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## TEXTILES

### What Every Homemaker Should Know

By Marion Weller, Division of Home Economics

#### INTRODUCTION

The women of this country are realizing that an intelligent expenditure of the family income is necessary to efficient homemaking. An examination of household budgets, compiled by investigators—the budgets of individuals and families living on the lowest incomes adequate for physical efficiency—reveals the fact that from 15 to 25 per cent of the income is spent for clothing and home furnishings. It is, moreover, a fact that women are increasingly the direct retail purchasers; 90 per cent of the money spent for home maintenance in this country is spent by women. The homemaker who is the purchaser of the clothing and household fabrics should, therefore, know how to buy economically, and it is the purpose of this bulletin to give to her such information concerning textile fabrics as may be helpful in planning and buying for the household.

There was a time when the production of textiles or woven fabrics for the home was entirely within the home. Women were the creators of these utilities and controlled the quality of the product. They knew when a piece of cloth was all wool and what grade of wool went into it.

Surprise is sometimes expressed that women of today can judge of the quality of fabrics with so little certainty, when our grandmothers could invariably determine the character of a piece of cloth by handling it. But our grandmothers had an intimate knowledge of these things through making them which the women of to-day can not have. Moreover, there was not the infinite variety in fabrics which we now have, and there was little adulteration or imitation. Even the most expert buyers to-day are sometimes deceived in the quality of the fabrics they select.

If, therefore, the woman who buys is going to be able to choose honest materials, she must have certain standards of quality and cost, and must be able to judge for herself as to whether or not she is getting the thing which she thinks she is paying for. Further, she must be protected through legislation against fraud; and the kind of legislation which will protect her can only come when those who do the lion's share of the buying know what should be demanded as pure textiles, and then see to it that such legislation is enacted.

The bulletin contains a brief discussion of each of the common fibers and their utilization for textile fabrics; some suggestions in regard to the selection and purchase of fabrics; a description of the methods of substitution, imitation, and adulteration, with simple practical tests which the purchaser may apply.

## FIBERS USED IN THE MANUFACTURE OF TEXTILES

There are now found in fabrics seven fibers with which the purchaser should be familiar: animal fibers, wool and silk; vegetable fibers, cotton, linen, ramie, and jute; and artificial or fiber silk. Four of these fibers, wool, cotton, linen, and silk, have been raw materials in the world's commerce for centuries; ramie and jute, though long in use, only recently have come to be utilized in the manufacture of household fabrics in this country; and fiber silk is a product of modern chemical science.

### Wool

#### A. Structure, properties, and identification of fibers

Wool, the hairy covering of the sheep, is especially desirable as a textile fiber because of the ease with which it adapts itself to spinning into fine, strong, elastic yarn. In common with other hair fibers it consists of three parts:

1. An outer horny layer of translucent flattened cells or scales, which overlap like the shingles on a roof and project so as to give the surface of the fiber a saw-toothed appearance.

2. The inner or cortical layer, made up of elongated cells, which forms the major part of the fiber, giving to it strength and elasticity.

3. A central marrow through which the coloring matter is absorbed in dyeing.

The scales, which can be seen only with the aid of a high-power microscope, form the surest identification for wool fiber. Figure 1 shows how the fiber appears when magnified about 400 times.

Wool, in common with all other animal fibers, when burned gives off the odor of burnt feathers, and leaves a residue in the form of a charred globule. Unless the fiber shows the easily recognized luster of silk, this test will help to identify it. The animal fibers are weakened if placed in an alkali solution. For a simple chemical test a sample of wool may be boiled for fifteen minutes in a solution of household lye, in the proportion of one tablespoonful to a cup of water, or for half an hour in a solution of any common washing powder, such as pearline, in the proportion of five tablespoonfuls to a pint of soft water. The wool will become a gelatinous mass, and if transferred to clear water and rubbed between the fingers, will disappear in the water. This test will identify any animal fiber.

#### B. Characteristics of wool yarn and cloth due to structure and properties of fiber

1. **Felting and shrinking quality.**—The projecting edges of the scales of the wool fibers interlock on rubbing against one another. This is known as the felting property of wool which makes it easy for the fibers to hold together while being spun into yarn. The free edge of the scale is what makes the felting and shrinking of wool possible. The more the free edge protrudes, the more closely will the scales interlock and the more the wool will felt and therefore shrink. Hence hot water and strong soap solutions which cause the scales on the wool fiber to open up increase shrinkage in wool cloth and if the cloth is rubbed in washing still greater shrinkage will occur.

2. **Luster.**—The wool of the merino sheep is short, soft, kinky, and without luster because the surface is broken by the many protruding scales. On the other hand, the wool from goats and from some kinds of sheep is long, straight, and lustrous because the scales do not project, but are closely attached. The first kind of wool is used in a soft fabric like French serge or broadcloth; the

second in stiffer and more wiry fabrics such as storm serge and mohair and many upholstering fabrics.

3. **Reaction to dye stuffs.**—All animal fibers are more reactive to dyes than are plant fibers. In dyeing wool, the color is readily absorbed into the body of the fiber through the central canal, and fixed by definite chemical change. Deeper, richer, and more enduring colors are obtained in wool fabrics than in cotton or linen.

4. **Elasticity.**—Wool has a natural elasticity due to the character of the fibrous layer. Therefore wool cloth does not wrinkle so much as does cotton or linen, and the wrinkles in a wool garment will disappear if the garment is hung for a time in the open air.

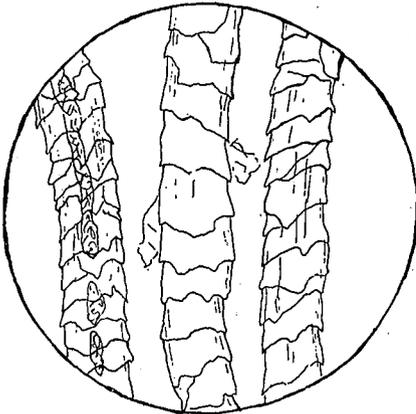


Fig. 1. Wool Fibers, Magnified About 400 Times

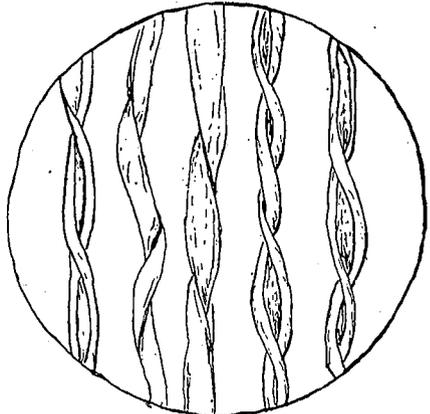


Fig. 2. Cotton Fibers, Magnified About 400 Times

## Cotton

### A. Structure, properties, identification of fiber

Of all the fibers, cotton is the cheapest, the most generally used, and the one best adapted to a great variety of purposes.

The fiber consists of the fine down or hair attached to the seed in the boll of the cotton plant, which grows in our southern states. A single tubular cell, in its unripe state, is more or less rounded and consists of a cell wall with a central canal, called lumen, but on ripening the cell collapses and appears as a flat ribbon-like fiber with thickened edges and numerous corkscrew-like twists. The fibers vary in length from three fourths of an inch in the common upland cotton to two inches in the sea-island cotton, and the number of twists per inch varies from 150 to 400. It is the twist which gives the cotton fiber its elasticity, and makes spinning possible. The cotton fiber is considerably stronger than the majority of wools.

