CHAPTER VI
CLOTH FOR CLOTHING

Characteristics and Structure (Weave)

Importance. In order to know how to select and use clothing to advantage we must know something about the different raw materials and finished products that compose it, such as cloth, furs, leather, etc.

As clothing is made for the most part of fabrics called textiles, everyone should understand the nature and value of clothing material so as to buy with judgment and economy, and be a more intelligent consumer.

Clothing is selected for a definite purpose, such as (1) occasion, (2) type of person, and (3) to utilize a certain fabric. The artistic appeal suggests that clothing should be selected for style — which means “line,” form, and color becoming to the wearer.

Cloth. What is cloth? It varies in composition, structure, and finish. If we look at a piece of muslin, broadcloth, satin, etc., we shall find that they differ in touch or feel, smoothness, warmth, shine (luster), etc. These differences are very valuable, since they allow us to have a wide variety of clothing.

If we examine cloth very closely, unraveling it, we shall find the yarn or threads are composed of short lengths called fibers. These fibers vary in nature but they can be twisted into threads that can be interlaced into cloth. The cloths differ because the individual fibers that compose the fabrics differ. Therefore it is important to study the characteristics of the different fabrics.

The kinds of cloths according to composition or nature may be divided into (a) cotton, (b) worsted, (c) woolen, (d) silk, (e) rayon, (f) linen.
Cotton. Cotton is valuable for clothing for the following reasons:

1. It is suitable for summer wear because it is cool to the touch, due to the fact that it is a conductor of heat, that is, it allows heat from the body to pass off.
2. It is reasonable in price, is very serviceable, and is adapted to a variety of purposes.
3. Any degree of body or thickness may be given to it after washing and rinsing by the addition of sizing, starch, etc.
4. It shrinks only when it is loosely woven, due to the loss of sizing.
5. While it crushes and wrinkles easily, it does not lose its shape.

Other qualities important to note are:

1. In many cases it is not fast to bright colors, except when vat and sulphur colors are used.
2. It requires frequent washing and starching, hence involves much labor, which makes it unpopular with many people.
3. Often cotton cloth is destroyed by what is called "mildew," which is caused by little living plants called moulds or bacteria. These appear on cloth that has been allowed to remain damp for a time and live on the cloth and starch. This may be prevented by adding to the starch or sizing of the cloth a small amount of an antiseptic like zinc chloride.

Cotton fabrics vary in fineness according to the fineness of the thread or yarn that composes them. The fineness of the thread depends upon the length of the cotton fiber: the longer the fiber, the finer the yarn or thread. Long-fiber cotton costs more than short-fiber.

The strength of the fabric depends upon the closeness of the thread and the degree of twist in the yarn or thread. The finer the thread the closer the weaving that is possible.

Cotton is raised by farmers in the warm parts of the world and the length and growth of the fiber depends upon the climatic conditions, such as warm days and cool evenings and proper rainfall. If the climatic conditions are not proper, then there is a scarcity of both the quantity and quality of the fiber.
CLOTH FOR CLOTHING

Cotton has suffered more than any other fabric from the change in fashion. Changes in the length of skirts and sleeves, the straight-line dress design, the decrease in the amount of clothing worn by women, and the vogue for dress designs that cannot always be suitably developed in cotton are some of the factors that have influenced the reduction in consumption of cotton fabrics.

Of all the fabrics that are used for clothing, cotton is the cheapest, the most generally used, and the one best adapted to a variety of purposes. It collects dirt quickly, but launders easily and can stand the high temperature of boiling, so with frequent changes it is a sanitary material.

Worsted. Examine a blue serge, which is a smooth-woven worsted fabric and is usually made of the fine wool that grows on the sheep’s back, and notice the following characteristics:

1. Worsteds have a special luster and a clear-cut surface, which gives them a distinctly smart appearance. They are valuable for fine suitings, etc.

2. In order to produce this smooth surface only the best and longest wool fibers can be used, and then they must be combed in order to have them all run in the same direction. Hence the worsteds cost more than the woolens. The smooth surface of the worsted fabric allows the weave to show, so that many attractive weaves give variety to worsteds.

3. Worsteds will stand hard wear on account of high tensile strength, due to long fibers and the twist in the yarn.

4. It is warm — a poor conductor of heat.

5. It holds its shape, due to elasticity.

6. It does not feel cold when damp, due to its power to hold moisture.

7. It is fast to sunlight, and has a great attraction for dye-stuffs.

8. It does not soil as easily as cotton, due to the smooth surface of the fiber.

9. It tends to shrink when washed with friction, due to the interlocking scales on the fibers.
10. It is adapted to purposes where warmth is required and frequent washing unnecessary.

11. Worsted fabrics will wear shiny, owing to the smoothness of the cloth.

WOOLEN AND WORSTED YARNS MAGNIFIED

a. Fine Worsted Yarn.
b. Fine Woolen Yarn.
c. Coarse Worsted Yarn.
d. Coarse Woolen Yarn.

I. Notice the projecting fibers in the woolen yarns which form the nap or fuzzy surface of the fabric. The worsted yarn has been combed, which prevents the fibers from projecting, hence the worsted fabric has a smooth surface.

