up off and on (in spots) on the raw silk thread, whereas with corkscrews the cocoon filament which is the cause of the trouble, runs slack in periods. Loops of a fair size will double up in the cleaners of the hard silk winder and break down the thread.

Split Ends affect the strength of the silk thread; they are only caught when a loose cocoon filament splits off the silk thread and in turn causes a break on the hard silk winder. They are a defect to the silk, reducing its strength, and silk lots in which this defect is noticed are better left alone, since where you notice a few, any amount will be present in the lot.

Bad Throws are the result of carelessness in the sericultural reeling, and means that the raw silk thread shows quite uneven throughout its length, indicating a shiftless reeler.

Bouchons are an imperfection caused by imperfect reeling of the cocoons by the sericulturist, a more aggravated form of imperfection to silk reeling compared to that of *Duvets,* the layers of the thread on the cocoon in this instance coming off more than one at a time. Also known as *Fouls* or *Slubs.*

Vrilles are an imperfection to the silk thread of commerce caused by imperfect reeling and produced by the breakage of one of the baves when it is necessary to reduce the number of the cocoons.

Duvets are an imperfection caused by bad reeling of cocoons, giving the thread the appearance of short fibres thrown off from the base of the thread. This was attributed formerly to the silkworm spinning an imperfect bave on the cocoon; but while there may be variation in thickness between the first and last end of the spun thread, there is no mechanical imperfection caused naturally. The microscope reveals to us the real cause, either frequent and imperfect joinings as the cocoons become attached to the main thread, or still more by an uneven temperature in the reeling basin (which should be kept at 140 to 160 deg. F.) thus causing the silk to unwind itself unevenly and cause small loops.

(To be continued.)

Preparing Cloth for Testing its Wearing Qualities.

It is stated that the present methods of testing cloth for elasticity and resistance to tearing do not yield a correct measurement of resistance to wearing. Scraping and rubbing tests have also been applied with unsatisfactory results.

It is now suggested that treating the cloth prior to testing in such a way that the interior parts and surface become perfectly uniform give much better results. The cloth may for this purpose be treated in the following manner:

(*a*) The samples are first thoroughly wet, then dried and evenly pressed.

(*b*) The samples are boiled in water alone, or in water containing slight quantities of alkalis, acids, glycerine, sulfoleates, or other mild substances, and subsequently dried and pressed.

(*c*) The samples are treated with alcoholic or ethereal liquids or hydrocarbons, and dried.

(*d*) The samples are evenly raised by mechanical means, and then pressed.

The treatments may be modified according to requirements. The cloth is then tested on a scraping, rubbing, or other kind of grinding or beating machine.

FABRIC ANALYSIS.

(Continued from August issue.)

Analysis of Silk-Wool Fabrics.

(1) Treat sample first with dilute hydrochloric acid and then with sodium carbonate, to remove finishing materials, etc., after which dry and weigh sample.

A concentrated solution of chemically pure hydrochloric acid (40 per cent) is now heated to 50 deg. C. and into this the sample is dipped for 2 or 3 minutes. By this treatment the wool is hardly affected, while the silk is dissolved. Dilute with water, and filter.

The weight of the dried residue represents the amount of wool present, which has lost about ½ per cent of its weight in the test and for which make proper allowances when calculating.

(2) By another procedure the silk is dissolved by immersion in an ammoniacal nickel hydroxide solution for 5 minutes at 20 deg. C. If it is found that the nickel hydroxide cannot be completely dissolved by the proper proportion of ammonia, then the mixture of hydroxide and ammonia should be thoroughly shaken before using.

After boiling the sample in this turbid liquor for 5 minutes it is removed, rinsed and then thoroughly washed with 1 per cent hydrochloric acid, in order to remove the adhering nickel hydroxide from the fibre and so prevent causing an increase in the weight. The residue of wool is then rinsed again, dried and weighed.

(3) The silk can also be dissolved in a boiling solution of basic zinc chloride. If dipped in this solution for not longer than one minute, the wool will remain unaffected. The residue, and which means wool, is then well washed with 1 per cent hydrochloric acid, washed again with water and in turn dried and weighed.

(4) To identify the presence of silk in a mixture of fine wool and silk, the following confirmatory test will solve the question. A short length of yarn is placed under the microscope on an ordinary glass slide, and is loosely covered with a small glass circle. While under inspection, a drop of concentrated sulphuric acid is taken up on the end of a glass rod, and gently dropped on the slide, so that it just touches the outer rim of the glass cover. By capillary attraction the acid will pass between the glass cover and slide until it comes into contact with the fibre, when it will creep along this for a certain distance.