The surest method of identification is by means of the microscope. The characteristic spiral twist in the flattened fiber is distinctly seen. Figure 2 shows the cotton fiber magnified about 500 times.

When burned, cotton, in common with other plant fibers, flashes up quickly and gives off the odor of burnt paper, leaving a fine powder or ash as residue.

It has been stated that animal fibers are weakened in an alkali solution. Acids have a similar effect on plant fibers. Thus, if cotton is placed in hot muriatic acid for one minute, then washed in fresh water, it will fall into

pieces. Again, if a saturated solution of oxalic acid is made by adding the crystals to water till some remain undissolved, and cotton is boiled in the clear solution for fifteen minutes, then removed and allowed to dry, it will be found to have become brittle.

### **B. Characteristics of cotton yarns and fabrics due to structure and properties of fiber**

1. **Variety in texture.**—The natural spiral-like twist of the cotton fiber which causes the fibers to interlock in spinning, gives it elasticity, less than that in wool, however. Its tensile strength is greater than that of most wools. These properties together with its fineness and length make it possible to spin cotton into yarns of all degrees of coarseness and fineness, and this explains the great variety in cotton fabrics, from the finest of laces to the coarsest of sheeting.

2. **Absorptive quality.**—A layer of wax covers the cotton fiber, consequently it does not absorb water so readily as does the flax fiber. Cotton yarn absorbs water slowly and gives it up slowly. For this reason, cotton does not make satisfactory toweling, except when a large amount of softly twisted yarn surface is exposed to absorption, as in turkish toweling. Absorbent cotton is made by removing the natural wax.

3. **Reaction to dye stuffs.**—It has been stated that wool absorbs a dye readily with a definite chemical change in the body of the fiber. This fixes the color. Cotton does not take a dye in the same way. The color is deposited on the outside of the fiber and only slight penetration takes place. Many of the dyes can not be used for dyeing cotton without a mordant, a substance which in the dyeing operation unites with both fiber and dye. There is a group of dyes, however, known as the salt or cotton colors, which may be applied directly to cotton and give good and fairly fast colors, but cotton fabrics never have the depth and richness of color seen in wool materials.

4. **Shrinkage.**—Cotton cloth shrinks in water. This is often noticeable the first few times the fabric is laundered. Hence, it is well to shrink all cotton cloth before making into garments.

5. **Serviceability.**—Cotton is an inexpensive fiber, strong, and light in weight. It is not injured in laundering, and will take and hold starch. It therefore makes a fabric that is serviceable for general wear.

### **C. Mercerization**

6. **Capacity for collecting and harboring dirt.**—The yarns of cotton cloth have many protruding ends from the short fibers in the twist and there is more or less oil and wax on the fiber. The cloth therefore collects the dirt. It has been estimated from experiments conducted that three times as much dirt clings to cotton as to linen, and nearly twice the number of bacteria will be collected by the skin when wearing cotton cloth, as compared with linen cloth of similar weave construction. Cotton, however, launders easily and can stand the high temperature in boiling, so with frequent changes it is a sanitary material.

Mercerized cotton is obtained by subjecting cotton yarn or cloth under tension to a bath of strong caustic soda. The fiber gains in strength, and loses its twist, becoming highly lustrous. It takes the dye more easily than ordinary cotton, and the colors produced are better and more permanent. The process of mercerization increases the cost of manufacture but produces a beautiful, lustrous, and more durable fabric which is often used as a substitute for linen or silk.

## Linen

### A. Structure, properties, identification of fiber

Linen is familiar as the long, smooth, lustrous bast fiber obtained from the stalk of the flax plant which is cultivated in Minnesota and other northern states for its seed. It lies in bundles beneath the thin skin or bark and outside the woody part of the stem. When examined with a high-power microscope the fiber appears cylindrical in shape with a very small central canal and a thick cell wall. Cross marks like joints, as in a cornstalk, may be seen at intervals. The fiber has a very high luster after the gum which holds the fibers together has been removed. It has great strength, and varies in length from a few inches to several feet. Good flax fiber should average twenty inches in length.

Again, the surest method of identifying the linen fiber is with the microscope. When burned it gives the same kind of odor and residue as cotton. It shows the same chemical reaction to acids as does cotton, except that the action is much slower.

### B. Characteristics of linen yarns and cloth due to properties and structure of fiber

1. **Luster.**—Good linen cloth has a luster due to this same characteristic in the fiber. The luster due to sizing will disappear in laundering, but the real flax luster, unless it has been destroyed in the preparation of the fiber or in chemical bleaching processes, is never removed. If linen cloth lacks this lustrous quality because of many short ends of fibers on the surface, it is either a mixture of linen and cotton or is made from the short fibers of linen tow.

2. **Stiffness.**—Linen cloth wrinkles easily. This is because of the stiffness and inelasticity of the fiber. This same property gives to closely woven damask a leathery feeling, and causes a linen cloth to lie smooth on a table.

3. **Reaction to dyestuffs.**—The linen fiber does not take or hold dyes and mordants as readily as cotton, consequently colored linens are more likely to be unsatisfactory, and the colors dull and not durable. Also, because of this resistance to dye, linen does not stain easily.

4. **Absorptive quality.**—Water is absorbed rapidly by linen and evaporates quickly from it. Because of this property, linen cloth is valuable for towels and handkerchiefs and for warm-weather clothing.

5. **Texture, and capacity for collecting and harboring dirt.**—Linen spins into a smooth yarn because of its length, luster, and stiffness. The cloth, therefore, has a smooth surface; does not become fuzzy, as does cotton; is free from natural oil or wax; and is, therefore, least likely of all the washable fabrics to collect and hold dirt. Moreover, in laundering, dirt is much more easily removed than from cotton cloth. These qualities make it especially desirable for table linen.

6. **Conductivity of heat.**—Flax is a better conductor of heat than cotton. Therefore linen fabrics always feel cooler to the touch than those made from cotton, and are useful for summer garments.

## Silk

### A. Structure, properties, identification of fiber

Silk is the most beautiful fiber known, and the most expensive to produce. It is obtained from the cocoon of the silk worm, which is cultivated in China, Japan, India, and southern Europe. The fiber may be unwound from the cocoon in one continuous strand, many hundreds of yards long. Each fiber is

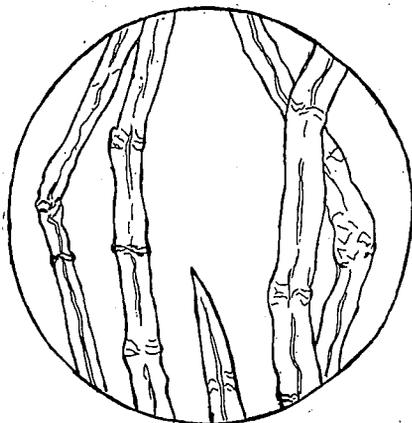


Fig. 3. Flax Fibers, Magnified About 400 Times

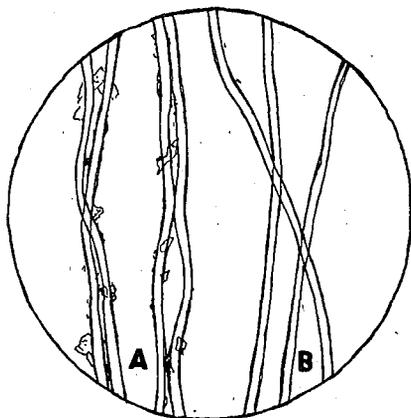


Fig. 4. Silk Fibers, Magnified About 400 Times  
A. Filaments Held Together by Sericin  
B. Single Filaments After Boiling Off

seen to consist of two tiny filaments, coated and held together with a gum called sericin. This makes the raw fiber stiff and non-lustrous, but when the silk is "boiled off," the process by which the gum is removed, the filaments appear as highly lustrous cylindrical rods without characteristic structure such as wool, cotton, and flax are seen to have. The long continuous fibers of "reeled silk" wound off directly from the cocoon, constitute somewhat over half of the silk product. This does not have to be spun as do other fibers. The remainder, consisting of the floss from the outside of the cocoon, the waste ends, broken and imperfect cocoons, is called "waste silk," and is carded and spun into yarn as is cotton or wool. The product is known as spun silk. The silk imported into this country comes either in skeins in the raw state, or in the finished fabric.