II. Observe also that the fibers are in a more or less twisted condition, which is done by machinery and is called twisting. The twist is measured by the number of turns the yarn receives per inch.

Worsted fabrics are of two kinds, English and French. The English has more twist than the French, hence, is stiffer, "holds its shape," "stands up," does not wrinkle easily, but springs back in place after being creased. Hence, it is not adapted to draping and adheres to fine straight lines. The French, due to less twist, is softer, and is better adapted to draping. Of course, the best draping wool fabrics are the light-weight woollens, but they wrinkle easily and shrink badly.

Wool has a natural spring or elasticity which allows the fabric to spring back into its original condition. Wool fabrics that are subject to a great and prolonged strain, as sitting on a skirt
and bending one's knees against trousers, will wrinkle under these conditions.

Wool has scales on the fiber that allow dirt to cling to it; silk on the other hand has no scales or ridges; hence wool requires more vigorous treatment than silk in washing. Silk requires gentle treatment.

Cotton mixed with wool reduces the shrinking of the fabric by preventing the scales of the wool fiber from coming together too closely. Hence, fabrics of mixed cotton and wool are more desirable as wash fabrics.

**Wool.** Look at overcoating materials or tweeds, which are composed of wool of various kinds, and notice how they differ from worsteds:

1. Woolen is fuzzier and softer than worsted.
2. The fuzzy surface of the cloth covers up, more or less, the weave structure.
3. The fuzzy surface is due to the fibers not being parallel.
4. Woolens are made of various kinds of wools of different lengths. Even rags (remanufactured wool) are used more or less. Hence woolens are cheaper than worsteds.
5. Woolens shrink more than worsteds.
6. Soft, thin woolens will shrink more than thick ones.
7. Since woolen is made of wool fibers it has many of the properties of worsted — is warm, does not feel cool when damp, does not soil as easily as cotton.
8. Woolens will not wear shiny, as the surface is not smooth.
9. Woolens are not as strong as worsteds, as they lack the twist in the yarn.
10. Woolens do not hold their shape as well as worsteds, due to softness of the cloth.
11. They will spot more quickly than worsteds, and the spots are harder to remove, due to the nap.
12. Wool is subject to attacks by moths.

Wool (virgin) is obtained from the backs of live sheep and goats. An inferior quality of wool, called "pulled wool," is
obtained from the bodies of dead sheep and goats. Remanufactured wool is obtained from woolen and worsted rags or used wool fabrics. This remanufactured wool when mixed with virgin wool can be made into woolens, but not worsteds. While the number of sheep and goats remains about constant, the demand for woolens fluctuates according to style. At present people are demanding more and more light-weight worsted fabrics, which require the best grades of wool with good length of fiber. Remanufactured wool is often called shoddy.

Mohair. Notice brilliantine, mohair, serge, and plush, and note that owing to its brilliancy, elasticity, and durability, mohair is peculiarly adapted for certain special uses, as distinct as silk, wool, or cotton.

1. It has the appearance of wool without its suppleness.
2. It does not feel like wool, is dyed with great facility, taking with equal readiness all colors.
3. Its qualities of luster and elasticity eminently fit it for the manufacture of pile fabrics.
4. It is also extensively used in the manufacture of dress goods, camlets, serge, poplin, brilliantine, braids, shawls, rugs, loop yarns, and imitation furs.
5. The mohair used in weaving seal plush for women’s cloaks represents the finest quality of the fiber.
6. Ordinary grades of mohair mix well with soft medium wools and are thus used in the manufacture of hosiery, velvets, delaines, braids, tassels, trimmings, coat linings, cloakings, bindings, fringes, etc.
7. The best mohair plushes are almost indestructible.
8. Due to the coarseness of the fiber, mohair cannot be spun into a fine yarn, and hence cannot be woven as closely as wool or silk.

Silk. What is there about silk that makes it naturally attractive to everyone? Consider crepe de chine, and notice the following qualities:

1. Silk fibers are strong, and the strongest light-weight fabric is silk. The demand for silk fabrics is great and increasing because
CLOTH FOR CLOTHING

they are light and will outwear all other fabrics, as well as being exceptionally beautiful.

2. Silk is an expensive fabric, due to the care and expense necessary in producing it.

3. It is cool, because it conducts heat. It is not practical as clothing in cold weather, but makes comfortable garments in mild temperatures.

4. It is a light-weight fabric, because the silk fiber is very fine.

5. It sheds dirt and keeps clean, because the fibers are very smooth.

6. Silks are difficult to wash, due to the injurious effect of friction and the action of soap in deposits of liquids. Therefore great care must be exercised in washing silk to have a neutral soap and little friction.

7. It is easily spotted, due to the delicate luster of the fiber.

8. It may be made heavy by the addition of salts of tin.

9. The fabrics hold their shape, due to the elasticity of the fiber.

10. Some silks will wrinkle and crease, due to the weight of the materials added.

Silk is obtained from the silkworm, whose care requires considerable human labor, hence its cultivation is restricted to China, Japan, Italy, etc., where labor is cheap. At one time more than half of the silk worms died, due to disease, before spinning their silken cocoons. The production of raw silk can and should be increased by educating natives in the care of raising of silk worms and eliminating disease from them. A new variety has been made possible by the establishment of a silkworm nursery for the propagation of disease-free silkworm eggs, according to the accepted Pasteur method. The eggs thus raised are distributed among farmers near Wusih, China, and the cocoons produced are reeled into the new variety.

