FABRIC ANALYSIS.

(Continued from July issue.)

To Distinguish Mercerized from Untreated Cotton.

According to *Lange,* prepare a reagent by dissolving one part by weight of iodine in a solution of 30 parts of pure zinc chloride and 5 parts of pure potassium iodide in 14 parts of water. Pour off (for use) the clear brown liquid which collects above a sediment of undissolved iodine, and which will turn blue both the mercerized and the untreated cotton, with the difference that with mercerized cotton such color is fast to water, but which is not the case with untreated cotton.

According to *Hubner,* steep the cotton for a few seconds in a solution of 20 grammes of iodine in 100 c.c. of a saturated solution of potassium iodide, and then wash it with water, and when untreated cotton becomes nearly white again, whereas mercerized cotton retains the blue-black color which fades very slowly on long washing.

Another test is to dye the cotton with 100 c.c. of a solution of 280 grammes of zinc chloride in 300 c.c. of water, adding to it just before use 10 c.c. of a solution of one gramme of iodine and 20 of potassium iodide in 100 c.c. of water. The cotton to be tested is wetted out, pressed between two filter papers and then dyed; with the result that mercerized cotton will take a dark blue color, untreated cotton remaining white.

Knecht finds that untreated cotton dyed with benzopurpurine becomes blue on the addition of hydrochloric acid, while mercerized cotton is changed to reddish-violet. By adding titanous chloride solution to the liquids from a burette, untreated cotton appears indigo blue and mercerized cotton red at the stage immediately before decolorization, provided caustic soda stronger than 30 deg. Tw. has been used without tension, or 35 deg. Tw. with tension. Cotton that has been treated with nitric acid of 83 deg. Tw. also gives this reaction.

Knaggs advises the following test: Dilute 5 c.c. of a solution of benzopurpurine 4 B in 10,000 times its weight of water to 100 c.c., and dye the cotton with the solution at the boil. On then adding 2 c.c. of strong hydrochloric acid, mercerized cotton becomes red, whereas untreated cotton takes a blue-black.

David, depending upon the fact that a second mercerization does not further increase the affinity of the cotton for dye, stretches the yarn or fabric to be tested, wetting one portion of it with caustic soda lye of 40 deg. B.; another portion of the material with the same lye previously diluted with its own weight of water, and a third portion of the material to be tested with the same lye diluted with twice its own weight of water. The goods are then rinsed, soured, again rinsed and dyed with a substantive dye, under tension the whole time. If both mercerized and untreated cotton are present, the three portions of the material will show differences in tint, whereas if the whole of the cotton has been mercerized, no change in shade will be seen.

To Distinguish Mercerized Cotton from Silk.

Treat fibres to be tested with a solution of iodine in zinc chloride, and when mercerized cotton takes a blue tint, which changes to a blacker tint, according to the degree of mercerization, while under the same condition silk is dyed a yellow or yellowish-brown.

Polished Cotton.

Cotton thread with a glazed surface is prepared by sizing the material and polishing it in a brushing machine. The fibres of cotton treated in this way appear like those of ordinary cotton under the microscope, but the foreign matter may be observed. A commercial sample of polished cotton examined gave the following results: Moisture, 7.63; ash, 0.21; and "sizing," 1.86 per cent.

Chemical Examination of Vegetable Fibres.

The following scheme of examination devised by *Cross, Bevan* and *King,* forms the basis of most modern chemical methods of judging of the value of vegetable fibres.

Moisture: The loss in weight at 110 deg. C. gives the amount of hygroscopic moisture. About 1 per cent of this moisture may be retained at 100 deg. C.

Ash: The residue left on ignition of a weighed quantity. The proportion is relatively low in lignocelluloses; higher in pectocelluloses.

Hydrolysis (a): Loss in weight (calculated upon the dry substance) when 5 grms. of the fibre are boiled for five minutes with a 1 per cent solution of sodium hydroxide. It indicates the "solvent action" of the alkali.

Hydrolysis (β): Represents the loss in weight after boiling the fibre for 1 hour with the alkali solution, and indicates the degree of the "degrading action" of the alkali. The results will give an idea of the degree of resistance that would be offered by the fibre to bleaching processes, and to the action of alkalis such as are used in the laundry.

Cellulose: This is determined by separation of the non-cellulose constituents by treatment with chlorine and subsequently with sodium sulphite solution.

Mercerization: Loss of weight on treating the fibre with a cold 33 per cent solution of potassium hydroxide is determined.

