be injured, although it may require some care to remove the pieces of lining material which adhere to it. It is of course impossible to fit the bearing surfaces of new work exactly. If the lining is of a comparatively soft metal it will flow sufficiently to conform to any slight irregularities of the shaft after a short period of use.

The metals usually used for this purpose are alloys of tin, antimony, lead, copper, and zinc in varying proportions and commonly sold under the name of "babbit."

Babbit metal is easily melted in a ladle and is poured into the iron box or casing around a mandrel of the same size as

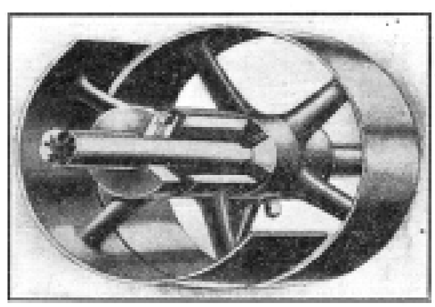

Fig. 41. Oilless Loose Pulley.

the shaft. To get the best results both the box and mandrel should be heated, otherwise the molten metal will not flow freely and the result will be an imperfect casting. A cold mandrel also produces a thin chill or hard film on the face of a bearing which is likely to be torn from the softer metal back of it by the grinding action of the shaft. Heating burns off any grease which may happen to be present on the box or mandrel. This prevents the formation of gas and resulting blowholes. It is the most economical in the end to use the best grades of babbit made up of pure metals and free from

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IDENTIFICATION OF TEXTILE FIBRES.

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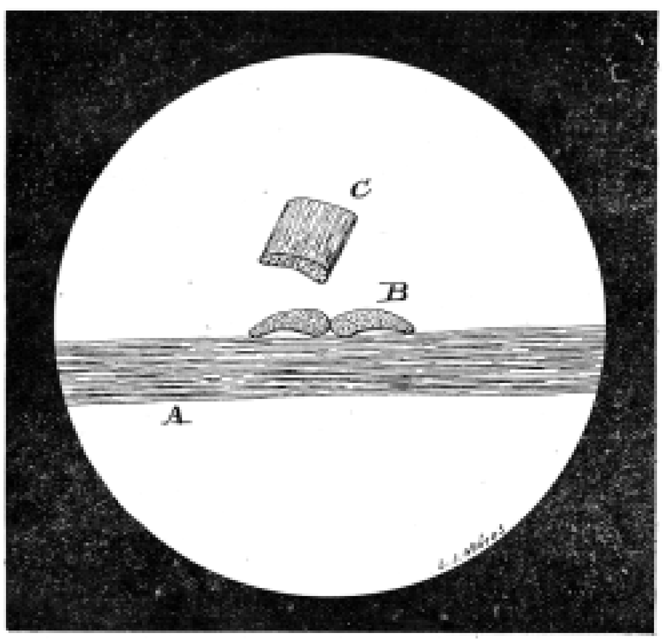
Plumbate of soda. Wool turns brown. No coloration.

In making microscopic mounts of wool fibers for factory or mill work, permanence of the slides is not necessary, consequently distilled water will serve all purposes, but when permanence is required, the use of a gum-arabic-glycerine-water



White cow hair when viewed under the microscope, appears gray.

Fig. 27. Tussah Silk. A—is a longitudinal view of a single fibre showing striae. B is a cross-section of the double filament. C—is a perspective view of a short section.

mixture, known as Farrant's Medium, will prove useful. It may be bought of most dealers in microscopic supplies, and a few ounces will make several hundred slides.