The price of silk depends upon the quantity raised and the style demands for silk. As the result of scientific care in raising silk the quantity has increased to such proportions as to allow the average person to have some silk clothing, and in many
cases complete silk outfits. Compare this situation to that of years ago when only the rich could wear silk.

**Rayon.** Notice a piece of rayon or artificial silk and compare the characteristics and uses for clothing with those of genuine silk.

1. Rayon has a metallic luster, while silk has a deep pearly luster.
2. Rayon is made of wood pulp, while silk is the fiber secreted by the silkworm.
3. Rayon is not very strong compared to genuine silk.
4. Dampness and washing tend to weaken rayon.
5. The knitting industry is one of the largest users of rayon.
6. The price of rayon per pound is less than half as much as that of raw silk.
7. There are different grades of rayon.
8. Rayon burns as cotton does and leaves little ash except in the case of Celanese, which forms a ball as it burns.
9. It is stiff, non-elastic fiber, hence rayon fabrics do not conform to the curves of the body.

Rayon is made from wood pulp by different processes of solvents, hence we have different kinds. Celanese has less luster than other forms of rayon and resembles voile, but has a slight sheen.

Rayon, combined with other yarns, makes a very desirable fabric, for example:

(a) Combined with wool, it gives a warm and brilliant fabric.
(b) Combined with cotton, it gives a silk-like appearance.
(c) Combined with genuine silk, it increases luster and makes a very attractive cloth.

The word "rayon" means a textile fiber made by converting cellulose (wood pulp) into thread formation by means of chemical and mechanical process. While cellulose may be made from the yarn by different processes, and a different trade name given to the product of each separate process, as Celanese (cellu-
CLOTH FOR CLOTHING

lose acetate), to distinguish them, nevertheless they are advertised and sold as rayon.

The fiber of rayon varies with the style tendencies, as most of the fabrics are novelties sold under trade names.

During the last five years, rayon, which was originally called artificial silk, has become popular. Rayon’s particular advantages over the natural fibers (cotton, wool, and silk) have been an important factor in establishing its position in the textile industries.

It is said that the production and consumption of rayon have expanded on so large a scale in the last five years as to assure definitely the importance of its place among the textile fibers. Introduced as artificial silk, a substitute for real silk, it at first fell short of active competition with the natural fiber and for many years after its advent made comparatively slow progress.

Improved yarns and a better understanding of its characteristics have steadily enlarged its field. Cotton, wool, and linen manufacturers have found that it can be used to give a new decorative appeal to their products. More recently it has proved of similar use to silk manufacturers, and it now begins to encroach on the province of natural silk. Today it is established in the apparel, furniture, and decoration fields, with its limits still undefined.

Several years ago considerable dissatisfaction developed among manufacturers and consumers of rayon goods because of its low tensile strength and peculiar action toward dyes. Largely because of the chemical composition, rayon yarns and fabrics will not take the same dyes as silk, cotton, or wool. This situation led to numerous complaints. Rayons were heavy, extremely lustrous, and lacking in elasticity. Popularly known as artificial silk, the new fiber was discredited because it would not stand up under the treatment accorded silk or cotton.

Experiments with the manufacturing and dyeing processes have brought about great improvements in recent years, which have made possible effects unattainable before. Further chemical treatment has helped a great deal in subduing the high sheen, and in the case of one brand (cuprammonium yarn) tighter twisting of the filaments has done much to produce the desired effect. Efforts to improve elasticity and tensile strength of the yarns have not been so satisfactory, and the future should bring even better results.
Encouraged by the greater success of improved products, rayon manufacturers everywhere are striving to bring their yarns to perfection and are continuing the expansion of plant capacity at a high rate.

Rayon has shown itself more and more adaptable to use with the old textile fabrics and has proved invaluable in introducing novelty effects which have shown unusual sales appeal.

Rayon as a manufactured product has two great advantages over silk. Production can be expanded or contracted in response to demand, and the price can usually be predicted several months ahead. Real silk, being an agricultural crop, is subject to weather hazards and is in production from three to nine months before it is ready for the market. Projected output each year is determined by consumption in the season just past rather than by demand for the season ahead. Manufacturers of rayon, besides being free from disturbances by weather, are in close contact with their markets and can regulate operations accordingly.

Rayon’s future competition with wool and cotton is more problematical. Seasonal variations in styles may give rayon a comparative advantage intermittently, but cotton has wearing qualities and covering capacity that rayon manufacturers are not trying to simulate.

Wool consumption has declined notably, 15 per cent in the last five years. This is due to the increasing favor for lighter-weight clothes. Rayon has gained some of this loss, but it has been rather indirectly, for it is silk that has actually cut into fields hitherto taken up by wool. Two new processes are reported from Europe for the manufacture of wool-like fibers from cellulose, but these are not advanced as substitutes for wool, but as complements to wool in the manufacture of inexpensive materials.