Nitration: The fibre is treated with a mixture in equal parts by volume of strong nitric and sulphuric acids and the weight of the product determined.

Acid Purification: A weighed quantity of the substance is boiled for one minute with a 20 per cent solution of acetic acid, to dissolve impurities, and the residue washed with water and alcohol, dried and weighed.

Elementary Composition: The percentage of carbon in ordinary cellulose (cotton) is 44.4 per cent. In compound celluloses it may be low (40 to 43 per cent) in the group containing the pectocelluloses, or high (45 to 50 per cent) in the group containing jute cellulose and other lignocelluloses.

Ascertaining Quantities of Materials in Union Yarns and Fabrics.

Results are based upon the fact (previously fully explained) that different fibres, under different reagents, are either dissolved or not. This principle forms the basis for separating one fibre from the other in union yarns or fabrics. For instance, caustic soda dissolves wool but not cotton; again, boiling in dilute or steeping in concentrated sulphuric acid dissolves (carbonizes) the latter, but not the wool.

In most cases, results near enough for ordinary purposes can be obtained by treating the yarns or fabrics in their ordinary state, *i. e.,* containing the same moisture as the surrounding air, but by far the most accurate determinations are obtained by first of all *conditioning* the material, *i. e.,* heating the sample in a conditioning oven to 105 deg. C., until a constant weight is obtained, then basing all calculations on this conditioned weight. (See chapter on Testing for Moisture.)

Analysis of a Wool - Cotton Fabric.

The analysis of this class of fabrics may be made, either depending on the solubility of wool in caustic alkalies, the destruction of the cotton by mineral acids, or the mechanical separation of the warp and filling threads.

Whether to test for wool or for cotton present depends upon the sample, as a rule destroying the fibre we consider to form the smaller percentage present.

Testing for Wool Present.

(*a*) Cut three samples of equal weight say 50 grains; one of these samples keep for reference.

(*b*) Test samples 2 and 3 for sizing and dyestuffs by boiling them for about 15 minutes in either a 3 per cent solution of hydrochloric acid or a one tenth per cent solution of caustic soda. If liquid becomes strongly colored repeat procedure with a fresh acid bath. Next wash both samples thoroughly in several changes of water.

It now depends on the estimated proportion of wool or cotton present which reagent to use; it being advisable to use the one which leaves the larger amount of refuse (in our test, for example cotton, hence caustic soda the reagent to use).

(*c*) Test sample 3 for percentage of wool and cotton present, by boiling it in a 5 per cent solution of caustic soda and which dissolves the wool in the sample. Wash the latter thoroughly.

(*d*) Take samples 2 and 3, and dry them thoroughly and then keep all three samples for about a day uniformly exposed to normal atmospheric conditions.

Example:

All three samples originally weigh 50 grains each.
Sample 2 weighs 49 grains.
Sample 3 weighs 40 grains.

Question: Ascertain percentage of size and dyestuffs, as well as wool and cotton present in sample.

Size and Dyestuffs:

50 grains weight of sample 1
49 " " " " 2
—

1 grain weight of size and dyestuff in every 50 grains of fabric (or yarn) tested, or 2 grains in 100 grains of material = 2 per cent.

Material:
49 grains weight of sample 2
40 " " " " 3 (cotton)

9 grains weight of dissolved substance.

The latter is chiefly wool, but it must be remembered that in the procedure the caustic soda produces a loss of about 5 per cent to the cotton, hence:

100 : 95 : : x : 40 = 42.1 grains of cotton in sample, or 84.2 per cent of cotton are present.
9 grains weight of dissolved substance less
2.1 " " " cotton the latter contains.

6.9 grains weight of wool in sample, or 13.8 per cent wool are present.

Answer: The sample in question contains:
2. per cent size and dyestuff
84.2 " " cotton
13.8 " " wool.

TESTING FOR COTTON PRESENT.

In this instance, proceed as in previously given example, using however dilute or concentrated sulphuric acid as the reagent for the third sample. The process will destroy about 2 per cent of the wool fibre, and which must be taken care of in the calculations, the same as done in previous example with the cotton.

Analysis of Silk-Cotton Fabrics.

Since caustic soda and sulphuric acid have the same effect on silk as on wool, the test may be conducted the same as for wool and cotton.

Another analysis for silk-cotton fabrics is the treatment with ammoniacal nickel oxide. The previously weighed sample is for this purpose entered into a cold ammoniacal solution of nickel oxide, which then is gently heated. The silk dissolves in about three minutes. After washing the refuse with dilute hydrochloric acid and drying it in an air-oven, the weight of the cotton present in the sample is then ascertained, to which 1.2 per cent has to be added, representing the average loss to cotton by the process and which must be taken into consideration when calculating percentage of each fibre present in the sample.