Aside from the cultivated silk, there is obtained in the forests of Manchuria and southern Asia a variety of wild or tussah silk, coarser than cultivated silk and yellowish brown in color, from which the native pongee and rajah silks are made.

The high-power microscope is a means of identification as with the other fibers. Filaments from the raw silk appear in pairs with bits of the gum attached, as seen in Figure 4, while the fibers from the boiled-off silk appear structureless and transparent, like glass rods.

The burning test gives the same result as with wool, and the chemical test with an alkali shows the same reaction, but with greater resistance on the part of the silk.

The silk fiber is the longest and the strongest of the textile fibers, and is highly elastic. Like wool it will absorb a large amount of moisture and still feel dry.

## B. Characteristics of yarn and cloth due to properties of fiber

1. **Luster.**—The luster of silk fabrics is due to the natural luster of the fiber. The luster is brought out in raw silk by boiling off the gum and then finishing the woven fabric. Pongee lacks luster because the fiber has not been degummed. The body and dull luster of gros grain are partly due to the fact that the sericin or gum is only partially removed. The natural luster is em-

phasized in satin by weaving the cloth so that the yarns on the surface all lie in the same direction and close together.

The luster of the silk fiber gives to the fabric its lustrous beauty, for which it is greatly in demand. This demand has led manufacturers not only to develop methods of cheapening the fabric by adulterating the fiber, but to substitute for it other cheaper fabrics with high luster, such as mercerized cotton and artificial silk.

2. **Durability.**—The wonderful strength of the pure silk fiber makes its wearing quality unexcelled. Many present-day silk fabrics do not wear well because they have been adulterated in such ways that the fiber deteriorates, not because silk in itself lacks wearing quality. (See Adulteration of Silk, page 13.)

3. **Absorptive quality.**—The very great capacity for absorption which silk possesses makes it take up very readily dye stuffs, gums, and mineral salts in solution. Most beautiful and brilliant colors are obtained in dyeing. The color is held by a chemical change as in wool. Through this power of absorption, silk may be made to increase weight enormously, and manufacturers have taken advantage of this in developing methods of "loading" or adding to the weight of silk.

4. **Capacity for collecting or shedding dirt.**—Silk has some things in its favor from the hygienic standpoint. It is so smooth that it sheds dust and is easily kept clean. Bacteria are not harbored on its surface as on the surface of wool fiber.

### Three Minor Fibers

#### Ramie, Jute, and Artificial Silk

##### A. Ramie

Ramie is a fiber which has been used for textile purposes in China and India for many centuries. It has only recently come into our markets.

The fiber is obtained from the stem of a plant belonging to the nettle family. It is separated from the woody part of the stalk as is the flax fiber but with far more difficulty, because the gum which holds the fibers together is not easily removed. Seen under the microscope, the structure of the fiber resembles that of flax, but it is larger and more strongly marked. It is pure white, strong, durable, and highly lustrous. It excels flax in luster and tensile strength.

This fiber is destined to be of great commercial value, for it will grow in the warmer parts of this country as well as in China. No efficient process of preparation has yet been found to compete with the cheap hand labor of China, and thus far most of the ramie used in textile manufacture in this country has been used as a substitute for linen, as in the fabric which is called "ramie linen." The so-called Chinese linen or grass-cloth, used for the Chinese and Japanese embroideries frequently imported into this country, is a native fabric made from ramie.

##### B. Jute

Jute is familiarly known as the material from which ordinary bagging or gunny sacking is made. It is a fiber obtained from the stem of a plant which grows in India, and has been imported in large quantities for use in the manufacture of sacking because it has been cheaper than cotton for this purpose.

This fiber is relatively weak as compared with linen and ramie, and when exposed to dampness it very quickly deteriorates. Consequently fabrics which

contain jute do not wear well. It is used as an adulterant in cheap rugs and carpets and in drapery and upholstery fabrics. Of late years it has been found mixed with wool in some novelty dress fabrics and men's suitings.

### C. Artificial or fiber silk

Artificial silk is not "silk," as its name might indicate. It is made by artificial means from wood pulp or cotton. The wood or cotton is treated with chemicals and made into a gelatinous mass, which is forced through very tiny tubes in an apparatus called a spinning frame. It comes out from these tiny spinnerets as fiber, which is solidified in a liquid and then wound into skeins.

Because of the beauty and value of the true silk fiber, many attempts have been made to imitate it, but nothing has ever been produced that is comparable to the silk itself. However, the more recent attempts have produced a valuable fiber. The chief characteristic of the imitation product is its high luster, which is superior to that of natural silk. In all other respects it is far inferior. Its greatest drawback is its behavior with water. It loses its strength when wet and shows a tendency to go to pieces in water, altho it does not turn yellow in washing as silk does. It is used as a substitute for silk in many materials which do not need constant washing, as drapery fabrics, braids, passementerie ribbons, sweaters, scarfs, and dress fabrics. It is often sold as silk.

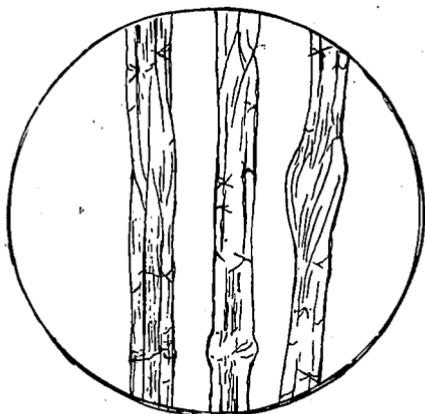


Fig. 5. Ramie Fibers, Magnified About 400 Times

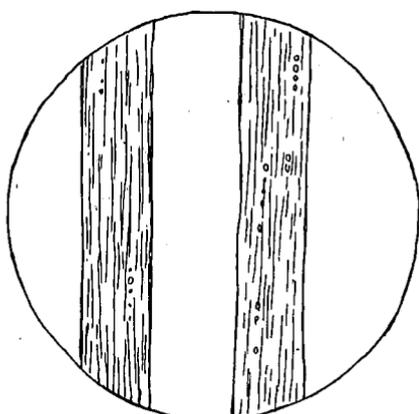


Fig. 6. Artificial Silk Fibers, Magnified About 400 Times

## FABRICS

### Points for Consideration of Purchaser

The woman who buys the textile fabrics for her home should know some of the better standard grades. She should be able to recognize their general characteristics by feel, appearance, weight, and firmness of weave structure. She should know prices and widths, and what to expect from material of standard grade. Her judgment of fabrics in general should be based upon this knowledge.