Rayon is woven into almost every type of fashionable garment. Dainty underthings, luxurious negligees, dresses for afternoon and for evening wear, coats — there are rayon fabrics for every occasion. Rayon is also used in men’s wear and in children’s apparel. It is particularly effective in striped, patterned, and brocaded materials, and therefore is ideally adapted to draperies and upholsteries. Rayon makes the smart costume more beautiful, the inviting interior more charming.
Rayon fabrics are unusually supple and flexible. Their rich coloring, too, lends itself admirably to the subtle and exotic motifs.

In addition to the soft daintiness which recommends it to the designer, rayon underthings, readily laundered, long in service, appeal also to the most practical-minded wearer. Rayon unites the beauty of rich color and fine texture with the economy of lasting service.

**Linen.** Compare a linen and a cotton handkerchief, and notice the qualities that make linen valuable and superior in many ways to cotton.

1. It is expensive, due to the labor and care necessary in producing the fiber.

2. Linen is a stem fiber, which means that it comes from the stem of the plant and is naturally stiff. Therefore, it makes a stiff fabric which is not adaptable for draping purposes.

3. Because linen and silk are smoother than cotton, they are more sanitary as they do not absorb the dirt easily, and do not stain easily. Silk waists, underwear, bathing suits, etc., are really dirt resisting and therefore valuable.

4. Linen has a beautiful luster, due to the smoothness of the fiber, which reflects the light.

5. It does not take on dirt as cotton does, because the fibers are not so porous.

6. It requires frequent washing and rinsing, because the fibers are stiff and not elastic, hence it creases easily.

7. It is useful for toweling and handkerchiefs, because it absorbs water and dries quickly.

8. It is usually more valuable in the white, due to the lack of fastness of color.

9. It does not lint or become fuzzy with frequent washing, due to the longer fibers, as compared to cotton, which has a tendency to lint because of its shorter fibers.

10. It keeps its shape of high construction.

11. Cheaper linens are not serviceable and will not last any longer than mercerized cotton, and in some cases not so long, because they are made of tow fibers, loosely twisted and woven
and heavily sized. After the cloth is washed the sizing comes out, leaving the fabric soft.

12. Linen is less elastic and pliable than cotton and bleaches and dyes readily. Flax from all countries is woven into table linen, though very fine linen must have carefully prepared fiber.

13. Linen should be soft, yielding, and elastic, with almost a leathery feel. Fineness of linen does not always determine good wearing qualities.

14. The celebrated Irish linen is the most valuable staple in the market, and on account of its fineness and strength, and particularly its bright color, it attains an unapproachable excellence because the best processes are used throughout the entire manufacture.

French and Belgian linens, while fine in thread and attractive in design, are not as serviceable as Irish linens. Germany makes a good wearing linen, but not a large variety of patterns. They are often printed and dyed. Scotch linens are now used more than any other kind. These linens are lighter than the Irish, and have a silver white finish and stylish designs. The Belgian linens have more sizing than the Irish, although they are very attractive.

Linen is obtained from the stem of the flax plant. The care and conditions for obtaining the best linen from the flax require a great deal of labor which makes the cultivation of raw linen available only in a few countries like Russia, where peasant labor is cheap. While the linen is finished in other countries, of course, this supply depends upon the source of raw material. Hence if the raw material is scarce, due to war or other conditions, the price of linen is high. During the last generation, or at least since the War, the demand for linen has decreased due to lack of appreciation of the fine home decorations of linen, and because women are now using more labor-saving methods, such as breakfast cloths, etc. Movies, clubs, and bridge are taking time that used to be given to decoration of the home.

**Style Governs Demand.** The demand for cotton, wool, linen, rayon, and silk varies with the styles. Sometimes cottons are popular, at other times silks are in demand. Then again, the
quantity of cloth worn varies with the style. To illustrate: A comparison of the lightest costume worn in the summer of fifty years ago (1879) with the costume (summer) of today (1929) will show that the weight of the first was almost seven pounds, while the weight of the latter was between 16 and 20 ounces at the most. A fashion magazine of 1879 lists the summer wearing apparel as follows: (a) long cotton chemise, (b) whale-bone corset, (c) long, stiffly starched pantalettes reaching to the ankles, (d) corset cover, (e) short cotton petticoat, (f) long, full petticoat about five yards wide, with hamburg ruffles and a duster ruffle, (g) high shoes, (h) lisle stockings, (i) a dress of stiffly starched muslin two inches above the ground, with several yards of ruching about the neck. The sleeves were long, with velvet ribbon bands.

The costume of 1929 consists of (a) one very thin undergarment of glove silk which combines a (1) vest, (2) girdle, (3) brassiere, (4) step-in, and is so light that it can be crushed into the size of a pocket handkerchief, (b) a sleeveless decolette one-piece crepe de chine dress that ends at the knees. Also a pair of chiffon stockings.

Thus we see that the quantity and composition of textiles used depends to a large degree on styles. Since the population is fairly constant there must be a curtailment of textiles when the styles are running to costumes of limited size and weight and of scanty proportions.