Another procedure for obtaining the result is to immerse the previously weighed sample in *Loewe's* alkaline-copper-glycerol solution at a temperature of 50 deg. C. for 15 minutes. The residue of cotton is then rinsed, dried and weighed.

TO ASCERTAIN AMOUNT OF SILK-COTTON IN MIXED FABRICS.

(1) Weigh a suitable size of the sample, in grains.
(2) Ether wash.
(3) Extract all impurities such as dirt, grease, and free dyestuffs by boiling.
(4) Dissolve the silk and ascertain the absolute dry weight of the residue by:
(*a*) Boiling the sample in a solution containg 10 per cent of caustic soda until the silk dissolves.
(*b*) Rinse thoroughly in several changes of cold water.
(*c*) Neutralize the caustic soda and wash thoroughly in hot water.
(*d*) Dry in oven and cool in desiccator.
(*e*) Weigh in grains.
(5) In calculating the percentage, add 2 per cent to the weight of cotton on account of loss which occurs in the soda bath.

Example: A sample of cloth is composed of a warp, part of which is cotton and silk twist, the remainder of the cloth being cotton.

Weight before extracting impurities & drying = 10.6 gr.
Weight after extracting impurities & drying = 9.2 "

Amount of moisture and impurities = 1.4 gr.

10:6 : 1.4 : : 100 : 13.2 per cent of moisture and impurities.

Weight of residue (cotton) after treating with caustic soda and drying = 8 gr.

9.2 : 8 : : 100 : 87 per cent of residue (cotton).
+ 2 per cent loss incurred in soda bath.

89 per cent of cotton, leaving
11 per cent of silk.

100

(*To be continued.*)

SILK THROWING.

(*Continued from July issue.*)

Raw Silk Importers seem to have no objection to manufacturers testing their silks before they buy, since it relieves them of part of their responsibility, but manufacturers as a rule seem to object to it, relying solely on the word of the importers' inspection instead of on their own, yet the same manufacturers would not buy any of the minor supplies for their mills upon the word of others.

He may claim that the dyer gives him the proper shades, that passing the thread through a lustring machine will give him the required lustre for his goods; that singeing the goods will impart the touch required, and that glue will substitute all the stiffness and handle the silk is short of. His chief aim in buying his silk may rest in production, quality to be produced by artificial means.

Some of the more careful silk manufacturers inspect their raw silks. The first inspection is made when sample skeins are submitted, the next is made from some of the bales bought to see if they conform with the samples, in turn obtaining a more thorough test. Additional tests are also made by some mills during or after throwing or dyeing or in the finished goods. Keeping a careful record of these tests will enable a manufacturer to gain a superior knowledge of raw silk, *i. e.*, the kind of silk wanted by him for a certain fabric he intends to make, as well as full data as to condition and value of a lot of raw silk offered to him, a knowledge of which will account for his success as a silk manufacturer. The expenses for fitting up a small laboratory for his mill will cost little and repay itself within a short time.

In testing raw silk, the same should be carefully handled when drawing a skein for testing from a book (bundle of skeins); the skein should be carefully opened and after examining very carefully retwisted (without breaking the ends or disarranging the skein) and with care replaced into the book, from where it was taken, in order that the skein will be in proper shape when handled on the raw silk winder in the mill. As a rule, this care in removing skeins from a book is not exercised, inspectors rip and tear the skeins and tangle them badly and then put them back into the book in a haphazard manner, not only ruining the skein handled, but also those adjoining.

The adopted standard for ascertaining the quality of a lot of silk is thus:

WINDING:

A proper winding test is represented by the number of breaks in the whole skein, *i. e.*, considering its top, middle and bottom. Breaks depend on the speed of the reel, the size or count of the thread, kind of reels used and whether weighted or not; the amount of sericin present in the silk, as well as the atmospheric conditions in the winding room.

Based on 50 r. p. m. of swift, for a 2 hour test.

100	bobbins,	1 break	or	none	=	extra good.
100	"	from 2	to	4 breaks	=	very good.
90	"	" 4	"	6 "	=	good.
80	"	" 6	"	8 "	=	good to fair.
70	"	" 8	"	10 "	=	fair.
60	"	" 10	"	15 "	=	fair to poor.
50	"	" 15	"	25 "	=	poor.
40	"	" 25	"	40 "	=	very poor.