She should have some acquaintance with the types of weave structure and be able to judge of the desirability of the more common weave designs. She should also know something of the methods by which cloth is cheapened, and be able to detect the imitation.

This knowledge will be gained partly through experience in buying. Reliable stores buy, so far as they are able to know, from manufacturers who

produce honest materials, and one can obtain much valuable information from the buyers in stores.

### Standard Versus Novelty

By standard fabrics is meant those woven materials which become familiar to the purchasers of clothing and household furnishings through their experience in buying year after year. They are found to be the same in their general characteristics season after season varying slightly in price, perhaps, and are used for the same purposes. Variations in price for different grades, mean a corresponding variation in the quality of the fabric. An all-wool serge may be bought for almost any price from \$1 per yard up to \$4, but with the variation in price goes variation in width, in quality of fiber and dye used, in amount of wool per square yard, in quality of finish, and in closeness and firmness of weave. Among the more common standard fabrics are serge, broadcloth, flannel, gingham, calico, chambray, lawn, sheeting, cambric, longcloth, linen crash, huck, damask, satin, velvet. Many fabrics that appeared as novelties at first, have proved their wearing qualities and have become standard.

The many novelty fabrics on the market show how skillfully the manufacturers have succeeded in meeting and encouraging the demand for variety and change. This is shown by the number of new names, colors, weaves, and methods of finishing that appear each season. A new novelty fabric sells at a higher price early in the season than it does later, and usually the lowest price is out of proportion to the quality of the material. Some of the new fabrics that appear from time to time are really the old standard fabrics under the disguise of new trade names, based on new methods used in the finishing processes. These fabrics bring high prices at first, but later find their place at a reasonable price among the standard fabrics.

Woolens and worsteds are two standard classes of wool fabrics, the main difference between them being that woolens are made from uncombed yarns in which the fibers are crossed and intermixed, while worsteds are made from combed yarns in which the fibers have been made to lie parallel to each other. Woolen cloth is softer than worsted, the yarns being more or less felted, and the weave structure being covered up in finishing, as in broadcloth. Worsted cloth shows the weave clearly, as in serge, is smooth and very firm, and gives better service in the utility garment than does the woolen fabric for the same money.

### Weave Construction

The weakness or strength of cloth, aside from the quality of the yarn, depends upon the way in which it has been woven. A fabric with close, firm weave has a strength and durability that is entirely lacking in one made from the same yarn, but with a loose, open weave. If the yarns in cloth pull apart along seams, if they are pushed on each other in laundering or in places where strain is applied, if they catch on rough surfaces, the fault is largely in the weave structure.

The weave structure is one of the elements of design in a fabric, and the design may be the determining factor in the choice of a fabric for a given purpose. It often happens that a novelty fabric with a fancy weave structure, from the standpoint of service, has no enduring quality.

The weave designs fall into three groups—(a) the plain or tabby weave; (b) the diagonal or twill weave; (c) the fancy weaves.

a. The plain or tabby weave shows the simplest alternation of yarns, as found in voile, muslin, Panama cloth, and brilliantine. The derivatives or

variations from the simple tabby are found in the basket and rib or cord weaves, in which groups of two or more filling yarns cross one, two, or more warp yarns. In weaving these fabrics it is impossible to push the yarns together closely enough to eliminate all spaces. The plain weaves are, therefore, used for many fabrics in which space between the yarns is desirable, as in cloth for summer dresses, underwear, curtains, and draperies.

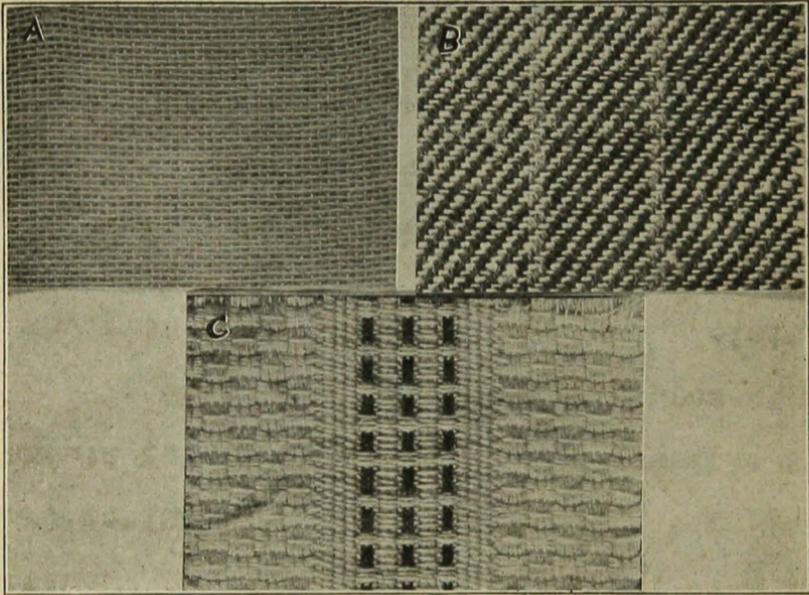


Fig. 7. Weave Designs

- A. Plain or Tabby Weave (wool voile).
- B. Diagonal or Twill Weave (cotton serge).
- C. Combination of Rib and Basket Weaves (cotton suiting).

b. The diagonal or twill weave always forms a diagonal line across the material, as in serge, whipcord, gabardine, denim, and foulard. The satin weave is derived from the twill, and if examined closely the diagonal may sometimes be distinguished.

In this type of weave construction the short floating segments of the yarns are pushed together in the weaving and lap over the spaces so that the cloth has a very close, firm texture. Unless the floating yarns are so long that they are likely to catch on obstructions, as in some wool whipcords and diagonal cloths, satins, and fancy novelty twills, the twill weave makes the firmest and most durable fabric.

c. The fancy weaves are worked out primarily for variety in design and are usually combinations from the first two groups. Certain ones have, however, come to be regarded as standard from the standpoint of utility, such as the huckaback and birdseye, which are recognized as especially desirable for toweling, because the groups of more or less floating yarns add to the absorptive power of the fabric. The fancy weaves are generally to be avoided, unless they have stood the test for utility and good design.

## Substitution, Imitation, and Adulteration

The skillful devices by which the manufacturer has succeeded in making many fabrics appear to be what they are not, should become a matter of common knowledge to the buying public. The standard fabrics of good medium grade are usually found to be as they are represented. It is in the cheap grades, and in novelty fabrics that the real quality is likely to be disguised. The disguise is accomplished (a) by adulterating the fabric with a low grade or cheaper fiber; (b) by increasing its weight with something which either the fiber or the cloth will absorb or hold in its meshes; (c) by substituting one fiber for another; (d) by imitating in a cheap fabric by means of the finishing processes the characteristics of a better grade material.

### A. In cotton fabrics

No textile fiber is cheaper or more plentiful than cotton, and the demand for cotton cloth is enormous. There is no reason why this demand should not be met with material of good quality. However, cotton fabrics of poor grade are given the appearance of high grade materials in various ways.

1. **By sizing.**—The sizing of cheap, loosely woven, cotton cloth with starch, gum, glue, china clay, or marble dust, gives firmness, body, and luster to the fabric. All of these properties will disappear in rubbing or washing. Moreover, the strength and wearing quality of the cotton are often decreased by injurious chemicals used in the sizing.