Weave (Structure) of Cloth. A piece of cloth has a structure or body like the structure or body of a house, and this structure, which is commonly called a weave, gives the cloth its strength and in some cases its beauty. As we have many different types of structure of houses, each for a different purpose, so we have many thousands of weaves, varying in strength and beauty.

While the structure of all fabrics is popularly called the weave, technically speaking this is not true — as hosiery is considered a knitted, lace a plaited, and felt a felted fabric.

Nature of Weaving. Hold up to the light a very coarse piece of
worsted fabric and note the way the threads interlace at right angles. This method of cloth structure is called weaving. The strongest and most popular method of producing cloth is by the interlacing of at least two sets of threads at right angles. It produces a fabric that is very strong and yet allows ventilation to take place, which is not true of felted fabrics.

PLAIN WEAVE

TWILL WEAVE

Parts of a Woven Fabric. Every woven piece of cloth is made up of two distinct systems of threads, known as the warp and filling (weft), which are interlaced with each other to form a fabric. The warp threads run lengthwise of the cloth, and the filling runs across from side to side. The manner in which the warp and filling threads interlace with each other is known as the weave. When the word end is used in connection with weaving it always signifies the warp thread, while each filling thread is called a pick. The fineness of the cloth is always expressed as so many ends and picks to the inch. It is expressed thus 84x80, meaning 84 ends and 80 picks to the inch.

We can divide all the weaves into the following classes:
1. Plain weave — like muslin and taffeta.
2. Twill weave — like serge.
3. Sateen weave — like silk satin.
5. Double cloth weave — represented by overcoatings with a back different from face.
6. Tubular weave — like pillow cases.
7. Pile weave — like velvets and plushes.
8. Lappet weave, found in dotted swiss.
9. Gauze or leno weave — represented by marquisette.

Plain or Homespun Weave. Plain cloth is the simplest cloth
that can be woven. In this weave one series of threads (filling) crosses another (warp) at right angles, passing over one and under one in regular order, thus forming a simple interlacing of the threads. It is sometimes called a plain or homespun or tabby weave.

This combination makes a strong and firm cloth. It gives a very light fabric, but does not give a close or a heavy cloth, as the threads do not lie as compactly as they do in other weaves. In plain cloth, if not fulled or shrunk in the finish, the result is a fabric perforated with large or small openings (see illustration) according to the size or twist of yarn used. If heavy or coarse threads are used, the perforations will be large; if finer threads, they will be smaller.

This weave is used in the production of sheeting, muslin, lawn, gingham, sometimes in broadcloth, taffeta, etc. It is commonly used when the cloth is intended to be ornamented with printed patterns. In weaving cloth of only one color but one shuttle is used, while for the production of checks, plaids, etc., two or more shuttles are required. These are called box-loom effects, because the portion of the loom holding the shuttles is called the box.

The plain weave was no doubt the first weave invented. Originally it was woven without any pattern, but as time went on inventive weavers found that decorations might be produced in the plain weave, as follows:

1. Introducing in the warp at stated distances a colored yarn which when woven produced a stripe effect.
2. Similar colored yarn in both warp and filling produced a check or gingham effect.
3. Introducing a thicker yarn at stated distances in the warp produced when woven a cord effect in the warp, like a repp.
4. Similar introduction in the filling would cause a cord effect in the filling, producing a poplin.
5. Introducing crepe yarn of left- and right-hand twist in the warp or filling or both would produce a crinkled appearance — crepe effect. Similar effects may also be produced by differences in the tension of the warp.

**Basket Weave.** Since the plain weave is not decorative in itself, a combination of the plain weave is used where two or more threads instead of one interlace. This weave is very popular and is used for woolens. It is known as basket (weave) cloth.
Twill Weave. Various successful attempts were made to produce a stronger fabric — one with either more ends or picks to the inch. This was done by having the pick interlace more than one thread at a time. From this formation we have the twills and sateens, fabrics that are more decorative than the plain weave and stronger in resisting friction or rubbing strain. The characteristic of the twill is the diagonal effect, and that of sateen the high luster due to smoothness of the fabric.

The twill is used extensively in worsted suitings. It is produced by having the filling thread interlace one and then more than one warp thread. Notice from the illustration that in the twill the interlacing moves one thread to the right with each pick as shown on the diagram above.

If there are the same number of threads to an inch in warp and filling, twill lines will form an angle of 45 degrees; if the warps are closer together than the filling, the angle will be steeper; if the filling threads are closer together, the lines will approach more nearly the horizontal. Different effects are obtained in patterns by variation in the size and twist of the yarn, by the use of heavy threads to form cords, ribs, etc., and by mixture of vari-colored materials in the yarn. Often one form of twill weave is combined with another to produce a fancy twill weave. The object of the twill weaving is to increase the bulk and strength of the fabric, or to ornament it.

Sateen Weave. While the twill has body and weight, it is necessary to give the yarn considerable twist in order to bring out the
diagonal effect to advantage. The additional twist makes the fabric appear rough. If the amount of twist is less and the diagonal effect is destroyed, the fabric is quite smooth, and naturally reflects the light and has a distinct luster. This is the object of the sateen weave. The sateen weave may be practically the same as the twill, except that the diagonal effect is destroyed by destroying the continuity of the diagonals.