Under these conditions, and within two minutes from contact with the acid, the silk will completely dissolve, leaving any wool present intact, and with a little practice a rough and preliminary estimate as to the relative proportion of wool and silk may be obtained.

Analysis of Wool-Silk-Cotton Fabrics.

(*a*) Cut out four samples of air-dry fabric, of equal weight, and keep one for reference.

(*b*) Boil three of the samples in a 3 per cent solution of hydrochloric acid, decant and repeat with a fresh solution until all size and coloring matter is removed. Wash thoroughly in order to remove all the acid. Keep one of the samples for reference.

(*c*) Two of these samples are then placed for from one to two minutes in a boiling solution of basic zinc chloride, or the samples are treated with ammoniacal nickel hydroxide solution in order to dissolve the silk. Wash well with 1 per cent hydrochloric acid and distilled water, and keep one of the samples for reference.

(*d*) The sample left has now to be treated for removing either the wool or cotton, using respectively either caustic soda or concentrated sulphuric acid. To remove wool the sample is boiled for 15 minutes with 5 per cent caustic soda, after which wash thoroughly with water.

Take all four samples, dry them thoroughly and keep them for some time uniformily exposed to normal atmospheric conditions.

By then carefully weighing the four samples, each constituent is readily determined: the first loss represents sizing and dyestuffs; the second loss that of silk; the third that of wool; the last is cotton.

The final residue of cotton will be found to be somewhat below the actual percentage present in sample so that 5 per cent should be added to the weight of the residue and subtracted in proportion from the weight of the wool.

Another test is thus:

Two grammes of lead acetate are dissolved in 50 c.c. of distilled water, and to this is added 2 grms. of caustic soda

dissolved in 30 c.c. of water. The solution is boiled until clear, and 0·3 grms. of magenta dissolved in 5 c.c. of alcohol is added after the solution is cooled down to about 60 deg. C., when the liquor should be colorless. The magenta may be replaced by 2 grms. of picric acid, and in either case the solution is made up to 100 c.c., and filtered if necessary.

A portion of the fabric or yarn is heated for two minutes in this solution, to somewhere near the boiling point. In the case of magenta it is then washed and placed in a dilute solution of acetic or formic acid, and it is sufficient in this case to heat the solution to 70 deg. C.

After drying, a microscopical examination of the mixture will show silk colored red where magenta has been used, or yellow with picric acid, while wool will be black or dark brown, and artificial silk, cotton, or other vegetable fibres white.

A solution of litharge in caustic soda may take the place of the lead acetate. In that case 2 grms. of NaOH are boiled with 5 grms. of litharge in 50 c.c. of water for fifteen minutes; 0·3 grms. magenta dissolved in 5 c.c. of alcohol is added after cooling, and the whole filtered and made up to 100 c.c. with water.

Artificial silk may be readily detected, and these or any vegetable fibres present are noticeable by their absence of color, when they can be isolated from the yarn for further examination.

Analysis of Cotton-Linen Fabrics.

The sample after having been freed from any size or dye, by a suitable boiling in dilute hydrochloric acid or distilled water, followed by a thorough rinsing, is then dipped for one and a half or two minutes in concentrated 66 deg. *B.* sulphuric acid, then rinsed out well, rubbed between the fingers and neutralized by steeping in dilute ammonia or sodium carbonate solution. After washing over again in water, the sample is pressed between blotting paper and dried and when flax fibres or threads will, as a rule, be found to have retained their structure while the cotton fibres or threads have dissolved after passing through a gelatinous stage in which they will tear like tinder, *i. e.*, have been destroyed.

THE INK TEST.

In order to ascertain quickly whether a fabric is either all linen, or a cotton and flax combination, what is known as the ink test may be used. This procedure consists in dropping a small quantity of black ink on the sample. If the ink spot spreads in all directions from the original spot, forming an aureola, *i. e.*, the ink acting somewhat like a drop of oil on a sheet of paper, then the fabric is pure linen. When, however, the ink is dropped on a sample containing cotton warp and linen filling, or vice versa, the ink will follow the linen threads quicker than the cotton threads, for the fact that the former are more porous, resulting in a more oval spot. The composition of the ink, *i. e.*, whether ordinary ink or copying ink, has something to do with the shape of the spot, ordinary ink running quicker, *i. e.*, producing a more pronounced oval effect spot.