2. **By finishing.**—By various finishing processes cotton fabrics are given the appearance of mercerized cotton, linen, or even silk. Deceptive trade names are sometimes attached to such fabrics, or they are put on the market as genuine and sold at the prices charged for honest materials. Because of its cheapness, a great deal of cotton is used as a substitute or adulterant for more expensive fibers. "Flaxon" and "linon" are pure cotton, altho their names would indicate that they are made of linen. The cheap cotton poplins are sold as mercerized, but the luster which would seem to indicate mercerization is obtained in a finishing process called calendering.

### B. In wool fabrics

It has been estimated that if the world's entire pure wool clip were manufactured into cloth apportioned equally to people living without the tropics, each person's share would be 13.2 ounces of cloth, equal to a piece of summer weight cloth 44 inches square. It is easily seen from this statement that many wool fabrics must be more or less adulterated or the wool used in admixture with other fibers, in order to meet the necessary demand for warm clothing. Moreover, because of the felting property of wool, this mixture is often desirable, especially in fabrics that are to be laundered frequently. The purchaser, however, should not be deceived as to the grade and amount of wool in the cloth sold.

Cheapening of wool fabrics is accomplished as follows:

1. **By mixing cotton with the wool.**—Cotton and wool are mixed in the manufacture of many so-called wool fabrics. These goods should be sold as union fabrics. They furnish the required warmth, have the advantage of being cheaper, and in the case of washable materials, as flannels and blankets, launder better than the all-wool fabrics. The use of cotton and wool union fabrics will also help in the conservation of wool, which is becoming more and more necessary. The cotton is mixed with the wool in various ways, as follows:

a. All-cotton yarns are woven with all-wool yarns, as in brilliantine, where a cotton warp is used, or in the cheaper grades of shepherd's checks and plaids where certain groups of yarns are cotton.

b. A cotton yarn is twisted with a wool yarn, as in the warp of covert cloth.

c. Cotton and wool are blended before spinning, as in some flannels and in the yarns of many union blankets. Because of the felting quality of wool, the cotton present can easily be disguised, and the manufacturer has devised many ways of doing this. The result is that many wool and cotton union materials are sold to the purchaser as all wool, and neither the salesman nor the purchaser has any ready means of knowing the difference.

2. **By the use of remanufactured wool.**—The use of remanufactured wool in the form of different grades of shoddy is very general. Shoddy is made from worn wool garments and clippings from the clothing factories. This material is put through a machine in the shoddy mill which pulls it apart, and delivers it in a soft fluffy mass of fiber. This in turn may be spun directly into yarn, or it may be mixed with new wool or cotton, and then spun, and woven into cloth. In this way wool is used over and over again, each time being more worn, until it can no longer be used in even the cheapest fabric.

The present shortage of wool in this country makes it necessary that no worn wool clothing go to waste. A concerted effort should be put forth to conserve all such material, and turn it into the proper channels for remanufacture.

The shoddy in a fabric is easily disguised. Too often materials containing a large amount of shoddy are sold for high grade wool. The fibers of shoddy have not the wearing quality of the better grades of unused wool, and if such fabrics are sold as high grade the purchaser is being defrauded. On the other hand, the better grades of shoddy will give more satisfactory service than the poorer grades of new wool.

### C. In linen fabrics

Linen is more expensive than cotton and is therefore more often imitated and adulterated. The adulteration is difficult to distinguish, and the buyer is easily deceived, unless she is quite familiar with the characteristics of real linen. Linens are adulterated as follows:

1. Cotton is the fiber generally used as an adulterant for linen. Coarse, unevenly spun cotton yarns are made to imitate linen yarns; mercerized cotton is substituted for linen; cotton cloth is made to look like linen in the finishing; a cotton warp is used in cloth with a linen filling.

2. Some fabrics are adulterated with ramie and jute, which are cheaper than linen. Many cretonnes and drapery fabrics are found to be cotton and jute mixtures. However, increasing quantities of ramie goods are being sold under the name "ramie," as the superior qualities of this fiber are coming to be recognized.<sup>1</sup>

### D. In silk fabrics

The silk gowns of our grandmothers have been handed down to us from generation to generation, wonderfully preserved. The usual remark, however, made about silk of the present day is that it does not "wear well." It has been stated that no fiber has better wearing quality than silk, and the reason that present day silk fabrics do not wear well is because of adulteration. Silk is an expensive fiber, and desirable because of its beauty. Consequently, manufac-

<sup>1</sup> Ramie importations are largely cut off by the war, and at present very little or no ramie is being used by manufacturers.

turers have sought to meet the demand for cheaper silks by discovering methods of adulteration. Silk is adulterated or imitated in the following ways:

1. The most successful method of adulterating silk is by "weighting." The silk fiber loses from one fifth to one third of its weight in the boiling-off process, when the sericin is removed. The very high absorptive power of the fiber makes it possible to add this weight, and more, in a weighting bath. In fact, one pound of silk can be made to weigh three or four pounds. The weighting substances sometimes used are sugar, glucose, gelatin, paraffin; but in our modern dyeing mills the salts of the metals iron, tin, and lead are the usual weighting substances. Not only does the heavily weighted silk lose its strength, but in a very short time exposure to sunlight and wear will cause it to crack and fall to pieces.

2. Spun silk is of different grades, but is less lustrous than the reeled silk and lacks its strength. It is used in place of reeled silk in many instances, as in the silk stripes in men's suiting, and in the filling of silk fabrics. Ribbons, silk cords, embroidery floss, drapery silks, and very cheap dress silks are often made from spun silk.

3. Mercerized cotton is perhaps more generally used as an imitation silk than any other material. Many beautiful fabrics are made of mercerized cotton, but they should be recognized as cotton and not silk. Several companies manufacturing mercerized cotton embroidery floss which was advertised as silk, have recently been "advised" by the Federal trade commission to put out their products under more accurate names.

4. Artificial silk, with its wonderful luster and its resemblance to true silk, is much cheaper and less durable than silk. It is sometimes sold either directly as silk, or under a trade name which leads the purchaser to believe she is buying silk.

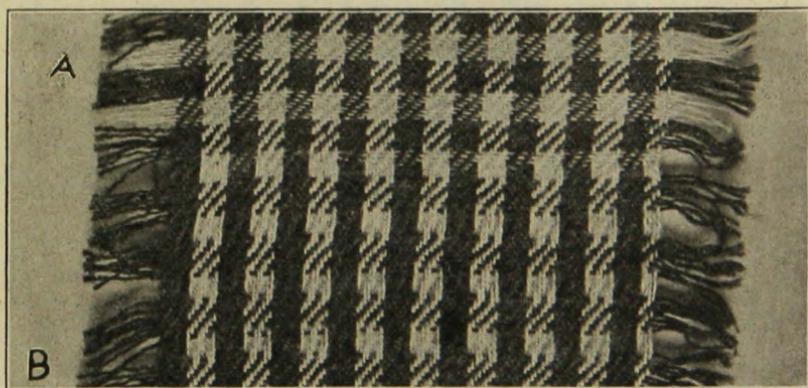


Fig. 8. Shepherd's Check, Mixed Cotton and Wool Fabric

A. Original Material.

B. White Wool Filling Yarn Removed, leaving black and white cotton warp and black cotton filling.

## SIMPLE AND PRACTICAL TESTS TO BE APPLIED TO FABRICS

It has been shown that a knowledge of textile fabrics is invaluable to the consumer. Familiarity with a few household tests is also essential in determining whether or not a fabric has the qualities claimed for it. Experience with the eye and hand will go far. A small magnifying glass called a "linen

tester" or weaver's glass will be of the greatest assistance in training the eye and hand in the examination of the yarns and weave structure. Such a glass may be purchased at any store where optical goods are sold, for from 25 cents to \$1.50.