**Satin Weaves.** To summarize: the object of a satin weave is to distribute the interlacings of the warp and filling in such a manner that no trace of the diagonal (twill) line will be seen on the face of the cloth. In weaving a satin design the filling is made to appear on the surface. In sateen weaving, either the warp or filling appears on the face. If the filling is on the face, then it is called a filling-face satin weave. A warp-face satin weave may be produced by reversing the order; in this case practically all of the warp is brought to the face of the cloth. In this way a worsted warp and a cotton filling might be woven so that practically all of the warp would show on the cloth, and give it the appearance of a worsted fabric. Many classes of silk goods are made in this way, with a silk filling covering a cotton warp.

This weave produces an even, close, smooth surface, capable of reflecting the light to the best advantage, and having a lustrous appearance which makes it resemble satin cloth. Satin cloth is made of silk, using a satin weave.

Satin weaves are used very largely in producing different styles of cotton-and-silk fabrics, and are also frequently found in woollen goods. They are extensively used in the manufacture of damask and table-covers. Satin stripes are frequent in madras, shirtings, and fancy dress goods in connection with plain and figured weaves.

**Jacquard.** Notice the large woven design in a piece of damask, and see that it runs the length of the pattern. Note also the large number of threads in the pattern — 500 more or less. Compare this number with the few threads in the repeat of a plain weave — two — and the twill and sateen weaves (called dobbý designs) — five to fifteen. To obtain an elaborate design a special device, called a Jacquard, is added to the top of the loom. Hence a Jacquard weave is used to produce a fabric having a more or less elaborately woven design.
Double Cloth. Examine a piece of heavy overcoating. Notice the side pick and face of the cloth; tear it apart and note how it is attached. A very heavy fabric, such as is used in making ulsters, weighing 24 ounces or more to the yard, is usually woven as two separate fabrics, and then connected by threads. Consequently a double cloth must have more than a single warp and single filling.

The name double cloth is applied to fabrics produced by combining two single cloths into one. Each of these single cloths is constructed with its own system of warp and filling, the combination being effected in the loom by interlacing some of the warp and filling threads of one cloth into the other at certain intervals, thus fastening them securely together. The reasons for making double cloth are many. Sometimes it is done to reduce the cost of heavy weight fabrics by using cheaper materials for the cloth forming the back. It may be used to produce a double-faced fabric. It allows great freedom for the formation of colored patterns which may or may not correspond in design on both sides. More frequently the object is to increase the bulk or strength of certain kinds of fabrics, such as heavy overcoatings, cloakings, pile-fabrics, golf-cloth, rich silk, etc. A double cloth may include two warps and two fillings, or two warps and a single filling.

Tubular Weave. Tubular weaving is similar to double cloth weaving, only the fabrics are woven together at the edges. Such is the method in practice for making pillow cases, pockets, seamless grain bags, etc.

Pile Weave. Examine a piece of velvet, velveteen, or plush. Notice the back and the face of the cloth. Note that the upright face (called the pile) is made of threads projecting from the foundation cloth. Pile weave is a general term under which are classed numerous varieties of cloth woven with a pile surface, as plush, velvet, velveteen, and carpeting of various kinds. Turkish towels are an excellent illustration of pile weaving. A pile surface is a closely set, elastic face covering various kinds of woolen, silk, and cotton fabrics, and consists of threads standing close together, either in the form of loops (uncut pile) or as erect thread-ends sheared off smooth so as to form a uniform and even surface. In the production of a pile fabric a third thread is introduced into the weaving and formed into the loops, usually by carrying it over wires laid across
the breadth of the cloth. The wires are afterward drawn out, leaving the loops standing; then the loops may be cut so as to form a cut pile, as in velvet and plush, or they may be left in their original form, as in Brussels carpets and Turkish towels. A more economical way of producing pile fabrics is to weave the fabrics as a double cloth, with a single thread interlacing both fabrics. Then the intervening thread is cut, leaving two distinct fabrics, each with a pile effect.

**Lappet Weave.** Examine a piece of dotted Swiss and note the embroidered design on the plain-woven fabric. The weave that produces this and similar small designs is called the lappet weave. This form of weaving imitates embroidery and is used mainly in plain and gauze fabrics. This weave is produced by a special device (called a lappet) attached to a regular loom, which affects the using of the warp threads so that the design is produced intermittently. The filling threads that do not form part of the design remain, are free or loose threads on the wrong side of the cloth, and are cut off by the finishing machine. Of course, these same effects may be produced by a Jacquard, but it is more expensive. Elaborate designs are beyond the range of lappet weaving, but there are many small effects that can be economically produced in this manner, such as the detached spots in dotted Swiss, and narrow and continuous figures running more or less into stripes.

Fabrics constructed or made of the lappet weave, such as high grade dotted Swisses and figured voiles, are usually light fabrics, and are not substantial in structure, and therefore not suited for hard wear.

**Gauze Weave.** Examine a piece of marquisette and note the open work of the weave and at the same time note the strength of the fabric. A fabric with open work made on the plain weave is not very strong, hence the need of a reinforcement to give it strength. This additional strength is given to the fabric by a modified plain weave, called gauze or leno weaving, which departs from the usual straight lines of the warp, as shown in the sketch on page 188.