TEST BY OIL.

By this process the cloth is first freed from finishing material by boiling in a weak solution of carbonate of soda, then, after rinsing and drying, is saturated with oil and spread out flat on a glass plate. After giving time for the air-bubbles to get away, the cloth is covered by another sheet of glass and both are squeezed tightly together until the surplus oil is removed, when the fabric is examined by holding it between the observer and the light.

Under this treatment the linen fibres become transparent because of the thickness of the cell walls, which give a refraction equal to that of the oil. By examining it between the light and the observer it appears clear, but when examined in the ordinary way it is opaque. On the other hand, cotton, by reason of its structure and the fact that air is imprisoned in its cells, shows opaque when viewed before the light, and appears clear in other positions.

SULPHATE OF COPPER TEST.

The same consists in removing the finishing materials, and then immersing the sample for ten minutes in a 10 per cent solution of copper sulphate. After rinsing in water, the sample is immersed in a 10 per cent solution of potassium ferrocyanide, when the linen acquires a copper-colored shade produced by the decomposition of the ferrocyanide, while the cotton remains nearly white. The contrast is made very plain after rinsing, by steeping the sample in Canada balsam, or in a very fatty oil.

TEST BY METHYLENE BLUE.

This is a simple test, but not suited for bleached goods, where the fibres may have been partly converted into oxycellulose. It consists in immersing the sample in a hot solution of methylene blue, and then rinsing in water. The washing removes the color from the cotton, while the linen remains blue. Safranine, or Bismarck Brown can also be used for this test.

TEST BY SULPHURIC ACID.

For this purpose the cloth is freed from any finishing materials adhering to it, and immersed for one or two minutes in concentrated sulphuric acid. After then rinsing in water, the sample is dried. The cotton is destroyed by this process, while linen remains unaffected.

TESTS WITH NATURAL DYESTUFFS.

The fabric is for this purpose immersed for 15 minutes in an alcoholic solution of natural dyeing materials, then dried between two sheets of blotting paper.

When madder is used the linen acquires an orange shade, while the cotton becomes yellow.

With cochineal the linen is colored a violet and the cotton a clear red.

Fuchsine, colors the linen, the color being removed from the cotton by rinsing.

Cyanine colors the linen blue, the cotton remaining unstained.

These tests by the aid of dyestuffs require many different products, also considerable time, and, besides are far from conclusive. The most practical tests for distinguishing cotton from linen are those with ink and by burning the fringes. as previously explained.

Mechanical Analysis.

The mechanical analysis of a fabric sample is in many cases quite as satisfactory as the separation of the fibres by chemical means. For this procedure it is however, essential that the yarns be made wholly of one fibre; the warp for instance to be all cotton and the filling all wool. The sample is for this purpose cut exactly parallel to the warp-threads and picks (or as near as possible) next carefully weighed and in turn picked apart, warp and filling threads being weighed separately.

Example: Cut sample of a 16-ounce cotton worsted trousering 4 by 3 inches = 12 square inches.

3 inches, length of cotton warp; 4 inches, length of woolen filling; the sample to weigh 41.71 grains.

Separating warp and filling gives us:

18.25 grains weight of cotton warp.
23.05 " " " wool filling.

41.30 grains weight of warp and filling.
.41 " loss caused by refuse of fibres liberated by picking filling from warp-threads.

41.71 grains original weight of sample.

(To be continued.)

Silk Imports (Fabrics and Yarns).

The foreign invoice value of dutiable silk imports entered at the Port of New York for immediate consumption and withdrawals from warehouse for the four weeks ending July 28, 1916, was $2,494,075, against $1,715,720 for the corresponding period of last year, representing an increase of $278,355.

The principle increases were Fabrics woven in the piece, and of which silk is the component material of chief value; velvets, chenilles or other pile fabrics, cut or uncut; ready-made clothing; laces, trimmings and embroideries, made of artificial or imitation silk yarns, and spun silk or schappe silk yarns.

Decreases were recorded in the imports of velvet or plush ribbons; yarns, threads, filaments of artificial or imitation silk or artificial or imitation horsehair.

During the period in question the imports of raw silk amounted to $177,273, a decrease of $235,710 for the corresponding week last year.