The following tests are suggested as simple and practical in their application:

#### A. Tests for the identification of fibers present

1. A test for cotton and wool mixtures may be made, based upon the fact that animal fibers are destroyed by alkalis, as has already been pointed out. If a wool fabric is suspected of containing cotton, a sample may be boiled for half an hour in a solution of washing soda, star naphtha, pearline, or gold dust, following the directions for the identification of wool given on page 2. The wool will be dissolved out of the fabric, leaving the skeleton of cotton yarns.

2. The burning test is satisfactory if cotton yarns are combined with silk or wool in weaving. Cotton and linen yarns burn with a quick flame and an odor of burning paper; a small amount of fine powder is left as a residue. Wool and silk burn slowly and the flame goes out quickly. The odor is that of burning hair, and the residue is a hard, rounded mass. If, however, different fibers, as cotton and wool, are blended in the same yarn, burning is not a satisfactory test because the residue will show the charred globule of the wool and not the ash from the cotton.

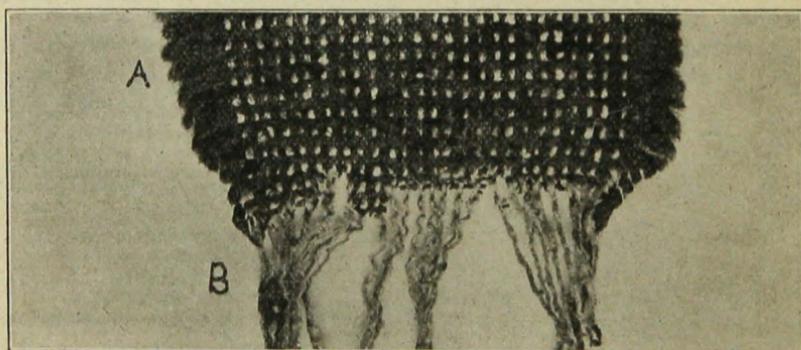


Fig. 9. Shoddy Fabric Boiled in Five per Cent Solution of Caustic Potash or in Lye Solution  
A. Original material.

B. Wool dissolved; alternate warp yarns of spun silk only slightly affected.

3. An examination of the yarns in a piece of cloth may help in forming a judgment as to the fibers present. Cotton and linen yarns break in different ways, the ends of the linen being stiff and uneven, and those of the cotton soft and fuzzy. Silk fibers are easily recognized by their luster. Wool fibers are identified by their dull, kinky appearance.

4. The oil test for linen is better than the old way of moistening the finger. A drop of olive oil or glycerin is placed on the cloth after the starch has been boiled out, and the cloth pressed between pieces of blotting paper and held up to the light. If cotton yarns are present they will appear opaque, while the linen become transparent.

#### B. Adulteration tests

1. White goods that are suspected of being weighted with clay or other heavy material filling the spaces between the yarns should be rubbed between

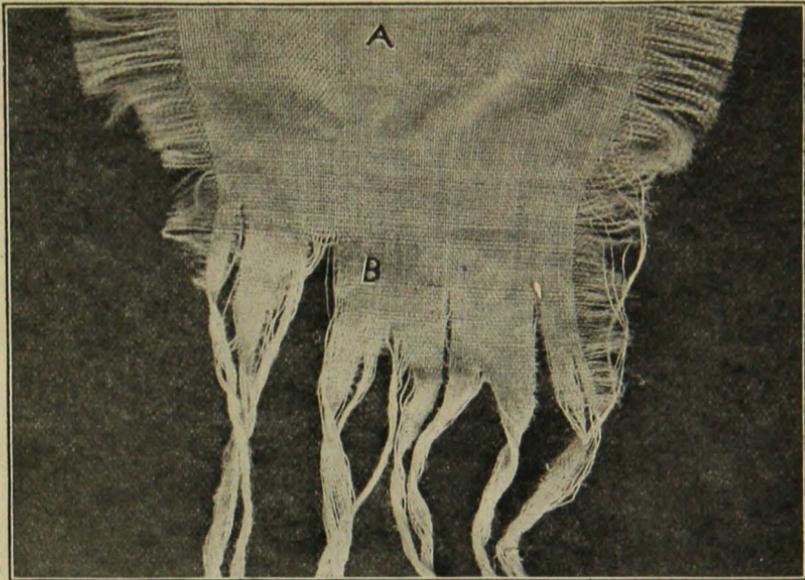


Fig. 10. Mohair or Brilliantine, Mixed Wool and Cotton Fabric Boiled in Solution of Washing Soda

A. Original material.

B. Wool dissolved, cotton remaining in fringe.

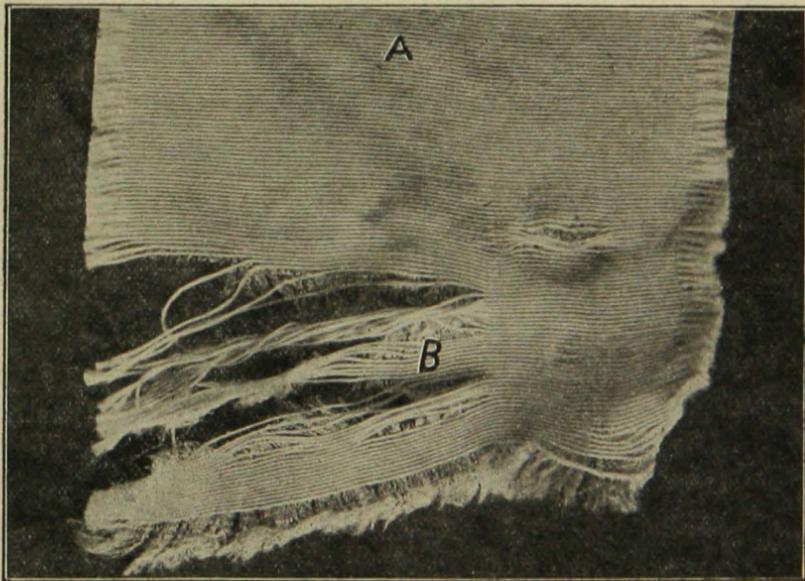


Fig. 11. Mixed Silk and Cotton Fabric Boiled in Solution of Lye for Twenty Minutes

A. Original material.

B. Silk warp yarns weakened, cotton not affected.

the hands or torn across. A cloud of dust will indicate weighting. If the material is held up to the light, the sleazy quality of the cloth will be revealed by the excess of sizing.

2. The amount of weighting in silk may be roughly estimated by burning a sample of the silk. If there is very little or no weighting, the burned edge shows a characteristic globular residue. If heavily weighted, the shape of the sample and of the weave construction remain. The silk is burned out, leaving the weighting.

#### C. Tests for fastness of color

Samples of the material to be tested should be mounted on a smooth surface with one half of the sample covered, and then exposed to strong sunlight and weather for a couple of weeks. To test the endurance of color in a wash fabric, the samples should be first washed in hot soapsuds, ironed, and then exposed to sunlight. Comparison of exposed samples with those which have been kept away from the light will show whether or not the colors are fast.