Gauze is especially characterized by its openness, and forms the lightest and strongest fabric with the least material. Gauze fabrics are designed for women’s summer gowns, flounces, window curtains, etc. When gauze is combined with plain weaving it is styled leno.
In gauze weaving not all of the warp threads are parallel to each other, but are made to intertwist more or less among themselves, thereby favoring the production of light, open fabrics, in which many ornamental lace-like combinations can be obtained.

The structure or weave of the gauze fabrics, such as marquisette, is very strong and firm, due to the twisting of the warp yarns about each other. In addition, this twisting of the warp yarn gives a decided artistic and attractive effect to the cloth.

**Construction.** The number of threads in a fabric is a very important element in its construction. Hence a quick method for determining this fact is very useful. Such an instrument is called a counting glass and is a magnifying glass of various forms and dimensions, but commonly of small size. The counting glass commonly used consists of a small, round magnifying lens set into a thin square piece of metal, hinged to an upright, which latter is hinged to a foot-piece in which there is a square opening. The size of the opening ranges from one-fourth of an inch square to an inch square. The three pieces composing the instrument can be folded together in a compact form convenient to carry in the pocket.

While the woven fabric is a very popular fabric, there are other methods of manufacturing cloth, according to the structure or the way it is put together: (a) felting, (b) knitting, and (c) plaiting, in addition to (d) weaving.

**Production of Cloth by Felting.** Felting is the process by which cloth is made by pressing strands of wool into layers and then pressing the layers together. This method of producing cloth is very
serviceable, as it makes it possible to have layers of any thickness that may be moulded and curved into permanent shape, in addition to the fact that they are strong and waterproof. Hats, linings, and shoes are made of felt. The disadvantage is poor ventilation.

**How Felt is Produced.** Since wool fiber is covered more or less with little scales, all pointing in one direction, these scales, combined with the curling tendency of the fiber under the influence of heat and moisture, produce the felting qualities of wool. Washing tends to make woolen or worsted fabrics felt.

![Plain Stocking Fabric](image)

**Plain Stocking Fabric**

**Knitted Fabric Structure. Stockings.** One of the most important pieces of clothing is the fabric worn on the leg and foot, called a stocking or hose. Notice carefully the elasticity of hosiery and jersey cloth. This elasticity is not found to any degree in a serge. Hosiery is constructed as a knitted fabric, while serge cloth is woven. Knitting is the second of the fundamental methods of making fabrics, and is distinguished from weaving by the fact that knitted fabrics are made by a single thread, while weaving has two threads at right angles.

**Knitting.** The terms knitting, netting, and knotting indicate varying methods of manipulating a single thread for the purpose of producing elastic and pliable fabrics.

The art and process of forming fabrics by looping a single thread, either by hand with slender wires or by means of a machine provided with hooked needles, is called knitting. Knitting may be made on either a circular group or straight row of needles. The circular machine produces a circular fabric, and the straight or flat machine a flat one. Crocheting is quite similar to knitting, but differs from it in the fact that the separate loops are thrown off and finished by hand successively, whereas in knitting the whole series of loops which go to form one round or length is retained on one or more needles while a new series is being formed on a separate needle. Netting is performed by knotting the product the knitter
made. The elastic feature of a knitted texture renders it peculiarly adapted for all classes and kinds of undergarments, for it not only fits the body snugly, but expands more readily than any other fabric of similar weight.

The essential characteristics of good hose are: (1) That they should be so knitted as to conform to the foot of the wearer. (2) That they should be thickened or reinforced where the greatest weight and friction come.

The essential characteristics of good underwear are: (1) It should be made from elastic cloth, which implies a knitted fabric. (2) It should be porous in a high degree — whether in winter weight or summer weight.

Examine different kinds of stockings (such as the cheapest, medium, and high grades) and see if you can distinguish or detect any differences in the structure or manufacture.

**Hosiery Manufacture.** According to the particular method by which socks and stockings are made, of whatever kind, quality, or material, they are classed as cut goods, seamless, or full-fashioned. Of the three methods of manufacturing the first-named is the least expensive.

*Cut goods* in hosiery are made of a round roll of cloth about the width of a sock or stocking when pressed flat. While some very creditable hose are produced in this way, yet the presence of the heavy seam is an objection which confines their use to the poorest class of trade. Cut goods are made in all sizes and kinds for men, women, and children.
Seamless Hose. Seamless hose are made on a specially constructed machine which produces the entire stocking, but leaves the toe piece to be joined together by a looping attachment. On half-hose the leg is made the same size down to the ankle, but on ladies' hose the stocking is shaped somewhat in the machine. Seamless hose are not, strictly speaking, entirely seamless, inasmuch as all stockings made on a circular knitting machine must have a seam somewhere. There must be a beginning and an ending. In the case of the stocking the ending is at the toe, and the opening left can only be closed with a seam.