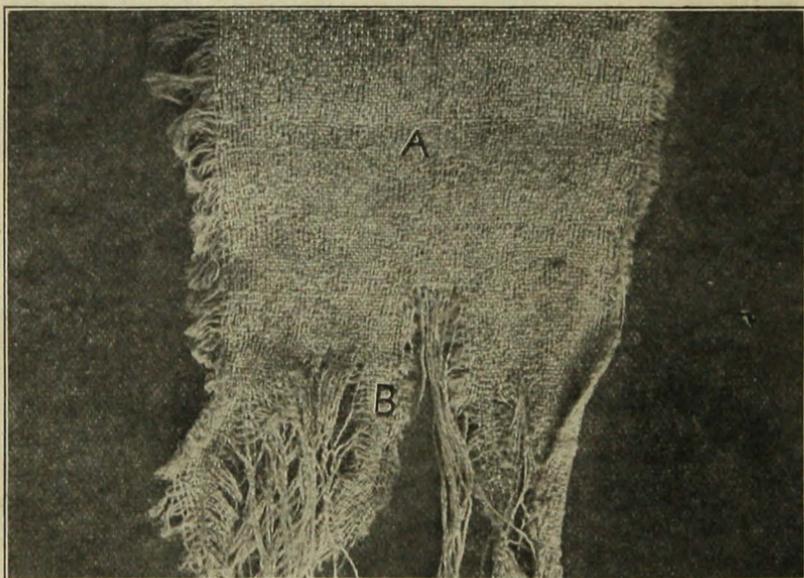


Fig. 12. Mixed Wool and Artificial Silk Fabric (Sold for Wool and Mohair) Boiled in Solution of Gold Dust

A. Original material.

B. Wool destroyed, the alternate warp yarns of artificial silk left uninjured in fringe.

#### D. Wearing tests

A test of wearing quality must take into consideration the use to which a fabric is to be put. To illustrate, a material that would give good service if used for curtains might not be at all satisfactory as a dress fabric.

1. The strength of the yarn in cloth largely depends upon the quality of the fibers. This can only be determined accurately with the compound microscope; but something can be learned in regard to the fibers used by drawing yarns from the cloth and examining the single fibers for length and strength. Experience in doing this will in time develop judgment of the quality of fibers.

2. The number of "counts" in cloth—that is, the number of warp yarns and the number of filling yarns to the square inch—is a measure of the durability. This can be determined for a standard fabric with the linen tester and a needle, and if the size of the yarns is noted, the hardness of the twist, and whether it is single or two-ply, a feeling for the fabric soon becomes fixed, and a basis for comparison will be established. To illustrate: A good medium quality of single damask shows 180 counts to the square inch each way, the finer grades showing a higher count, and the poor grades a lower count.

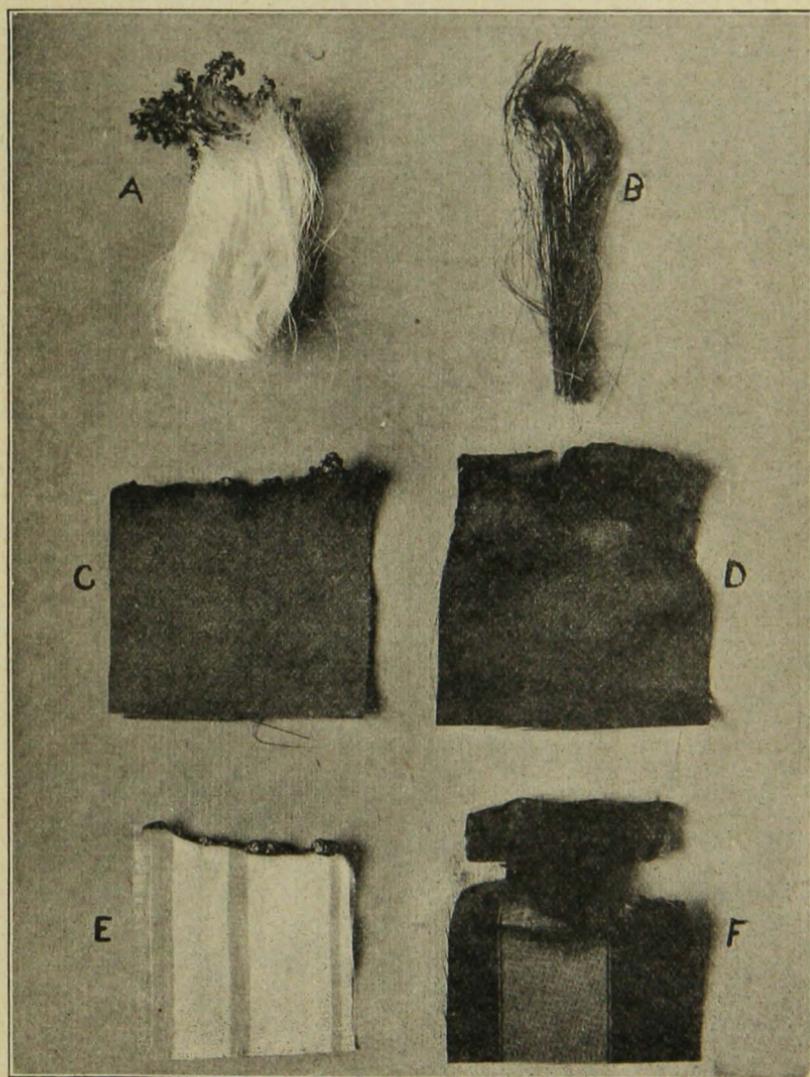


Fig. 13. Burning Test for Loaded Silk

- |  |                              |
|--|------------------------------|
| A. Residue from burning raw unweighted silk.         | D. Satin heavily weighted.   |
| B. Residue from burning heavily weighted silk yarns. | E. Taffeta lightly weighted. |
| C. Satin lightly weighted.                           | F. Taffeta heavily weighted. |

3. The closeness and firmness of the weave are factors in durability, and may be tested by holding the fabric up to the light, by drawing the fingernail across the cloth, or by noting the pull on the yarns in a seam.

#### USEFUL HINTS FOR THE SHOPPER

1. Do your buying at the store that has the reputation of handling honest goods.

2. Standard materials are generally what they are represented as being. Learn from merchant or buyer what are the standard grades and trade names.