Full-fashioned Hose. Full-fashioned hose are produced by means of complicated and expensive knitting frames, which automatically drop the requisite number of stitches at the ankle so as gradually to narrow the web down and give the stocking the natural shape of the leg. The toe is produced in the same way, and the shaping of heel and gusset is brought about in like manner. Hence, the goods are called full-fashioned, because so fashioned as to conform to the proportions of the leg and foot. The first operation consists of knitting the leg down to the foot; then the legs are transferred by expert workmen to another frame, which knits the foot. Next they go to another department where, with the aid of a special looping machine, the heels and toes are stitched together. Then the stockings or socks are handed over to expert women operators, who seam up the legs on a machine especially adapted for the purpose. After being sorted they are dyed, boarded, stitched, dried, and finally subjected to heat and pressure to give them a finished appearance. Full-fashioned hose are made in all shades and grades of silk and cotton, in lisle thread, and in all kinds of cashmere, merino, and woolen goods. They are likewise knitted plain, ribbed, and with fancy stripes and embroidery effects.

Knitted Fabrics. While we may think of hosiery and underwear when we speak of knitted fabrics, there are many other possibilities for them, such as knitted outerwear — sweaters, dress accessories, lingerie, infants' wear, and sport coats and hats.

The fact that knitted fabrics can be shrunken and napped means that the cloth can be given a firmness and nap to cover loop construction, and made nearly equal to a woven fabric, thus making it adaptable for warm outer garments.
Nap knitted fabrics can be made into a strong, thin fabric of cotton, wool, silk, and linen and used for lingerie.

All knitted fabrics have an elasticity due to the softness of the yarn and the looped construction which allows the strain of the body movements on the garment to be evenly distributed. This elasticity prevents the knitted garments from wrinkling or destroying the appearance of the fabric.

Knitted fabrics are soft to the touch, which always makes them feel comfortable, and they readily absorb moisture, due to the structure and softness of the yarn.

The disadvantages of knitted fabrics are:
1. A tear will rapidly destroy the fabric, due to the dropstitching.
2. It is difficult to handle knitted fabrics in sewing.
3. Due to their structure, knitted fabrics are likely to stretch and lose the shape.
4. Due to the elasticity, knitted fabrics tend to cling to the figure.

**Plaited Fabrics.** Look at a piece of lace and notice the open design or pattern. Remember the method of producing handmade lace — a single thread interlaced with considerable freedom so that it is possible to make elaborate designs. Fabrics produced in this manner are called *plaited* fabrics. The knitted fabric is also made by the interlacing of a single thread, but the design is limited to either circular or straight-line effects.

**Lace.** The term *lace* may be used in two ways: specific and general. In a specific sense, lace is the name applied to the ornamental open-work of threads of flax, cotton, silk, gold, or silver, and occasionally of mohair or aloe fiber. The latter are used by the peasants of Italy and Spain. (Laces are discussed in more detail on page 426.)

**QUESTIONS**

1. Give a general description of the term "clothing."
2. (a) What is meant by "cloth"? (b) How does cloth differ? (c) Why are differences important in clothing?
3. What are the essential kinds of cloths?
4. Why is cotton a popular fabric for clothing?
5. What is meant by the expression "a good conductor of heat"?
6. Why is cotton reasonable in price?
7. How does one mean when he says "cotton is not fast"?
8. Why does cotton wrinkle?
9. Name some of the characteristics of a worsted fabric.
10. What is the exact difference between the manufacture of a worsted and a woolen?
11. Why has a worsted a smoother and better face than a woolen?
12. Which is stronger — a worsted or woolen fabric? Why?
13. Why is a worsted or woolen fabric warmer than cotton?
14. Does a worsted hold its shape? If so, why?
15. Which feels cooler when wet — cotton, woolen, or worsted? Explain in detail.
16. Which is faster to colors — woolen, worsted, or cotton? Why?
17. Which soils quicker — cotton or worsted? Why?
18. Why does woolen and worsted tend to shrink when washed?
19. (a) What causes a worsted suiting to wear shiny? (b) Does a woolen wear shiny in the same way?
20. What is meant by moth-eaten cloths?
21. Describe the fuzzy effect of woolens.
22. Which will hold its shape better — a woolen or worsted suiting?
23. Which will spot quicker, woolen or worsted? Why?
24. What makes silk more expensive than cotton or worsted or woolen?
25. Why is it possible to make lighter weight silk fabrics than cotton or worsteds or woolens?
26. Why does silk fabric keep cleaner than cotton or worsteds or woolens?
27. Why is it difficult to wash silk?
28. Why do silk fabrics hold their shape?
29. (a) Compare the luster and wearing qualities of silk and rayon. (b) State the reason for the differences.
30. Compare the style and wearing qualities of cotton and linen.
31. Why does linen cost more than cotton?
32. (a) What is meant by the structure of a fabric? (b) What is the popular term for structure? (c) Is this structure technically correct?
33. What are the characteristics of a woven fabric?
34. What are the principal points of a woven fabric?
35. (a) Name the principal weaves. (b) Give an example of a fabric resembling each weave. (c) What are the characteristics of each weave?
36. How are (a) cords, (b) stripes, and (c) checks produced in a plain weave?
37. (a) How is the cloth of a felted hat produced? (b) State the characteristics of a felted fabric.
38. Describe briefly the characteristics of (a) knitted and (b) lace fabrics.