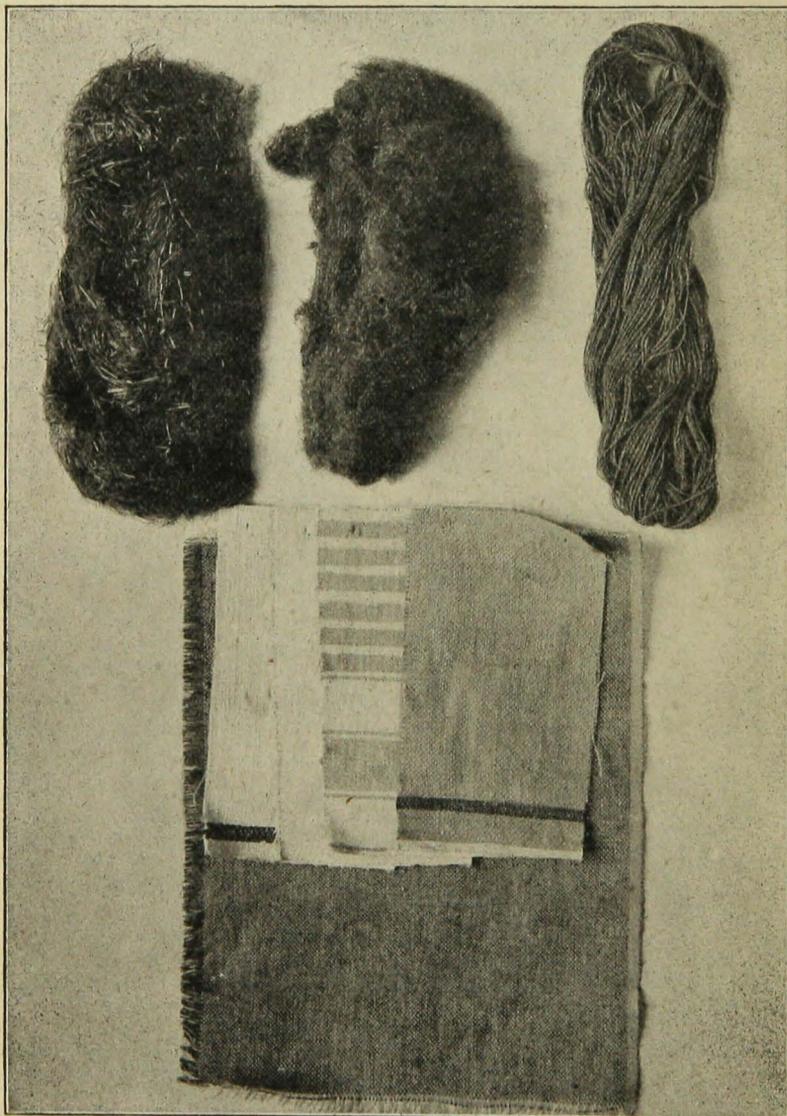


Fig. 14. Minnesota Flax Straw Used in Toweling and Crash, Duluth, Minnesota

Know these fabrics and learn to judge for yourself of the quality of other fabrics by comparison.

3. As a general rule, if you wish durability avoid buying sale specials, and the novelties of the season.

4. Consider carefully width of material with relation to price per yard and economy in cutting. According to investigations of the possibilities of cutting for ready-to-wear women's garments, 54-inch material cuts to the best advantage.

5. Know the amount of material needed for your purpose when you go to buy. Do not depend upon the salesman to tell you.

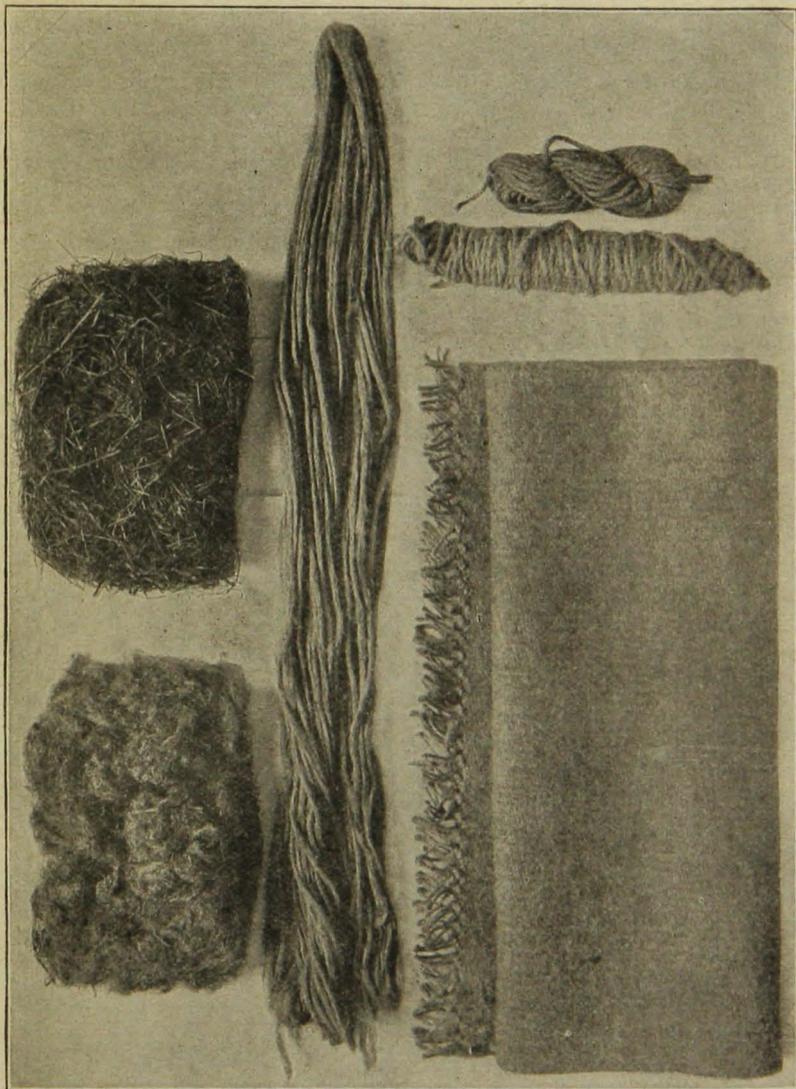


Fig. 15. Minnesota Flax Straw Used in Rugs, Duluth, Minnesota

6. A good salesman will cut off material by a cross thread, thus avoiding waste for both purchaser and seller. See that this is done.

7. In buying wool fabrics, select firmly woven worsteds, such as serge, epingle, and gabardine, for service. Woolens, such as broadcloth and velour are more dressy, but cost much more and will not stand the same wear and tear.

8. Avoid cotton and wool union fabrics in which groups of cotton yarns appear. The wool will shrink more than the cotton in sponging, pressing, or wetting, giving the surface of the fabric a wavy effect as a result. In a wool and cotton mixture like covert cloth, where cotton and wool yarns are twisted together in a two-ply yarn, no difficulty is experienced.

9. Avoid buying for dresses or suits the loosely woven basket cloths or any material in which the yarns push on each other. The garment will pull out of shape and yarns will push at the seams.

10. The buying of silk is a lottery. As a rule, do not buy silk remnants or silks that have been in stock more than six months or a year. If they are heavily weighted, they will not be worth making up.

11. Do not buy cheap silks. They may be heavily weighted and marked down to close out the stock. They may be made of a cheap grade of spun silk. They may not be silk at all.

12. The soft crepe silks and taffetas at \$2 a yard and up are not likely to be over-weighted, but the stiff, rustling taffetas at from \$1 to \$1.50 a yard are heavily loaded.

13. It is wise to buy for every-day underwear muslin, longcloth, or cambric at from 18 to 25 cents a yard.

Prices of fabrics are so rapidly advancing that the figures given may have to be advanced from 20 to 50 per cent.

14. It does not pay to buy or to make up into dresses cotton fabrics like gingham, chambray, poplin, that do not prove to have fast colors.

15. Colored mercerized cotton fabrics are more expensive than the unmercerized fabrics, but the colors are more likely to be fast.

16. Yarn-dyed and yarn-mercerized cotton fabrics are of better quality than piece-dyed and piece-mercerized.

17. Colored linens do not wash well and commonly fade in sunlight, because the flax fiber does not hold the dye.

18. The high price of medium and fine grade linen damasks is making them prohibitive. The high grade mercerized cotton damasks will give far better service than the poor grades of all linen or linen and cotton union damasks.